

Spanish Greyhound



● **Spain**
Galgo Español

Other name: Galgo

Morphology: Graioid

♂ 24½-27½
inches
(62-70 cm)

♀ 23½-26¾
inches
(60-68 cm)



Grooming
Monthly



FCI	-
-	-

Short-haired
sighthounds

10

Spanish eyes



Spanish Greyhounds are sighthounds of good size with compact bones, a long, narrow head, a generous ribcage, well tucked-up belly and very long tail. Functional harmony and proportions are imperative at rest and in action. These are serious, aloof dogs with a lot of energy that show great vivacity on the hunt.



Descendant of the Asian sighthounds

Romans in Antique times were familiar with Spanish Greyhounds, and it is thought that they were introduced to the Iberian Peninsula prior to the arrival of conquering legions. Descendants of the ancient Asian sighthound, the Spanish Greyhound has adapted to various types of terrain, from steppe to plain. The breed was exported in great numbers, mainly to Ireland and England in the 16th century, and is said to be the ancestor of many other sighthound breeds.

Did you know?
Spanish Greyhounds, said by some to be among the ancestors of the Greyhound, also exist in a rough-coated variety, with harsh hair that can vary in length and tends to form a beard and moustache, as well as eyebrows and a tuft on the top of the head.

THE SPANISH GREYHOUND IN BRIEF

Head: Proportionate to the rest of the body, long, lean and without fleshiness.

Ears: Broad at the base, triangular, fleshy at the base, finer and thinner towards the rounded tip.

Body: Rectangular, strong and supple, exuding robustness, agility and endurance. Ample ribcage and very well-tucked up belly.

Tail: Strong at the base, set low, hanging between the legs, remaining in contact with the legs.

Colour: All colours, but the following are most typical, in order of preference: fawn and brindle, black, dark and light black flecks, burnt chestnut, cinnamon, yellow, reds, whites with white markings and pied.

Coat: Dense, very fine, short and smooth, over the whole body including between the toes.



● United Kingdom
Greyhound

Greyhound

The pacesetter in every sense



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Morphology: Graioid

♂ 28-30
inches
(71-76 cm)

♀ 27-28
inches
(69-71 cm)



Grooming
Monthly



10

Short-haired
sighthounds

FCI	AKC
KC	CKC

Did you know?
The Greyhound is the world's fastest dog and the archetype of the sighthound as its full potential is expressed in movement. Straight lines, amplitude and liveness in movement enable them to cover large distances at high speed. The hindlegs provide great impetus.

THE GREYHOUND IN BRIEF

Head: Long, moderate width, flat skull, slight stop.

Ears: Small, rose-shape; fine texture.

Body: Fairly long, broad, square back; powerful, slightly arched loins; deep, capacious chest with sufficient room for the heart; long, well-sprung ribs that are carried well back.

Tail: Long, set fairly low, strong at the base, tapering to the tip, carried low and lightly curved.

Colour: Black, white, red, blue, fawn, fallow, brindle or any of these colours broken with white.

Coat: Fine, close.



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Gone with the wind

Greyhounds are strongly built, upstanding and of generous proportions with powerful muscles and a harmonious formation. These are the ultimate racing dogs, built for speed and performance. They have a long head and neck; clean, oblique shoulders; a large, deep chest; arched loins; and powerful hindquarters. Their supple limbs add to their distinctive nobility. As well as being wonderful hunters, Greyhounds are suited to the life of a companion dog.

Photo opposite page : © Labat/Rouquette



● Ireland
Irish Wolfhound

Irish Wolfhound

Other name: Cú Faol

Morphology: Graioid

♂ 31-34 inches
(79-86 cm)
120 lbs
(54.5 kg)

♀ 28-34 inches
(71-86 cm)
90 lbs
(40.5 kg)

Grooming
Weekly



A sheep in wolf's clothing

So-called because they were bred to hunt wolves – not because they look like them! Irish Wolfhounds are extremely gentle companion dogs and make good guard dogs, protecting their human family from any threat.

Did you know?

"Lambs at home, lions in the chase." Up to the end of the 17th century, sighthounds were used in Ireland to hunt wolves and deer. They were also used to hunt wolves in a large part of Europe before the forests were cleared. Nowadays, they are renowned companion dogs.

10 Rough-haired sighthounds

FCI	AKC
KC	CKC

Celtic favourite

The Celts of Ireland, long interested in breeding large sighthounds, favoured the rough-coated variety to cope with the Irish climate. Unfortunately, as the wolf population dwindled, so too did the Irish Wolfhound and by the end of the 17th century the breed had become something of a rarity. Captain G.A. Graham initiated a renaissance, and a breed club was founded in 1885. Irish Wolfhounds have today regained some of the reputation they enjoyed in the Middle Ages.

Power and elegance

Certainly not as heavy or solidly build as the Great Dane, Irish Wolfhounds are more akin to the Deerhound in terms of general type. They are very big, imposing dogs with a lot of muscle - and elegance too.

THE IRISH WOLFHOUND IN BRIEF

Head: Long, carried high, forehead bones very slightly raised, very slight furrow between the eyes.

Ears: Small rose-shaped, like the Greyhound's.

Body: Long, well ribbed-up, rather long back; slightly arched loins; broad croup across the hips; very deep chest of moderate breadth.

Long, curved slightly, moderately thick, well covered with hair.

Colour: Grey, brindle, red, black, pure white, wheaten and steel grey.

Coat: Rough and harsh on body, legs and head, but especially wiry over the eyes and on the beard.



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Magyar Agar

Hard-working Hungarian

Magyar Agars have boundless energy. They are packed with swiftness and staying power. Prized for their endurance and resistance, some Magyar Agars even out-perform Greyhounds at some distances on the track. Naturally a little aloof, but never timid, this Hungarian breed is quick, intelligent, loyal and very vigilant.



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THE MAGYAR AGAR IN BRIEF

Head: Viewed from the side and above, wedge-shaped with a fairly broad base.

Ears: Good size, thick, set medium-high, well-carried rose ears, clinging to the neck.

Body: Long, muscular; well-developed withers; firm, broad, very muscular back; very broad, highly muscular; straight loins; broad, slightly sloping croup.

Tail: Set medium-high, strong, thick, tapering only slightly, curved a little, reaching the hock.

Colour: All sighthound colours and colour combinations are permitted, except blue, blue-white, brown, wolf grey, black and tan, and tricolour.

Coat: Short, dense, coarse, flat, in winter a thick, abundant undercoat may develop.



© Duhayer/Royal Canin



Morphology: Graioid

♂ 25½-27½ inches (65-70 cm)

♀ 24½-26½ inches (62-67 cm)



Grooming
Monthly



FCI	-
-	-

Short-haired sighthounds

10

Built for speed

Skulls unearthed on archaeological digs prove this breed's long history, dating back to the arrival of the Magyars in what today is Hungary. These dogs were cross-bred with various sighthounds in the 19th century to improve speed and stamina. Magyar Agars have solid bones and good muscles, giving the impression of elegant strength.

Did you know?
Magyar Agars have impressive ribcages that accommodate powerful lungs and a heart that work together to propel these dogs at high speeds.



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Italian Greyhound

Small but perfectly formed

Morphology: Graioid

♂ and ♀
12½-15 inches
(32-38 cm)
≤ 11 lbs (5 kg)

Grooming
Monthly

10 Short-haired sighthounds

FCI	AKC
KC	CKC

Italian Greyhounds are square-shaped dogs with forms reminiscent of a Greyhound or a Sloughi only reduced. These smallest of the sighthounds are docile and affectionate if a little reserved. They are certainly full of grace and distinction, qualities that have been winning over more and more people this past decade or so.



Did you know?
Although practically exclusively companion dogs, Italian Greyhounds are true greyhounds, which is plain to see when they get moving. Their gait is springy and harmonious with a high stepping and effortless action; the gallop is swift with a sharp spring.

From Egypt to Italy

Italian Greyhounds are descended from small sighthounds kept at the court of the Pharaohs in Ancient Egypt. They were also popular in Sparta, where numerous portrayals have been found on Greek vases. They first arrived in Italy in the 5th century BC, and during the Renaissance enjoyed life among the nobility. Some of the greatest painters of Italy and elsewhere have portrayed the breed.



THE ITALIAN GREYHOUND IN BRIEF

Head: Elongated, narrow, length up to 2/5 height at withers.
Ears: Set very high, small, with fine cartilage, folded onto themselves and carried well back on the nape and upper part of the neck.

Body: Straight topline, arched around the loins, sloping harmoniously to the croup.
Tail: Set low, fine also at the base, gradually tapering to the tip.
Colour: Self-coloured black, blue, slate grey or yellow (Isabella in Italian) in all shades.

Coat: Smooth, fine on the body without any fringing whatsoever.



● Russia
Russkaya Psovaya Borzaya

Borzoi

Aristocratic Russian

Morphology: Graioid

♂ 29½-33½
inches
(75-85 cm)

♀ 26¾-30¾
inches
(68-78 cm)



Grooming
Monthly



Borzoi have been an integral part of Russian history and culture for nine centuries. The 11th century French Chronicle reports that the Grand Prince of Kiev's daughter, Anna Yaroslavna, arrived in France for her marriage to Henri I with three Borzois. Other owners and breeders of note include tsars and poets such as Ivan the Terrible, Peter the Great, Nicolas II, Pushkin and Turgenev. The Grand Duke Nicolas Nicolaevitch and Dimitri Valtsev established the landmark Pershinskaya Okhota kennel. Since the end of the 19th century, Borzois have been bred in the United States and Europe.

10

Long-haired
or fringed sighthounds

FCI	AKC
KC	CKC



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Lean and robust

Borzoi are large aristocratic dogs of lean yet robust constitution. Their bodies are slightly elongated (females tend to be a little longer than males), with a strong but not massive bone structure. The bones are fairly flat under lean, well-developed muscles, especially on the thighs. Balance and harmony of movement are essential.

Borzoi are quiet and well-balanced in daily life, but become suddenly excited when they see the game, reacting impetuously. They have a piercing gaze and can see over long distances.



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Did you know?
Individuals that exceed the maximum size are accepted provided they have the typical Borzoi morphology.

THE BORZOI IN BRIEF

Head: Viewed from above and the side: lean, long, narrow, aristocratic. Viewed from the side, the lines of the skull and foreface form a long, slightly convex line; the line of the sagittal crest is straight or slopes slightly towards the occipital protuberance, which is pronounced. Big, expressive eyes, slightly prominent, coloured dark hazelnut or dark brown, almond-shaped but not slanting, placed obliquely.

Ears: Small, thin, mobile, set above eye level and far back, close to the nape when not alert.

Body: Broad, muscular; elastic back, forming a curve (more pronounced in males) with the loins and croup; the highest point is the middle of the loins or around the first or second lumbar vertebra.

Tail: Sickie- or sabre-shaped, set low, thin, long.

Colour: Combinations of any colours, but never blue, brown (chocolate) or their derivatives; all colours may be uniform or pied.

Coat: Silky, flat and supple, wavy or forming short curls, but never small tight curls.



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Saluki

Middle Eastern melting pot

Perhaps the oldest known domesticated dog, the breed expresses grace and symmetry, great speed and endurance, strength and activity. It is rather cat-like in its behaviour and reserved with strangers, but neither timid nor aggressive. Salukis are full of dignity and intelligence, while cultivating a certain degree of independence. There is also a rarer smooth-coated variety.



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Token of esteem

Originally, each Middle Eastern tribe had dogs that were best suited to hunting the game in its region. According to tradition, these dogs were never bought and sold, only given as marks of honour. Those presented to Europeans, which went on to constitute the breeding stock in Britain, reflected the great diversity of terrain and weather conditions in which they were bred. The British standard published in 1923, the first official one in Europe, took great care to embrace the rich diversity of the breed.

Did you know?

There is a lot of variation in the Saluki type, which is desirable and typical of the breed. This is due to the special place reserved for the breed in Arab tradition and the immensity of the Middle East region, where each tribe bred its own type. This variety was preserved when the breed was imported into Britain.

THE SALUKI IN BRIEF

Head: Long, narrow, expressing nobility, skull moderately broad between the ears, not domed.

Ears: Long, covered in long silky hair; set high, mobile, falling against the skull.

Body: Sufficiently broad back; slightly arched, very muscular loins; hip bones set well apart; long, deep chest that is moderately narrow.

Tail: Long, set low, carried naturally in a curve, well-feathered on the underside with long silky hairs, not bushy.



● Middle East
Saluki

Other names: Gazelle Hound, Persian Hound

Morphology: Graioid

♂ 23-28 inches (58-71 cm)

♀ Smaller than the male



Grooming
Monthly



FCI	AKC	Long-haired or fringed sighthounds	10
KC	CKC		



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Colour: All colours and combinations are permitted, except brindles, which are undesirable.

Coat: Smooth, soft and silky, with feathering on the back of the legs, except in the smooth-haired variety.

● Morocco
Sloughi

Sloughi

Maghreb melancholy

Morphology: Graioid

♂ 26-29
inches
(66-72 cm)

♀ 24-27
inches
(61-68 cm)



Grooming
Monthly



10

Short-haired
sighthounds

FCI	-
KC	-

Did you know?
The eyes have it in this breed. Large, dark eyes, well set in their sockets, produce a particularly gentle expression, a little pensive, even wistful.

Despite a look of nobility and haughtiness, Sloughis are very fond of their owner, whom they will defend. Hunters by instinct and capable of sustained effort, these North African dogs also enjoy creature comforts.

Racy and elegant

Sloughis have existed for centuries in the Maghreb. Today, most of them are found in Morocco, which holds the standard. These smooth-coated sighthounds are very racy, elegant dogs, not only in terms of demeanour, but also because of their lean musculature and fine tissue.

THE SLOUGHI IN BRIEF

Head: Viewed from the side, elongated, elegant, fine but rather large. Viewed from above, shaped like a very long wedge.

Ears: Set high, falling, close to the head, not too big, triangular, lightly rounded at the tips.

Body: Gently, harmoniously curving topline; prominent hip bones, level with or slightly higher than the withers.

Tail: Thin, lean, extending from the croup, carried below the topline.

Colour: From light sand to red sand (fawn), including all intermediate shades, with or without black mask, with or without black mantle, with or without black brindling, with or without black overlay.

Coat: Very short, dense, fine.



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Whippet

United Kingdom
Whippet

Morphology: Graioid

♂ 18½-20
inches
(47-51 cm)

♀ 17-18½
inches
(44-47 cm)



Grooming
Monthly



FCI	AKC
KC	CKC

Short-haired
sighthound

10



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Whippets are happy just about anywhere. The race-track gets their heart beating, they put their best foot forward in the show ring, and they love living in the home. All told, these gentle, affectionate, even-tempered dogs are ideal companions and great athletes.



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Did you know?
The word whippet, now obsolete in everyday English, used to mean "to move briskly". The name was chosen when the breed was officially recognized at the end of the 19th century. The Whippet Club was founded in 1899.

Mysterious origins

Whippets combine muscle and strength with elegance and grace in the quest for speed. Built for work, all exaggeration must be avoided to safeguard their aptitudes. Now the most popular of the sighthounds, Whippets were known as small Greyhounds for a while until the name Whippet was adopted. Although their origins are not well known, there's no denying that small-sized sighthounds have existed in Britain for centuries.



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THE WHIPPET IN BRIEF

Head: Long, lean skull, flat on top, tapering toward the muzzle, but broader between the eyes, slight stop.

Ears: Small, fine texture, rose shaped.

Body: Broad, very muscular; firm, rather long back, loins giving the impression of strength and power; very deep chest with plenty of room for the heart.

Tail: Long, tapering, in action carried in a delicate curve but not above the topline.

Colour: Any colour or combination.

Coat: Fine, short, close in texture.

Rare breeds

Some breeds registered with the FCI are down to just a few individuals or are bred on a very limited scale. Others have gradually grown in popularity but are yet to be officially approved. These “new” or more correctly “neoformed” breeds (Y. Surget) are often varieties of existing breeds.

Braque Dupuy

7

Continental
pointers

Other name
Dupuy Pointer

Native country
France

A very old breed, known since the 18th century, named after the breeder in Poitou who created it. The Braque Dupuy is said to be a cross between the old Braque Francais and the Greyhound or the Sloughi. It was very widespread in Poitou and the west of France at the beginning of the 20th century. It has now practically disappeared.

THE BRAQUE DUPUY IN BRIEF

Character, aptitudes, training

This fast, supple dog was a very good pointer with a very fine sense of smell, which was valued as a hunting dog in open country.

Advice

It is well suited to rural life.

Purpose

Gun dog.

Head

Long, narrow, fine, lean. Long, narrow, domed skull. Very pronounced occiput. No stop. Long, narrow hook muzzle. Broad, dark brown nose. Fine, lean, close lips.

Eyes

Golden or brown.

Ears

Rather long, narrow, very fine and supple, sparkling and set slightly back.

Body

Slender. Very long, light, fine neck without dewlap. Very clear withers. High, deep, well descended chest. Flat ribs. Well supported back. Slightly arched powerful, rather short-coupled loins. Highly developed sternum. Slightly hollow, turned up flanks.

Limbs

Strong, bony. Very lean, elongated feet. Toes close together.

Tail

Medium thickness, fairly long, carried low or very slightly curved. Quite well furnished with hair.

Coat

Fairly short, always smooth. Close and very fine on head and ears. Rough to the touch on back and loins.

Colour

White and dark brown. Foundation of beautiful white with fairly big brown markings or brown mantle with or without brown spots, mottling mainly on the front limbs.

Height

Male: 26-26¾ inches (67-68 cm)

Female: 25½-26 inches (65-66 cm)

Weight

Around 66 lbs (30 kg)

Griffon Boulet

The Griffon bred by Mr E Boulet in the 19th century is a longhaired pointer resembling a Barbet without curls. This breed of woolly-haired griffons, which some say is descended from the Barbet, was long found in northern France. Boulet improved it around 1880 by crossing it, some say, with Braques, Poodles or sheepdogs. The breed is now very rare.

Native country
France

Griffon-type continental pointer

7

THE GRIFFON BOULET IN BRIEF

Head

Bushy look. Long, broad, square muzzle with heavy moustache. Blond or brown nose.

Eyes

Yellow. Bushy eyebrows can cover the eyes slightly.

Ears

Set fairly low, drop, slightly rolled, covered with smooth or wavy hair.

Body

Compact. Slightly longer than average neck. Broad, deep chest. Strong loins.

Limbs

Strong, muscular. Slightly elongated toes.

Tail

Straight, carried well, no feathering.

Coat

Long, semi-silky, smooth or wavy, never curly.

Colour

Dead-leaf brown with or without white, but no big white patches.

Height

Male: 21½-23½ inches (55-60 cm)
Female: 19½-21½ inches (50-55 cm)

Weight

44-55 lbs (20-25 kg)

Character, aptitudes, training

Very hardy, with an excellent nose, the Griffon Boulet is very good in wood and marshland. It is well protected by its coat, so it is not afraid of the cold or bad weather. It works slowly but methodically over a limited area. It is a pleasant companion.

Advice

It needs plenty of space and exercise. Regular brushing.

Purpose

Gun dog, companion dog.

The 357th FCI breed

The FCI gives provisional recognition to new breeds every year. In 2009, it was the turn of the South-Eastern European Shepherd, the Bucovina.

South-Eastern European Shepherd

This big, powerful mountain dog has a similar morphology to such breeds as the Great Pyrenees and some shepherd dogs from the east used for guarding and protecting herds. After the recent recognition of related breeds such as the Romanian Miortic Shepherd Dog, the South-Eastern European Shepherd is a newcomer to the FCI. This native to Romania is one of the big breeds, with males growing to over 30 inches (almost 80 cm) at the withers.

INFORMATION

Native country Romania

Name South-Eastern European Shepherd

Other names Bucovina, Dulau, Capau

Purpose Shepherd dog

Classification Group 2 Molosoid breeds, Mountain type

Native region Bucovina in northern Romania in the midst of the Carpathians

First standard Published in 1982

Current standard 2002 version submitted to the FCI for provisional recognition

Character This brave, imposing protection dog is not afraid to stand up to such predators as bears and wolves to keep its herd safe.

King of the mountains

Provisionally placed in FCI group 2, the Bucovina is a big, powerful dog with marked differences between the sexes.

This breed, which forms a close bond with its handlers, can be used to guard and protect anything it is entrusted with. Its balanced character, loyalty and highly developed protective instinct are fundamental traits of all South-Eastern European Shepherds.

The head, expression, ear carriage, stop and eyes are very typical of the breed.

While a South-Eastern European Shepherd must be physically powerful, this should not be the be all and end all, as it does have to perform its duties pain-free and without tiring itself out without reason.

The Bucovina generally moves in a supple trot, without apparent effort. This hardy dog is able to cover long distances, without expending too much energy. The hair is especially abundant, except on the head, where it is short. The coat comes in a variety of colours, which is becoming of the breed and a great delight to potential buyers when they are choosing a puppy. Don't all rush at once, though, because the South-Eastern European Shepherd is virtually unknown outside its native country.

Breeds not recognised by the FCI

Some of these breeds are recognised by the kennel club in their native country (the **Cursinu** in France and the **Alano** in Spain, for example) or by clubs not recognised by the FCI (like the **Boykin Spaniel**, which is recognised by the **United Kennel Club**).

Sheepdogs

Akbash (Coban Kopegi): Turkish in origin, the Akbash is used in the United States. Its ancestors are said to include the Komondor, the Kuvasz and the Tatra Shepherd Dog. It grows to 28-34 inches (71-86 cm), weighing in at 88-110¼ lbs (40-50 kg), with thick white coat.

Berger de la Crau (France): A well known sheepdog among those that move their livestock in the Alps with the changing of the seasons. A French-style Border Collie that has everything but official recognition.

Himalayan Sheepdog (India): A breed of unknown provenance that measures 20-26 inches (51-66 cm) and weighs 50¾-90½ lbs (23-41 kg). It has a thick, harsh coat of varied colours.

New Zealand Huntaway: A black and tan sheepdog measuring 20-24 inches (51-61 cm) and weighing 39½-66¼ lbs (18-30 kg), with semi-prick ears, short hair and thick, feathered tail.

Lancashire Heeler (Ormskirk Terrier): Cross between the Welsh Corgi and the Manchester Terrier, this short-legged, long-bodied British dog measures 10-12 inches (25-30 cm) and weighs 7¾-15½ lbs (3.5-7 kg). Its coat of short hair is coloured black and tan. A herder that snaps at the heels of cattle, but also used to catch rats or rabbits. A provisional standard was published in 1986. Rare outside the United Kingdom.

Miniature Australian Shepherd (United States): A miniature copy of the Australian Shepherd, this breed measuring 13-18 inches (33-46 cm) and weighing 15½-29¾ lbs (7-13.5 kg) has medium-length hair in various colours. It has made the transition to companion dog.

Guard dogs

Alapaha Blue Blood Bulldog (United States): Bred from English Bulldogs by the Lane family in Georgia, measuring 20-24¾ inches (51-63 cm) and weighing 50¾-88 lbs (23-40 kg). Solid head, prominent eyes, pronounced stop. Short hair in various colours. Also a companion dog.

Boerboel (South Africa): A big, powerful dog bred from imported Boxers, Mastiffs and Bullmastiffs. Boerboels arrived in the Netherlands in 1994. They can measure up to 27½ inches (70 cm) and weigh 132¼-154¼ lbs (60-70 kg). Broad head, flat skull, strong jaws, drop ears, short hair. Docked tail. Brindle, yellow, grey, red-brown, brown. Protection dog.

Bull Boxer (United Kingdom): A very recent cross between Boxer and Staffordshire Bull Terrier. Measuring 16-20¾ inches (41-53 cm) and weighing 37½-53 lbs (17-24 kg), the Bull Boxer has a powerful body, drop ears and a coat of close-cropped hair in various colours. Also a friendly companion.

Moscow Watchdog (Russia): Very similar to its main ancestor the St Bernard in terms of coat and morphology, but distinguished by its even temper, which it owes to crosses with Caucasian Shepherd Dogs.

King Shepherd (United States): Bred from non-standard German Shepherd – which you can see just from looking at it – crossed with other sheepdogs. Its height, weight and other general characteristics are diverging from those of its European cousin all the time.

Tibetan Kyi Apso: The ancestors of this very ancient dog protected the encampments and flocks of Tibetan nomads. Measuring 24¾-28 inches (63-71 cm) and weighing 70½-90½ lbs (32-41 kg). The hair is long and the tail is curved and well feathered.

Old English Bulldog (United States): This breed was created in the 20th century by crossing English Bulldogs, Bullmastiffs and American Pitbull Terriers. Measuring 20-25¼ inches (51-64 cm) and weighing 64-105¾ lbs (29-48 kg). Solid head, powerfully built, mastiff-type body, rose ears, close-haired coat in various colours. Brave, determined, sometimes aggressive.

Gun dogs

Alano (Spain): A cross between the descendants of Celtic hounds and mastiffs. It is said to be an ancestor of the Dogo Argentino. It has a solid head, drop ears, a fairly short body. Its hair is short, the coat red with a black muzzle. It hunts wild boars.

American Staghound (United States): Created through crosses between Scottish Deerhounds, Greyhounds and Irish Wolfhounds.

Bluetick Coonhound (United States): Created through crosses between Foxhounds, the English Coonhound, French guard dogs and hounds and the Black and Tan Coonhound. Measuring 20-27 inches (51-69 cm) and weighing 44-79½ lbs (20-36 kg). Close-cropped tricolour coat, with blue-ticked white foundation and tan markings. Created in Louisiana in the 19th century to hunt raccoons.

Boykin Spaniel (United States): An outstanding retriever specialised in ducks, created by Whit Boykin in South Carolina, who wanted a spaniel that could retrieve and hunt with talent.

Catahoula Cur (Catahoula Leopard Dog): The official state dog of Louisiana with a long but poorly established history. Measuring 20-26 inches (51-66 cm) and weighing

Sanshu (Japan): Created at the beginning of the 20th century in a cross between the Chow-Chow and the old Japanese Aichi. Weighing 44-55 lbs (20-25 kg) and measuring 17¾-21½ inches (45-55 cm). Robust, short-coupled body, broad head with almond eyes and straight ears. Curved tail. Stiff, harsh, medium-length hair, in the colours rust, black and tan, light brown, salt and pepper, white and more. A brave and hardy guard dog and an affectionate companion.

Valley Bulldog (Canada): Said to be created by crossing Boxers and English Bulldogs in the Annapolis Valley in Nova Scotia in the 1950s. All colours are accepted. The most common are white, fawn and brindle.

39½-66¼ lbs (18-30 kg). Drop ears and close-cropped hair. Walleyes are possible. Grey in colour with irregular black patches and tan markings on head and limbs. Big game dog that hunts bears just as well as raccoons. Used as a herder but it also has good guarding qualities.

Catalburun (Turkey): Breed with much in common with the Pointer and pointing dogs in general, but with one striking difference: a nose “cut” in two, created by intensive inbreeding.

Épagneul de Saint-Usuge (France): This very old spaniel, which is separated by a regional differentiation of the French Spaniel in Bourgogne and Franche-Comté, had its own standard back in 1936. The breed was officially recognised by the Société Centrale Canine in 2003, when the first registrations were accepted.

Kerry Beagle (Ireland): Descendant of a stag dog in the south of the country, it was used to catch hares. Imported into the United States in the 20th century, where it played a part in the creation of various American hounds. Bigger than the Beagle, measuring 22-26 inches (56-66 cm) and weighing 44-59½ lbs (20-27 kg). Broad head, drop ears, short hair. Colours are white and tan, blue and tan, black and tan or tricolour.

Rampur Greyhound (India): Its origins are a little murky. It is said to be related to the Afghan Hound and the Sloughi. Greyhound blood was introduced into the breed in the 19th century. Measuring 22-30 inches (56-76 cm) and weighing between 50¾-70½ lbs (23-32 kg). Close-cropped hair. Very poorly known outside of its native country.

Lucas Terrier (United Kingdom): Created by Sir J. Lucas by crossing the Sealyham Terrier with the Norfolk Terrier in the 1950s. Measuring 10-11¾ inches (25-30 cm) and weighing 10-12¼ lbs (4.5-6 kg). Varied coat colours. Hunts in packs.

Lurcher (United Kingdom): Created by crossing Collie types with Greyhounds and Deerhounds, this Irish breed looks like a small greyhound. Measuring 27-30 inches (69-76 cm) and weighing 59½ -70½ lbs (27-32 kg). Long, narrow head, long body. Rough hair, often two-coloured coat: white with dark mantle and patching. Very popular hound, especially among poachers. Virtually unknown outside of Ireland or the United Kingdom.

Majestic Tree Hound (United States): A recent creation based on a cross between a Bloodhound and other hounds, used to hunt big cats and big game. It has an outstanding nose and a good voice. Big, solid, with skin folds on the face. The hair is short and the coat comes in one or more colours.

Mountain Cur (United States): Created from crosses of European dogs imported by colonists and local pariah dogs. Strong and stocky, very similar to a former English sheepdog breed. A good tracker that rarely gives voice, hardy and brave. Weighing 35¼-66¼ lbs (16-30 kg) depending on the sex.

Patterdale Terrier (Black Fell-Terrier) (United Kingdom): Originally from the village of Patterdale in Cumberland, northwest England, where it was very popular. Measuring 11¾ inches (30 cm), weighing 11-12¼ lbs (5-6 kg). Stocky, sturdily built, with folded ears, close hair. Coat colours are black, black and tan, brown and red. A brave, tenacious hunter of rabbits, foxes and vermin.

Plott Hound (United States): Descendant of dogs imported from Germany by the Plott family in the 17th century, which were crossed with English hounds. The Plott Hound hunts wolves, pumas, coyotes, wildcats, stags, bears, wild boars and more. Measuring 20¾-25¼ inches (53-64 cm) and weighing 39½-64 lbs (18-29 kg). Drop ears, short hair. Tricolour coat: white, tan with black saddle.

Plummer Terrier (United Kingdom): Its creator, Mr B Plummer, crossed the Fell Terrier variety of the Patterdale Terrier, the Jack Russell Terrier, an American Beagle and the Bull Terrier. Measuring 11½-13¼ inches (29-34 cm) and weighing 12-15½ lbs (5.5-7 kg). Compact body, drop ears, short, close-cropped hair, white and tan in colour. An excellent ratter.

Rastreador Brasileiro (Brazil): Created by crossing the American Foxhound, the Black and Tan Coonhound, the Treeing Walker Coonhound and the Bluetick Coonhound. Measuring around 25½ inches (65 cm) and weighing around 55 lbs (25 kg). Drop ears, short hair, either black and tan or tricolour. Strong, lively, brave and hardy, it hunts jaguars.

Redbone Coonhound (United States): A variety of the Black and Tan Coonhound that bears the name of its creator, the Tennessee breeder Mr P Redbone. Measuring 20¾-26 inches (53-66 cm) and weighing 50¾-70½ lbs (23-32 kg). Short hair of a solid red colour. It hunts racoons.

Redtick Coonhound (United States): Close parent of the Bluetick Coonhound, measuring 20-27 inches (51-69 cm) and weighing 44-79½ lbs (20-36 kg), with drop ears, short hair and hazel coat with lots of ticking. It hunts racoons and foxes, and is also a good guard dog.

Treeing Walker Coonhound (United States): Variety of the Black and Tan Coonhound introduced into Virginia in the 18th century by Mr T Walker. A dog that is bred for treeing, i.e. chasing racoons and opossums into a tree and holding them there until the hunters arrive. Measuring 20-27 inches (51-69 cm) and weighing 50¾-70½ lbs (23-32 kg). Solid head, drop ears. The smooth-haired coat is either tricolour (black, white and tan) or bicolour (white and tan).

Trigg Hound (United States): Variety of the American Fox Hound, measuring 20-24 inches (51-61 cm) and weighing 44-55 lbs (20-25 kg), with fine hair that can come in any colour. A hardy hound with a subtle nose.

U'Cursinu (France): Old Corsican breed of medium proportions, measuring 16-22¾ inches (41-58 cm) and weighing 44-66¼ lbs (20-30 kg). Short to mid-length hair in fawn brindle or dark fawn, often with a black mask. A club founded in 1989 to protect the breed is recognised by the Société Centrale Canine.

Companion dogs

American Hairless Terrier (United States): This small dog was unexpectedly born into a Rat Terrier litter in 1972. The puppy was raised by the Scott family, who decided to breed it, retaining only hairless dogs in each generation to produce the breed.

Bichon-Yorkie (United Kingdom): A cross between a Bichon Frise and a Yorkshire Terrier, measuring 9-12¼ inches (23-31 cm) and weighing 6½-12¼ lbs (3-6 kg). Dense, soft hair in various colours.

Biewer Terrier (Germany): Named after its creators, Mr and Mrs Biewer, who bred Yorkshire Terriers for 20 years until 1984, when a new variety was born, which would be the first of the future Biewer Terrier breed. The family devoted a chunk of their life to breeding this little companion dog, which is similar in looks to the Yorkshire Terrier, but the breed has really taken off in the United States.

Cockapoo (United States): Created in the United States by crossing Toy Poodles and American Cocker Spaniels. Weighing 19¾-24¼ lbs (9-11 kg) and measuring 13¾-14½ inches (35-38 cm). Various coat colours similar to the Poodle.

New Guinea Singing Dog (New Guinea): Breed known in the 19th century that disappeared from view in the 20th before two couples were found in the 1950s and 1970s. They were used to try to recreate the breed. Similar to Dingoes, measuring 13¾-14½ inches (35-38 cm) and weighing 17½-22 lbs (8-10 kg). Short-haired coat with various shades of red and white patches. It often lives in a feral state. Its singing is melodious. Distant and unpredictable, certainly not the ideal companion dog!

Carolina Dog (United States): Said to be originally from Asia, but discovered in South Carolina. Measuring 21½-22 inches (55-56 cm) and weighing 28½-39½ lbs (13-18 kg). Elongated head, large, erect ears. Dark brown almond eyes. Short, dense coat of dark yellow hair. Once a herder and hunter, it has become a companion dog, in spite of its feral instinct.

Peruvian Inca Orchid (Moonflower Dog): Spanish conquistadors in the 16th century were the first foreigners to see this dog, which was kept by the indigenous population until the 20th century. Imported into the United States and Europe. Hairless but for a tuft on the head. Measuring 19½-25½ inches (50-65 cm) and weighing 26½-50¾ lbs (12-23 kg).

Dingo - Haliki, Warrigal, Noggum, Boolomo - (Australia): Pariah dog that is thought to have migrated to Australia more than 20,000 years ago at the same time as the Aborigines. It was used as a hunting and companion dog, but ultimately returned to a feral state. Measuring up to 20¾ inches (53 cm) and weighing 22-44 lbs (10-20 kg). Yellow or orange eyes. Smooth hair in various colours, often yellow, ruddy, black and white. It can be trained but only if started at a very young age.

Toy American Eskimo: Descendent of the Spitz, measuring 11-12¼ inches (28-31 cm) and weighing 6½-11 lbs (3-5 kg). Fox-like head, drop ears and tail curved over the back with attractive feathering. Long, thick pure white hair. A vigorous sporting breed.

Foo dog (China): An original among the family of spitz-type Asian breeds, coming in three sizes, Toy, Mini and Medium, and showing some resemblance to the short-haired Chow Chow.

Kyi Leo (United States): Bred in California in the 1970s as cross between the Lhasa Apso and the Maltese. Measuring 9-11 inches (23-28 cm) and weighing 12¼-15½ lbs (6-7 kg). Drop ears and long, somewhat wavy hair in black and white. An amiable house dog.

Mi-Ki (United States): Small companion dog created by crossing Papillon, Shih Tzu, Maltese, Japanese Spaniel and Yorkshire Terrier, a labour of love by companion dog breeder Micki Makin in Wisconsin in the 1980s.

Prazsky Krysavick (Czech Republic): A small dog created some 20 years ago. Measuring 7½-7¾ inches (19-20 cm) and weighing 2¼-6½ lbs (1-3 kg). Delicate head with narrow muzzle. Smooth, fine hair.

Shiloh Shepherd (United States): Created in the 1980s on the basis of the German Shepherd, the Shiloh measures 26-27½ inches (66-70 cm) and weighs 79½-110¼ lbs (36-50 kg). Erect ears.

Toy Fox Terrier, American Toy Terrier, Amertoy (United States): Created in the 1930s by crossing small smooth-haired Fox Terriers, English Toy Terriers and Chihuahuas. Measuring 9½-10 inches (24-25 cm) and weighing 3¼-6½lbs (2-3 kg). Curved skull, pronounced stop, drop

ears, generally docked tail, dark, round eyes. Smooth-haired, either tricoloured (white with black and tan patches) or bicoloured (white and tan, white and black). A lively, alert dog that also works as a ratter. Trained to assist the disabled in their home.

Working dogs

Boulab (Canada): Created in 1990 by crossing Labradors with Bernese Mountain Dogs to produce a dog as active as the former and as attentive to its owners as the latter. A little bigger than the Labrador, but of the same colour. Used as a guide dog.

Labradoodle (Australia): Produced in 1989 by crossing a Poodle with a Labrador. Measuring 21¼-25½ inches (54-65 cm) and weighing 55-77 lbs (25-35 kg). Curly-haired coat in various colours. Companion dog that is also used as a guide dog.

Sled dogs

Alaskan Husky (Alaska, United States): Created by Alaskan mushers at the beginning of the 20th century by crossing Siberian Huskies, local indigenous dogs and other sporting breeds. The Alaskan Husky is the world's most successful sled dog, accounting for around 90% of all competition dogs. Measuring 17¾-25½ inches (45-65 cm) and weighing 39½ -57½ lbs (18-26 kg). Resembles a Nordic sled dog.

Chinook (United States): Created by Mr A Walden at the beginning of the 20th century by crossing Eskimo dogs, the St Bernard and Belgian shepherd dogs. The breed is so rare it may be close to disappearing altogether. Weighing 66¼-88 lbs (30-40 kg) and measuring 20¾-24 inches (53-61 cm). A dog of great strength. Drop or cropped ears. Abundant thick fawn hair. Used as a guard or as a companion dog.

Canadian Eskimo Dog: Very old lupoid-type breed. Measuring 20-26¾ inches (51-68 cm) and weighing 59½-105¾ lbs (27-48 kg). Prick ears, thick, dense hair. Bushy tail rolled over the back. All coat colours are acceptable.

Greyster (Norway): Still very rare breed created by crossing the German Shorthaired Pointer with the Greyhound. Measuring 26¾-29½ inches (68-75 cm) and weighing 55-77 lbs (25-35 kg). Short-haired coat of brown or black brindle. A sprinter that is not suited to longer distances.



Part 3

Dogs and culture

Dogs in art

Humans have always depicted the animals around them. Cave paintings, archaeology, sculpture and paintings illustrate the important role dogs have played in our daily life and our imagination – guard, hunter or companion, hellhound, guardian of the dying, symbol of vigilance, loyalty and obedience, or accursed, linked to death and the forces of evil. Dogs have also been widely used in heraldry, coins and, more recently, postage stamps.

Dogs in archaeology

A large proportion of the animal depictions found by archaeologists are of dogs. These depictions show the importance of dogs as symbols — from slave to god, depending on time and place. The oldest depiction is a cave painting from around 10,000 BC in Cueva de la Vieja, Spain, which appears to show a dog cutting off a deer's retreat on the hunt.

Dogs as gods

The best-known example of a deified dog in Egypt is Anubis, half-dog, half-jackal, which is first mentioned in the 19th dynasty (around 4200 BC).

Dogs were often found lurking around necropolises at night, so Anubis was the god of the dead, presiding over funerals and care of dead bodies, particularly embalming.

In Greek mythology, the dog was a creature forged by Hephaestus, the god of artisans, bestowing it with a privileged position among the animals.

For the Aztecs the dog-headed god Xolotl gave birth to humanity, feeding and raising it, throwing the bones of the dead into hell.

Working dogs and war dogs

Since the dawn of time, humans have used dogs as assistants. From being slaves in Mesopotamia (“dog” and “slave” share the



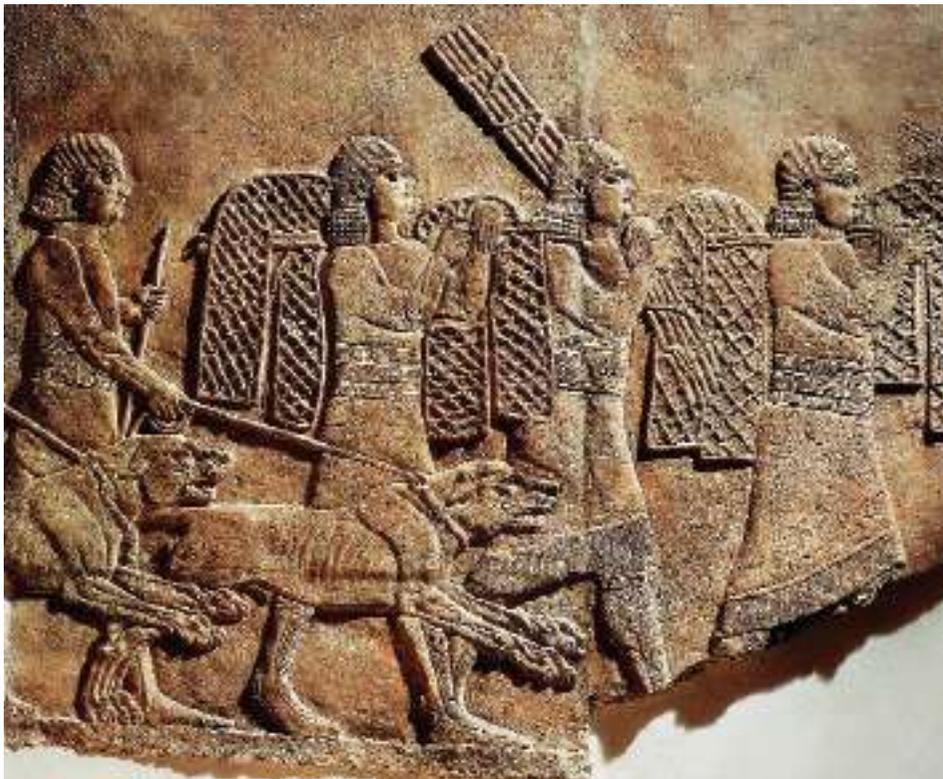
Anubis, God of Judgement and the Dead; statue of the Museum of Egyptian Antiquities, Cairo, part of the Tutankhamen treasure collection
© Marthelot/Leemage/Josse

same ideogram in cuneiform script from around 2000 BC), dogs gradually took on an essential role in human work.

Virtually all early hunting depictions portray dogs alongside men, including scenes depicting hounds hunting big cats on the outer walls of the Neolithic settlement of Çatalhöyük in southern Anatolia. Prior to the 18th dynasty in Egypt, dogs helped humans hunt antelope and gazelle. Around 1500 BC, the multiplication and specialisation of breeds produced faster

Greyhounds. In ancient Greece and Rome too, dogs helped on the hunt and were often depicted in art.

They also began serving as guards, such as Cerberus, who controlled access to Hades in Greek mythology. In the Far East, lapdogs were the guardians of eunuchs (3470 BC), whereas in ancient Rome (1st century AD), they were leashed and tasked with guarding homes – a mosaic from Pompeii bears the famous inscription *cave canem*, beware of the dog.



Assyrian hunters accompanied by leashed dogs. Palace of Assurbanipal or Ashurbanipal, King of Assyria (Mesopotamia) (669 BC - 627 BC), 645 BC, British Museum, London. The British Museum. © Aisa/Leemage/Josse

Dogs in paintings

Since the birth of civilisation, paintings have suggested that the dog is man's best friend. The first depictions of dogs are in prehistoric cave paintings from around 4500 BC in general, with the exception of the earlier Cueva de Vieja frieze. While dogs are portrayed less frequently than game, which was the main source of inspiration, they are shown as hunting dogs of a breed unlike any currently known. Dogs started to resemble those we know today in paintings from ancient Egypt.

Diana the Huntress. The goddess armed with a bow and accompanied by a dog.
Painting of the Fontainebleau school, 16th century. The Louvre, Paris.
© Luisa Ricciarini/Leemage/Josse



Roman Empire: watchdogs

The status of dogs in society improved in the Roman Empire, where they were fully-fledged domesticated animals prized as guards and hunting dogs. They were loyal companions, completely devoted to their owners. Most of them were proud mastiffs, as impressive as they were ferocious, tasked with guarding access to the home.

Middle Ages: primarily hunting dogs

Dogs were virtually absent from pictorial art until the Middle Ages. This may have been due to the awareness among artists at the time of the aggressive, famished stray dogs that devoured carcasses. In Islam, dogs are still regarded as accursed symbols of the force of evil and death.

The use of dogs in hunting helped change public opinion. It is, however, important to note that aggressiveness was the only trait people were interested in exploiting in the early Middle Ages. Thus, dogs started to reappear in paintings, usually in packs. Tableaus depict kings hunting with their dogs, sometimes in packs of a thousand.

In time, the portrayal of dogs in art mirrored reality more and more closely, although it was not always easy to determine exactly which breed was depicted. That said however, every type of dog had its speciality. Scenthounds are shown tracking game animals with their nose. These breeds of similar appearance but

different coat colours include Bloodhounds (Chiens de Saint-Hubert), Chiens Blanc du Roy, Fauves de Bretagne and Gris de Saint-Louis, whose names clearly show who they belonged to or where they came from. Pointers are shown with falcons, hunting large game; they were used to kill prey before the invention of guns.

The Renaissance: dogs became humanised

Companion dogs began to be depicted in paintings in the late Middle Ages when Renaissance ladies were portrayed with small dogs on their lap or at their feet. Small Greyhounds and other miniature breeds appeared to enchant their mistresses, who lavished them with caresses. Renaissance artists depicted dogs much less sparingly. All sorts of breeds appear in 16th century paintings, from the small lapdogs of ladies through refined Greyhounds to the larger dogs accompanying the lords.

Dogs were depicted in a more human light: lying under the table at banquets, feasting on titbits. By now, they were fully-fledged companion animals. Artists everywhere started to paint dogs: in one, set in Venice, Bichons rest themselves on cushions while being doted on by their mistress in a gondola. Dogs were still essentially hunting companions, however, and artists began to distinguish the different types of hunting dog (scenthounds, pointers etc.) more clearly.

17th Century to the present day: the development of the breeds

The number of breeds began to grow significantly at the start of the 17th century, again in connection with hunting, at least in the early stages. As hunting techniques and game diversified, so, too, did hunting dog breeds. But by the end of the century the focus had switched to smaller dogs like the King Charles Spaniel, a royal favourite.

Dogs gradually began to be depicted alone in paintings or at least as the focal point. Some artists began to specialise in animal painting, including François Desportes

(1661-1743), artist at the court of King Louis XIV, Paul de Vos (1596-1678), Abraham Hondius (1625-1691), Franz Snyders (1579-1657) and Jean-Baptiste Oudry (1686-1755).

Dogs were depicted with striking realism, in terms of both anatomy and expression. The distinctive postures and expressions of each breed were copied directly from real life. Sometimes, it is as though the artist's goal was simply to immortalise the dog.

In the 19th and 20th centuries artists' depictions of dogs were verging on the sentimental, as the packs of hunting dogs serving royalty were replaced almost totally by companion dogs and, less frequently, by herders and watchdogs.

Soon the style became abstract. Dogs began to be portrayed as symbols, making it impossible to determine which breed had inspired a particular piece. Dogs began increasingly to appeal to artists and society as a whole, and today, dogs continue to be a source of endless admiration and inspiration, appreciated by all.

Many contemporary artists use dogs, more or less stylised, in their paintings.

Arearea (Joyeusetés) or Le chien rouge. Painted in the second year of his stay in Tahiti. Painting by Paul Gauguin (1848-1903), 1892. Oil on canvas. Musée d'Orsay, Paris. ©Aisa/Leemage/Josse



Dogs in sculpture

As humans evolved, they invented art to express their feelings about the world around them. They began by drawing what they saw on cave walls, using pigments in relief. Later, they discovered pottery and sculpture. Animals naturally became subjects of artistic inspiration. They became religious symbols, alternatively feared or respected.



Entrance to a temple in Myanmar. © Timurk/Fotolia

Prehistory: figurative art

The first sculptures of dogs are earthenware objects in a very plain style. This figurative art was primarily dictated by respect for the animal's uses, which was as a hunting companion, breeding object and part of everyday life. Traces of claw and tooth marks are sometimes found. Sculptures portray animals with disproportionate bellies and short legs.

Precolumbian art

Precolumbian art was also very simple. There was no desire to depict dogs realistically as such, but rather to instill them with the qualities of the god with which they were associated. Precolumbian sculpture became an expression of the spiritual and mystical world, a trend that reached its peak in Antiquity.

Egypt: dogs as stylised symbols

The ancient Egyptians worshipped all sorts of animals including the dog, which was the earthly incarnation of the god Anubis and sometimes Thot. In their highly elaborate, stylised sculptures, artists sought to evoke the dog's character, while retaining its normal form, generally based on that of the desert Greyhound. The limestone dog at the Musée du Louvre, Paris — showing a sheepdog wearing a collar — is a perfect example. Bas-reliefs often depict dog racing or hunting scenes.

The ancient Egyptians also used dogs to decorate tombs and necropolises. The depictions of Anubis on the sarcophagus of Madja from the 18th dynasty clearly show a dog with a fox's tail. Two statues of dogs stand guard at the entrance to all temples as a symbol of how the king watched over his people.

Asia: lion-dogs

The dog occupies a very unique position in Asia, where it has been considered both a god and a delicacy, earning either respect or scorn. At the entrance to most Chinese temples and palaces stand two “lion-dogs” with clear similarities to the mastiff breeds native to the region. Even in everyday sculptures, the traits of the dog are exaggerated and embellished with ornamentation of various sizes.

Assyria: fine animal sculpture

High-quality animal sculpture was abundant in Assyria, where religious beliefs and the cult of kings dictated artistic inspiration. Dogs are generally portrayed alone, with remarkable finesse, as part of hunting scenes, or accompanied by their master.

Ancient Greece and Rome: geometric style

The art of ancient Greece and Rome was primarily geometric in style, characterised by clean lines, but, as in human sculpture, animals became more refined, to the point of near-perfect realism. Very few dog statues have been found, which is not surprising, given that dogs were no longer seen as gods.

Middle Ages: imaginative representations

In the Middle Ages, art turned towards the imagination and symbols. Good and evil were the main sources of inspiration after religion. Dogs played a limited, essentially decorative, role.

In the Renaissance, artists concentrated on anatomical and morphological studies as they endeavoured to find the ideal proportions. The main theme was the horse; dogs seemed to have limited appeal.

17th century to the present day: popular subjects

The dog remained a subject of practice rather than a true theme in sculpture, although animal artists did start to depict dogs as their main subjects in the 19th century. These included Antoine Louis Barye (1796-1875), who created anatomically accurate bronze sculptures based on dissections. His main subject was the hunting breeds.



© SVM/Forola

The dog: myths and symbols

Dogs have lived alongside humans for almost 15,000 years, so it is only natural that they are a major component in our imaginations. Man has always used day-to-day objects and creatures to represent the invisible and the mystical. The dog's appearance and especially its behaviour have been used to symbolise situations, powers and even divinities.

Guardian of hell

Dogs are guardians, they howl at the moon and often hunt at night. For these reasons, many cultures have associated dogs with death. Both Cerberus, the three-headed black dog of Greek mythology, and Garmr in Norse mythology protected the gates of hell, preventing the living and the dead from breaking through the gate separating the two realms.

Guide of the spirits of the dead

Dogs were seen as everyday companions in life and in death. They symbolised the guide of spirits on their journey to the place of the dead in Greek mythology. The best-known is Anubis, an ancient Egyptian god with the head of a jackal, whose role was to oversee the embalming of the dead before leading the spirits to their judgment, where he would weigh their heart against the feather of truth.

Anubis' counterpart in ancient Mexican civilisation is the god Xolotl, a lion-coloured dog who accompanied the sun god on his journey to the underworld. Traditionally, a Mexican Hairless Dog, with a yellow coat like the sun, was sacrificed at funerals. The dog of the deceased person might also be sacrificed, to protect the owner until he arrived at the gates of death. In Guatemala, dog figurines were traditionally placed at the four corners of the tomb, a practice still observed today.

In oriental cultures, the dead and dying were entrusted to dogs charged with guiding them to heaven, the seat of the pure divinities.

Messenger between the living and the beyond

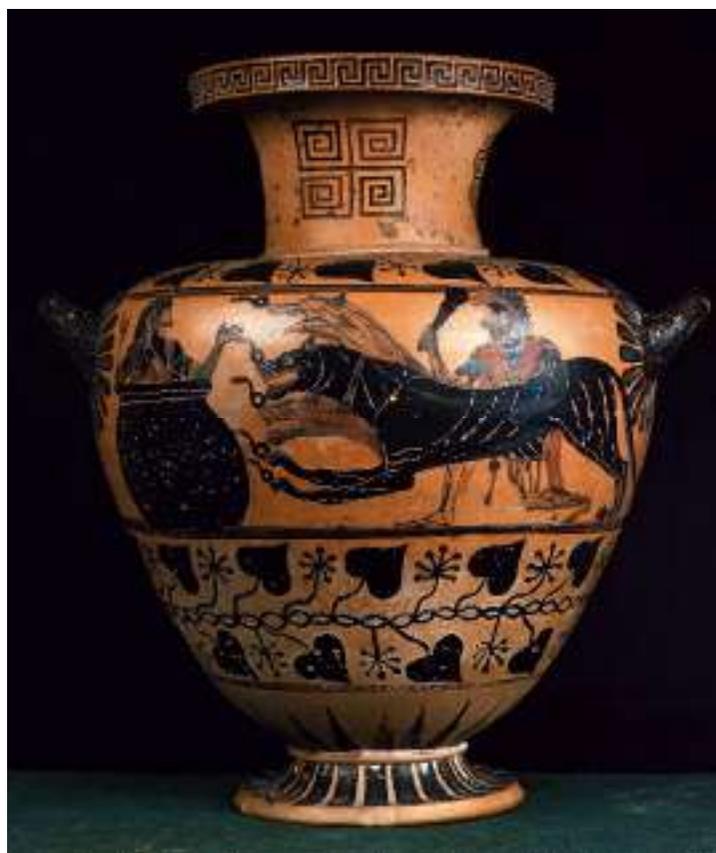
Dogs have also been seen as a link between the world of the living and the beyond. There are two variations on this theme: either the dog delivered its messages to a sorcerer in a trance, as believed in Congo by the Bantus and in Sudan, or it was given a message for the dead after being sacrificed, as believed by the Iroquois of North America.

It is easy to understand from these examples how the dog's association with death, together with his nocturnal hunting habits, might have fuelled rumours of sorcery and evil spells regarding dogs.

Dual symbol

Islam brought out this dark side of dogs, considering them impure creatures like pigs. Dogs were seen as carcass eaters who frightened the angels and heralded death with their barking. People were to avoid dogs, and anyone who killed one became as impure as the dog itself. On the other hand, they believed they could protect themselves from evil spells by eating the flesh of a puppy, and they acknowledged the dog's loyalty to its owner.

Paradoxically, Muslims revered the Greyhound as a noble animal and a symbol of kindness and luck. The Koran also states that anyone can have a dog, provided they are left outside the home, which is a health rule that is very understandable in the historical context.



Hydra with Hercules. Cerberus and Eurystheus. Di Villa Giulia Museum, Rome
© Costa/Leemage/Josse

The duality of dog symbolism is also found in the Far East. In China, the dog was alternately a destroyer in the shape of a huge, hairy dog called T'ien Khuan, or a loyal companion who escorted immortals to heaven. The philosopher Lao Tzu portrays the dog as an ephemeral creature, describing the ancient Chinese custom of burning straw effigies of dogs to ward off evil spells. On the contrary, in Japanese culture the dog was a good animal that protected children and mothers. In Tibet, dogs were symbols of sexuality and fertility, providing the spark of life. This leads us to another aspect in the symbolism of dogs: fire.

Dogs and fire

In most cases, dogs do not evoke fire themselves, but they are recognised as having passed it on to humans. The dog was therefore the equivalent of Prometheus in certain African and Native American tribes. On the South Sea Islands, the dog was the master of fire, growling and sleeping beside the flames.

For the Aztecs it was fire itself, while for the Mayas it was simply the guardian of the sun during the night.

Alternatively, dogs could symbolise war and victory. This was true of the Celts, who showered it with praise. For these ancient Europeans, it was an honour to be compared to a dog.

Symbolic ambiguity

In time, the dog became an important symbol, although the ambiguity of human feelings towards it was shown in the range of symbolism. Protector and watchdog for some, evildoer and demon for others, the dog's symbolic image has evolved and gradually disappeared in modern civilisations.

The dog is evoked in many common expressions, often with a negative connotation: no one wants to have to "work like a dog," but some say it's a "dog eat dog world," so if you don't want to "go to the

dogs" you may just have to. There are plenty of examples in other languages also. Expressions in which "dog" is used in a positive sense are far and few between, although they are lauded for their loyalty. Given the growing importance of dogs in our lives, they may begin to be perceived in a more positive light in future generations.

Other representations of dogs in art

Dogs have been depicted in various ways on coats of arms, coins and, more recently, postage stamps.

Dogs in heraldry

The use of coats of arms began in the 11th century, at the time of the Crusades, because the lords were unable to tell each other apart in their heavy armour. They resolved that problem by wearing a personalised design that everyone was able to identify. The French and English were particularly imaginative in designing emblems expressing the qualities they wanted to represent. Fantastic animals were favoured initially, but they were gradually replaced by real animals.

Dogs were used from the beginning. They embodied one of the exclusive privileges of the nobility – hunting. Breed specifications started to appear as early as the 9th century, covering hunting and fighting dogs. By the 11th century, hounds and mastiffs adorned the coats of arms of English, Scottish and Irish lords. The coats of arms have since been adopted as emblems of large institutions, like the armed forces.



Graham Taylor/Foodia

Arms of the French Armed Forces

Every section of the French Army has its own coat of arms. The School of Non-Commissioned Officers of the Gendarmerie – Training Centre for Dog Handlers in Gramat is no exception. Designed by heraldry expert Robert Louis, its insignia was approved December 10, 1948.



The coat of arms is combined with the gendarmerie's characteristic insignia: a 15th century plumed helmet in a three-quarters view atop a shield with a sword and a civic crown. On the shield below the helmet's throat-piece is the gendarmerie's grenade ornament. The plumed helmet is specific to this army corps. It evokes the origins of the gendarmerie, established in the 15th century by the High Provost Marshal as the *Compagnie de la Connétablie et de la Maréchalerie*. The shield features an unsheathed sword pointing upward as a symbol of force in the service of the law. The circular civic crown of oak branches was bestowed upon soldiers in Rome who had risked their lives to save others. The silver field is exclusive to specialised training centres. The ensemble evokes the mission of protecting citizens and helping those in danger. It emphasises the gendarmerie's military origins and its military and civilian activities.

The coat of arms itself is exclusive to the training centre in Gramat. In the heraldic jargon, the field consists of azure and sable sections with an argent grenade ornament charger. Blue and black are the gendarmerie's traditional colours, and the grenade ornament is its traditional badge. In the centre of the grenade ornament is a dog standing in front of red flames, signifying that dogs fear nothing, not even fire.

The coat of arms of Allerdale, in the UK, signifies the history and culture of the borough. One of the two supporters is a large dog with a fish's tail: the marine dog. He refers to the activities of the coastal towns and to salmon fishing. The ship's chain around his body refers to the ship building industry and mercantile maritime activities. His crook or represents local sheep-rearing.

Selected contemporary coins from around the world

China (1982): 20-yuan and 200-yuan coins mark the year of the dog

Malta (1977): £1 coins depict the Pharaoh Hound

Canada (1997): 50-cent coins depict the Newfoundland, Nova Scotia Duck Toting Retriever, Labrador Retriever and Canadian Eskimo Dog

Somalia (2000): 10-shilling coins mark the year of the dog

Cook Islands (2003): 1-cent coins depict a Collie or Pointer

On coats of arms, dogs symbolise protection, vigilance, loyalty, obedience and gratitude. They are depicted in various heraldic attitudes: on their hind legs (with their back towards the edge), in profile, passant (striding), courant (running), sejant (sitting), couchant (lying) and rampant (rearing up). The colours, which also often have French names, are sable, gules (red), vert (green), azure, or (gold) and argent (silver). They constitute a code: an argent dog on a sable field signifies a loyal, steadfast horseman; an or dog on a gules field signifies a knight willing to die for his lord; and a sable dog on an or field signifies a knight in mourning for his lord. Dogs can also be used as supporters, the figures on either side of a coat of arms.

Dogs in sport

If "sport is war minus the shooting", as George Orwell claimed, then it should not be surprising that dogs are also featured on the logos and badges of many professional sports teams around the world. Strength, reliability, loyalty and aggressiveness are the key traits of dogs that clubs want to be associated with.

Dogs on coins

Coins from all ages feature dogs either as the main subject, part of a scene or a purely decorative symbol. Dogs are found more frequently on ancient coins than on modern ones.

The first known coins carrying images of dogs are silver or bronze. On these coins from 480-440 BC, dogs are the symbol of Segesta. The mythical origin of this city is attributed to Acestes, son of the nymph Segesta and the river god Crimisus, who took the form of a dog at their wedding. A dog appears on the reverse side of various coins featuring Segesta's head on the obverse side. In the same period, heavy bronze coins were used in certain Italian regions. In the Latium-Campania series, a dog is shown running towards the left; in the Tuder-Umbrian series (the origin of the lira) a dog is shown lying down.

After dogs were featured on several small bronze coins of the Rome-Campania series minted around 210 BC, they appeared on the Roman Republic's silver denarius. This coin, minted extensively in Rome for economic and commercial reasons, is one of the



Ulysses recognised by his dog Argos.
Silver Roman coin, 83 BC
© Costa/Leemage/Josse

Selected roman coins

82 BC: Magistrate Caius Manilius Limetanus evoked the touching scene in which the elderly Argos recognises his master Ulysses.

69 BC: A dog runs between the legs of the deer pulling Diana's chariot.

64 BC: A sprinting Greyhound occupies the entire reverse of a denarius from the time of Caius Postumus.

60 BC: A hunting scene in which a dog attacks an injured wild boar.

45 BC: A dog running towards the right on a silver sesterce by Titus Crisius, and a dog at the feet of Diana with bow and arrows on a denarius from the time of Augustus.

most important, for it uses a variety of subjects to illustrate many aspects of the social, economic, historic and religious life of the period.

Dogs are depicted on many coins from feudal times, mainly pieces of lesser value. A dog reclining with his head to the left appears on the reverse side of some coins from Tuscany, a dog tied to a tree appears on the lira from Milan under Philippe II of Spain (1556-1598), and a dog is shown as a winged figure on some smaller coins from Verona (1375-1381). The Gonzaga family showed the greatest interest in dogs, depicting the animal crawling, lying down and climbing. Their coins are characterised by an inscription surrounding the central dog figure and reading "Infensus feris tantum" ("Enemy of none but the big cats"). This inscription echoes nicely the highest praise of dogs as "man's best friend".

Dogs in philately

Dogs are an integral part of a country's art and daily life, so it is only natural that they are also depicted on postage stamps, something that delights many philatelists. Whether as the main figure or as a detail that only clued-up collectors notice, dogs are one of the most popular themes in philately (stamps, books and postal logos). There are so many issues that philately clubs recommend collectors limit themselves to a subgroup (a breed or speciality) to keep things in perspective.

Dogs initially appeared on stamps in their country of origin. A superb Newfoundland was the very first "philately dog", appearing on a stamp issued by the then British colony of the same name back in 1887. The Belgian Sheepdog appeared on Belgian stamps, while sled dogs were featured on stamps from the Nordic countries. When it became clear that dogs sold stamps they began to appear elsewhere, regardless of the origins of a particular breed, including Nicaragua, which issued stamps featuring an English Springer Spaniel.

Dogs also appear on stamps in a cultural guise, as part of a work of art or to represent a book or comic strip.

Postage stamps are issued to mark historic events, of course. China's year of the dog is a favourite, while the famous Laika, the first dog in space, adorned many Soviet postage stamps. Stamps can also pay homage to assistance dogs and service dogs, such as guide dogs or those that search for missing persons. In some countries you can even immortalise your own dog by having it feature on your own personal postage stamps.

Passionate philatelists are also interested in the history of dogs in the postal service. In the 1940s mail was transported from one town to another by dog-pulled sleds. Earlier, during World War I, military kennels in France were designated a special postage paid cachet.



Marek Słusarczyk/Forolia

Dogs in history

Dogs and humans share a common history that goes back thousands of years. Dog bones have been found together with human ones at many archaeological sites, proving that they have assisted humanity since before recorded history began. That being said, dogs have not always fulfilled the same function down the millennia.

Dogs and civilisations

Following domestication, dogs worked first and foremost on the hunt, driving and taking game. Virtually all early hunting depictions portray dogs alongside men, including scenes depicting hounds hunting big cats on the outer walls of the Neolithic settlement of Çatalhöyük in southern Anatolia.

The Hunters in the Snow Painting by Pieter Bruegel the Elder (1525-1569). 1566. Dim.Vienna. Kunsthistorisches Museum. © Luisa Ricciarini/Leemage/Josse



Hunting assistant or carrion eater

Given scraps and leftovers from the hunt, dogs also fulfilled the essential roles of carcass strippers and organic waste disposal systems for human settlements. Greek antiquity left many texts alluding to this. After the death of Achilles, Hector was abandoned to the vultures and the dogs. The Jewish Bible, too, mentions dogs that gorged themselves on the body of Jezebel. This has led to dogs sometimes being cast in a perjorative role. "Throwing someone to the dogs" is a phrase that harks back to the practice of leaving the corpses of dishonoured people for the dogs to devour.

Sled dog

Early on in history, humans started to use dogs to pull sleds across the snow in frozen regions, when other forms of transportation were impractical.

Coveted for its meat

Dogs were also an important source of nutrition in times of scarcity. Prehistoric humans ate their flesh for sustenance and also used their bones, pelt and teeth. Commonly consumed during Roman antiquity, dogs were also appreciated in Europe (until the beginning of the 20th century in France and up to the Second World War in Germany). It is mentioned in Guillaume Apollinaire's 1913 anthology of poems *Alcools*. To this day, dogs continue to be eaten in parts of Asia, although animal welfare organisations have vigorously challenged the practice, given that dogs are now an integral part of our lives.

Used to hunt men

Dogs have also assisted soldiers in wars. Mesopotamian dogs, especially hounds, were highly sought after for tracking humans, such as escaped slaves, in the Far East around 1000 BC. In India, the door of the Buddhist temple of Sanchi-Tope is adorned with sculptures of the mastiffs used in wars. War dogs were specialised in ancient Rome.

Defence dogs protected the rear, attack dogs were sent to the front and liaison dogs ensured communication between army posts. Liaison dogs were perhaps the worst off: they were forced to swallow messages and were sacrificed upon arrival so the evidence could be retrieved.

Roman art, *cave canem*, the hall of the dog. Vestibule or entrance of a villa in Pompeii. Italy.
© Prisma Archivo/Leemage/Josse





Mummy of a dog, Ancient Egypt. Late Period (664-332 BC). The Louvre, Paris.
© Photo Josse/Leemage

Venerated in Egyptian age

While dogs appear to have had an unenviable lot in ancient times, there is also evidence that they were sometimes held in high esteem. During Egypt's New Dynasty, dogs were so highly regarded that to mistreat or kill one was punishable by law. Ancient Greek artists depicted dogs as animals that had a privileged relationship with humans. Ashurbanipal's Mesopotamian sculptors express this in *Jeune satyre au repos* (Musée du Louvre, Paris). But the first sign that dogs were truly a part of family life is an earthenware sculpture from Gaul, depicting a couple embracing in bed with a dog sleeping soundly at their feet, a very modern idea of "love" for dogs from around 50 AD.

Dogs were now starting to be regarded as companion animals.

Some people have even felt the need to build a tomb in memory of their loyal companion after its demise. In ancient Egypt dogs were mummified to accompany their dead owner or as a sacrifice to the gods. The relationship was even more intimate in other parts of the world, including Amazonia, Oceania and even 19th-century France, where women would sometimes even suckle puppies.



The dog, always assisting humans

Dogs have been at our sides in every stage of human history and prehistory. Guardian, hunter, everyday helper – they have been given more and more roles in the course of time.

Hunter then devil

Since Antiquity, dogs have fulfilled various roles in activities as diverse as hunting, war, sled-pulling and religious rites. Dog breeding was pioneered in the Roman Empire, known as the "home of a thousand breeds," which were mainly used as companions, guard dogs and hunters.

Hunting was their main function in the Middle Ages, although they continued to be used on the battlefield. Dogs became the companions and assistants of lords, who were principally involved in war and hunting. The future horseman had to learn to care for and train his horses, and also his dogs.

In the 15th century, one of them, Phoebus, wrote a superb, richly illustrated treatise on hunting with dogs. Crossbreeding was practised to produce dogs with endurance, aggression and the senses needed to find game.

It was around this time that dogs were banished by the Catholic Church. Some saw them as one of Satan's preferred incarnations, a carrier of rabies that devoured corpses and howled at night. Catholic bishops were even prohibited from owning a dog, to ensure that the faithful were not bitten.

© Duhaier/Royal Canin



Fox Hunting, Miniature from *Le livre de la chasse (Book of Hunting)* by Gaston III Phoebus, Count of Foix, Lord of Béarn (1331-1391), 1387-1388. Chantilly (France), Condé Museum. © Photo Josse/Leemage



During the expedition of Swedish explorer Salomon Andree by balloon to the North Pole in 1897. © Heritage images/Leemage/Josse

Playmate and source of energy

During the Renaissance, while more than ever a hunting companion, the Italian influence meant that dogs also started to take part in more carefree activities, such as being a playmate for children. Some authors, like Erasmus in his *Adagia* (around 1500), railed against “these dogs with no other utility than the distraction of spoilt, idle matrons”.

Dogs were also used as a source of energy since the Middle Ages, in “dog wheels,” which became widespread in the 18th century. The principle was simple: the dog was made to run inside the wheel to drive various instruments, such as bellows, roasting spits, knife sharpeners, wood lathes, butter churns and even sewing machines. There are testimonies in French affirming to the use of 400 dogs in a nail factory in the Ardennes in 1879 and in a cutlery works in Châtellerault in 1919.

Canine explorers

Dogs continue to assist humans in hunting, guarding and protection today, but they have also diversified into new fields, including exploration. Both North and South Pole expeditions have involved sled dogs. Dogs started to explore the skies, as well, and in 1785 Blanchard demonstrated the use of a parachute for safely disembarking from a hot-air balloon, testing the recent invention on a dog from an altitude of around 1600 feet. Dogs were to go into outer space within two centuries, in the guise of the Soviet canine Laika who “manned” Sputnik 2 in 1957.



Military parade, 14 July 2007 in Paris (France) © Meigneux/Witt/Hadj/Sipa

Dogs in the armed forces

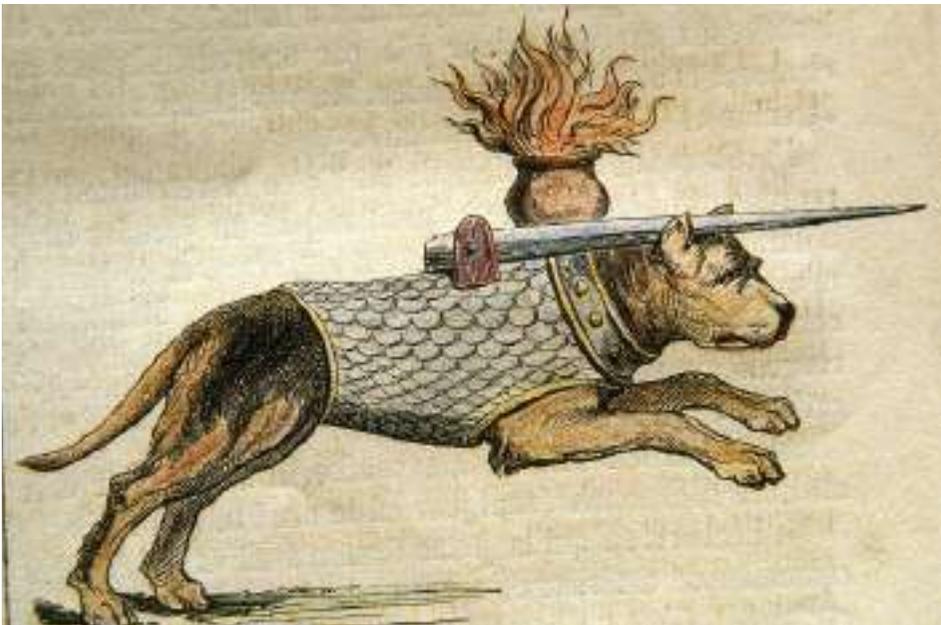
The role of dogs on the battlefield has evolved as weapons and armies have been developed. Originally employed as a “foot soldier” in the frontline, dressed in a suit of armour, dogs gradually took on other duties as guards, trackers, patrollers, messengers and medical assistants, once again displaying their extreme devotion, generosity and capacities to serve and protect people and societies.

Combat dogs

Dogs have been used in human wars since the 13th century BC. Powerful molossers were used most often, formidable beasts which could bring a man down and inflict serious injury with their terrible bites. These dogs looked much like the present-day Tibetan Mastiff, although considerably more imposing, measuring up to 30 inches at the withers, compared with today's 27 inches.

More ferocious than the Greyhounds bred by the Pharaohs, these dogs were in great demand in Egypt and later in Greece, eventually gaining ground in the Roman Empire after the conquest of the Greek territories. Around the same time, Gauls, Celts and Germans developed a breed derived from the Great Dane. The two canine types would have faced each other in the battles of the 1st century BC.

Roman dog © Cogis/Alexis



It was not difficult to train these dogs, given that their role was simply to kill any enemy soldiers or horses they came across. Gradually, they were equipped with armour plating with spiky points and strips of sharp scythes, spiked collars and hides covered in a flammable substance. These machines of war were used to scatter horses and frightened or injure foot soldiers. Advancements in firearms in the 19th century saw the disappearance of these terrifying animals from the battlefield.

Sentry dogs

Their astonishing sense of smell and predisposition to defending and guarding has enabled dogs to become sentries at forts and fortresses.

Plutarch described the exploits of the dog Soter. "Corinth was defended by a garrison, assisted by 50 Molossers that slept on the beach". One evening, the enemy armies disembarked. The troops had feasted the night before and were not in a state of readiness, so it was left to the dogs to fight the battle. Facing a much bigger force, the canine defenders were all killed until only one was left. This dog, Soter, managed to escape and raise the alarm with his barking, enabling the Corinthians to arm themselves and fend off the attack. To reward his courage, Soter was given a magnificent collar with the inscription "To Soter, defender and saviour of Corinth". This type of dog was especially common in the Middle Ages, defending places such as St. Michael's Mount in Normandy and the fortified town of Saint-Malo in Brittany, where, in a tradition started in 1155, 24 English Mastiffs were left on the shore every evening to guard the boats from pirates. The practice was discontinued in 1770, when a young officer was devoured on the beach. Dogs continue to work as sentries to this day.



Lookout post on the Chemin des Dames: above the entrance to the shelter is signalling equipment and a sentry dog in the trench. From L'illustration, 16/06/1917. © Selva/Leemage/Josse

Tracker dogs

Numerous dogs have been trained to follow a trail left by a person. During Columbus' invasion of Native American territories dogs were trained to find and kill the enemy. In La Vega, the modern-day Dominican Republic, thousands of Native Americans were routed by just 150 foot soldiers, 30 cavalymen and 20 war dogs. Later, the Spanish used dogs in South America to track down escaped plantation slaves. The dogs were trained using black dummies filled with blood and guts. Excited by the odour, the dogs would quickly make the connection between these dummies and the poor slaves, who really didn't stand a chance.

In the Algerian War of Independence (1854-62) tracker dogs were deployed to find enemy troops that had managed to elude security. One of them was Gamin, a German Shepherd from the military kennels so aggressive on first arrival in the country no one dared go near him. It took a military policeman, Gilbert Godefroid, to

calm and train Gamin. In March 1958 a group of around 200 men managed to cross the electrified fence at the Tunisian border. Godefroid and Gamin were quickly dropped in the battle zone by helicopter, followed by the 1st foreign parachute regiment. Gamin soon found the trail, but just as he released his dog Godefroid was mortally wounded by a burst of automatic gunfire. The dog was also wounded, but it didn't stop him from killing the gunman. Gamin crawled back to his master and lay over his body to protect him. It ultimately took six men with a tent sheet to overpower Gamin, and although they got him back to base camp he was completely unapproachable. Military bosses gave Gamin an honourable discharge, retiring him to south west France, where he died of grief just two weeks after his arrival. The United States armed forces also used tracker dogs in Vietnam, where they were trained to follow soldiers silently on missions to find and encircle Vietcong encampments.

Liaison dogs

Good communications are critical in war. Advanced detachments need to get information back to HQ or the front line so that plans can be updated. Before the invention of telecommunications dogs were widely used as messengers.

In Antiquity, dogs were forced to swallow messages and were killed on arrival so that these messages could be retrieved. This practice was short-lived, however, not because it was considered cruel, but because it was expensive.

In the 18th century, Frederick II (the Great) of Prussia reintroduced the practice to pass messages between armies in his kingdom. The dogs he used made a great impression in the Seven Years' War, giving birth to a whole line of messenger and liaison dogs.

'Relay dogs' were introduced in the Great War (1914-1918). The selection criteria were stringent: these dogs had to be between about 16 inches and 28 inches at the withers, have a neutral coat, be in perfect health, have excellent sight, smell and hearing, and be calm, intelligent and obedient. They had to be 2-5 years old to ensure they were at the top of their game and robust enough to withstand bad weather, privations and fatigue.

They had a vital role to play, connecting points several miles apart in often difficult climatic conditions. It was reported that these dogs could cover 3 miles in 12 minutes during a bombardment. They carried messages in clear that could be easily deciphered by enemy troops, but this gamble paid off because they were rarely caught.

Carrier and draught dogs

Dogs are able to carry up to 15 lbs of extra weight, so it's no surprise they were widely used to carry munitions, provisions and even arms to the front lines in various wars. In the Great War, German dogs were captured carrying light machine guns. That conflict saw the creation of two types of dog. Some were

trained to carry a reel of telephone wire over a dangerous route through trenches, firing lines and barbed wire to re-establish lines of communication cut by fighting, while others were trained to carry homing pigeons to outposts.

Draught dogs were used as early as 1911, when the Belgians employed them to pull machine guns. They were preferred to horses due to their better endurance and excellent mobility in following men in the undergrowth. In the same phase of the war, dogs were harnessed to carts loaded with supplies and stretchers bearing the injured. They were even used by the Germans on the eastern front to pull sledges. Due to the controversy that developed about a dog's capacity to pull any moving object, only the Belgian, German (for a short time) and the Russian armies actually used this type of dog.

Scout dogs

Their well developed guarding and protecting instincts meant that scout dogs soon made names for themselves. Used to flush out enemies hidden in bushes and thickets, they enabled patrols to thwart ambush attempts and flag up the presence of enemy troops. These dogs were also deployed to guard prisoner escorts. Few dogs were to get their names into the history books, but they did enable countless patrols to find the enemy or their trails.

Medic dogs

The Egyptians were the first to train dogs to recover the wounded: once the battle was over these dogs would be released onto the battlefield to find anyone still alive, who they would mark by licking.

Medic dogs returned to the theatre of war in the 20th century. Trained to recover the wounded, they would flag them up by bringing back an object belonging to them: a soldier's helmet often served as a signal for the medics who would send out the dog again in search of new wounded comrades. Their involvement was fundamental: the wounded could only be recovered under cover of darkness, and the dogs were good at directing search parties. The first Société du Chien Sanitaire was established in 1885

Belgium, First World War. Machine gun cart pulled by dogs.
Belgium 1914-1918. © Yli/Sipa



by the Belgian Van de Putte, followed by a German society founded by the animal artist Bungartz. Not until 1908 did France equip its own dogs, following an earlier move by the German army.

There are a whole host of stories about the exploits of these dogs, such as this testimony of a soldier from Mans, who was wounded on 2 November 1915. "Hit in the arm by a shell, with a bullet in my jaw and a bayonet wound in my scalp, I was half buried under the corpses of many of my comrades when I felt something stroke my forehead; it was a fine German Shepherd medic dog that licked my face. I managed to raise myself a little in spite of my physical pains. I knew that the dogs were trained to return to camp with the helmets of wounded soldiers, but I had lost mine. The brave dog hesitated. 'Go,' I said to it, 'Go little doggie, find my comrades.' It understood, turned and made off for camp energetically, barking, pulling on their coats, which grabbed the attention of two brave stretcher-bearers. They followed it, it took them right to me. I was saved."

Dangerous missions

Dogs have sometimes been used in difficult situations and exceptional conditions.

During the war in Indochina, the terrain and the vegetation posed a great many problems in operations undertaken by French troops. The dangers facing parachutists dropped in enemy territory were revealed in the first few months of the campaign. Dogs were able to accelerate the meticulous searches the soldiers had to conduct. On September 5-6, 1949, parachutist dogs were tested at Meucon.

The principal difficulties during parachute training were encountered when the dogs left the plane, and when they hit the ground. Lighter than their masters, dogs reached the ground a long time after the humans and far away, which delayed recovery and the start of the operation significantly. A reduction in parachute size solved this problem, enabling the dogs to touch down at the same time and close by their masters.



Bhody, a dog trained for search and rescue operations. Jumping over Sergeant Lénine Ospina of the Colombian army during basic military training in Bogota, Colombia. © Fernando Vergara/AP/Sipa

Other dogs have sadly sacrificed their lives for the cause. The Soviet general Panfilon, faced with the advance of the German army, trained dogs to search for their food under armoured vehicles. Not feeding them for one or two days ahead of an attack, a mine was attached to their backs and the dogs were pushed towards their terrible fate. This cruel practice spread pandemonium through the German ranks.

Dogs are indispensable assistants in every army in the world, often poorly recognised by some commanders who are only interested in sophisticated arms, forgetting the extraordinary things this animal can achieve. Many of these dogs have been decorated for heroic deeds.

Dogs in literature

Dogs were the first animals to be domesticated by humans. While ancient authors mainly refer to dogs as workers, more contemporary ones describe the close relationship between the species and sometimes our devotion to dogs.

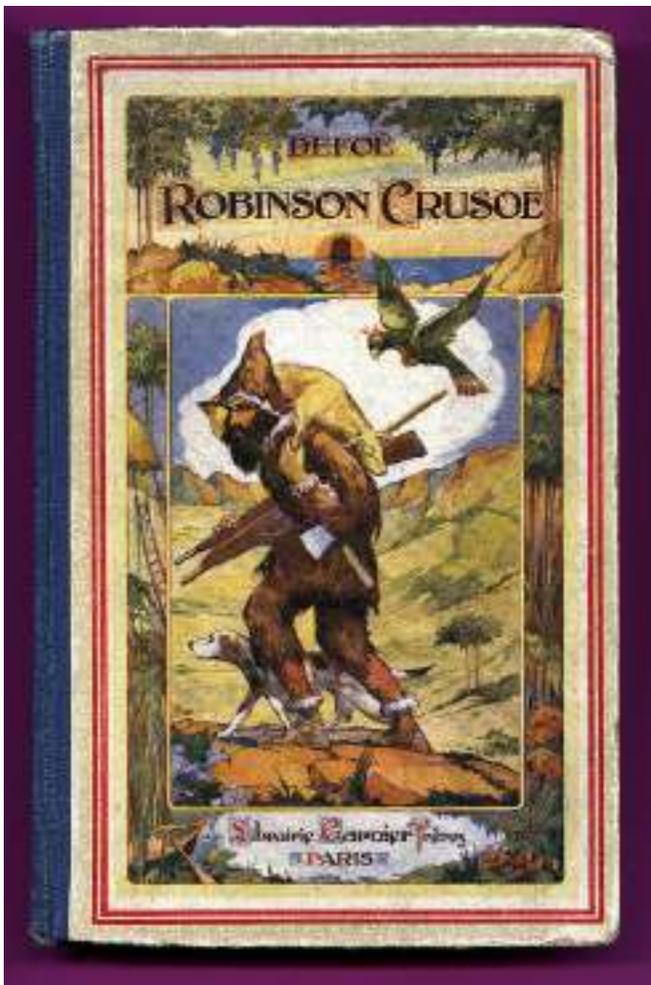
Dogs appear in all forms of written communication today. Their image is reproduced in press and advertising, due to their positive image among the general public.

Dogs in literature

The dog's main role in literature mirrors the dog's role in everyday life – that of guardian angel and loyal companion. Many literary works use dogs as a metaphor for humans.

Faithful friend, confidant and protector

The dog's role of confidant and protector is well represented in children's literature, especially where the dog comes to the rescue of a child. Eric Knight's novel *Lassie Come Home* features a loyal Collie and its young master Joe. The book and subsequent films were so popular that people still commonly refer to Collies as Lassie dogs. In James Matthew Barrie's *Peter and Wendy*, Nana is a Newfoundland, although a Saint Bernard plays the role in the Disney adaptation (*Peter Pan*). Wendy, John and Michael are unable to escape from the house because the dog has been stationed in the garden.



Robinson Crusoe by Daniel Defoe. Cover of a Garnier edition illustrated by Grandville, late 19th century. Robinson explores his deserted island accompanied by his dog and a parrot. © Gusman/Leemage/Josse

Dogs are mentioned in various plays by Shakespeare, most memorably Crab, the companion of facetious Launce, in the comedy "The Two Gentlemen of Verona".

The question of humanity

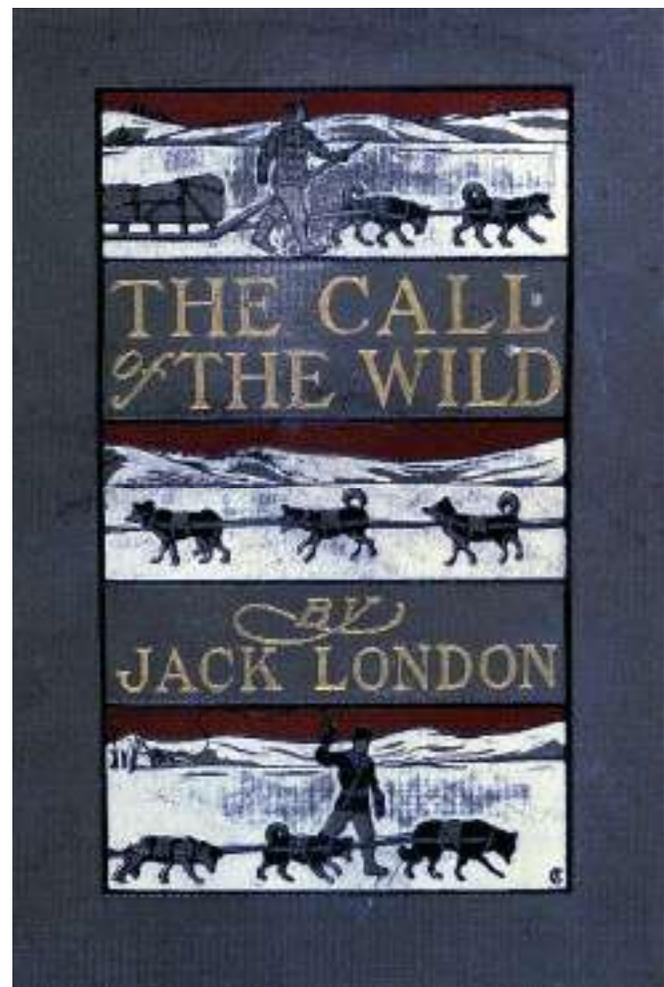
In his *Jacques the Fatalist*, Diderot explains "that any man would like to command another; and that the position of the animal in society is immediately under the class of the lowest citizens commanded by all other classes, they would also take an animal in order to command someone too [...] everyone has his dog. The minister is the king's dog, the chief clerk is the minister's dog, the wife is her husband's dog, or the husband his wife's".

Some science fiction authors have even given dogs the power. In Clifford Simack's novel *City*, there are no more humans, only dogs and robots. The question is whether they can build a cleaner, less violent society.

Between wolf and dog: incarnation of wild freedom

The dog's ancestor the wolf is the wild animal incarnate. While the dog represents servitude and loyalty, the wolf epitomises freedom and the rejection of all constraint. As in Jean de la Fontaine's fable *The Wolf and the Dog*, wolves would rather live free than be confined.

This is illustrative of a question for which there is not always an answer: is it preferable to live as a slave or die free? This question is addressed by a fervent humanist who lived during the 1891 Gold Rush in Alaska. While Jack London defends animals against man's brutality, he does not give a definite answer to the question of which path to choose: that of *White Fang*, a wolf-dog who chooses to live among humans, or that of Buck in *Call of the Wild*, a companion dog who goes to live among wolves. Perhaps this means that in character each of us is part dog and part wolf, depending on the circumstances.



Cover of *The Call of the Wild* by Jack London (1876-1916) 1903.
© Photo Josse/Leemage



Plates illustrating the fables of Jean de La Fontaine (1621-1695): The Donkey and the Little Dog, The Shepherd and the Sea. Engraving, 1792. Château-Thierry, Musée La Fontaine, France.
© Photo Josse/Leemage

Wild beast

Deified by some (the Egyptian god Anubis), demonised by others (Cerberus, the Roman dog that guarded the gates of Hades), the worrying aspect of the dog – or is that the wolf – has inspired many writers.

Poets and novelists describe the prowling beast, a frantic, demonic creature who devours dead bodies or small children. Sir Arthur Conan Doyle even uses a dog in the title of one of Sherlock Holmes' best-known adventures, *The Hound of the Baskervilles*, in which a huge dog kills the inhabitants of bleak Dartmoor.

*Around the rocks a restless bitch was eyeing
Us with a look of one forsaken
As if from the living skeleton she were spying
The flesh that from it had been taken*

(Baudelaire, *Prose and Poetry*. Translated by Arthur Symons. Albert & Charles Boni, New York, 1926.)

These lines from Baudelaire's *The Flowers of Evil* also evoke this darker side of dogs. But here again, isn't the dog simply an expression of its thinking alter ego, humans?

Whether as friend or foe, our canine companion continues to appear in literature as an innocent reflection of human shame, misery and loneliness.



The Hound of the Baskervilles
by Arthur Conan Doyle, 1902.
Illustration from the early 20th century.
© Costa/Leemage/Josse

Dogs in comic strips

As in literature, dogs are popular characters in comic strips for young and old alike. The very first comic strip, published in a New York daily in the early 20th century, takes place at a dog show. This was only the beginning. Dogs started out as secondary characters, but they gradually developed into stars in their own right.

Companion, silent witness

In Hergé's *Adventures of Tintin*, Snowy the Fox Terrier is the Belgian detective's inseparable companion. Snowy is never anything but a dog throughout the entire series; while his sense of smell and intuition are vital to Tintin, Snowy never speaks, (although he can follow human reasoning and sometimes there is a dilemma between duty and his craving for a big bone) (*King Ottokar's Sceptre*).

The indispensable canine sidekick

Asterix the Gaul by René Goscinny and Albert Uderzo first appeared in 1959. The dog in the series, Dogmatix, was originally created to fill out the frame, but he soon became the inseparable companion of Obelix, Asterix's accomplice. Dogmatix brings out the tender side of his strapping master; this cunning canine loves nature (hating it when people cut down trees) and is obsessed by bones. His greed even helps save the heroes from making a wrong move in *Asterix and Cleopatra*. Dogmatix became so successful that he even got his own collection for young children.

The anthropomorphic dog

Elsewhere, dogs have taken on more human traits, especially when they are the main characters. Charlie Brown's dog, Snoopy, in Charles Schultz's *Peanuts* stands upright on his hind legs and has a kennel with all the modern comforts, even a pool table, although Snoopy mostly sleeps on the roof. Snoopy's rich imagination is depicted in the cartoon strip, revealing himself to be a child – and sometimes an adult – at heart.



Tintin struggling with his coat
© HERGE/MOULINSART 2004/AP/SIPA

Despite his human-type behaviour, Snoopy communicates like a dog, although he seems to be understood perfectly well by the children in the series, for whom he is, by turns, tormentor, companion and confidant.

Epic canines

In the Japanese take on the comic book – manga – dogs have assumed the role of fully-fledged heroes. In *Ginga Nagareboshi Gin* (1983-1987) the story of a family of canine bear hunters (Kuma-Inu) and their master in their battle against a bear by the name of Akakabuto, which has unleashed a reign of terror in the mountains of Japan, is told through Gin, an Akita Inu. There is a gradual transition from the world of humans to that of dogs from the first book.

The dogs communicate with each other in a way that readers can understand, although the humans in the stories continue to interpret it as barking.

The 18-volume series has been a great success for author Yoshihiro Takahashi.

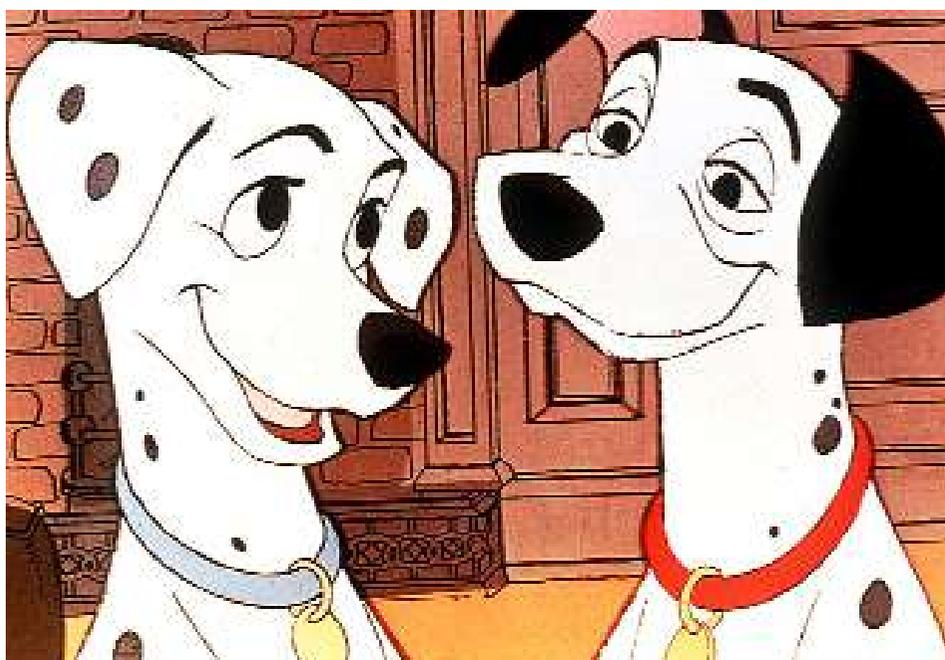
Dogs in entertainment

For kids and grownups alike, dogs are the archetypal loyal companion with just a touch of stubbornness. This has enabled them to become a real star on the page and on screen.

Dogs in cartoons

Some comic strip dogs have become so popular that their adventures have been made into animated films.

From 101 Dalmatians
© Walt Disney/Sipa



The many faces of the dog

One such character is Dingo, a dog that stands on two legs like a human but has a dog's head with long, droopy ears. He has often appeared as a "spokesdog" for educational purposes, including car safety campaigns targeting young children. Sad-looking Droopy, the dog in Tex Avery's cartoons, repeatedly announces his presence with the famous line, "You know what? I'm happy!". Pluto is the only Walt Disney animal character not given the power of speech or humanised to an extreme degree.

Other cartoon dogs live with humans, just like real pets or watchdogs. This is true of Lady and the Tramp, who live with their owners but share a romantic dinner and lead their own lives among other dogs. When Lady's owners bring home a new baby, they ignore her and humiliate her by forcing her to wear a muzzle.

This serves as a brutal reminder that she is “just” a dog.

Perdita and Pongo, the leading dogs in 101 Dalmatians, perhaps the most famous cartoon canines, are also companion animals to humans. But they become romantically involved with each other, just like their owners.

Nana the Saint Bernard protects the children in Peter Pan, while leading a life like that of other dogs.

Sometimes, the dogs in animated features are almost caricatures in their appearance and actions. They may look generally like dogs, but one of their physical characteristics is exaggerated. Rarely the main character, they are more likely to serve as a watchdog for their owner or for another animal. Cartoons featuring a cat and mouse often include a big, burly, unfriendly dog that seems to do little but lie around lazily and chase the cat. In Tom and Jerry, for example, a bulldog defends Jerry by getting Tom into trouble.

From *Asterix Conquers America* directed by Stefan Fjeldmark and Jesper Moller © Nana productions/Sipa



By giving dogs many human qualities, both good and bad, the creators of comic strips and cartoons use canines to depict our changing society.

Loyal dogs

Lion-heart or scaredy-cat, brainiac or lame-brain, dogs are always loyal. Tintin's little Fox Terrier Snowy is always right there with his master when he needs a way out of a bad situation. They are an inseparable couple and the indefatigable Snowy is always there to help. Snowy's barking is an easily understandable means of communication for Tintin and for viewers and readers.

Rantanplan, the loyal companion of Lucky Luke and his clever steed Jolly Jumper is another example. Rantanplan is not the quickest dog in the West, but he does bring the out the best from his master.

Another faithful friend is Dogmatix, a dog who never lets his master down.

Dogs can also be loyal to each other, of course. Lady and the Tramp, the Fox and the Hound, and Perdita and Pongo from *the 101 Dalmatians* are perfect illustrations. Regardless of the tribulations they have to face, these dogs always retain a strong bond, doing their utmost to find their friends even when that means putting themselves in deadly danger.

Disaster waiting to happen

Mickey Mouse's dog Pluto constantly pesters Donald Duck. Lacking any predisposition to obedience, Pluto is a canine calamity; the kind that plays with a magician's hat when told not to, generating a string of beasts from doves to rabbits.

Greedy chops

Scooby-Doo sprang from the imagination of character designer Iwao Takamoto. This 7-year-old Great Dane, brown with black spots, first hit the small screen in the United States in 1969. 'Scoob' is a dog that can talk and read with one main passion: Scooby snacks. Adorable but cowardly, Scooby-Doo sticks close to his best buddy Shaggy, who is just as wimpy and greedy.

Wallace's faithful friend Gromit is another gluttonous dog. Gromit is happy to help the hair-brained inventor, but is actually dreaming of Corn Flakes all day long.

Heroes

The lead character in *Balto*, an animated/live action movie based on a true event directed by Simon Wells and produced by Steven Spielberg, is a Husky that bravely ensures a cargo of serum gets to the children of Nome in northern Alaska to save them from a diphtheria epidemic when the musher is incapacitated. The route taken by this character is followed in a major annual dog sled race from Anchorage to Nome known as the Iditarod. Loyal, indefatigable and courageous are the words that best describe this dog, which has his own memorial statue in New York's Central Park.



Wallace and Gromit: The Curse of the Were-Rabbit, UK
- 2005 © LILO/SIPA

Stars of the big screen

Dogs have appeared in movies almost since the birth of cinema. In the early 20th century, dogs played small parts in several silent films. One of the most memorable was Charlie Chaplin's canine companion in misery in *The Kid* in 1921. Just a year later, a dog played the starring role in Hollywood's *Rin Tin Tin*.

Loyal companions

What could be more natural than acting for a dog whose past was far from the peaceful existence of a farm dog? Rin Tin Tin served as a messenger to the Germans during World War I and was found by an American aviator who brought him back to the United States after the war. When the American veteran discovered how quickly his canine companion could learn, he decided to make him a show dog. From 1922 to 1932, Rin Tin Tin appeared in 22 films, always in the role of an honourable and fearless hero who would do anything to defend the innocent, as the companion of Rusty the soldier in a 19th century U.S. cavalry regiment. His popularity spread all over the world, making him a true movie star. Rin Tin Tin had his own dressing room, "signed" his own contracts and chose his own co-stars! When Rin Tin Tin eventually died, his character was played by his pups and grand-pups; and in fact, Rin Tin Tin's fourth-generation descendants brought the character to television. In 2007, a movie written by Danny Lerner traced the history of this famous dog and his master.

Another dog superstar was the famous Lassie. Purchased for five dollars by an animal trainer, this Collie launched her career in 1943 in *Lassie Come Home*. (In fact, the dog was actually a male called Pal). While Rin Tin Tin tore after the bad guys and leapt across chasms, Lassie exemplified the loyalty and unconditional love of a dog for her master, a child. Like Rin Tin Tin, Lassie enjoyed worldwide popularity. Her trainer and agent demanded astronomical salaries — \$50,000 a year and \$4,000 per commercial appearance — as well as a dressing room, a private secretary and even paid holidays! Through the third generation, Lassie's descendants made films; then her legacy was brought to television.

The stories of Rin Tin Tin and Lassie are unique in the history of cinema. Both dogs had talented trainers who helped them gain recognition as actors in their own right and who had the business sense to manage their career and earnings.

The 2009 movie *Marley and Me* by David Frankel tells the tale of a Labrador adopted by a young couple. The guy buys the dog hoping that it will satisfy his partner's maternal instincts for a while, but Marley ends up running amok in their home. Above all, though, he becomes an unwavering friend, helping the couple and their family through some difficult times.



Benji the hunted © Oxley/Sipa



Marley and Me © Lilo/Sipa



Beethoven II © Nana Production/Sipa

Friend and guardian

After Rin Tin Tin and Lassie, the presence of dogs in cinema declined. Before the 1980s, a few books by Jack London were made into films, but none featured dogs as developed characters. Instead, dogs usually served as sidekicks for their co-stars, as in *Call of the Wild* with Charlton Heston. Not until the 1970s did Walt Disney Studios make another push for canine films. They needed to find a suitable dog that was, of course, extremely loyal and had a friendly face with star quality — in short, a kid's best friend. Into the studios trotted *Benji*, a little Pyrenean Shepherd cross. For the first time, casting directors chose not a big, proud sheepdog but a spunky ball of fur. Disney made five movies about Benji's adventures before launching a television series. With an annual salary of a million and a half dollars by 1974, Benji was certainly expensive to produce. Several films pairing the police with dogs were also released but had little success. Around 1990, the dog hero for kids was a big, fat Saint Bernard named *Beethoven*, whose films were successful worldwide. The legendary White

Fang was also honoured with a new Disney adaptation of Jack London's novel.

The thinking dog

Dogs are often given human qualities in movieland. Obelix's faithful companion Dogmatix can think, although he cannot talk. As a nature-lover, this little dog is broken-hearted when someone cuts down a tree, and can even give his master the cold shoulder.

Dogs in the 2000's can both talk and think. In 2009, the Disney animated film *Bolt* is about a canine TV star which escapes from the studio only to discover that the outside world is full of danger. He meets other anthropomorphised animals on his many adventures on the "outside".

Specialised training schools

Today's dog actors are graduates of professional training schools where they learn everything from barking and whining on command to playing dead, as part of a genuine drama course. The result of all this effort does pay off for trainers; only one of their "students" needs to be picked for them to make a fortune.

Animal health organisations are present whenever dogs are used in films to ensure that they are not mistreated.

As long as films with dogs are successful, Hollywood will continue to make them. Of course, not all aspects of this success have been positive. Certain films that feature a specific breed have triggered considerable demand for that breed, resulting in the subsequent overbreeding of puppies of poorer quality by some breeders. These films must not lose sight of the fact that, while the dog is a wonderful companion, it needs daily care throughout its life. While both children and grownups fall for them, it is important that adults don't buy a dog without understanding that a child is not always able to look after it and that they will have to take their responsibilities, too. Let's hope that cinema is not afraid to show the dog as it really is, an animal that gives so much to humans.

Dogs on television

Dogs have had a television presence since the early days. First as extras and later as full-fledged characters, dogs quickly gained a permanent place on television.

In silent films, dogs often appeared as loyal, indispensable companions but also as a comic element (with Charlie Chaplin, for example). This was the beginning of dogs in acting. Dogs were featured more and more in television series, playing roles of greater and greater significance.

Leading dog

Soon, dogs were playing leading roles. Breeds were not chosen haphazardly. Larger breeds were favoured for adventure and police shows, and smaller breeds for comedies. Nevertheless, the focal point for all breeds on television has remained the dog's loyalty to its work and to its owner. There are many examples of this, from Belle, the Pyrenean Mountain Dog who protects Sebastian, to Lassie, the wandering Collie who is always ready to help those in need; from Rin Tin Tin, the German Shepherd police dog, to White Fang. Not forgetting The Magic Roundabout's Dougal, who, although rather arrogant and rude, is a bit of a softie at heart. These examples show that the role of dogs on television (and in everyday life) is far from trivial.

In Japan, mangas have also used dogs because of their appeal, highlighting their loyalty and strengths, including Blanca and Dog of Flanders, which are about a dog that is ever ready to lay down its life to save its masters.

Dog and master

More and more, shows focus on the relationship between dog and master, proving the theory that dogs resemble their masters and vice versa. For example, in the French series *La loi est la loi* [The Law's the Law], the similarities between Max, a British Bulldog, and the prosecutor are no mere coincidence. The same is true of Columbo's dog. More recently, dogs have appeared in numerous sitcoms. In some series, not only does a dog play a leading role, but it is also able to communicate with humans.

Dog care shows

There has also been a trend towards shows focusing on dog care. These shows discuss the dog's habits, the characteristics of each

breed and the details of dog grooming, raising and training puppies and canine nutrition — all the practical tips an owner needs to live happily with his or her four-legged friend. Some of these shows end by showing a listing of dogs of all ages and breeds available for adoption.

Currently, the purpose of dog care shows seems to be to shed light on a particular dog or its owner by discussing the main characteristic of a breed. More and more, these shows emphasise communication between dog and owner. Dogs try to understand their owner and communicate through specific behaviour. When we study a dog's habits and behaviour, we give it the ability to “talk” to us.

There are also a range of television programmes devoted to training and dog behaviour, to help owners understand more

easily how to train their pet, how to correct behavioural difficulties and how best to integrate their pet into family life. For example, in “It's Me or the Dog”, dog behaviour expert Victoria Sitwell visits people's homes to help them correct outrageous canine behaviour that threatens family stability or a couple's relationship. Another programme, *The Dog Whisperer*, shows the remarkable transformations Cesar Millan can make to aggressive, frightened, compulsive or jealous dogs. Nowadays, there are even TV stations totally devoted to animal viewers. The purpose of these stations is to help alleviate the boredom animals can feel when they are shut up indoors all day, although they can obviously never replace human companionship and play, which are essential to the dog's behavioural well-being.

Dougal and his friends in *The Magic Roundabout* © BALTEL/SIPA



Dogs in advertising



Renault advert by Pierre Brissaud – from La gazette du bon ton, 1914.
©Selva/Leemage/Josse

Advertising has become one of the mainstays of our consumer society. It is no longer used simply to promote products, but also to spark trends. Advertisers began using images of dogs very early on, in an effort to seduce consumers, but the role of dogs in advertising has grown significantly in the past few decades. What is it about dogs that make them so popular with advertisers?

Dogs and brands

Many brands have based a lot of their advertising on dogs. Some have even fully incorporated the image of a dog in their products. While this may be a logical step for firms selling dog-related products and services, it can be surprising to find dogs elsewhere, promoting products that have nothing to do with them on the surface. But advertising execs will tell you that dogs represent a number of values in the collective unconsciousness.

A different dog for every value

Canines first started to appear in advertising in the early 20th century. One of the most famous is still featured on the high street today – Nipper the dog rapturously listening to a recording of “His Master’s Voice”. The message is that if a dog is unable to tell that it is a recording, it must be of excellent quality! Advertisers for Black and White Whiskey chose the Scottish Terrier and West Highland White Terrier for the product’s logo, evoking the breeds’ loyalty to their native land. The larger breeds are often favoured in ads for cars,

to evoke power and safety. In one campaign, the ease with which a Husky runs through the snow is compared with the quality of snow tyres. Another tyre manufacturer, Kleber, uses a Boxer, while Agip oils has a mythical six-footed dog to promote it. Big dogs like the Saint Bernard give consumers a feeling of comfort and security, while mongrels give ads a humorous tone.

Today, dogs are part of the family. They play with children and keep the elderly company.

For these reasons, dogs commonly appear in ads portraying the typical modern family. Dogs complete the picture and create a casual atmosphere.

Dogs are also used to advertise cleaning products, which is fairly ironic given that they are much more likely to produce a mess than to clean one up. And then there are toilet rolls. Some claim to be very, very long, and they’ve used playful puppies to prove it.

Elsewhere, the elegant side of dogs is highlighted in adverts for Chanel and other cosmetics manufacturers, where Afghan Hounds and Dalmatians are the order of the day.

Marketing tool

In these examples, whether they're shown as real dogs or given human attributes, these dogs are merely marketing tools, often adopted by advertising agencies, which also use the same breeds. This can create harmful trends for a particular breed.

Dogs as consumers

Unlike in many ads targeting humans, dogs are the focal point when it comes to pet food, but the approach differs depending on the brand. For Royal Canin, the dog should be respected as an animal. A German Shepherd running across a field to join its master and young puppies discovering their environment are depictions of elegant, powerful dogs in the best of health. Ads for Fido dog food show different breeds that have "tasted and approved" the product. Friskies and Frolic take a humorous approach in skits with canine actors; here again, the dog is enjoying its food. These ads appear in all kinds of magazines and especially on television, a better medium for showing the dog in motion.

The last domain – veterinary medication – is essentially reserved for the specialised press.

Some advertisements are strictly medical in tone, pointing to the product's efficacy, purpose and safety. But in some cases, medications are presented to consumers as miracle treatments that will cure their animal of every perceived problem, including stress.

Owners should always ask the advice of their veterinarian before buying any medication for their dog.

In conclusion, over time dogs have become selling tools, either because of the qualities they represent or as potential consumers. Dogs have been used to sell almost everything, not just products designed specifically for them. This has created the risk of media hype, which could make dogs a thing of fashion, regardless of the consequences for dogs in general and a specific breed in particular.



Royal Canin established its image with a remarkable 30-second TV ad campaign that featured Ennio Morricone's score from *Le Professionnel*. The first 9 seconds shows magical imagery of a sublime countryside environment with a German Shepherd in full flow, backed by music that would very soon become famous, establishing the emotion, culminating with a simple, minimalist message. © Royal Canin



His Master's Voice, advertisement in *The Theatre*, 1910.
© Selva/Leemage/Josse

Dogs as cult objects

Given the increasingly important place dogs have in modern society, it is unsurprising to find them depicted on many consumer products. The consequences for dogs are not always good, as they can end up becoming nothing more than cult objects.



From plaything to dog of the people

As fully fledged members of human society, dogs are everywhere nowadays, from the arms of the stars for whom they are sometimes nothing more than a way of improving their image as a friendly person, to various playful representations for children or adults.

Earthenware, plastic and wooden dogs

Toys, which contribute to a child's emotional and creative development, have been around much longer than films, television and comic strips. They remain as popular today as they have ever been, continuing to adorn children's rooms everywhere, be they big or small. The first toys based on images of dogs were made with clay, dough or wood. At first, they were mounted on wooden boards with wheels for children to pull or rock on.

One of the most successful toys has been the cuddly toy, of course. Its pleasant soft, safe texture makes the fluffy dog something that children can hold in their arms. It also gives them a feeling of confidence and protection.

Purebred dogs are well represented in the world of toys, especially in the form of merchandising for films such as 101 Dalmatians, although those perennial favourites Labradors and Saint Bernards also get their fair share of attention.

To make them more realistic, toy dogs have been equipped with mechanical joints – a mouth that opens, a wagging tail – and batteries, but even these have been superseded by more sophisticated robot dogs, such as Sony's AIBO, available between 1999 and



AIBO. Sony's robot dog ©SONY/SIPA

2006. Initially, canine robots could do little more than walk and bark, but they quickly developed the ability to recognise and respond to commands and objects using sensors and cameras. Their behaviour is gradually approaching that of real dogs and the artificial intelligence technology has made it possible to fine-tune their character to suit the preference of the individual owner. Dogs are also alive and kicking in the 2D world, in a range of video games, some of which are not only entertaining but educational, too.

Children's toys involving dogs may be so popular because real dogs require time, space and a great deal of responsibility. Cuddly, electronic or, nowadays, virtual – imitation dogs are a great playmate for kids without the hard work of a real dog for the parents.

Everyday objects

It would be impossible to quantify just how many different objects bear the image of a dog, so widespread have they become. Wood, China, glass, metal, plastic – dogs come in every imaginable material, either in their own right or as part of a bigger whole.

To mention just a few, there are key rings, figurines and statuettes of every kind, posters, postcards, calendars, clothes and perfumes. You can even get decorative plates, mugs and knives with a picture of a dog on them. This is often a character from

a recently released film, a fashionable breed, a dog used by a brand or one that represents something to people. For instance, a Labrador is seen as cute and friendly, while a Husky evokes the great open spaces of the north; a Rottweiler is imposing. This use of dogs will sell items as long as the breed is adapted to the target audience.

With all these articles available, it's only natural that they attract the interest of collectors. Some people limit their collections to a particular type of article, while others concentrate on a particular breed. Dog-lovers are also served by a plethora of magazines, both general and specialised in a specific breed or canine sport.

Snoopy toy collection given away to children by MacDonald's
© Geoffrey Robinson/Sipa





The Prince of Denmark and his children out with their dog © Wenstrup/Sipa



Tatum O'Neal and her dog ©Adam Nemser-Photoli/newscom/Sipa

The dogs of the stars

While some dogs have been catapulted into the limelight after completing dangerous missions or working assiduously alongside humans, others have become stars because of who they belong to. Some of these are companions to the great and the good in the world of politics, including presidents and prime ministers. Posing with your dog is often a good career move in public life, as it points to your human side, reassuring the electorate that you are a caring person. Depending on the breed, this type of owner can highlight key qualities, be that tacit strength, perseverance, vitality.

Celebrities also like to show off their companion animals. Some have original pets like pigs or snakes, but a great many are more than happy with a dog. The choice of breed provides plenty of scope for expressing their personality. While Audrey Hepburn did pose with a Yorkshire Terrier all those decades ago, today's glitterati really take the biscuit.

Some female stars are totally devoted to the diminutive breeds. Alyssa Milano and Paris Hilton both have a Chihuahua, while Gwen Stefani and Heather Locklear go for a Poodle-Bichon cross. Cécilia Attias and Sienna Miller have also joined the bandwagon. Eva Longoria cannot seem to be without her Maltese Terrier, which even attended her wedding. French singer Patricia Kaas has her own Maltese Terrier, called Tequila, while Rihanna, the princess of R&B, has a cuddly little Poodle.

But it's not only girls that like little dogs, plenty of guys like them, too. Tough guys whose hearts have been melted by mini dogs include Mickey Rourke, Adrian Broody, Jean-Paul Belmondo and Jorge Garcia, whose tiny pooch goes by the name of Nunu.

Women who go for the biggest sizes include Pamela Anderson, Jessica Biel, Anne Hathaway, Lauren Conrad and Lucy Liu.

Of course, stars just wouldn't be stars if they did not – allegedly! – get up to some strange business with their dogs. It's said that Jessica Simpson carries her dog round in a Vuitton or Gucci bag, while Tori Spelling transports hers around in a pram. Rumours are that Paris Hilton's Tinkerbelle has a life of manicures, skin and hair care and cashmere outfits. The Chihuahua once went missing after her mistress's home was burgled, prompting Hilton to put up a \$5,000 reward. Happily the dog was found again six days later.

Word is that Mariah Carey had her Jack Russell flown in first class to join her on a video shoot, and has also produced several websites in honour of her pooch. Meanwhile, Jennifer Aniston makes sure her dogs enjoy only the most luxurious treatments, while Denise Richards is reported to have installed mini swimming pools for hers, as well as orthopaedic beds.

Most of these US stars attended the Much Love Animal Rescue Benefit at the Playboy Mansion in July 2008.

The French-Dutch singer Ophélie Winter decided to stand out from the crowd, by posing with a 21st century dog that never needs to go into quarantine when she's on tour abroad: she has one of those AIBO robot dogs.

True or false, the stars and their dogs certainly help fill a lot of magazine and web pages.

Princess Masako of Japan and her dog Yuri.
©AP photo/Shizuo/Kabayashi/Sipa





Understanding the dog



Photo in the left: © LabatRoyal Cann

© Grosvenor



© DuhaeyerRoyal Cann



© DuhaeyerRoyal Cann



© DuhaeyerRoyal Cann



© Duhaeyer/Cege



© Linceau



© DuhaeyerRoyal Cann

Canine morphology



Morphology is the branch of biology concerned with the form of living organisms. When it comes to dogs it would perhaps be more fitting to speak of canine morphologies, given the big differences between the many different breeds. Some knowledge of canine morphology will help readers to better understand the words used to describe individual dogs and breeds. The different morphologies also have an impact on physiology.

Dogs can also be classified by size.

There are three height classes:

- Small (less than 46 cm)
- Medium (46-61 cm)
- Large (more than 61 cm)

And four weight classes:

- Small (less than 10 kg)
- Medium (10-25 kg)
- Large (25-45 kg)
- Giant (45 and greater)

In terms of general morphology, all dogs have the same body parts:

- Forequarters: head, neck and front legs
- Trunk: back, loins, ribcage and abdomen
- Hindquarters: croup, hind legs and tail

Dogs display a wide variety of coat colours and textures.



Hindquarters Trunk Forequarters

Hair varieties and colours

The dog's coat is made up of two different types of hair. The guard hair, which forms the topcoat, is hard, coarse and longer than the down hair, which forms the short, woolly protective undercoat. Not all breeds have an undercoat, but it is essential in the Nordic breeds.

The coat fulfils a number of aesthetic and protective roles which mirror the dog's state of health. The coat appearance is determined by the distribution of hair colours and the pigmentation of the nose and skin. Dog coats can be whole-coloured, patterned or modified.



Classification

Canine morphology is highly varied. Veterinarian Pierre Mégnin's classification identifies the following groups:

- Lupoids, which have prick ears and a triangular head (e.g. Belgian Shepherd Dogs)
- Braccoids, which have drop ears, a broad muzzle and a well-defined stop (e.g. Dalmatians)

- Molossoids, which are generally large, with small drop ears, a solid round or square hoot muzzle (e.g. Mastiffs, Pyrenean Mountain Dogs)

- Graoids, which have small ears that point backwards, a fine, broad head, an indistinct stop and thin limbs (e.g. Whippets, Salukis, Afghan Hounds).

The goal of morphology...

... is to be able to describe every physical characteristic of the dog as precisely as possible.

The morphological types (from Pierre Mégnin)



Lupoids
Prick ears and a triangular head (e.g. Belgian Shepherd Dogs, German Shepherds)



Braccoids
Drop ears, a broad muzzle and a well-defined stop (e.g. Dalmatians, Pointers)



Graoids
Small ears that point backwards, a fine, broad head, an indistinct stop and thin limbs (e.g. Greyhounds)



Molossoids
Large, with small drop ears, a solid round or square head and a short muzzle (e.g. Pyrenean Mountain Dogs)

Coat colours

Whole-coloured coats

Whole-coloured coats contain a single pigment, dark or light, or no pigment at all. There are therefore three types:

- **Dark coats**, which are made up of hairs containing eumelanin, are black or brown if the pigment is not diluted, and blue or beige if it is.
- **Light coats**, which are made up of hairs containing phaeomelanin, are fawn if the pigment is normal, and sandy if it is diluted. Fawn and sandy coats are the most varied colours in terms of shades.
- **White coats**, which are made up of unpigmented hairs.



Dark coats



Light coats



White coats

Patterned coats

Patterned coats contain two pigments, dark and light, without any white whatsoever. There are five types: masked fawn, dark fawn, brindle, black with fawn markings, and fawn saddle.

Fawn coats



• **Masked fawn**

This is fawn with a black mask, more or less widespread on the face. It is worth noting that the mask, which is very common in dogs, can also be present on any of the following four coats.



• **Dark fawn**

This is essentially characterised by the presence of bicoloured hairs (known as “bands” or “agouti”). The abundance of dark pigment varies considerably, which gives dark fawn a high variable phenotypic expression, ranging from virtually fawn to blackish.



• **Brindle**

In brindle coats eumelanin is condensed into stripes, which are more or less extensive. If they are widespread they can also produce a blackish coat.



• **Black with fawn markings**

This is a well-known colour, which is traditionally called black and tan. The fawn markings are located on the extremities. They may also be observed on a dark fawn foundation, which is known as dark fawn with fawn markings.



• **Fawn saddle**

In fawn saddle coats eumelanin is less dominant, sometimes producing a small saddle. The hairs of the saddle may be banded, which is known as fawn with dark saddle.



Greying coat

Modified coats

Modified coats are whole-coloured or part-coloured coats which can be identified by careful examination but which have a modified phenotypic expression. They are split into three categories:

- Greying coats which gradually go grey
- Merle coats, which are characterised by a partial lightening of the foundation of the coat
- Flecked, ticked, and speckled coats have more or less dominant white bands masking any undercoat.

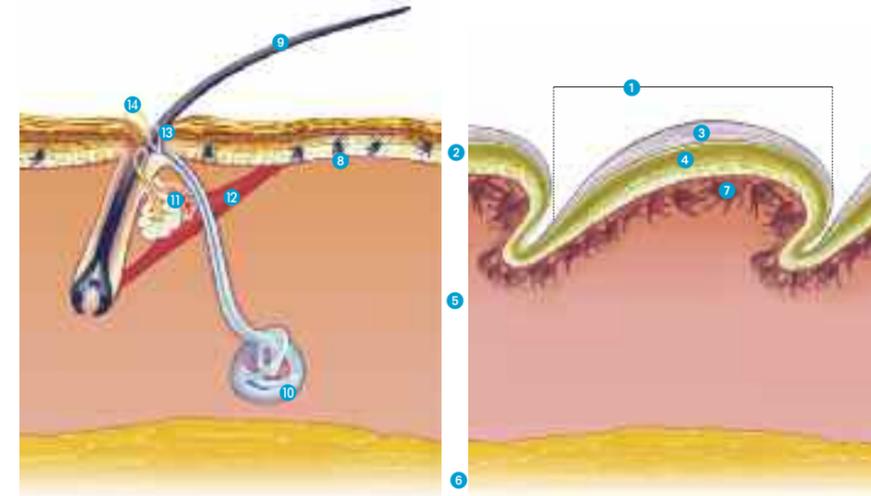


Flecked coat



Merle coat

Comparison between the skin of a mammal and the skin of a reptile



- | | | |
|-----------------------|------------------------------|--------------------------|
| 1. Scale | 6. Fat | 11. Sebaceous gland |
| 2. Epidermis | 7. Chromatophores (pigments) | 12. Arrector pili muscle |
| 3. Hard keratin layer | 8. Melanocytes (pigments) | 13. Sweat |
| 4. Soft keratin layer | 9. Hair | 14. Sebum |
| 5. Dermis | 10. Sweat gland | |

Hair

Hair is a flexible, elastic, keratinous filament. The section which grows out of the skin is actually dead. Just as there are various breeds of dog, there are also various types of hair. Hair varies in length, diameter, texture and form (straight, flexible, wavy or curly). They are also distributed in different ways. Dogs can have a tuft of hair on the head, a mane (like the Chow Chow), fringing on the hind limbs, under the belly and on the tail, or a close-cropped coat, when the hair is longer on the tail than on the rest of the body.

Many different factors influence the hair, including age. In some breeds, puppies have very different hair to adults. A Braque d’Auvergne, for instance, only acquires its mottling with age, while many Dalmatians are born without spots and Yorkshire Terriers are completely black at birth.

The hair lightens with age, particularly around the head, starting with the muzzle. A dog in poor health or on a poor diet will have dull, brittle hair. Light can also turn hair brittle and russet. After clipping, hair is clearer and purer.

Hair grows continuously. Dogs renew their hair by the process of moulting, which generally occurs in spring and autumn, extending over a period of four to six weeks. In dogs which spend a great deal of time indoors, moulting is virtually continuous throughout the year.

Hair length

- Absence of hair. Hairless dogs, such as Mexican Hairless Dogs and Chinese Crested Dogs, which have crests of hair on the head and the end of the tail. They have a fine, soft and warm skin, with heavy black pigmentation.
- Short hair, between 15 mm and 4 cm long. This is smooth, stiff and fairly harsh in a dog such as the German Shepherd. It is coarse when shorter, like a Beagle’s.
- Medium-length (4-7 cm) or long (more than 7 cm) hair, which can be fine, silky and wavy like a Setter’s, longer than the height at the withers like a Yorkshire Terrier’s, curly like a Water Spaniel’s, woolly like a Spitz’s or corded like a Puli’s or a Komondor’s.
- Close-cropped or smooth hair, between 5 mm and 15 mm in length. This is very fine in Pinschers, fine and short in Whippets and thicker in Pointers.



Mexican Hairless Dog



Pinscher



German Shepherd



Puli

Hair characteristics

• Harsh

Wiry to the touch, tousled, trapping a layer of air, like a Picardy Shepherd's, where it is of medium length, and a Griffon Vendéen's.

• Heterogeneous

Two thirds fairly harsh and one third softer, fur-like, like a Dandie Dinmont Terrier's.

• Smooth

Shiny looking and neat like a Great Dane's or a Rottweiler's.

• Silky

Very fine, flexible and soft like a Setter's.

• Woolly

Less shiny and thicker looking, like a Poodle's.



Picardy Shepherd



Dandie Dinmont Terrier



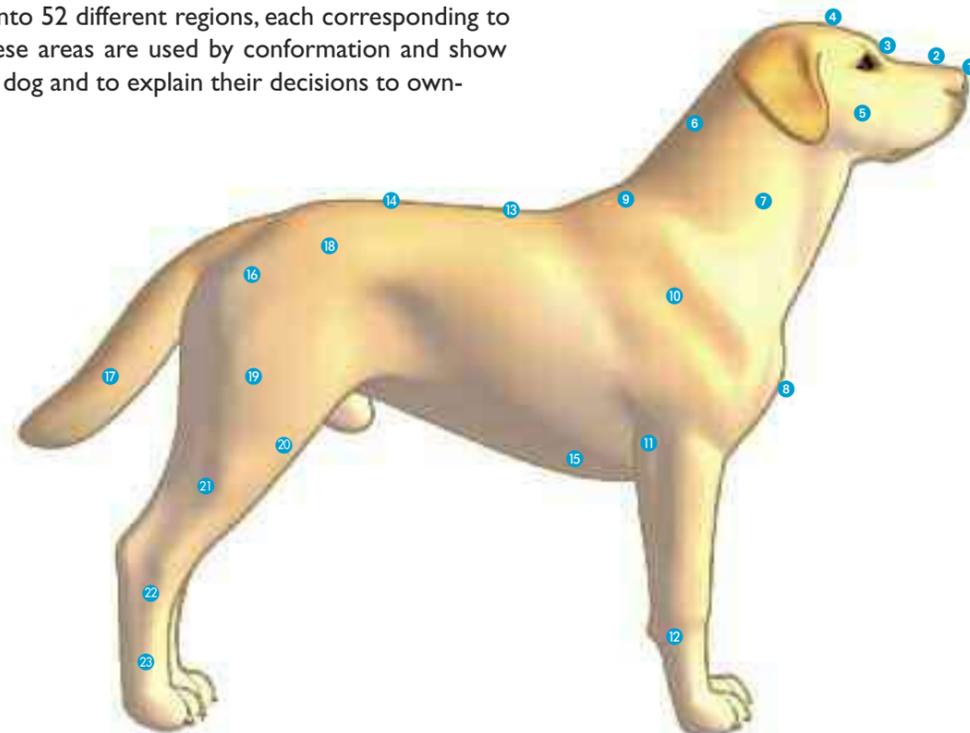
Great Dane



Poodle

Parts of the body

The body of a dog can be split into 52 different regions, each corresponding to a specific anatomical sector. These areas are used by conformation and show judges to evaluate the individual dog and to explain their decisions to owners.



- | | |
|---|------------------------------|
| 1. Tip of the nose | 13. Back |
| 2. Bridge of the nose (top of the muzzle) | 14. Loin |
| 3. Stop | 15. Lower line of the chest |
| 4. Forehead | 16. Rump |
| 5. Cheek | 17. Tail |
| 6. Nape | 18. Hip |
| 7. Neck (collar) | 19. Thigh |
| 8. Chest | 20. Knee (stifle) |
| 9. Withers | 21. Leg |
| 10. Shoulder | 22. Hock (tarsus) |
| 11. Elbow | 23. Cannon bone (metatarsus) |
| 12. Cuff (carpus) | |

The three head types



Brachycephalic (French Bulldog): skull as wide as it is short.



Mesocephalic (German Shepherd): pyramid-shape head.



Dolichocephalic (Greyhound): skull in the shape of an elongated cone.

Skull

The **frontal region** may be rounded (Beagle, Cocker Spaniel), convex (Boxer), flat (Dalmatian), oval (Poodle) or broad (Rottweiler).

The **stop** runs from the forehead to the bridge of the nose. It is visible from the side and is more or less well defined, between 90° and 180°. It is virtually absent in Greyhounds.

The **muzzle** or **bridge** of the nose contains the nasal cavities, which are spacious in pointing dogs (like Setters) and smaller in Bulldogs, which have a squashed muzzle. A complete flattening of the face (as in the Pekingese) leads to jaw alignment problems (undershot jaw, overbite) and breathing difficulties.



Weimaraner
The long muzzle accommodates spacious nasal cavities



Bulldog
The short muzzle means the nasal cavities are small



Tervueren



Perro de Presa Mallorquin



Munsterlander



Bull Terrier

The **stop** is either well-pronounced, as in the Munsterlander, accentuated to a lesser or greater degree in other breeds (marked in the Perro de Presa Mallorquin, present in the Tervueren) and absent in the Bull Terrier.

The **nose** has two nostrils, which should be open, and a median fissure. The nose of a healthy dog should be pliable, wet and cold.

The **lips** must not be flaccid and must be located opposite each other. They are well pigmented and covered with hair and vibrissa (long stiff hairs which have sensory receptors at the base). The inside of the lips is pink (or blue in Chows Chows).

The **ears** come in various shapes and lengths. They are also carried and attached in different ways. They can be pointed

(Belgian Shepherd Dogs), a little rounder (German Shepherds), very rounded (Bulldogs) or rather fine and covered with sometimes very long hair (Cocker Spaniels). They have a fundamental role in hearing. Pricked ears are better at picking up sound waves, while bloodhounds often have dropped ears, which protects the interior of the ear from vegetation and the penetration of foreign bodies into the ear canal. Terriers have short ears, which do not get in the way when they go underground.

“Pricked ears are better at picking up sound waves, while bloodhounds often have drop ears.”



Sloughi. In sighthounds the head is elongated and the stop virtually absent.



Cavalier King Charles. The head is round, the stop marked and the muzzle short.



Cane Corso. The square head accommodates short, muscular jaws.



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Topline, ribcage and abdomen

- The topline is made up of the whole of the back and loins. It is almost horizontal in normotypes, hollow in young dogs and rising in dogs that are “camped forward” (see below). The back has a straight or horizontal profile and may slope slightly towards the rear. It is arched in long-backed dogs. The back runs into the loins, which tend to be a little broader than the back. The croup is in line with the loins. It slopes and is rounded to a greater or lesser degree, although it is rectangular viewed from the side. It ends at the base of the tail.

- The ribcage comprises the chest (or ribs), which is a highly convex region formed by the 13 ribs. A deep chest (running from the point of the shoulder to the last rib) accounts for two thirds of the dog’s total length.

The sternum describes an arc with a large radius. This region contains the cardiac area, which must be fairly broad in physically very active dogs.

- The abdomen is a cavity located behind the diaphragm. It accommodates several essential organs (urogenital system, liver, spleen and digestive system). The flank is a slightly concave region which varies in length depending on the size of the dog. It is difficult to see precisely where the flank turns into the belly in dogs. The female’s teats are on the lower side; the male’s external sex organ towards the rear.

“Tails may be carried straight, horizontal or curved.”



© Labat/Royal Canin

Hindquarters and tail

- The hindlimbs are longer and more solid than the forelimbs and the angles of the joints are more obtuse. The thighs are generally meaty. The stifle marks the boundary between the thigh and the upper leg, which is long and at a slant. The hock marks the start of the lower leg; the metatarsal bones are slanted forwards and sometimes accommodates a dewclaw on the inner edge. The hind foot is generally a little shorter than the front foot.

- The length, size and carriage of the tail is specific to each breed. It may be a screw tail (Spitzes), a long plume (Setters) or a short tail (Terriers). Dogs are also born without a tail or with the smallest stump of a tail. Tails may be carried straight, horizontal or curved.

Head, neck and forelimbs

The head can be round (Cavalier King Charles Spaniels), long (Greyhounds) or square. It plays an important role in balance. Breeds with a long head tend to have a pointed nose, whereas those with a square head have short, muscular jaws (mainly dogs originally bred for fighting).

The head is divided into two main regions, the cranium at the back enclosing the brain and the face at the front accommodating the nasal cavities. The middle region is centred on the two eye sockets. The difference in proportions between cranium and face determine whether the dog is **dolichocephalic** (elongated muzzle), **brachycephalic** (short, squashed muzzle) or **mesocephalic** (between the two).

- The head also comprises other less well defined regions. The temples are located on the sides of the head behind the eyes and directly above the zygomatic arches, which are next to the cranium and are fairly decisive for the shape of the head. The parotid region is located under the ears, behind the masseteric region, which is in turn behind the cheeks. The cheeks themselves are very small, because of the dog’s large mouth opening. The nape of the neck is moderately prominent and the throat may have folds of skin known as dewlaps.

- The neck is cylindrical, larger in diameter towards the trunk than closer to the head. It ends at the withers, forming a more or less open angle with the back.

This is an important region when judging the dog’s appearance. It has an influence on head carriage and general balance, because it determines where the centre of gravity is. The head-neck axis therefore acts as a counterweight to the rest of the spinal column and helps the dog during motion (when the dog’s head and neck are held against the ground, for instance, it is unable to get up). The neck runs into the shoulders, the withers and the chest. Its position changes with stance, upright in the drive phase, extended in the recovery phase.

- The forelimbs are generally long and slightly flattened. The shoulder slants from high to low and from back to front. It is also slightly convex. The arm is directly below the shoulder and directly above the elbow and lies against the chest wall. The two medial digits are longer and broader than the two lateral digits. The footpads (which consist of a thick, keratinous layer rather than fat) are prominent and very slightly arched. Curved, keratinous nails are found at the end of the digits. They should not touch the ground when the dog is standing.

- The chest, which comprises the front part of the thorax, varies in height and breadth. Its position in relation to the forelimbs also varies. It shows itself as a perfect square in French Bulldogs and an arch in English Bulldogs.

“The head is divided into two main regions, the cranium at the back enclosing the brain and the face at the front accommodating the nasal cavities”

Stance

Stance refers to the direction of the limbs in relation to level ground. Stance has a major influence on the topline, making it a key aspect in the dog's general bearing and its sporting abilities. It ensures the body is well supported and the weight distributed among the joints and the feet. Generally speaking, the main axis of a limb should

be vertical. Even a slight divergence can overload the joints and the sole of the foot (on the side of the divergence), leading to premature wear of the joints, tendons and ligaments (which is an especially awkward handicap for working dogs). Stance is therefore not just a theoretical or aesthetic consideration.

When the dog is relaxed, the dorsolumbar line sags and the back is slanted. If the forelimbs also sag it is said to be saddle-backed. The loins are arched and the back curved upwards when the dog tightens up. The hind feet are often turned-out, which is natural. Pigeon toes are more of an issue.

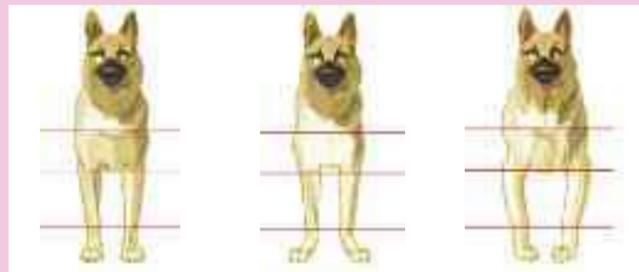


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Stances of the forequarters viewed from the front

- Side view: The vertical through the middle of the arm goes through the middle of the foot at a tangent to the wrist (the front of the carpus). If it falls forward, the dog is said to be "down at knee", if it falls backward, it is said to be "camped". If the wrist is behind the vertical, the dog is said to have a receding wrist, while it is knuckled over if the wrist is in front of the vertical. In this case, the dog has a fetlock deformity. If this vertical is far from the footpads the dog is long in the pastern; if it almost bisects them the dog has an upright pastern.

- Front view: The vertical line from the point of the shoulder must bisect the forearm, wrist, metacarpal bones and foot right down the middle. The two limbs must be as parallel as possible.
- Pigeon toes: The wrists and elbows are turned outwards, the metacarpal bones and feet turned inwards.
- Turned-out feet: The elbows are close to the body, the metacarpal bones and feet turned outwards. Pigeon toes and turned-out feet can begin at any point on the leg.
- Base narrow or base wide: The front limbs are slanted and convergent or divergent at the extremities. This is not to be confused with narrow or wide front, when the limbs are parallel. If only the wrists are within the vertical, the dog is said to be knock-kneed; if they are curved inwards outside the vertical, the dog is said to be bandy-legged. If the limbs curve outwards, the terms Chippendale front or fiddle front are used.



Good base: well descended chest, with good breadth; balanced, straight front legs.

Straight, insufficiently descended chest; lack of upper chest; flat ribs; pulled-up body; turned in elbows; weak wrists; turned out feet.

Broad barrel-shaped chest; turned out elbows; upper arms curved outwards; turned out pigeon toes.

Stances of the hindquarters viewed from the rear

- Side view: The metatarsal bones must be vertical to the ground. The vertical from the hip joint must go through the middle of the foot.
- Camped forward, standing under: The entire limb is in front of the vertical. If it is not, it is said to be camped forward, which is not really a fault since it is a fairly natural position. If the hock joint is at too acute an angle, the dog is said to stand under; in the converse case the hock is hyper-extended.

- Rear view: The vertical goes through the point of the rump and the point of the hock and should bisect the metatarsal bones right down the middle. The dog may be too close or too open, which is determined by the convergence or divergence of the extremity of the limbs. This should not be confused with a dog that is too narrow or broad at the rear. When the limb is rotated outwards from the hip joint, the limbs are turned out. This is also characterised by divergence between the stifle and the foot. When it is rotated inwards, the result will be pigeon toes. There is convergence between the stifle and the end of the feet, whereas the hock is divergent.



© Duhayer/Royal Canin



Good stance, straight legs.

Extensive rump, cow hocks, dewclaws (single left dewclaw, double right dewclaws), semi-pricked ears, rudimentary tail.

Open or barrel-shaped hocks, ears set too low and large, tip of the tail slightly off centre.



Eyes

The distance between the eyes varies greatly from breed to breed, although they are always far enough apart so the dog has a wide angle of vision. The eyeballs are generally sunken (though they are globular in the Pug). The opening can be round, as in Pointers, or almond-shaped, in sheepdogs and Nordic breeds for example. The eyes are the main medium of expression and they should be lively, open and gentle.

Dogs have two visible eyelids, one at the top and one at the bottom. They should be fine, set far apart and well pigmented, with abundant lashes. The external part is made up of skin covered with hair, whereas the internal part – the conjunctiva – is a pink mucous membrane. The lacrimal gland, which secretes the tears that keep the cornea wet, is located under the upper lid. The lacrimal duct at the inside corner of each eyelid runs into the nasal cavity.

The dog also has a third eyelid, the nictitating membrane, much of which is hidden under the lower eyelid. It works as a kind of windscreen wiper and pushes away foreign bodies.

Eye colour depends on the pigmentation of the iris. It is usually brown, which is a sign of good health. Any shade is possible, all the way up to black. Eyes should not be too light, so that they look like a bird of prey's. This detracts from even the most handsome dog.

Eye colour does not have to be the same as coat colour. Dark eyes with a light whole-coloured coat are perfectly acceptable, even obligatory as in Samoyeds. Dogs with a greyish blue (Weimaraners), blue pied or blue brindle coat can have lighter eyes.

Colour can also change in the course of the dog's life.

The term walle eye is used when the eyes are two different colours. Anatomically, this is referred to as heterochromia, which is not uncommon. Although not desirable, it is tolerated in Siberian Huskies.

The iris may lack pigmentation, appearing partly or totally bluish. This is a common fault in dogs with a tricoloured or mottled coat. It can affect one or both eyes. It should not be confused with walle eye, which is found in Siberian Huskies. It is preferable to bar dogs suffering from this condition from reproduction.

Other eye defects include cataracts (when the crystalline lens becomes progressively opaque), entropion (when the eyelid is rolled inwards against the eyeball), glaucoma (when pressure increases in the eyeball causing gradual loss of sight) and strabismus (when abnormal alignment of the eyes causes a squint).

“The dog also has a third eyelid, the nictitating membrane, much of which is hidden under the lower eyelid. It works as a kind of windscreen wiper and pushes away foreign bodies.”

Third eyelid.



© UMES



© Hermeline/Cogis

Prognathism



Correctly aligned jaws.



Undershot jaw.



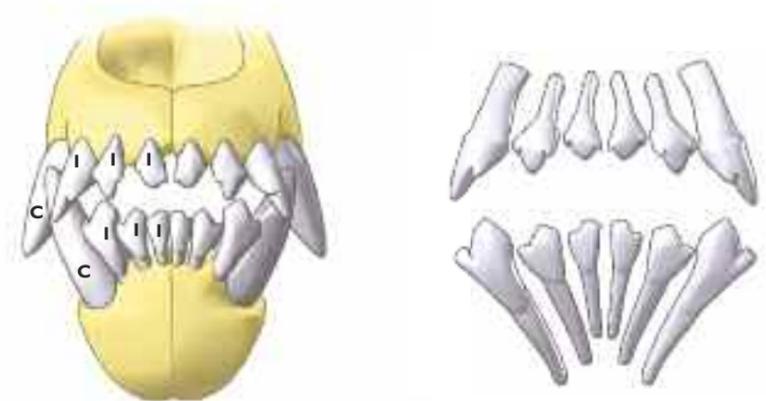
Overshot jaw.

Teeth

Adult dogs have 42 teeth, 20 on the upper jaw and 22 on the lower jaw. The way the teeth are arranged is known as dentition. Teething is the term used to describe the eruption of teeth at various points in the dog's life.

The teeth are hard and bony-looking. They are used to grasp, tear and grind food. Dogs are so-called heterodont mammals, which means that their teeth are differentiated for specific use. The molars (M) are permanent teeth, whereas the incisors (I), canines (C) and premolars (P) are deciduous.

Dentition of the dog viewed from the front



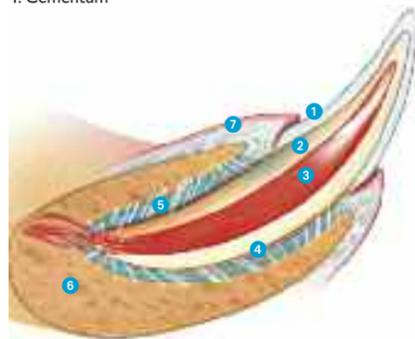
“The molars are permanent teeth, whereas the incisors, canines and premolars are deciduous.”

The dental formula for each quadrant is I 3/3, C 1/1, P 4/4, M 2/3. This formula can vary depending on the breed (short or long face). Working outwards from the middle, the incisors, which are bigger on the upper jaw, are termed central, intermediate and

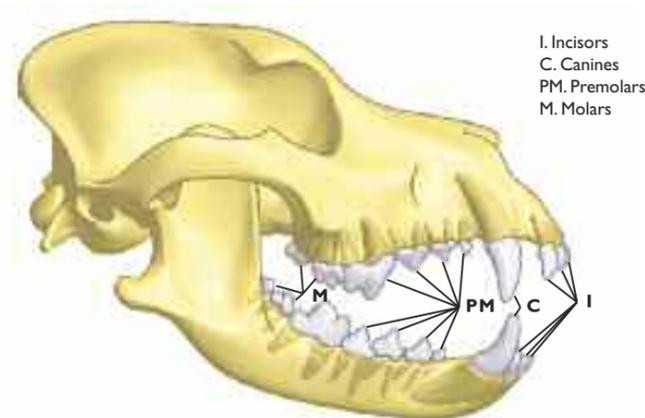
lateral (or first, second and third). The canines are conical, but finer and narrower in puppies. The molars and premolars are referred to as pre-carnassial, carnassial and post-carnassial.

Cross section of a tooth

- 1. Enamel
- 2. Dentine
- 3. Pulp
- 4. Cementum
- 5. Periodontal ligament
- 6. Jaw bone
- 7. Gum



Side view of the dog's skull



- I. Incisors
- C. Canines
- PM. Premolars
- M. Molars

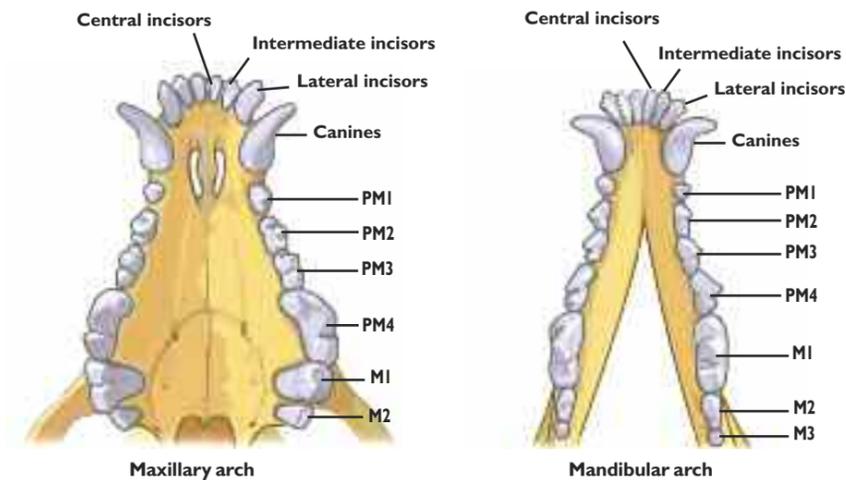
The dental formula of a puppy is I 3/3, C 1/1, P 0/0 M 4/4. Puppies are born toothless. The milk teeth start to erupt around day 20, at the following rate (average for medium-sized dogs): first canines towards the end of three weeks, then premolars (P3, P4), lateral incisors (3-4 weeks), central and intermediate incisors and P2 (4-6 weeks). P1 appears around 4 months and is permanent. All the other teeth are replaced between month 3 and 5. The first teeth fall out as the roots are reabsorbed and are replaced by the permanent teeth. Molars, incisors and canines erupt around month 4 or 5, lower M2 in month 5, upper M2 and P in month 5-6 and the last molars in month 6-7, as shown in the table opposite.

The eruption dates vary depending on the breed. Too many or too few teeth may erupt. Too many is uncommon, whereas too few may be a reason for refusing a pedigree. The absence of certain molars is common. The importance of the teeth increases from front to back. The first premolar is often absent. One or two incisors can also be absent, especially in small breeds.

The maxillary and mandibular arch should fit together without lateral movement. The upper incisors partly cover the lower incisors. In the event of undershot jaw, the lower jaw projects beyond the upper jaw. If the upper incisors project beyond the lower incisors the dog has an overshot jaw. The teeth play an important part in determining the dog's age. The top of an incisor features three lobes. As the dog ages, the incisor is first smoothed down (wear on the medial lobe), then worn down (disappearance of the three lobes).

Teeth can suffer from various diseases. Tartar is the calcification of plaque in the teeth by a build up of calcified salts from saliva at the bottom of the tooth, often leading to gum disease and tooth loss. Ageing dogs may have yellow teeth, as may seriously ill dogs on a course of antibiotics. Some diseases can cause the decalcification

of teeth. Caries is uncommon, as the enamel is very hard. Holes are caused by necrosis of the alveolar membrane, which results in abscesses. The persistence of milk teeth can obstruct the development and eruption of permanent teeth.



Teeth	Eruption	Replacement
central	30 days	4 months
intermediate	28 days	4½ months
lateral	25 days	5 months
canines	21 days	5 months
P1	3-4 months	permanent
P2	4-5 weeks	6 months
P3	3-4 weeks	6 months
P4	3-4 weeks	6 months
M1	4 months	
M2 (upper)	5-6 months	
M2 (lower)	4½-5 months	
M3	6-7 months	

Development of the dentition with age

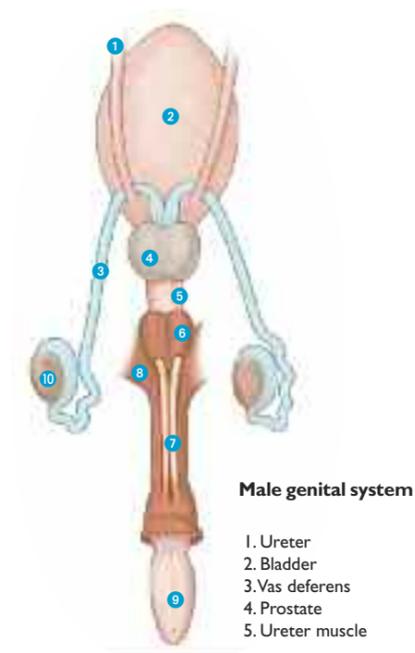




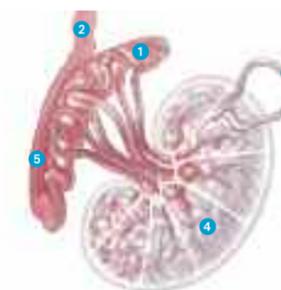
Physiological functions

Physiology is the study of the body's normal functions. The body has many organs, each of which performs one or more essential functions. From reproduction to digestion, seeing and smelling, there are numerous physiological functions and by better understanding them we can ensure the dog has the best possible living environment. More importantly, we can help prevent the physiological from developing into the pathological.

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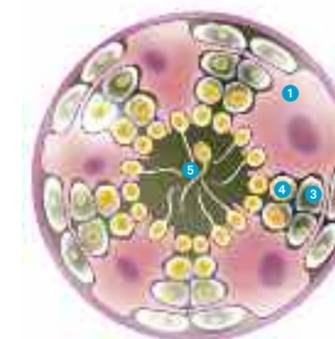


Cross section of a testicle



1. Epididymis
2. Vas deferens
3. Seminal duct
4. Testicular lobule
5. Duct of epididymis
6. Bulb of penis
7. Retractor muscle
8. Ischiocavernosus muscle
9. Glans penis
10. Testicle

Cross section of the seminal duct

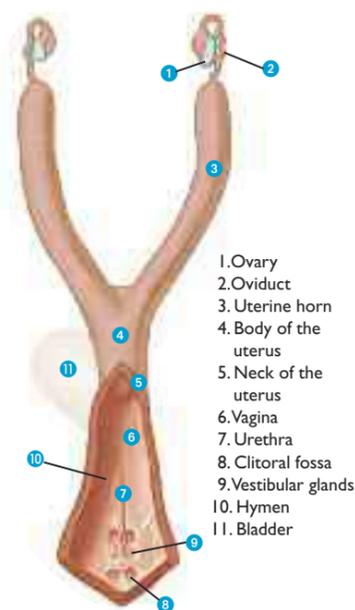


1. Sertoli cell
2. Spermatogonium
3. Primary spermatocyte
4. Secondary spermatocyte
5. Spermatozoon

Reproduction

Without the reproductive function no species would be able to survive. This is one of the most fundamental areas dog breeders need to understand, because it has a direct impact on the success of their endeavours. The canine species has many particularities when it comes to reproductive function, which we examine here in simple terms.

Female genital system



Genital anatomy

Female genital anatomy

The vulva consists of two labia, connected by a ventral commissure (line) and a dorsal commissure (line). The clitoris, which is the analogue organ to the male penis, is relatively small and located in a clitoral fossa on the floor of the vestibule. The vagina, the organ of copulation, is characterised by its great length (15 cm in a medium-sized breed). The uterus, the organ of gestation, consists of a body and two horns in which the embryos are distributed during gestation. At the very top, the ovaries are surrounded by a fat mass. After ovulation, the ova (eggs) move along a narrow tube, the oviduct, where they are fertilised by the male's spermatozoa. The embryos then move to the uterus, where they attach and grow.

Male genital anatomy

The spermatozoa are produced in the testes. It takes about two months to produce spermatozoa, which then mature in the epididymis, located along each testis. The epididymis is a small multifolded duct, which if unravelled would measure about 10 feet in length. The spermatozoa only become mobile and fertile once they have matured. Testes and epididymes are located in an outgrowth of skin called the scrotum.

At the moment of ejaculation the spermatozoa are mixed with prostate secretions to dilute the semen. Any prostate problems will therefore have major consequences for fertility.

The penis, the organ of copulation, is characterised by a penis bone, which helps keep it stiff but can fracture in the event of trauma or forceful mating. This commonly happens when a mating couple are abruptly separated.

The erectile bulbs at the base of the penis grow hugely during erection, generating a reflex spasm in the vagina during mating, which retains the penis in the vagina.

Puberty in females

In general, females are around two thirds their final adult body weight when they experience their first oestrous cycle. In small breeds this is around 6-8 months, whereas in some giant breeds it will not occur until 12 or even 20 months.

These are general parameters, however. The first oestrus (heat) can be discreet (little blood discharge, little attraction of males) and may even pass unnoticed. This is called silent heat. It is important to make the distinction between puberty (the ability to ovulate) and nubility (the ability to go to term and whelp). Bearing in mind that the birth canal is not yet fully developed during the first oestrous cycle and maximum fertility is not achieved until second, third or even fourth oestrus, it is inadvisable to mate a female during the first heat. Minimum age limits are in place for pedigree female reproduction in most countries.

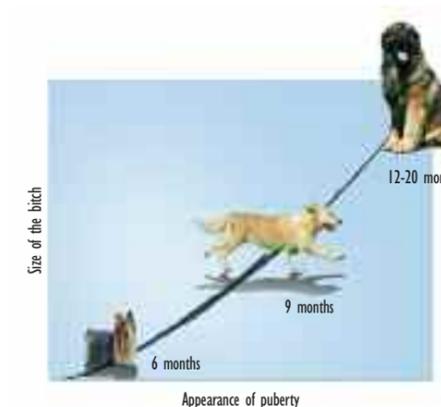
During puberty the female reproductive system adopts a cyclic rhythm which is generally expressed as two periods of oestrus every year.

Puberty

Puberty in males

The age at which puberty occurs primarily depends on the adult size of the breed (from six months in miniature breeds to 18 months in giant breeds). In males it corresponds to the production of the first fertile spermatozoa. As fertility diminishes at an earlier age in large breeds (a phenomenon probably linked to thyroid ageing), large breeds are fertile for a shorter period of their life. Sperm fertility begins to diminish at around 7 years of age in giant breeds.

“In general, females are around two thirds their final adult body weight when they experience their first oestrous cycle.”



The age at which the first oestrous cycle occurs depends on the size and breed of the female.

Oestrous cycle

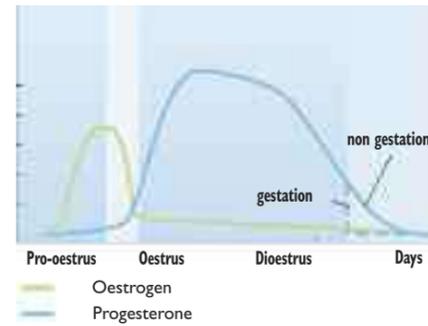
The bitch's sexual cycle

Bitches ovulate once every oestrous cycle. This ovulation is spontaneous, which means it is not triggered by mating as it is in cats, for instance. The oestrous cycle breaks down into four successive stages:

- Pro-oestrus, during which the body prepares for ovulation
- Oestrus, which is the period of ovulation
- Dioestrus or metoestrus, which corresponds to the length of a gestation
- Anoestrus, which is the period of sexual inactivity

The duration of the individual stages can vary. Only dioestrus / metoestrus is relatively stable (60 ± 20 days). Heat is the period comprising pro-oestrus and oestrus, which lasts an average of three weeks, although the actual duration depends on the date of ovulation, which in turn varies from one female to another, and from one cycle to another. Therefore, just because a female ovulates 12 days after the first bloody discharge in an individual cycle, it does not mean that ovulation will occur at the same interval the next time around.

Main hormonal secretions by the female during the oestrous cycle



The four phases of the oestrous cycle

	Average duration [minimum – maximum duration]	Behaviour	Clinical signs	Hormonal changes	Physiology	Vaginal cytology
Pro-oestrus	9 days [0 - 27 days]	Attraction of males but refusal to copulate	Swollen vulva Bloody discharge from the vulva	Oestrogen peak Progesterone drops until the end of the phase	Development of follicles (containing the future ovules)	Mixture of parabasal and intermediate cells Presence of red blood cells Inflammatory cells sometimes present
Oestrus	9 days [4 - 24 days]	Attraction of males and willingness to copulate	Swollen vulva Lighter vulval discharge	Drop in oestrogen to basal level Rapid increase in progesterone	Ovulation Maturation of oocytes for two days, necessary before possible fertilisation	More than 90% of cells keratinised
Di-oestrus	2 months	Refusal to copulate	Reduction in the size of the vulva Development of mammary gland Lactation possible at the end of this phase	Oestrogen at basal level Increase in progesterone to a peak 3-4 weeks after ovulation, then gradual decrease to basal level at the end of this phase	Secretion of progesterone by the corpus luteum in gestating and non-gestating females	Fewer than 50% cells keratinised + intermediate cells (beginning of di-oestrus) Visible inflammatory cells (abundant at the beginning of this phase)
Anoestrus	4 months	Refusal to copulate	Small vulva No vulval discharge	Oestrogen and progesterone at basal level	Low ovarian activity	More than 90% of cells parabasal and intermediate Few inflammatory cells

The cycle

During pro-oestrus, under the influence of the pituitary gland, the growing ovarian follicles secrete oestrogens, which are hormones that trigger changes in behaviour (attraction to males, need for affection) and physical changes (discharge from the vulva). The vulva becomes flushed and oozes a bloody discharge, which attracts males, although the bitch will not allow mating at this stage.

Males are generally accepted during oestrus. In this part of the cycle females often adopt a posture in which the tail is carried to the side due to the stimulation of the vulva. This sign should, however, be interpreted with caution in some bitches who will accept males outside their ovulation period. During oestrus, vulval discharges are lighter and become less abundant. The mucus turns thinner, which facilitates the progress of the spermatozoa.

In this phase the ova are still at an immature stage, during which time they are called oocytes. They generally become fertile after 48 hours.

Unlike most species, in dogs the ovaries begin to secrete progesterone a few days before ovulation. The blood progesterone increases gradually, regardless of whether fertilisation has occurred. In dogs, measuring blood progesterone provides information on ovulation but not on pregnancy.

Progesterone is secreted throughout dioestrus by the corpora lutea, which “lay” the oocytes. This hormone prepares the uterus for the implantation of the embryo and enables its development in the event of pregnancy. Its production falls abruptly two months after ovulation, enabling the commencement of lactation and involution of the uterus or the complete quiescence of the female reproductive system (anoestrus).

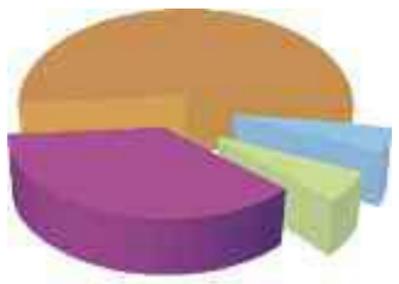
Gestation

Fertilisation, which is the union of a spermatozoon and an ovum, occurs in the fallopian tubes. Towards the end of the first week after fertilisation the embryos move from the fallopian tubes to the uterine horns. They float in the uterine fluid and may even move from one horn to the other. The embryos implant in the uterus fairly late, around the 16th day after ovulation. This is when they begin to grow.

The development of the future puppy can be split into two phases:

- Embryogenesis, in which the organs begin to form. At the end of this phase the future puppies are still very small, although most of their structures are in place and all the organs have started to grow. The embryo is now a foetus, which is recognisable as a given species.
- Weight gain: the foetus gains more than three quarters of the puppy's birth weight after day 40 of gestation.

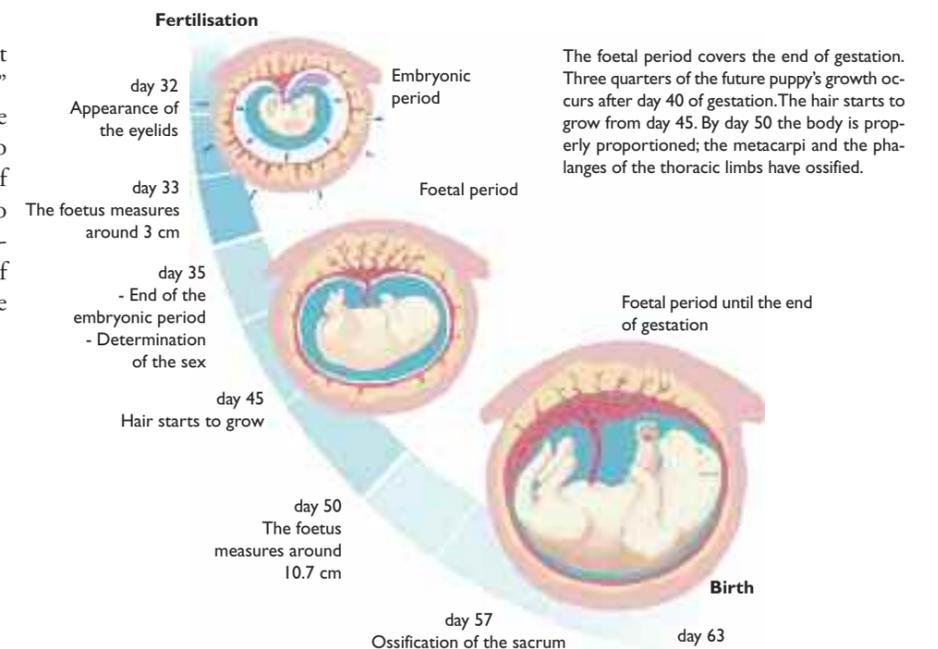
Representation of the different phases in the oestrous cycle



HEAT

- Pro-oestrus: average = 10 days
- Oestrus: average = 7 days
- Di-oestrus: 2 months
- Anoestrus: average = 3 months

Development of the foetus



Musculoskeletal system

The skeleton provides the frame for the dog and consists of a collection of bones connected by joints. These differ depending on the degree of movement allowed between two bones; some of them are immovable, such as those connecting the bones of the skull, whereas others allow movement in three dimensions, such as the joint that connects the skull to the spinal column.

Skeletal muscle, attached to the bones by tendons, gives the skeleton its mobility; when it contracts the bones move in relation to each other, as in flexion and extension.

Muscle contractions are controlled by nerves through the

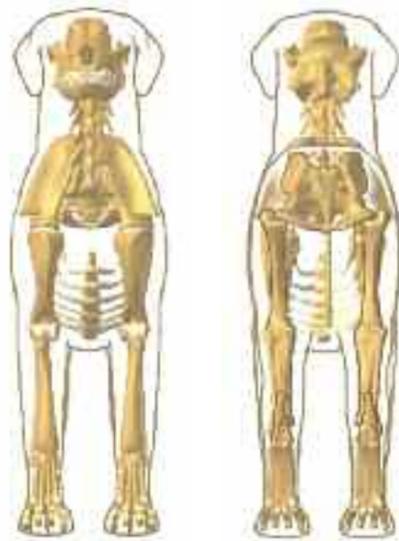
central nervous system: the cerebrum and the cerebellum control voluntary movements and the spinal cord controls reflexes. The neurons involved in controlling movements are called motor neurons compared with sensory neurons which convey information to the brain.

Dogs have three or four different gaits – walk, trot, gallop, amble – which are developed to a greater or lesser extent depending on the breed. Dogs are very good jumpers and moderate swimmers, although again, there are variations between breeds.

Three types of mammal foot



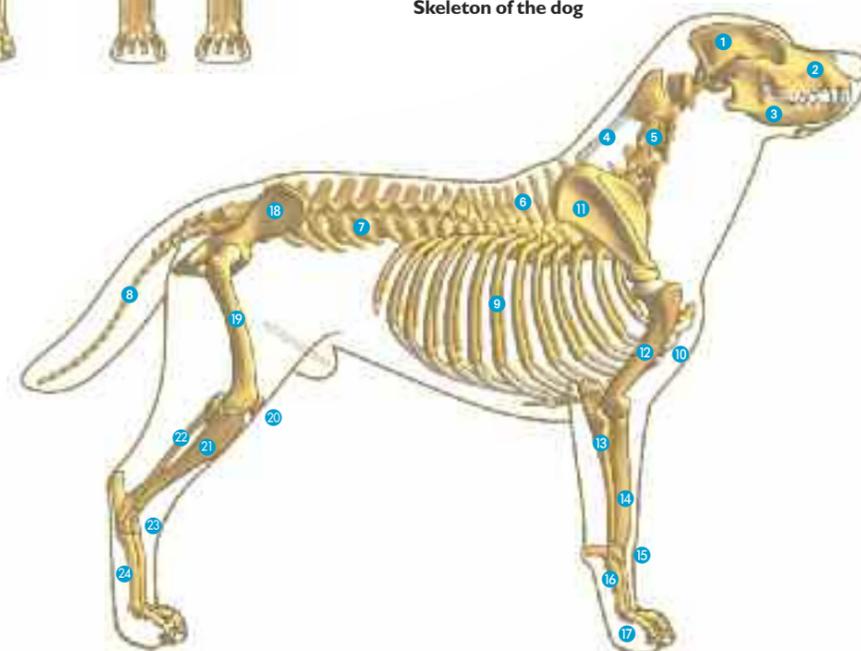
Skeleton of the dog viewed from the front and rear



Skeleton and bones

The axis of the **skeleton** is the spine, which is formed by various types of vertebrae. Thirteen ribs are attached to the spine through the breastbone (sternum) forming the ribcage. The skull is connected to the first cervical vertebra, a ring-like structure known as the atlas, which is connected to the next vertebra, the axis, in the form of a pivot, to allow the head to move around the axis formed by these two vertebrae.

Skeleton of the dog



- 1. Skull
- 2. Maxilla
- 3. Mandible
- 4. Nuchal ligament
- 5. Cervical vertebrae
- 6. Thoracic vertebrae
- 7. Lumbar vertebrae
- 8. Caudal vertebrae
- 9. Ribs
- 10. Sternum
- 11. Scapula
- 12. Humerus
- 13. Ulna
- 14. Radius
- 15. Carpus
- 16. Metacarpus
- 17. Phalanges
- 18. Pelvis
- 19. Femur
- 20. Patella
- 21. Tibia
- 22. Fibula
- 23. Tarsus
- 24. Metatarsus

The **hind limbs** are the dog's propulsion system. They are attached to the pelvis at the hip joints, while the pelvis is connected to the vertebral column by a complex system of ligaments. The forelimbs, which are less involved in propulsion, are simply attached to the vertebral column by the scapula (shoulder blade) and the adjacent muscles.

Bones are made of a calcified fibrous structure. This calcification occurs gradually during the development of the foetus and in the growth period, which is very long in large breeds. As a result, calcium intake must be carefully regulated in growing puppies to avoid any deficiency or excess. Bone calcium is a reserve available throughout the dog's life that increases or decreases depending on the blood calcium level, which should be constant. The centre of bones contains bone marrow, a spongy tissue which produces blood corpuscles.

Joints and muscles

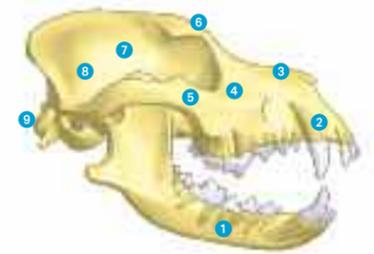
The joints differ depending on what movements they allow. Sutures (as in the skull) do not allow any movement what-

soever, whereas symphyses (cartilaginous joints) allow very slight movements between two bone structures (eg symphysis pubis). True joints have surfaces covered with hyaline cartilage and a capsule shared between two bones, allowing complete movement.

This joint capsule is a cavity filled with viscous synovial fluid, which nourishes and lubricates the cartilage. This is a very fragile tissue which does not regenerate if destroyed, which is why the protective synovial fluid is so important. The joint capsule is often surrounded by a fibrous shell and numerous ligaments which support the individual joint. If the ends of two bones are not an exact match, there may be an additional articular disc between the two, as in the knee for example.

The muscles are composed of a body of contractile cells interconnected by membranes to form fasciae, which merge at the ends to form fibrous tendons connected to the bony attachments. As their name suggests, the contractile cells are made up of special proteins (actin, myosin) that are able to contract, which in turn contracts the muscle. This demands

Side view of the skull



- 1. Mandible
- 2. Incisive bone
- 3. Nasal bone
- 4. Maxilla
- 5. Zygomatic bone
- 6. Frontal bone
- 7. Temporal bone
- 8. Parietal bone
- 9. Occipital

Synovial joint

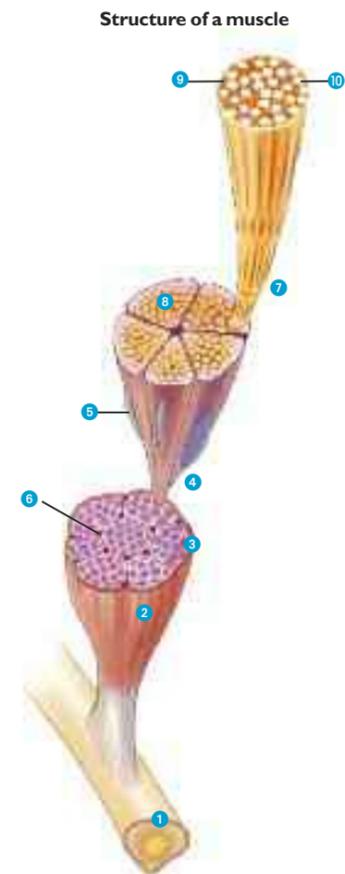


- 1. Bone
- 2. Joint capsule
- 3. Synovial membrane
- 4. Synovial cavity
- 5. Cartilage





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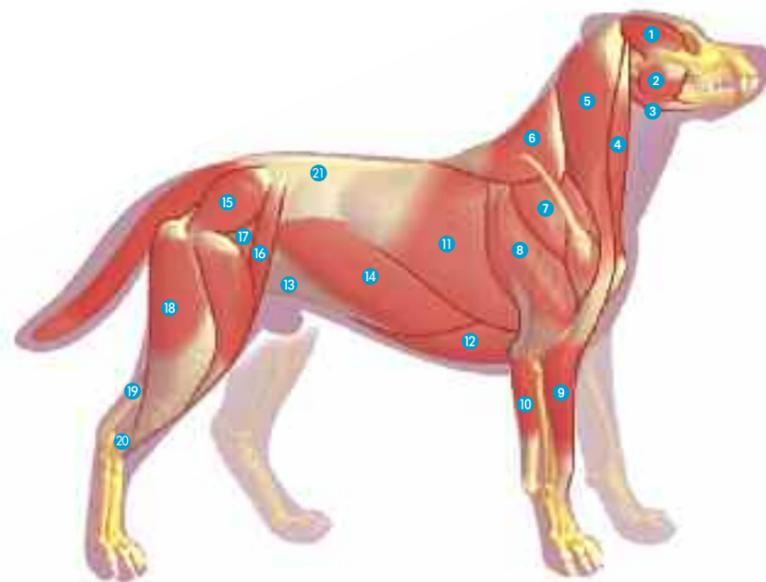


- | | |
|-----------------|----------------|
| 1. Bone | 6. Capillary |
| 2. Muscle | 7. Myofibril |
| 3. Epimysium | 8. Muscle cell |
| 4. Muscle fibre | 9. Actin |
| 5. Nucleus | 10. Myosin |

energy provided by the blood, then stored and metabolised in the cells in the form of the high-energy substances ATP (adenosine triphosphate) and CR (creatine phosphate). Nerves control muscle contraction. The junction between the nerve cell and the muscle cell is called the motor end plate – this is part of a complex system,

which enables nerve information to be transformed into a muscle contraction. Because of this, the muscular system is very closely linked to the circulatory and nervous systems, so a change to either has rapid repercussions on the musculoskeletal system.

The muscles of a dog and their roles



- | | |
|--|---|
| 1. Temporal (closes the mouth) | 14. Abdominal internal oblique (flexing the spine, supporting the intestines) |
| 2. Masseter (closes the mouth) | 15. Gluteus medius (extending the hip) |
| 3. Digastric (opens the mouth) | 16. Sartorius (flexing the hip) |
| 4. Sternocephalic (flexes the head) | 17. Quadriceps femoris (flexing the hip) |
| 5. Brachiocephalic (flexes the head) | 18. Biceps femoris (extending the hip, propulsion) |
| 6. Trapezius (turns the scapula) | 19. Gastrocnemius (extending the tarsus, flexing the knee) |
| 7. Deltoides (flexes the shoulder) | 20. Cranial tibial (flexing the tarsus) |
| 8. Triceps (extends the elbow, standing up) | 21. Thoracolumbar fascia |
| 9. Extensor carpi radialis | |
| 10. Flexor carpi ulnaris | |
| 11. Latissimus dorsi (propulsion) | |
| 12. Deep pectoral (propulsion, supporting the thorax) | |
| 13. Rectus abdominis muscle (flexing the spine, supporting the intestines) | |



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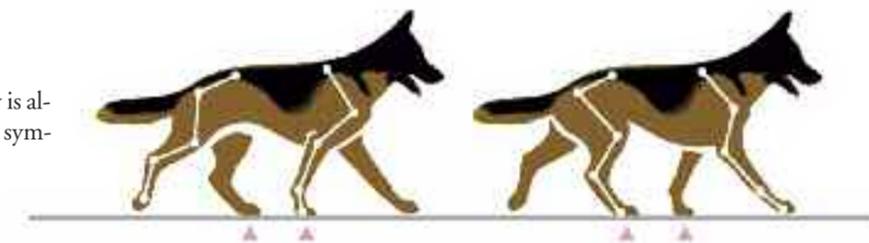
Gait

Gait describes the various phases of mechanical work by the limbs caused by muscle contractions, which enables the animal to move. There are several main gaits, which are differentiated by the manner and sequence in which the limbs move: walk, trot, gallop and jump.

Walking gait

Walking

This is a four-beat gait in which the body is always in contact with the ground. It is symmetrical and tilting, which means that the front and the back rise and fall alternately. It is called a diagonal gait, because the steps follow each other diagonally.



The limbs move in the sequence front left, back right, front right, back left. Walking is a gait in which the body undulates laterally with regular tilting of the pelvis each time the back feet touch the ground. The head follows the movement of the shoulders produced by the front limbs. Well-built dogs that are able to walk freely will walk in a regular, harmonious way in which the back feet touch the ground in the same place as the front feet.

Amble

This is a gait that often needs training, although it also occurs naturally in some breeds, including Bobtails. This is a two-beat lateral gait in which two limbs on the same side move at the same time. The pace of this gait is between the trot and the walk but less tiring than the former, which is why some dogs adopt it instinctively when they start to tire from too much trotting.



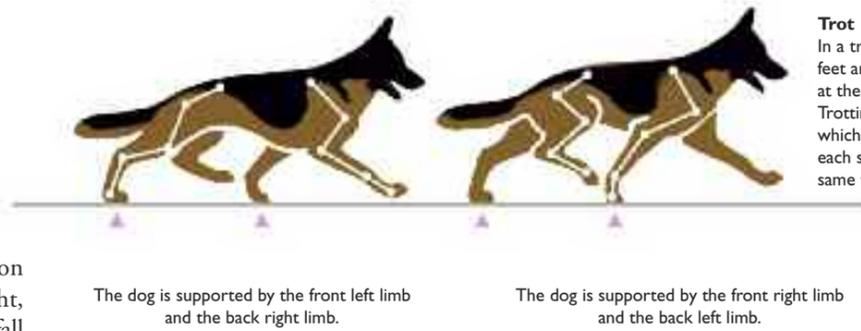
Amble

The amble is a two-beat lateral gait in which the two limbs on the same side are lifted at the same time.

Jumping gaits

Trotting

This is a natural two-beat gait in which the diagonal feet on each side (front left- back right, front right- back left) rise and fall at the same time.

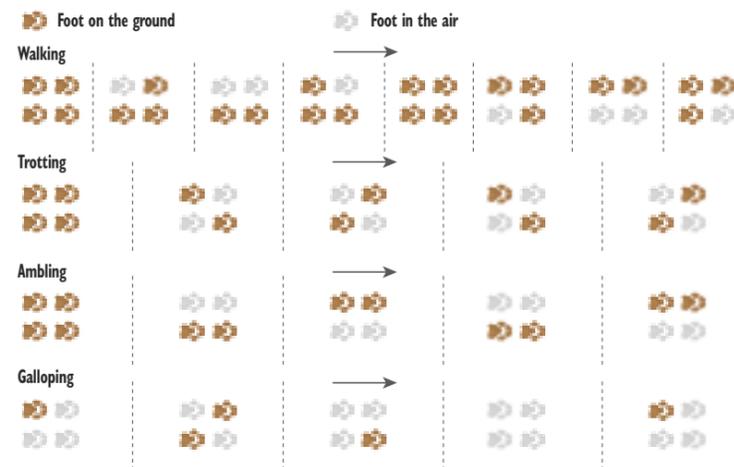


Trot
In a trot, no more than two feet are ever on the ground at the same time. Trotting is a two-beat gait in which the diagonal feet on each side rise and fall at the same time.

A trot can be normal, collected or extended depending on the speed of the dog. When trotting, the dog's head, neck and back is tensed and horizontal, and there must be no vertical or lateral movement between one region of the body and another. This is the preferred gait of judges for evaluating a dog's conformation.



Cycle of movements with the various gaits.



New biomechanical analysis techniques have been developed for use on dogs. A treadmill with pressure receptors is used to study when the dog in movement touches the ground.



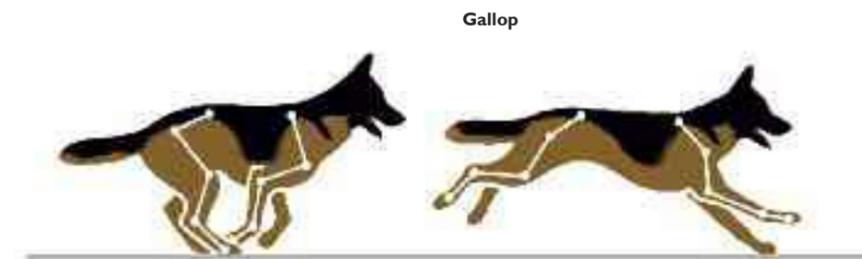
Gallop

This is a fast, three-beat dissymmetric, tilting gait. The dog gallops left or right depending on the order in which its limbs are engaged. In a left gallop, for instance, the sequence is back left, diagonal left (front left + back right), front right.

During this sequence, the dog alternatively has only the back left and the front right on the ground.

All feet are in the air for a short instant.

If the gallop is very fast (as in a race) it will be an extended, four-beat gait. Because of the speed of the gallop this gait does not allow a judge to evaluate the dog's conformation in the same way as a trot.





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Skin

Broadly speaking, the skin is the boundary between the body and the external environment. It consists of two structures – the skin in the strict sense, which is a keratinised organ, and its associated structures (hair and glands).

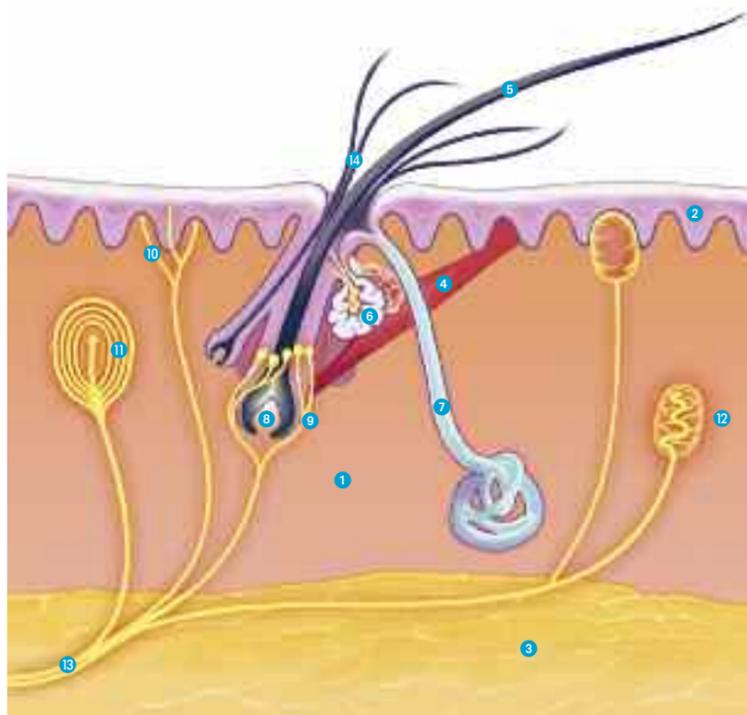
The skin is a keratinised structure

The skin is split into three layers:

- The epidermis itself consists of several layers:
 - a basal layer of dividing cells and cells producing melanin (the pigment that gives the skin its particular colour); a very thick clear layer (two or three cells deep) on the nose and footpads, produced by the cell divisions in the basal layer and macrophages (cells that digest cell debris and pathogens); a granulated layer of flattened cells; a horny layer of very flat cells without a nucleus, which contain a lot of keratin; and an outer layer of flaking cells.
- The dermis is a thick layer – 1.3 mm on the back and up to 2.5 mm on the footpads – separated from the epidermis by a basement membrane. It contains the elastic fibres and collagen, which give the skin its toughness and pliability.
- The hypodermis is the lowest layer, which has a high number of adipocytes, cells that store fat.

Only the dermis and the hypodermis are vascularised and innervated (contain nerves), which enables them to receive information from both the outside and the inside.

Cross section of the skin



- | | | |
|-------------------------|--------------------|---------------------------|
| 1. Dermis | 6. Sebaceous gland | 11. Vibration receptor |
| 2. Epidermis | 7. Sweat gland | 12. Hot and cold receptor |
| 3. Hypodermis | 8. Dermal papilla | 13. Sensory nerve |
| 4. Arrector pili muscle | 9. Touch receptor | 14. Secondary hair |
| 5. Primary hair | 10. Pain receptor | |

The functions of the skin

- The skin first and foremost has a barrier function. It ensures that substances, such as water, ions and macromolecules, are retained in the body. It also ensures that a number of substances including water and bacteria cannot enter the body. When the cells of the epidermis become swollen with water some substances can pass through into the body. This mechanism is exploited in the use of wet dressings. The skin barrier is also mechanical, which means it protects the body from infrared and ultraviolet radiation (outer layers, and hair and pigmentation respectively) and biological agents.
- The skin also has an exchange function. The sweat produced by the apocrine and exocrine glands (the latter are only located in the nose and footpads) seems only to cool down the skin locally in dogs. It is worthwhile remembering that dogs only sweat from their nose and the skin between their toes. The sebum produced by the sebaceous glands in the hair follicles provides protection by destroying bacteria. The skin can also absorb drugs and toxins such as alcohol, as well as fat-soluble vitamins, sex hormones and other substances. Thermal exchanges are also possible, with the transfer of calories in the wake of a change in temperature.
- Metabolic function: The adipocytes in the hypodermis store fat and the skin also plays a minor role in the production of vitamin D3 when ultraviolet rays strike the outer layers of the epidermis.
- Sensory function: The nerve endings in the dermis and hypodermis enable the skin to pass on information about temperature, pressure, pain or contact with other objects.

Associated structures

There are various associated structures:

- Hair and hair follicles, which are made up of the sheath of cells and connective tissue which surrounds the root of a hair, a sebaceous gland and an arrector pili muscle, which is responsible for making the hair stand on end.
- The sweat glands. These are the apocrine glands, located deep in the dermis throughout the body, which play a role in the production of pheromones and have a duct opening under the sebaceous gland, and the exocrine glands, which are located in the nose and in the skin between the toes, which pour the sweat they produce directly onto the skin, with a duct opening onto the epidermis independently of the hair follicle.
- Other glands, including the anal glands and the violet or supracaudal glands on the upper surface of the tail, both used for scent marking.

“Hair follicles are made up of a sheath of cells and connective tissue, a sebaceous gland and an arrector pili muscle, which is responsible for making the hair stand on end.”

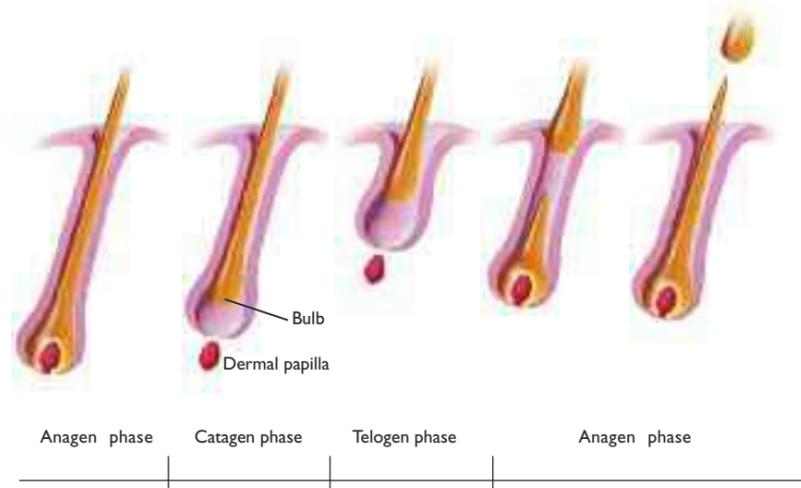


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The three phases of hair growth



The hair cycle comprises a growth or anagen phase and a relaxation or telogen phase, separated by an intermediate catagen phase.

Hair structure

In dogs, the hair follicles are arranged in groups consisting of one primary hair surrounded by thinner, shorter secondary hairs.

Hair density depends on the age and the breed. The softer the hair the denser it is. A German Shepherd, for instance, has 100-300 follicle groups per square centimetre, whereas a breed with a softer coat can have 400-600 follicle groups per square centimetre. The number of follicle groups is established at birth, although young dogs only have down hair, which is why they are so soft to the touch. During growth, the angle of hair to skin decreases to about 45°, that of adult dogs.

Hair colour is genetically determined by the dominance of one colour over one or more other colours. This explains the palette of coat colours and the specific markings on some breeds, as explained above.

There are two specific periods of moulting, which produces a winter and a summer coat. This is explained by the three stages of hair follicle activity.

During the anagen phase the hair grows upwards and the hair follicle drives itself down into the dermis. This phase lasts an average 4 months in most dogs, although it takes 18 months in an Afghan Hound.

In the catagen phase growth stops and the follicle recedes.

In the telogen phase the follicle shortens all the way down to the sebaceous gland and the base of the hair contracts into a cone before dropping out. Another hair then starts its anagen phase, taking over the same cavity.

The hairs do not all fall out at the same time, of course. Moulting starts at the rear and progresses forwards. The winter coat is much thicker than the summer coat, to protect the dog from the lower temperatures.

These changes to the dog's coat do not occur randomly. The main trigger of moulting seems to be the photoperiod (the duration of daylight). As the days grow longer, spring moulting is triggered, whereas autumn moulting is triggered as the nights draw in. Changes in temperature only affect hair density and the speed of regeneration. They have no major impact on moulting.

Although the hairs are replaced the coat colour remains the same, except for some greying on the muzzle of ageing dogs. It is important to clean a dog's coat regularly to safeguard it against skin disease.

Digestion

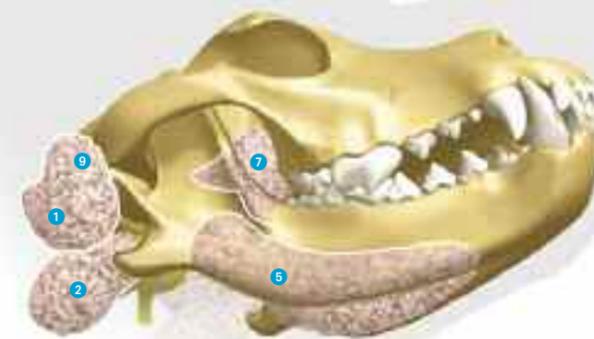
Digestion is the process by which dogs break down the food they ingest into nutrients which can be used by the cells. This is necessary because whatever type the food is it is made up of substances too complex to be immediately absorbed in the intestine.

The dog's digestive tract is completely devoted to breaking down the substances in the food (carbohydrates, fats and proteins) into simple molecules which can be absorbed. The digestive process is divided into three sections. The first, concerned with ingestion, comprises tongue, teeth, salivary glands, pharynx and oesophagus. The second, concerned with digestion itself, involves the stomach, small intestine, large intestine and associated glands (liver and pancreas). The third, concerned with evacuation or excretion, is made up of the last part of the large intestine and the anal canal.

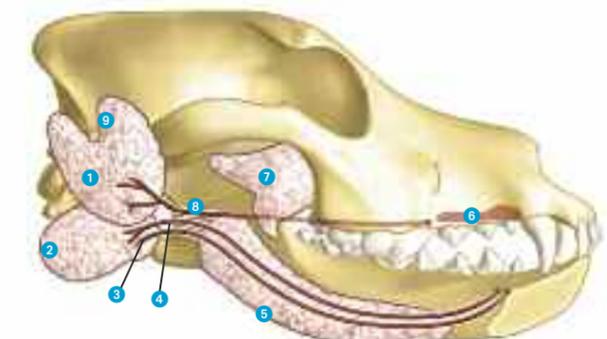


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Salivary glands



1. Parotid gland
2. Submandibular gland
3. Submandibular duct
4. Sublingual duct
5. Sublingual gland
6. Dorsal buccal gland
7. Zygomatic gland
8. Parotid duct
9. Cell texture



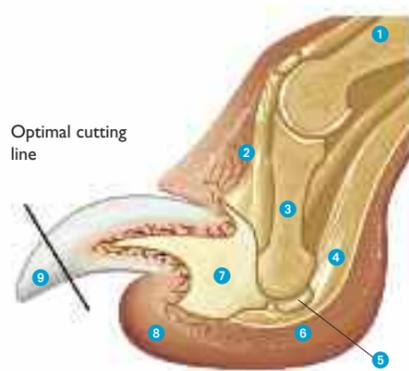
Ingestion

The dog takes in food through its mouth. Like all carnivores, the teeth of canids have specialised roles in mastication, although today's dogs scarcely predigest their food before swallowing it. The paired salivary glands secrete saliva into the oral cavity.

The liquid and mucus in the saliva moisten the food and facilitate its movement into the oesophagus. During swallowing, the tongue pushes the food into the oropharynx and then the oesophagus (while the epiglottis closes to prevent the food from entering the trachea).

Muscle contractions in the oesophagus push the ingested food through the thorax and the diaphragm to the cardia, the upper opening of the stomach.

Vertical section of a nail



1. Proximal phalanx
2. Toe extensor muscle tendon
3. Medial phalanx
4. Toe flexor muscle tendon
5. Distal sesamoid bone
6. Subcutaneous tissue
7. Distal phalanx
8. Epidermis
9. Nail

The folds and villi covered with cilia enlarge the absorption surface of the small intestine.



Digestion

Food consists of three categories of nutritional substances: carbohydrates, proteins and lipids. Each one is digested in a different part of the digestive tract by different processes involving different enzymes. There are also differences in digestion depending on the size of the dog. A small dog's digestive tract accounts for 7% of body weight, whereas a large dog's accounts for just 3% of its body weight. This means that large dogs are more susceptible to digestive problems.

- The stomach is located to the left of the abdominal cavity, extending just past the sternum. Because of the dog's carnivorous diet, the stomach is large in proportion to the gut. The stomach dilates even more just after the dog eats. A completely distended stomach can occupy half of the abdominal cavity. Food undergoes both me-

chanical and chemical digestion in the stomach. Contractions of the muscles lining the stomach mix the food up with the gastric juices, which work on breaking down the food at the chemical level.

- The pulpy acidic fluid consisting of gastric juices and partly digested food, known as chyme, is then pushed through the pylorus into the duodenum, the first part of the small intestine. The intestine is delicate, so the pylorus and the first part of the duodenum control the process to ensure the stomach is emptied slowly.
- The chyme then undergoes further chemical digestion in the small intestine by secretions released through ducts by two digestive glands, the pancreas and liver.
- In carnivores, the pancreas is a very long V-shaped organ. It is made up of a cluster of cells known as acini, which produce and secrete digestive enzymes into the

pancreatic duct via pancreatic juice after the dog has eaten. The enzymes are inactive when they are secreted (otherwise they would destroy the organs they pass through) and are activated by chemical processes in the intestine. They are therefore precursors of proteases, lipases and amylases. The pancreatic juice also contains bicarbonates to neutralise the chyme, which is acidified in the stomach.

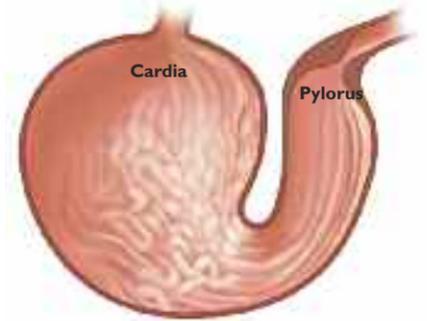
- The liver has various functions, including a digestive one. It is located beneath the diaphragm, on the right of the body. The cells of the liver are arranged in hepatic lobules. They secrete bile continuously, which is conducted through the bile ducts into the gall bladder where it is stored until needed. When the chyme reaches the duodenum, the gall bladder contracts, releasing bile which contains water, mineral salts, bile pigments and bile salts. Bile pigments have no function in digestion (they are by products of the breakdown of haemoglobin) and are actually excreted by the digestive tract. Bile salts, on the other hand, have a fundamental role in lipid digestion.

- As in all animals, the dog's gut accommodates a large population of essentially bacterial microorganisms which play an active role in digestion. This gut microflora is highly sensitive to variations in food quality (dogs are not strict carnivores), which means that dogs should not have such a varied diet as humans, because this would destroy the flora and could lead to diarrhoea.

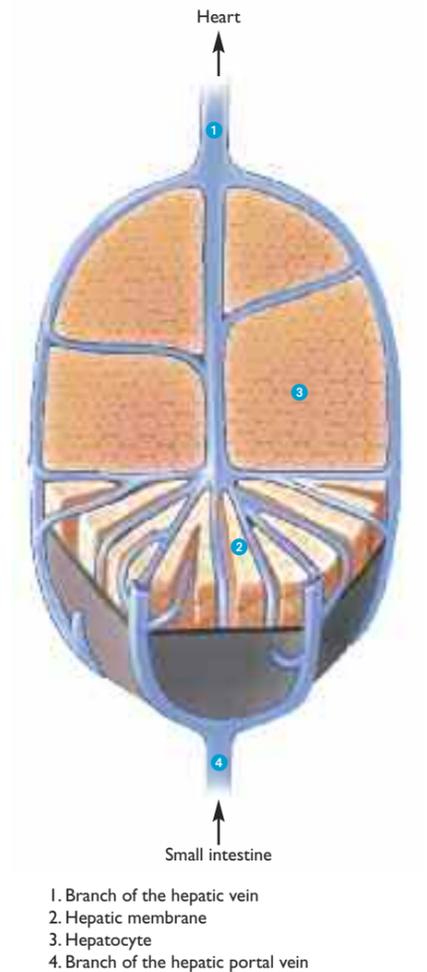
This explains why:

- any change in diet must be spread over a period of seven days
- some lactic bacteria (probiotics) mixed in with the chyme have very positive digestive benefits for dogs.

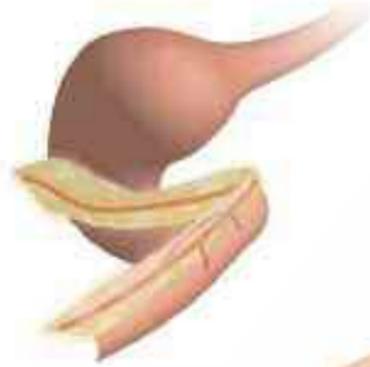
The interior of the dog's stomach



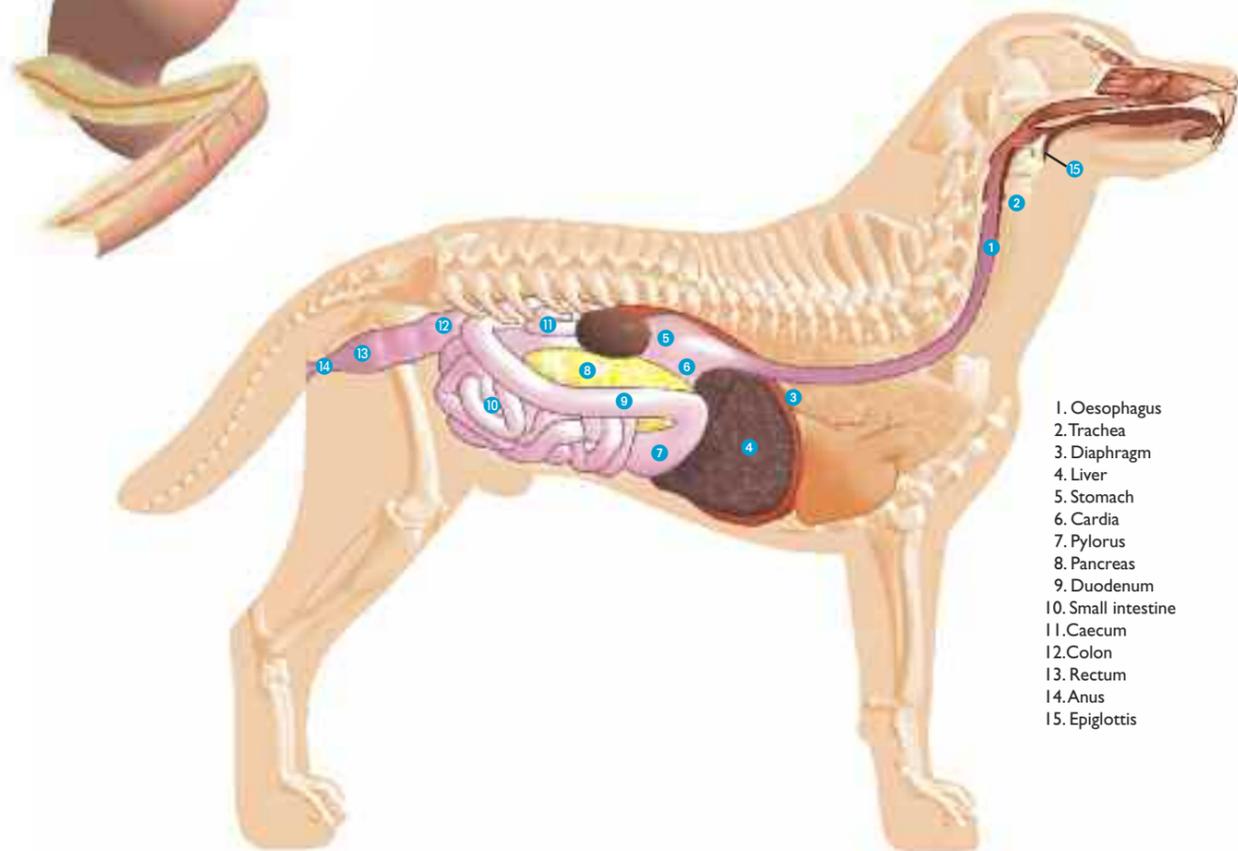
Lobule of the liver



The pancreas and the pancreatic duct



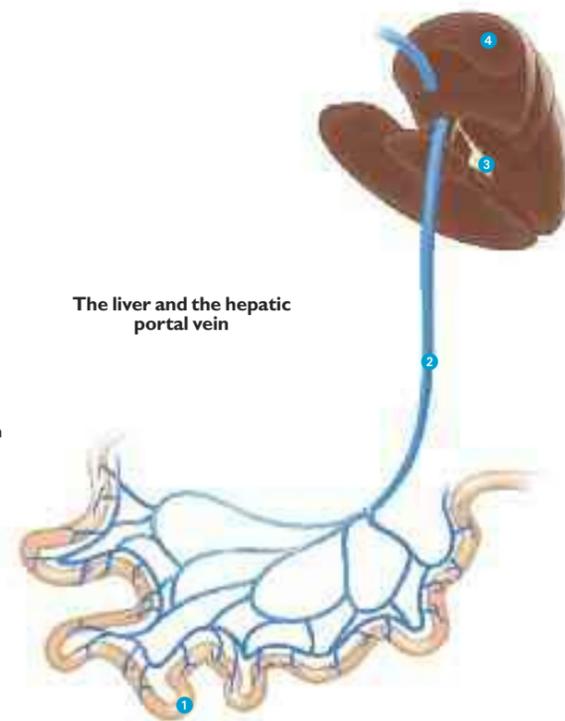
Digestive system



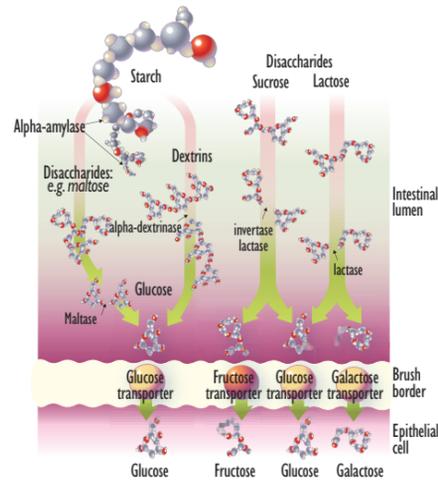
1. Oesophagus
2. Trachea
3. Diaphragm
4. Liver
5. Stomach
6. Cardia
7. Pylorus
8. Pancreas
9. Duodenum
10. Small intestine
11. Caecum
12. Colon
13. Rectum
14. Anus
15. Epiglottis

The liver and the hepatic portal vein

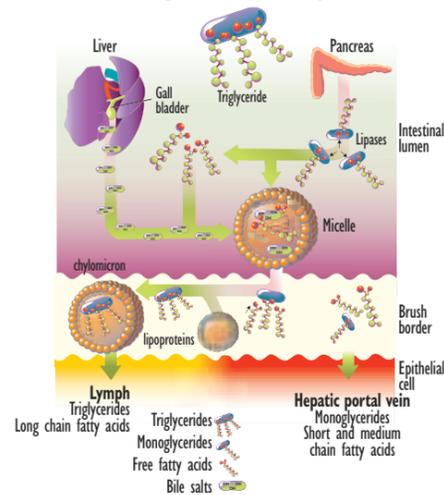
1. Small intestine
2. Hepatic portal vein
3. Gall bladder
4. Liver



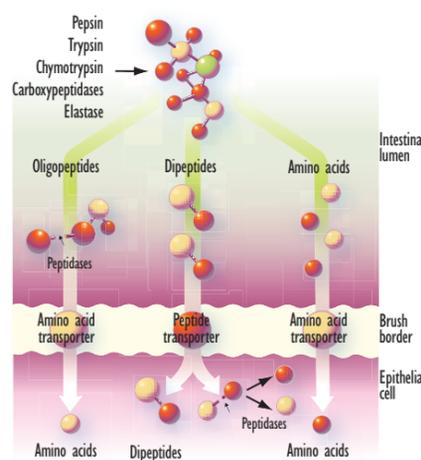
Digestion and absorption of carbohydrates



Fat digestion and absorption



Protein digestion and absorption



• **Carbohydrate digestion.** Carbohydrates are found in food in various forms, some more complex than others. The base substance is designated with the ending -ose, as in glucose or fructose. These form chains to produce much more complex substances. Starch, for instance, is made up of a large number of glucose molecules.

In carbohydrate digestion the larger substances are broken down to facilitate absorption. This is a chemical process involving amylase, an enzyme produced by the salivary glands (in a small quantity) and the pancreas. Most carbohydrates are therefore broken down in the small intestine.

• **Lipid digestion.** Lipids (fat) are broken down into triglycerides by lipase (a pancreatic enzyme which only acts on fat) and bile salts from the liver. Bile salts forms an emulsion with the triglycerides, increasing contact with the lipase, which partially hydrolyses the lipids to produce microscopic lipid droplets called micelles.

• **Protein digestion.** A protein is a chain of amino acids of varying length. Protein is broken down by enzymes in specific conditions to release the amino acids, which are then absorbed.

Protein digestion begins in the stomach, through the action of acids and protease (an enzyme that only acts on protein) in the gastric juice. Protease secreted by the pancreas continues the process in the small intestine.

Nutrient absorption

• The intestine is where most nutrient digestion and absorption takes place. By necessity it is folded up in loops in the abdominal cavity. If it were to be unfurled it would be six times longer than the dog's body. All the abdominal viscera (organs) are enveloped by the greater omentum, which helps hold them in position.

The inside wall of the small intestine is folded to increase the absorption surface. The cells that make up the microvilli (microscopic protrusions in the cell membrane) do not all have the same function. The lower cells primarily secrete mucus, whereas the ones higher up towards the tip absorb digested nutrients. Dead cells release other types of enzymes when they break down.

The absorption method differs depending on the type of chyme.

• **Carbohydrate absorption.** The -ose form of carbohydrates are found in the small intestine. They are absorbed by the intestinal cells and enter the blood vessels, which are numerous in the small intestine.

• **Lipid absorption.** The micelles are absorbed by the intestinal cells, which reconstitute them into triglycerides. These are then bound to proteins and other molecules, entering the lymphatic vessels of the small intestine.

• **Protein absorption.** Peptides present in the intestinal lumen are composed of amino acid chains of varying lengths. These are hydrolysed by protease enzymes to break them down to just two or three amino acids which can then be absorbed by the intestinal microvilli and enter the bloodstream.

Absorption of other nutrients

Water and mineral salts are also absorbed in the gut. Water is only partially absorbed in the small intestine in a process involving sodium ions and glucose molecules or amino acids. Different parts of the gut absorb mineral salts by different processes. Calcium, for instance, is absorbed in the duodenum through the action of a protein responsible for transporting nutrients.

The blood vessels in the small intestine come together to form the portal vein, which goes to the storage depot, the liver.

Evacuation of faeces

The following sections of the large intestine are responsible for evacuation: the caecum, colon, rectum and anal canal. The total length of a dog's large intestine is about 70 cm, although it varies depending on the breed.

• The caecum is a very short section of the large intestine that has the same function as the colon, which is located at the back, under the loins. These two sections absorb any nutrients that have not already been absorbed in the small intestine, especially

water. Any remaining digesta is partially digested by the gut microflora, but this is of secondary importance in dogs. The resulting nutrients are absorbed as in the small intestine. The caecum and colon also play a role in the formation, storage and evacuation of faecal matter.

• The rectum and anal canal are located in the pelvic cavity. As in all carnivores, their function is to store and evacuate faecal matter.

• The evacuation of faecal matter occurs in three phases. The first is of an essentially behavioural nature: the dog looks for a place to defecate. It will tend to want to do so well away from its living space. The second phase is mechanical preparation characterised by muscle contraction, which causes the animal to adopt a typical position. The third phase, actual evacuation, occurs with the strong contraction of the large intestine.

Assessment of the quality of faeces			
1			
Runny faeces, diarrhoea			
2			
Mainly unformed and soft			
3			
Mainly formed but soft			
4			
Formed and firm but not hard			
5			
Formed, dry and hard			

The faecal score is an easy way to identify digestive problems, which may be caused by diet, viruses, bacteria or parasites.



© Duhay/Royal Canin

Respiration

Respiration is the body's way of taking in oxygen and expelling carbon dioxide. The dog's respiratory system can be divided into the upper and lower respiratory tract.

Upper respiratory tract

The upper respiratory tract consists of the nasal cavities, the nasopharynx, larynx and trachea. The dog's nasal cavities are located in the bridge of the nose and the forehead, opening to the exterior via the nostrils, which are cartilaginous structures with wide holes to allow air in.

- The nasal cavities are made up of scrolled turbinate bones and nasal sinuses, separated by a bony septum. They are lined by a very extensive mucosa, which is highly vascularised, enabling it to amplify its function of warming and saturating the air with water vapour.

The nasal glands secrete mucus which traps aggressive particles in the air (dust, microbes). Dogs access their sense of smell using another part of the olfactory mucosa. After passing through the nasal cavities and the posterior nares towards the nasopharynx at the back of the mouth, the air has been purified and warmed almost to body temperature.

- The air continues its journey to the lungs through the larynx and trachea. The larynx is made up of four different cartilage structures (cricoid, thyroid, arytenoid and epiglottis), which are attached to the bones of the skull by the hyoid bones. A group of muscles controls the way these cartilage structures move in relation to each other. Although the larynx is open during respiration, when it controls the

flow of air by constricting and expanding, it closes during swallowing to ensure that food does not enter the trachea. It also houses the vocal cords, which vibrate when air passes over them, producing such familiar canine sounds as growling and barking.

- The trachea is a long tube, made up of around forty rings of cartilage which are closed by the tracheal muscle. The trachea pushes the air from the larynx in the mouth to the bronchi in the thorax. The contraction of the tracheal muscle reduces the diameter of the trachea, regulating the flow of air. This muscle also prevents excessive dilatation during coughing.

Lower respiratory tract

The lower respiratory tract includes the bronchi, bronchioles and alveoli contained within the lungs and located inside the thoracic cavity, from which they are separated by the pleurae. The thorax is defined by the ribs at the sides and the diaphragm at the back. The lungs are separated from the chest wall by the pleurae, which maintain the pleural cavity, so they are always filled with air. The dog's lungs have seven pulmonary lobes: three on the left (cranial, middle and caudal) and four on the right (cranial, middle, caudal and accessory).

The bronchi, of which there are seven, one to each pulmonary lobe, branch into bronchioles, alveolar ducts and alveolar sacs

where gas exchange takes place across the very thin walls of the sacs into and out of the bloodstream. The lungs are highly vascularised, facilitating the exchange of oxygen and carbon dioxide (oxygenation) over a large surface area.

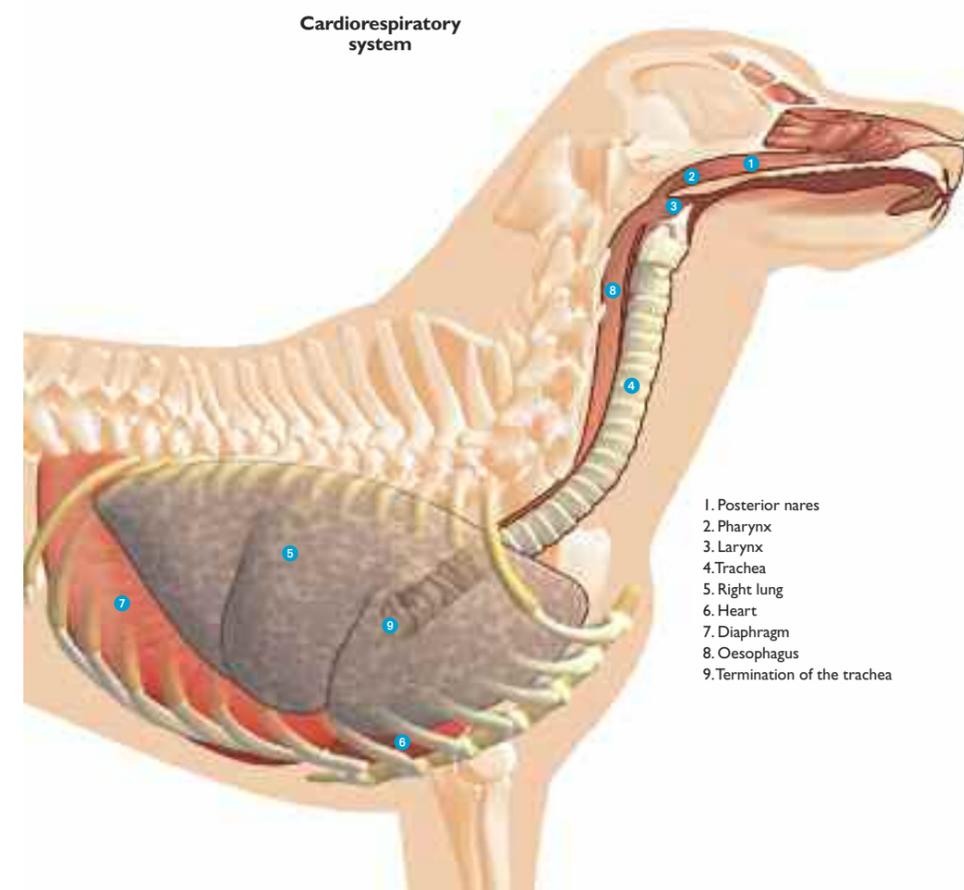
Respiratory phenomena

Respiration itself is a complex process involving both muscles and blood circulation.

- The exchange of gases between the air in the alveoli and the blood is dependent on the oxygen and carbon dioxide pressure on each side of the capillary wall. Gases move from areas of higher pressure to areas of lower pressure, which means that carbon dioxide moves from the capillaries to the lungs, while oxygen moves in the opposite direction. To ensure constant oxygenation, the air and the blood need to be constantly renewed, which is why the blood is pumped around the body by the heart.
- Pulmonary ventilation renews the air in the alveoli. This is a two-step process. "New" air is inhaled into the lungs, flushing out waste air. Inhalation is essentially caused by the contraction of the diaphragm and the intercostal muscles together with the relaxation of the abdominal muscles. These contractions increase the volume of the thoracic cavity, drawing air into the lungs, which inflate like a balloon. During exhalation, these muscles gradually relax and the thorax decreases in volume due to its elasticity.

A dog's normal respiratory rate is between ten and thirty breaths per minute. This varies with size (it is higher in small dogs), body condition and level of excitement.

- The respiratory process is regulated by the nervous system, and therefore mostly unconsciously. In exceptional circumstances it is a conscious process (for example, when the normal respiratory rate is increased). Dogs can modify their respiratory rate or volume depending on the physiological conditions, such as strenuous muscle effort, when the dog pants, in-



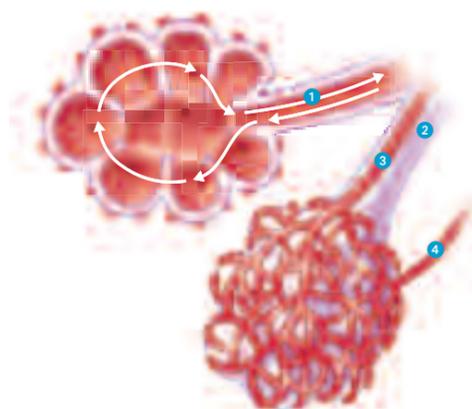
1. Posterior nares
2. Pharynx
3. Larynx
4. Trachea
5. Right lung
6. Heart
7. Diaphragm
8. Oesophagus
9. Termination of the trachea

creasing its respiratory rate and volume by breathing through the mouth. Muscle action consumes more oxygen and heats up the body, leading dogs to speed up their breathing to increase the rate at which oxygen is supplied to the cells (because the heart beats faster, too). Dogs barely sweat (and then only through their footpads), so the loss of water vapour through the lungs is their way of cooling down. By breathing through the mouth, dogs bring cool air from the trachea into contact with the warm blood vessels, which cools them down.

Based on the quality of inhaled air (the partial pressure of oxygen in the air decreases with altitude), the partial pressure of oxygen and carbon dioxide in the blood are also regulated, depending on the blood pH, which affects the partial pressure of carbon dioxide in the blood.

“A dog's normal respiratory rate is between ten and thirty breaths per minute.”

Pulmonary alveoli



1. Air circulation
2. Bronchiole
3. Pulmonary arteriole
4. Pulmonary venule

Body temperature: 38.5-39°C

Average heart rate (beats per minute): 70-160.

Blood pressure: 130/ 75

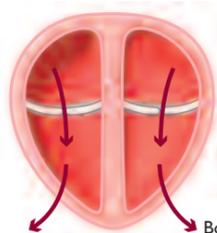
Average breaths per minute: 15-20

Heart

In adult dogs, the heart is fully compartmentalised. Oxygenated and deoxygenated blood cannot come into contact with each other, because the blood flow in the various chambers is regulated by the heart valves.

The heart is divided into four main chambers

The right atrium receives deoxygenated blood from the body, which it passes on to the right ventricle, which in turn pumps it to the lungs.



The left atrium receives oxygenated blood from the lungs, which it passes on to the left ventricle, which in turn pumps it around the body.

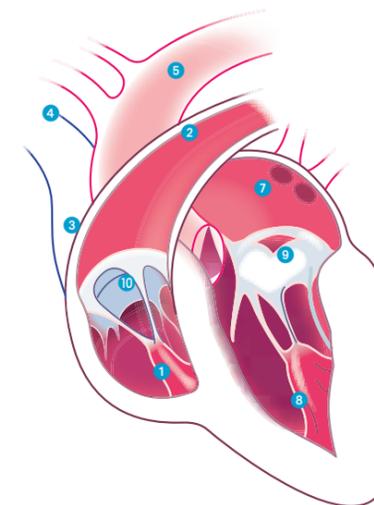
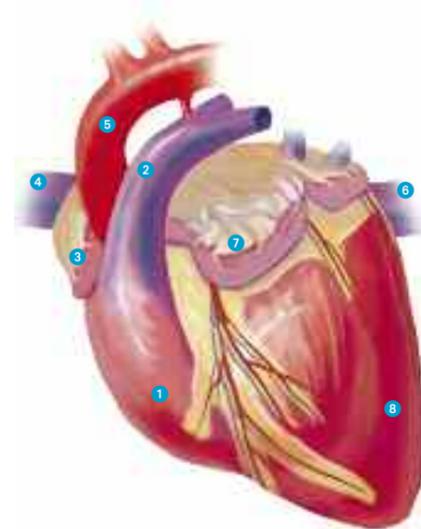
Lungs Body

Position

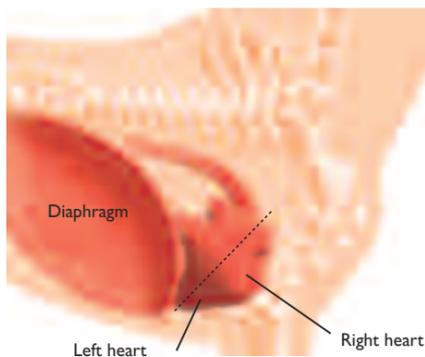
If it develops normally, the heart should not be in the middle of the body, but slightly to the left (4/7ths). It is flat transversally, which positions the right heart cranially (towards the front) and the left heart caudally (towards the back).

Thus, the bottom of the heart, where the vessels are, is in the cranial and dorsal position, whereas the top is in caudal and ventral position. The heart is situated between the third and sixth rib, and its weight varies greatly depending on the breed of dog.

Cross section of the heart



1. Right ventricle
2. Pulmonary artery
3. Right auricle
4. Cranial vena cava
5. Aorta
6. Caudal vena cava
7. Left auricle
8. Left ventricle
9. Mitral valve
10. Tricuspid valve



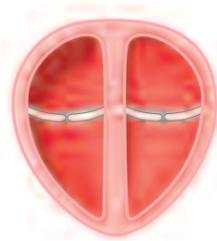
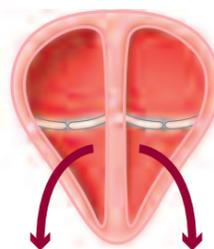
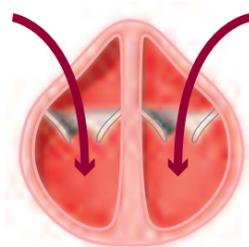
Function

In physiological terms, the heart works to a regular cardiac cycle. The heart chambers, which have contractile properties, work in two phases, of which systole is the contraction phase and diastole is the relaxation phase.

These phases are not synchronised in all chambers, because the atria contract before the ventricles do. The number of cardiac cycles per minute is called the heart rate, which is between 70 and 160 in dogs, depending on the breed (the heart of a small dog beats faster) and physical activity.

The heart rate falls (bradycardia) during sleep and rises (tachycardia) in the event of physical exertion or great stress, like a visit to the veterinarian. These are purely physiological phenomena.

The cardiac cycle



The cardiac cycle follows a well-established sequence. In **atrial systole**, due to low venous pressure and the opening of the atrioventricular valves, the ventricles fill up passively (as the arterial valves are closed). The contraction of the atria completes the process.

Ventricular systole then occurs. The ventricle is completely full, the intraventricular pressure increases, which closes the atrioventricular valves. The contraction of the ventricles is intensified as the intraventricular pressure rises above the arterial pressure, which opens the arterial valves.

The cardiac muscles then **relax**, allowing the closure of the atrioventricular valves. The atria fill up again, the atrioventricular valves open, the ventricles fill up and a new cycle begins.

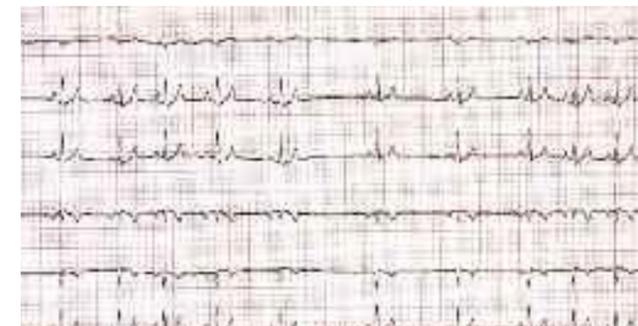
During auscultation with a stethoscope, the veterinarian will only hear the sounds caused by these phases. The cardiac cycle produces two sounds in dogs: a long sound followed by a short interval, then a short sound followed by a long interval. The long sound is caused by a number of different phenomena: closing of the atrioventricular valves, pressurisation of the blood in the ventricles, turbulent flow of the blood into the large arterial vessels. The short sound is caused exclusively by the closing of the arterial valves. Any additional sounds may be regarded as pathological.

Modern techniques like electrocardiography and echocardiography mean that the study of the full cardiac cycle can be much more in-depth. Interpreting the data is a complicated process, however, and should be carried out by specialists.

So how does the heart beat in the first place? The muscle wall contains three so-called nodal tissues, which consist of cells which are able to slowly and spontaneously depolarise, producing an action potential that spreads to all heart cells, causing the heart to contract. The nodal tissues in the atria set the rate, acting as the heart's natural pacemaker.

The heart rate can be adjusted by various factors, both external (the sight of a stressful object, for instance) and internal, by acting on the nerve pathways, which are made up of accelerator and inhibitory fibres. The lungs and blood gases also influence the heart rate through baroreceptors (sensory nerve endings) in the arch of the aorta. Too much oxygen slows the heart down, whereas too much carbon dioxide speeds it up.

Normal electrocardiogram of a dog



Blood and lymphatic circulation

Blood circulation is the system of vessels (veins and arteries) and the heart in anatomical and physiological terms. Blood circulation is different in foetuses and adults, which means they are two separate fields of study. Lymphatic circulation drains the lymph into the general blood circulation.



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Blood circulation in foetuses

Dog embryo



1. Heart, extra-embryonic position
2. Head

The first vessels start to form in the embryo when it is no longer able to feed itself by cell-to-cell diffusion. The development of the internal organs demands the supply of vital nutrients directly to the cells involved. The development of the heart is more complex: it is formed from the surface cells of the embryo. It starts out as extra-embryonic before becoming intra-embryonic, gradually taking its final place in the thorax. It is initially straight (a vestige of evolution), acquiring its familiar shape by curving and rotating.

The foetus's lungs are non-functional. Oxygen is provided through the umbilical veins and carbon dioxide is removed through the umbilical arteries.

The blood circulation is shunted through the intracardiac orifices and a canal – the ductus arteriosus – connecting the aorta (the main artery leaving the left heart) to the pulmonary artery (which leaves the right heart). The chambers do not form in the heart until the end of gestation and the first few hours after birth. The ductus arteriosus, on the other hand, does not close until after birth when the lungs start to function.

Abnormalities include defective development of the heart chambers, retention of the ductus arteriosus or faulty positioning of the heart.

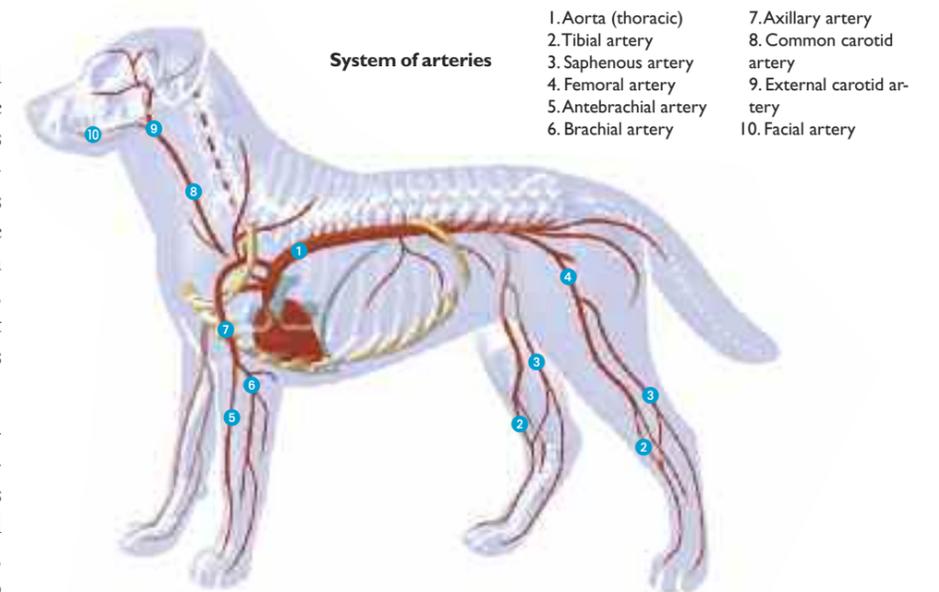
Blood

- Blood volume: 80-90 ml blood per kg of body weight
- Red corpuscles: $5.5-8.5 \times 10^6$ per mm^3 (= 5,500,000-8,500,000)
- White corpuscles: 6,000-17,000 per mm^3
- Haemoglobin: 12-18 g per 100 ml
- Platelets: 200,000-500,000 per mm^3
- Haematocrit: 37-55 % (volume of red corpuscles by blood volume)
- Calcium: 95-120 mg/l
- Glucose: 0.7-1.1 g/l
- Total lipids: 5.5-14.5 g/l
- Cholesterol: 0.5-2.7 g/l
- Phosphorus: 40-80 mg/l
- Bleeding time (ear): 2-3 minutes
- Clotting time: 6-7.5 minutes

Blood circulation in adults

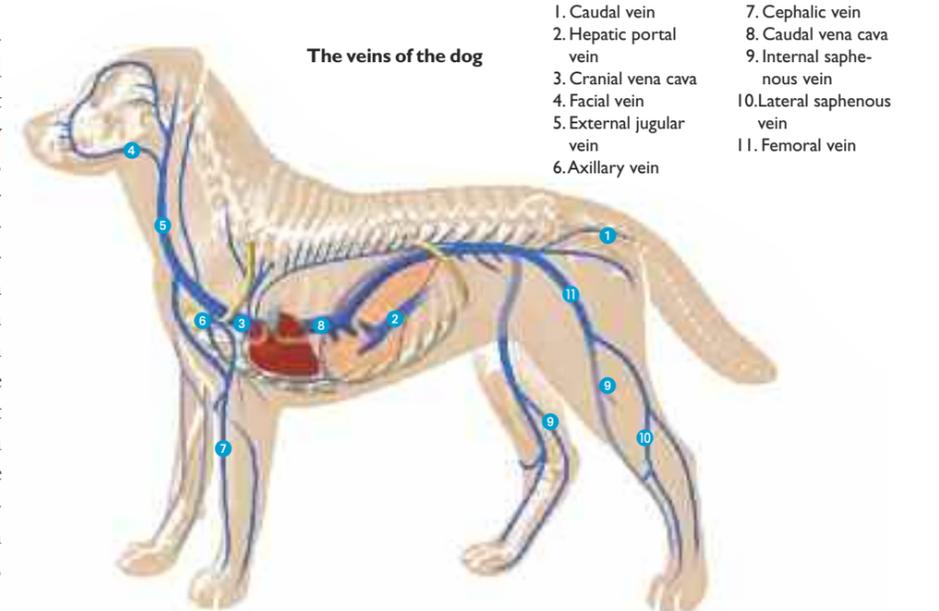
The heart acts as a pump, but it is the blood vessels which actually convey the blood to the organs. Anatomically speaking, the vessels conveying blood (either oxygenated or deoxygenated) from the heart are called arteries and vessels conveying blood to the heart are called veins. Veins contain tiny valves, which ensures that the blood pressure, although low, is sufficient for circulation. This is why a cut artery spouts blood in fits and starts, whereas a cut vein bleeds at a constant rate.

The aorta, a large artery that carries oxygenated blood, leaves the left heart in the direction of the front of the dog. It curves abruptly, forming the arch of the aorta and moves towards the rear. Just before it curves, the brachiocephalic trunk branches off (to vascularise the head and forelimbs), as does the subclavian artery (towards the thorax). The aorta then enters the abdominal region to vascularise all the organs and hind limbs through smaller arteries. When it reaches a muscle or an organ the artery branches off into a bundle of arterioles, which mean that oxygen and carbon dioxide can be exchanged. The blood is then carried by venules converging toward a small-diameter vein. These small veins join with the cranial vena cava in the anterior portion of the body or with the caudal vena cava in the posterior portion of the body. These two veins return the blood to the right heart, which pumps it to the lungs through the pulmonary artery. In the lungs, the blood releases its carbon dioxide, before returning, oxygen-rich, to the heart through the pulmonary veins to complete the cycle, and a new cycle begins all over again.



System of arteries

1. Aorta (thoracic)
2. Tibial artery
3. Saphenous artery
4. Femoral artery
5. Antebrachial artery
6. Brachial artery
7. Axillary artery
8. Common carotid artery
9. External carotid artery
10. Facial artery

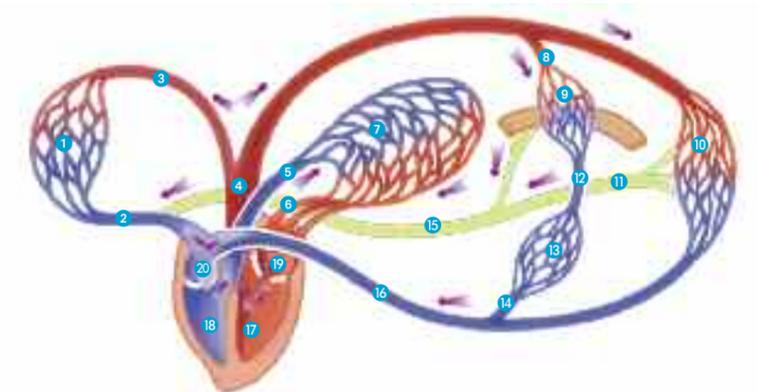


The veins of the dog

1. Caudal vein
2. Hepatic portal vein
3. Cranial vena cava
4. Facial vein
5. External jugular vein
6. Axillary vein
7. Cephalic vein
8. Caudal vena cava
9. Internal saphenous vein
10. Lateral saphenous vein
11. Femoral vein

Arrangement of the circulatory system General circulation

1. Capillaries of the head
2. Cranial vena cava
3. Brachiocephalic artery
4. Aorta
5. Pulmonary artery
6. Pulmonary veins
7. Lung capillaries
8. Iliac and mesenteric arteries
9. Capillaries of the digestive viscera
10. Capillaries of the body
11. Lymph ducts of the body
12. Hepatic portal vein
13. Liver capillaries
14. Subhepatic veins
15. Thoracic duct (lymph)
16. Caudal vena cava
17. Left ventricle
18. Right ventricle
19. Left auricle
20. Right auricle.



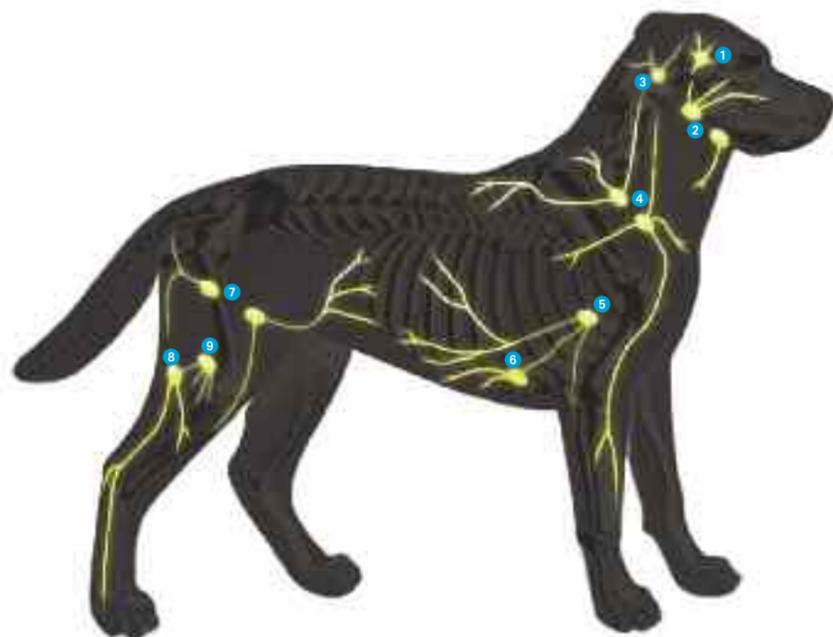


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Lymphatic circulation

Lymphatic circulation drains the lymph into the general blood circulation. Lymph vessels, which also contain valves, gradually converge into two main trunks: a thoracic duct and a right lymphatic duct. The vessels are very difficult to see, but it is very easy to identify the lymph nodes, which filter the lymph in a given part of the body. There are a great number of lymph nodes, some of them superficial, others so deep (in the large cavities) they can only be seen by X-ray or ultrasound.

They can be enlarged, especially if the drainage area is inflamed, which is why they need to be palpated by the veterinarian during a clinical examination. They are also the preferred routes of cancer cells moving from one organ to another, so lymph nodes may be removed along with a tumour to limit the spread of the disease.



Palpable lymph nodes

1. Parotid
2. Mandibular
3. Lateral retropharyngeal
4. Superficial cervical
5. Axillary
6. Accessory axillary (inconstant)
7. Superficial inguinal
8. Popliteal
9. Femoral (inconstant)

Urinary system

The same organs are involved in urine production in males and females. The urinary system consists of the kidneys, each with a ureter leading to the bladder. The bladder drains into the urethra, which carries the urine to its evacuation point. These organs and ducts are located in the abdomen; the kidneys are located under the lumbar arch, near the first lumbar vertebrae; the left kidney is slightly more towards the rear than the right one; the two ureters run into the dorsal side of the bladder, which is just in front of the pelvis.

The urethra follows a different route depending on the sex of the dog. In bitches, it is shorter and generally wider, leading to the vestibule through a small papilla. In males, it is longer, narrower and split into three sections: prostatic, membranous and penile.

Structure of the kidneys

The kidneys are composed of an external cortex, an internal medulla and a renal pelvis, the broadened top part of the ureter.

The nephrons are the functional parts of the kidneys. They are relatively long tubules which run into collecting ducts. They are split into various parts: a glomerulus, a cluster of capillaries, with a proximal tubule consisting of a convoluted portion and a straight portion, an intermediate tubule and a distal tubule (which also has a convoluted portion and a straight portion). Each tubule runs into a collecting duct via a short connecting tubule. In simplified terms, the glomeruli and the convoluted portions of the tubules could be said to be grouped in the renal cortex, whereas the straight portions of the tubule, forming the Loop of Henle, forms the medulla.

Production of urine

Urine is produced in the kidney nephrons in various stages to enable the elimination of part of the body's waste, among other functions. Other kidney functions include regulation of ions, acids and bases.

The first stage in the production of urine is blood filtration, the purpose of which is to produce "primary" urine. To do so, the blood passes through fenestrated capillaries (small arteries with perforated walls) in the renal tubules. Substances that are suffi-

ciently small can pass through these capillary walls because of the large difference in pressure and be collected in the renal tubules.

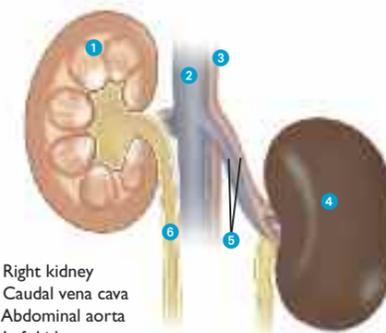
The resulting filtrate solution is "primary" urine, because its composition is modified before it is evacuated. At this point, it is very similar to plasma.

Filtration is followed by absorption in the convoluted portion of the tubules, especially the proximal tubule. This returns substances and ions the body needs to the bloodstream. These transports are often combined with the absorption of water, which is a passive process, while absorption without water requires the expenditure of energy by cells.

Chloride, sodium and potassium are the main ions absorbed. All glucose and proteins, as well as some amino acids and organic acids are absorbed by the convoluted portions of the tubules.

Some substances enter the urine as a result of secretion, which also occurs in the convoluted portion of the proximal tubule. This mechanism involves substances present in the blood (such as contrast media used in medical examinations or medications such as penicillin) and substances created in the tubule's epithelium (ammonia for example). Both active and passive mechanisms are involved, as well as exchanges.

Kidney structure



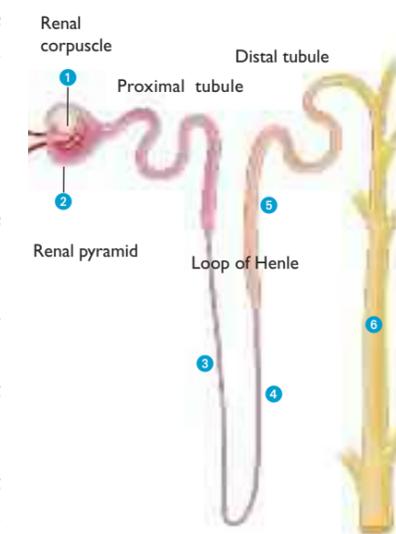
1. Right kidney
2. Caudal vena cava
3. Abdominal aorta
4. Left kidney
5. Renal artery and veins
6. Ureter

Kidney structure



1. Fibrous capsule
2. Renal cortex
3. Renal medulla (renal pyramids)
4. Renal pelvis
5. Ureter

Structure of a nephron



1. Glomerulus (arterioles)
2. Capsule
3. Descending portion of the loop of Henle
4. Ascending portion of the loop of Henle
5. Right portion
6. Collector tubule

Urine attains its final form in the last part of the nephron, the collecting duct. Regulatory mechanisms are triggered to determine the concentration of the urine and increase its acidity.

Urine storage and evacuation

The urine, in its final form, flows from the collecting ducts into the renal pelvis, a small pouch which empties into the urethra. It is conveyed to the bladder, a watertight organ capable of swelling dramatically, where it is stored between urinations. A sphincter between the bladder and the urethra prevents incontinence. Urination occurs when the bladder accumulates a given volume of urine. The bladder, which is composed of many smooth muscle fibres, contracts and the urethral sphincter relaxes. The urine is then evacuated under pressure.

This process is regulated by the nervous system. The brain has voluntary and conscious control of urination. Nerves originating in the lumbar, sacral and pelvic regions cause contraction and relaxation of the bladder.



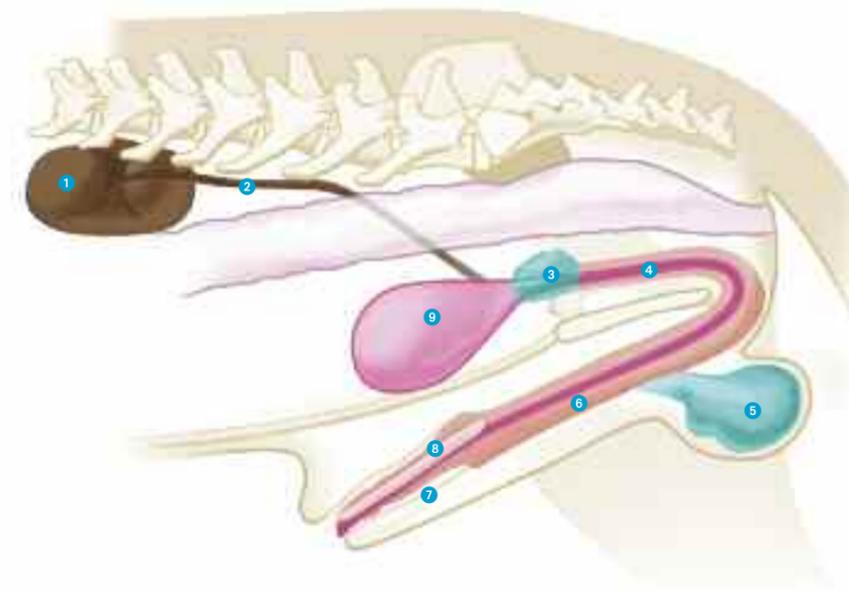
Why does my dog's urine burn the grass?

One of the major functions of the kidneys is to excrete nitrogen waste products derived from the breakdown of proteins. Consequently, when dogs urinate on the lawn, grass may be damaged as a result of exposure to excessive amounts of nitrogen contained in the urine. This damage is usually recognized as dead brown patches of grass, created because of dehydration caused by the nitrogen. Female dogs are more likely to contribute to "lawn burn" because their urination habits most often involve squatting and releasing larger volumes of urine than the typical marking behavior of the male dog.

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Male urogenital system

1. Kidney
2. Ureter
3. Prostate
4. Urethra
5. Testis
6. Penis
7. Glans penis
8. Penis bone
9. Bladder

Positioning of the kidneys and the spleen



Regulation

The urinary function is primarily regulated through control of the kidneys which happens in various ways. External factors, especially blood circulation, can play a part; indeed the amount of urine produced by the kidneys is heavily dependent on the amount of blood filtered. When the blood volume decreases, less urine will be evacuated; when it increases, more urine will be evacuated.

The nervous system also plays a role, influencing both kidney function and bladder function (urination). The kidneys are stimulated by numerous nerves, which have an impact on the blood vessels in the kidneys. They can rapidly decrease the rate of renal perfusion, resulting in a decreased volume of evacuated urine.

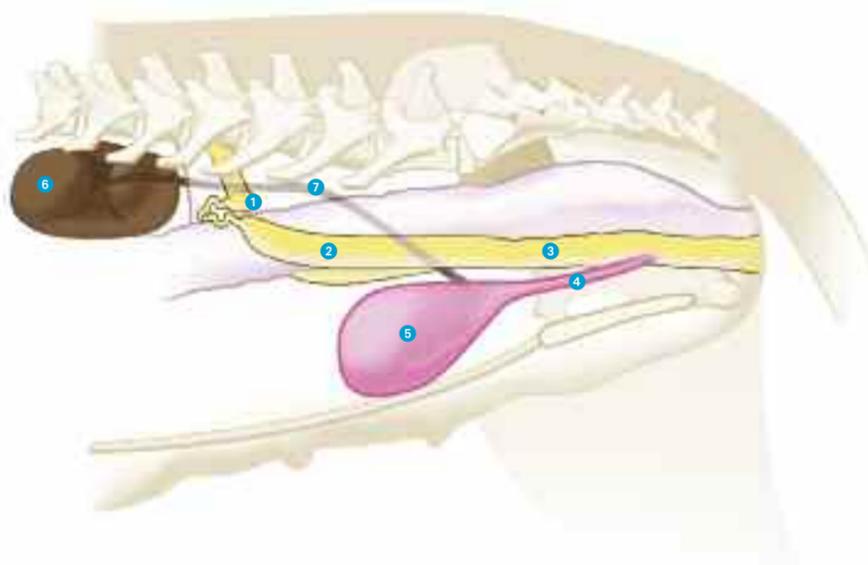
Hormones have the greatest regulatory effect. Many hormones are involved in controlling the evacuation of water and ions,

but most of them only come into play in pathological situations. The most important of these hormones is vasopressin, also called antidiuretic hormone (ADH). Vasopressin is secreted by the pituitary gland, which is located at the base of the brain. It acts on the end of the convoluted portion of the distal tubule and on the nephron's collecting tubule. Secretion is triggered by a rise in osmotic pressure in the blood (due to the fall in the amount of water in the blood compared with other substances) or a fall in arterial pressure. Other stimuli that can also trigger secretion of vasopressin are stress, a drop in ambient temperature and physical exercise.

Vasopressin is trapped by receptors on the surface of the cells of the collecting duct, resulting in the increased absorption of water in the nephron. This enables the animal to conserve some of the water in its cells.

Urine

Daily evacuated volume: 25-40 ml/per kg of body weight
pH: 5-7.
Urea: 300-800 mg/kg of body weight per day



Female urogenital system

1. Ovary
2. Uterine horn
3. Uterus
4. Urethra
5. Bladder
6. Kidney
7. Ureter



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Nervous system

The nervous system receives information from the outside world and from other parts of the body. It also sends out nerve impulses, which cause voluntary or involuntary contractions of the skeletal muscles that control movement, visceral muscles and the muscles involved in glandular secretion.

The nervous system is composed of specialised nerve cells known as neurons and their supporting structures, which form the neuroglia.

Neurons are receptors when they receive a stimulus, transmitters when they send nerve impulses and relays when they connect two different neurons.

Nerve fibres have different levels of excitability and conductivity. The speed of nerve conduction from the periphery to the brain and vice versa is about 30 milliseconds.

A reflex is the immediate conversion, via the general nervous system, of sensory information from the outside into motor, secretory or inhibitory information, which is then transmitted to the organ concerned by the reflex in question. This all occurs in a short space of time.

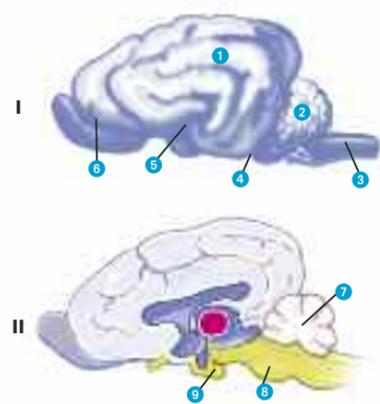
Central nervous system

The central nervous system comprises the cerebrum, cerebellum, medulla oblongata (in the cranial cavity) and spinal cord (in the medullary cavity, all along the spinal column). Besides the protective bones that surround it, the central nervous system is covered

by three membranes, the meninges: the dura mater, which is in contact with the bone, the arachnoid membrane and the pia mater, which is in direct contact with the nerve tissue. This protection from both physical shocks and internal attack is vital

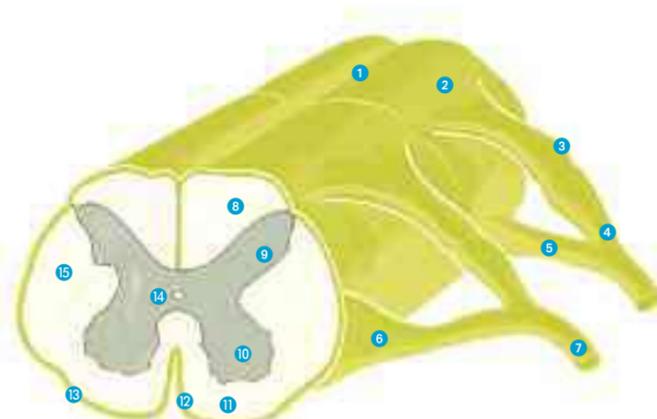
because neurons do not regenerate, so any damage will be irreparable. There is a barrier too between the blood and the meninges, known as the blood-brain barrier, which blocks various substances to help provide protection.

Exterior conformation of the cerebral hemispheres



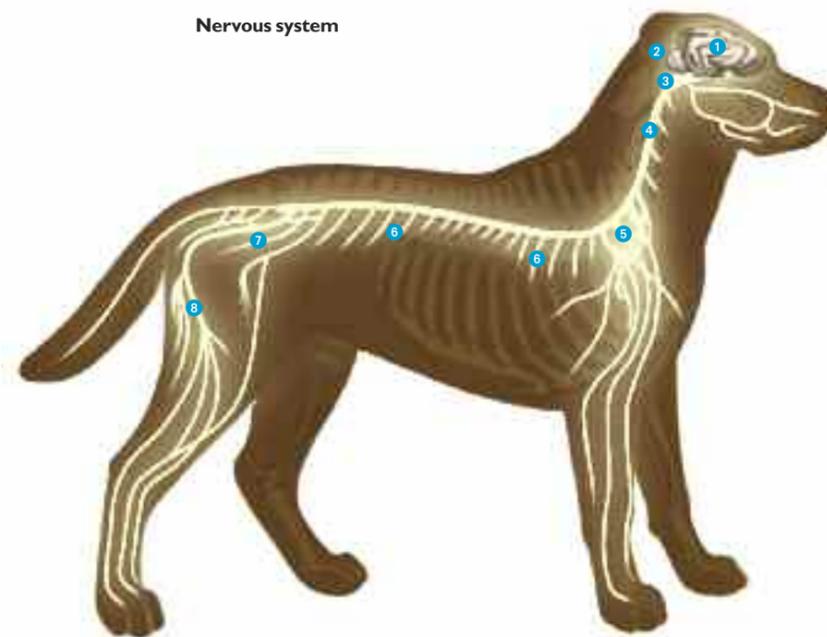
- I. Left lateral view II. Medial view
- | | |
|----------------------------|---------------------------|
| 1. Cerebral hemisphere | 6. Lateral rhinal fissure |
| 2. Cerebellum | 7. Cerebellum |
| 3. Spinal cord | 8. Spinal cord |
| 4. Cerebral peduncles | 9. Pituitary gland |
| 5. Pseudo-Sylvian fissures | |

Spinal cord Dorsolateral view in cross section

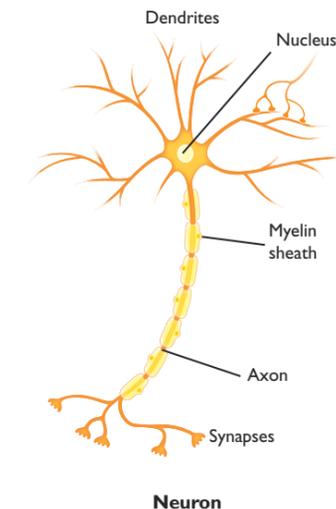


- | | | |
|--------------------------|-------------------------|---------------------------|
| 1. Dorsal median sulcus | 6. Denticulate ligament | 11. Ventral cord |
| 2. Dorsal lateral sulcus | 7. Spinal nerve | 12. Ventral median sulcus |
| 3. Spinal ganglion | 8. Dorsal cord | 13. Lateral sulcus |
| 4. Posterior root | 9. Posterior horn | 14. Central canal |
| 5. Anterior root | 10. Anterior horn | 15. Lateral cord |

Nervous system



- | | | |
|----------------|---|-----------------------------|
| 1. Cerebrum | 4. Spinal cord | 6. Spinal nerves |
| 2. Cerebellum | 5. Brachial plexus: arrangement of nerve fibres | 7. Lumbar and sacral plexus |
| 3. Spinal bulb | | 8. Sciatic nerve |



Neuron

- The cerebrum is the centre of motor and sensory nerves, sight, hearing, smell and taste, as well as memory and association.
- The cerebellum is the centre of balance and coordination.
- The spinal column is an important centre of reflex, as is the medulla oblongata which is also the centre of autonomic functions, such as respiration, vomiting, salivation, cardiac function and vessel dilation/constriction.

Peripheral nervous system

The peripheral nervous system is composed of nerve fibres grouped into nerves which form symmetrical branches throughout the body. Sensory nerves convey sensory information from the periphery to the collecting centres of the central nervous system. Motor nerves convey nerve impulses generated by the central nervous system to the target or-

gan. Many nerves contain both sensory and motor fibres.

Autonomic nervous system

The autonomic nervous system is centred in ganglia on either side of the spinal column. It controls the autonomic or visceral functions, which are those not controlled by the central or peripheral nervous systems. It is divided into the sympathetic and parasympathetic systems, which have opposing effects, activating or inhibiting an organ's functions. The parasympathetic system stimulates intestinal activity, for example, whereas the sympathetic system decreases it.

The nervous system is involved in many diseases and interactions between medications. Disorders can be highly varied and exceptional knowledge of the subject is required.

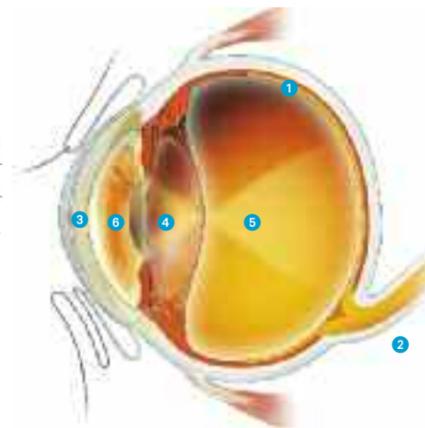


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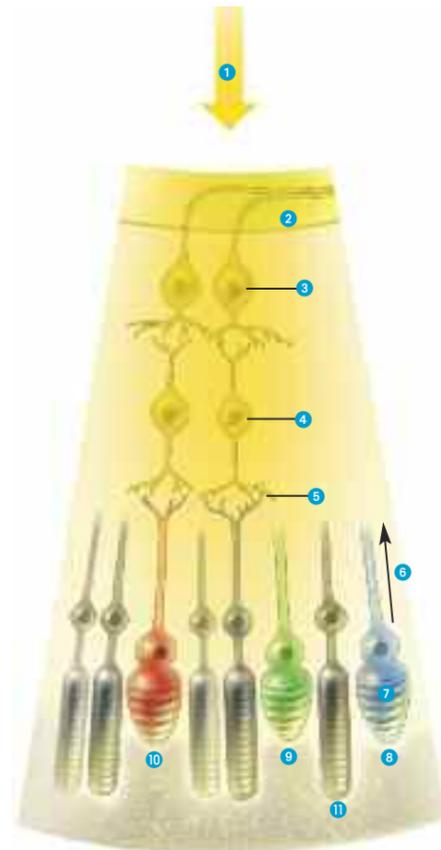
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Longitudinal section of the eyeball



- 1. Retina
- 2. Optic nerve
- 3. Cornea
- 4. Crystalline lens
- 5. Vitreous humour
- 6. Iris

Sight: cones and rods



- 1. Light
- 2. Optic nerve
- 3. Sensory nerve
- 4. Bipolar neuron
- 5. Dendrites
- 6. Electrical impulse
- 7. Photosensitive pigment region
- 8. Cone sensitive to blue
- 9. Cone sensitive to green
- 10. Cone sensitive to red
- 11. Rod: low luminosity, night vision

Sight

The dog's vision

Although the topic is strongly debated, current thinking is that dogs have better night vision than humans. Their retinal cells concentrate more light information, which means that they have good twilight vision.

Dogs are very good at perceiving movement far away, but they have more trouble distinguishing stationary objects at the same distance. This is a practical advantage on a hunt.

The viewing angle differs between breeds, depending on the work they have been bred

to do. Herders need the widest possible viewing angle to enable them to monitor livestock optimally. To achieve this, their eyes are typically on the side of the head. Hunters need narrow binocular vision to be able to perceive prey, so they have their eyes on the front of the head.

Eye and associated structures

The eye fits into the eye socket, a cavity of the skull, where it is held in place by muscles with different orientations, which enables it to move in a specific direction.



How well do dogs see?

It is generally accepted that most dogs are myopic (nearsighted), therefore cannot clearly image far away objects. Visual acuity in the dog is thought to be more sensitive to motion than actual imagery of the object reviewed.

Do dogs see colour?

Recent studies at the University of California indicate that dogs have limited colour vision. The spectrum is divided into two hues: (human, violet range) seen as blue in dogs; (human, yellow to red) seen as yellow by dogs. The spectrum between the two is probably viewed as white to gray.

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Eyelids and glands protect the eye. Each eye has three eyelids. The upper and lower eyelids are folds of skin lined by a mucous membrane on the inside. They are edged with lashes, which protect the eye from falling dust and other foreign particles. The third eyelid is a simple membrane in the inside corner of the eye which is usually invisible. It covers the eye when it is closed or irritated, or in the event of a nerve problem.

Given that the eye is exposed to dry air, it needs the protection of the lacrimal glands, which produce an aqueous medium (tears) which bathes the cornea. The tears are col-

lected in the space between the eyelids and the eye and evacuated via a narrow duct that begins at the inside corner of the eye socket and ends in the nostrils. If too many tears are produced or the duct is obstructed, they will run out onto the dog's face forming red streaks in the coat due to oxidation, which can cause them to be confused with blood.

The eye is made up of two distinct parts:

- The anterior segment comprises the cornea, iris and lens. Its role is to concentrate the light, rather like a camera lens. The cornea and lens are transparent sur-

faces which act as optical lenses, whereas the iris, which has an aperture called the pupil, acts as a diaphragm, regulating the amount of light which gets through.

- The posterior segment comprises the vitreous chamber, choroid and retina. Its role is to convert the optical signals of the light into nerve signals sent to the brain by the optical nerve. Returning to the example of the camera, the posterior segment serves as the film, which is developed by the brain.

Hearing

The dog's hearing

A dog's hearing is twice as good as a human's. A dog can hear sound frequencies up to two and a half times higher than those human ears can perceive. Dogs can even hear ultrasounds, which explains why dog whistles are so effective. They are very good at distinguishing between different sounds, which means that they can easily make out words spoken to them, although tone of voice and gesture are also very important in this regard.

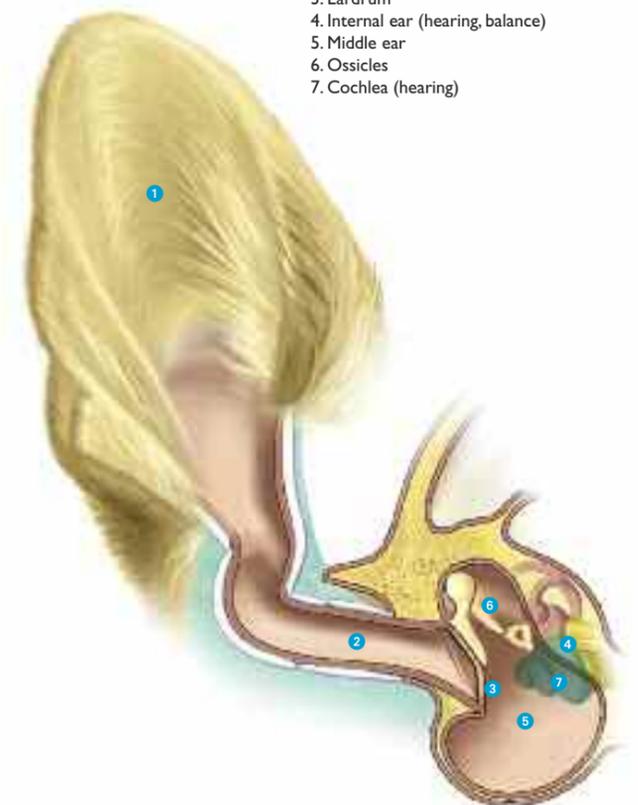
Ear

The external ear is a cartilaginous structure covered by skin and muscles, forming a mobile pinna that can be oriented to the source of sound, like a radar antenna. The pinna runs into the external ear canal, a cartilaginous canal covered in very fine skin, which is firstly vertical then horizontal. It ends in a very fine membrane, the eardrum. Thus, the outer ear collects sounds, which are directed into the middle ear.

The middle ear is the resonance chamber. In contact with sound waves the eardrum vibrates and causes the vibration of the three ossicles – the malleus (hammer), stapes (stirrups) and incus (anvil) – in the middle ear cavity by a lever system. This mechanism enables sounds to be conveyed to the inner ear, amplifying them while reducing the violent vibrations, since the ossicles have limited amplitude.

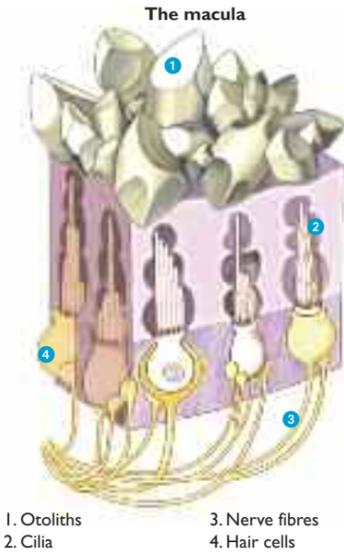
The inner ear is split into two parts, each with a very different role. The cochlea converts the sound waves into nerve signals and sends them to the brain via the auditory nerve. The semicircular canals contain tiny hairs that are able to perceive the position of the head and play a role in balance.

Section of the ear

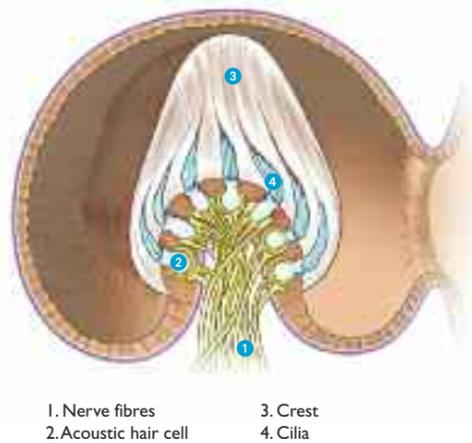


- 1. External ear: pinna
- 2. External ear: ear canal
- 3. Eardrum
- 4. Internal ear (hearing, balance)
- 5. Middle ear
- 6. Ossicles
- 7. Cochlea (hearing)

Management of balance by the internal ear



Section of the ampulla



**Management of hearing by the internal ear:
Section of the cochlea, organ of Corti**



The pinna contains several nerves, including the vagus, which slows down the heart. This nerve is stimulated when the ears are cropped, which can cause problems with anaesthesia. This procedure is now banned in many countries and is unnecessary for dogs participating in shows or as part of pedigree standards.

Taste

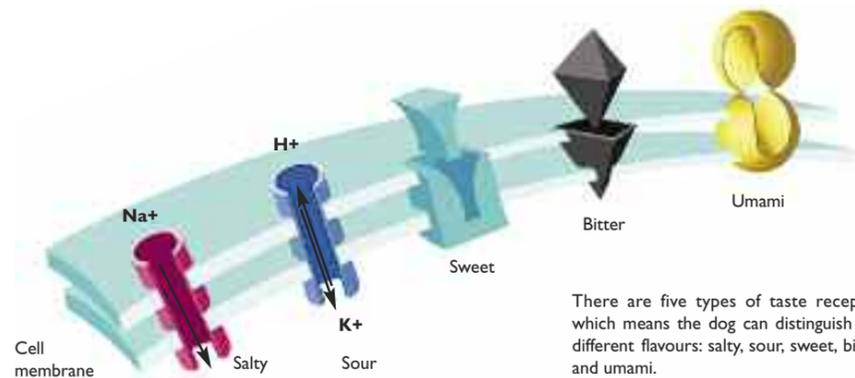
A very subjective concept

Taste is a highly subjective concept. It is closely linked to smell, and both senses are used to evaluate the palatability of food.

Taste is never dulled in dogs, which will happily consume the same food day after day as long as it is palatable. In fact, this is the recommended option for feeding dogs.

How taste develops

The perception of taste is the work of the taste buds in the mucosa of the tongue, palate and pharynx. Dogs have about five or six times fewer taste buds than humans. The taste buds contain glossopharyngeal and lingual nerve endings, which transmit nerve signals to the brain. As with smell, these signals are produced by the interaction of chemicals in the food, which are dissolved in the saliva, and the taste receptor cells.



There are five types of taste receptor, which means the dog can distinguish five different flavours: salty, sour, sweet, bitter and umami.

Smell

A sense beyond compare

Smell is the dog's primary sense. It is used for hunting, getting their bearings, communicating with other dogs and conveying their food preferences. Dogs recognise their owner and their home by smell rather than by sight. Smell is also important in the perception and evaluation of food, prevailing over taste. A dog will not eat anything it doesn't like the smell of.

A dog's sense of smell is a million times keener than a human's. Forty times as many brain cells are involved in decoding smells in the dog's brain than in a human's. This great sensitivity to smell is also due to the larger surface area of the receptor organ: the olfactory mucosa covers 200cm² in dogs, compared with just a few cm² in humans.

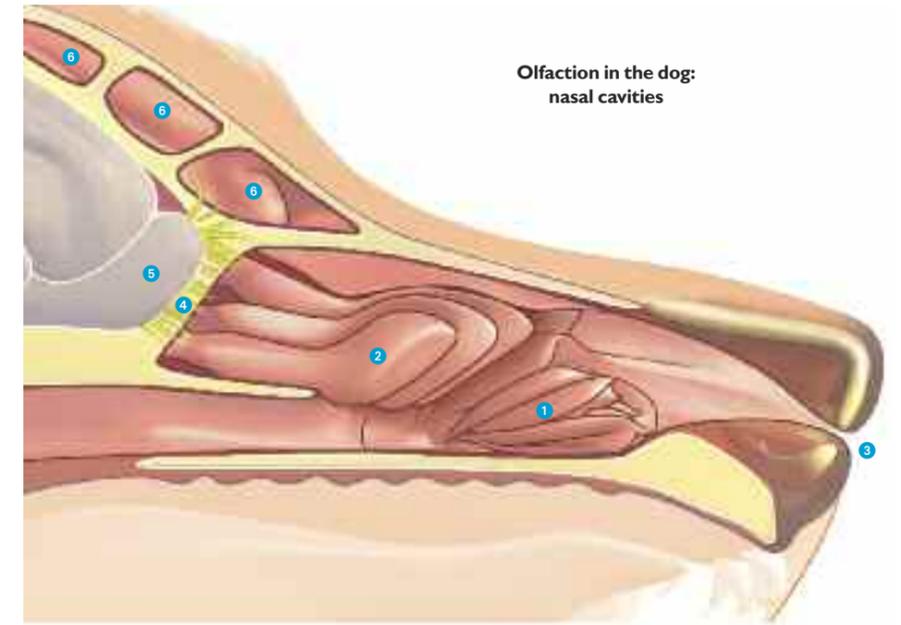
Dogs also have a large number of olfactory cells, although the actual number varies depending on the breed (220 million in Labradors and German Shepherds, 70 million in Cocker Spaniels).

Last but not least, the size of the brain processing olfactory stimuli in dogs is around ten times bigger than in humans.

Perception of smell

The mucosa covers the turbinate bones in the nostrils. These bones are scrolled in shape and separated by the sinuses, into which inhaled air rushes, trapping smells. The ethmoid at the back of the nasal cavity is another organ of smell, also made up of sensory cells.

The smells which come into contact with these cells attach themselves to specific receptors, triggering chemical changes which produce a nerve signal that is sent via the olfactory nerve to the area of the brain responsible for processing this information. By 2009, more than 300 types of olfactory receptor had been identified, each dedicated to a specific "odotope" (part of the chemical molecule).

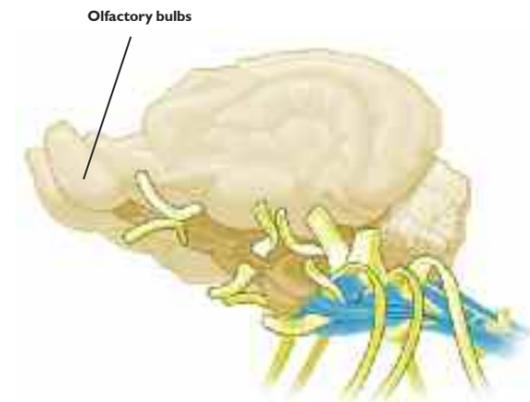


Chemical composition, air humidity and molecular weight determine how well a smell is perceived. A heavy molecule that is mildly water-soluble is easier to perceive. These principles are used in the work of all types of sniffer dog, from search and rescue to drug detection.

The olfactory sensation

The olfactory sensation can be fairly slow to work in dogs. Not only must the molecules cross the nasal mucosa and attach themselves to the right receptor, a latent period is often needed before the dog really "recognises" the smell. The addition of equivalent stimuli is needed to cross the olfactory threshold and provoke a reaction. In the same phase, the dog's olfactory acuity will ultimately diminish (generally after 30-45 minutes), in connection with what is called olfactory fatigue. This is when all the specific smell receptors are engaged. When this happens, the dog will have to be rested to give the receptors time to free themselves up.

A dog's olfactory sensation is optimal after 2-4 minutes' work; the relaxation phase lasts 3-4 minutes.

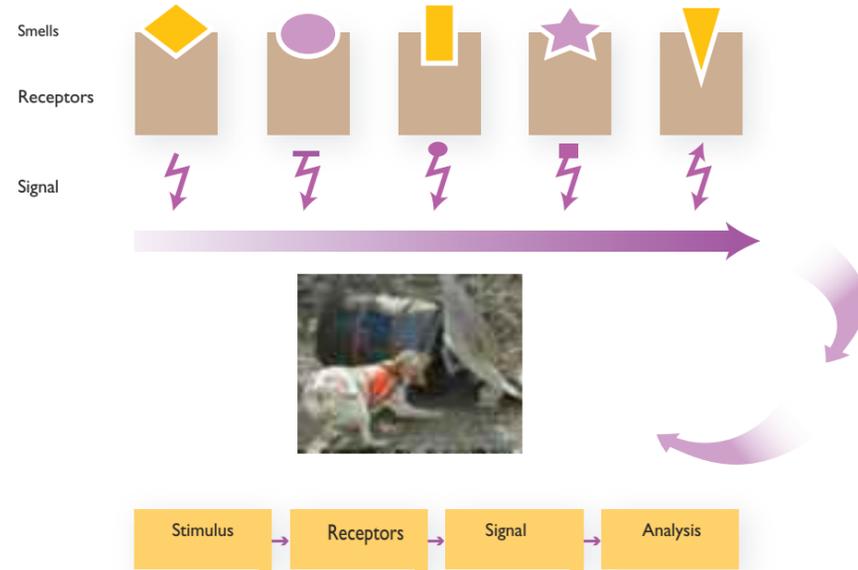




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“A dog’s olfactory sensation is optimal after 2-4 minutes’ work; the relaxation phase lasts 3-4 minutes.”

Physiology of olfaction in the dog



Lastly, a few useful pieces of information for sniffer dog handlers:

- While females have better olfactory acuity than males, it does vary with the oestrous cycle (oestrogens, like male testosterone, have a positive impact on this).

- The pigmentation of the pituitary mucosa influences olfactory capacity. Dogs with a clear mucosa are less effective.

- A dog’s olfactory acuity can be affected by the biological environment (a sensation of hunger improves olfactory capacity, whereas poor general health or physical tiredness reduces it).



© Croserny

Touch and sensitivity

The skin can perceive thermal, tactile and painful sensations because of nerve endings, which form a very dense network connected to the spinal cord and the cerebrum. These nerve endings are irregularly distributed throughout the body.



© Duhaier/Royal Canin

Different veterinary procedures for testing sensitivity and reflexes in the dog.



© Duhaier/Royal Canin

Stages in the life of a dog



Photo on the left: © Duhayer/Royal Cann



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From conception to old age

With the anatomical and physiological information from the previous chapters, we can now look in detail at the main stages in the life of a dog, from mating and gestation to whelping, from nursing to weaning, growth and adulthood. Ageing and its consequences are also addressed.

Reproduction

While the goal of reproduction is always the same – the birth of healthy puppies – the resources for achieving this vary greatly between private owners and professional breeders. Owners of a companion or working dog will sometimes mate their dog to obtain puppies with comparable qualities, but reproduction is not vital to a dog's psychological or physiological balance, as many people mistakenly think. Participation in reproduction is closely related to hierarchical status in wild dog packs, because mating is a sign of dominance, which sometimes explains incompatibilities of character between mating dogs.

Meticulous selection

Breeders select their breeding stock based on ancestry, offspring and genetic traits. They manage to sidestep the hierarchical aspect by assisting and directing mating between dogs of their choosing. And if one or both of the dogs refuse to cooperate, they can employ artificial insemination to get what they want.

Mating

After the partners have been selected and the approximate moment of ovulation determined, the female is presented to the male – the stud – for mating. For reasons of hygiene, it is worthwhile checking the genitals of both dogs for lesions. This will limit the risks of transmission of STDs such as canine herpes virus. The genitals must be clean, and regular blood tests are preferable to the use of antiseptics, which often have spermicidal qualities that can prevent fertilisation.

In longhaired females, the hair around the vulva may be smoothed, separated or clipped to make penetration easier. Mating is preceded by a short period of wooing and smelling, which increases the excitement of both dogs. The erection caused by the rigidity of the penis bone (os penis) and the inflow of blood into the erectile tissue enables the male to insert the penis. This triggers contractions of the vagina, which favours the ascent of the spermatozoa, maintenance of the erection and tying during ejaculation.



© Francisco Cagig



Mating is completed fairly quickly in dogs

This phase should last for at least five minutes, but can last for up to half an hour if the female's movements maintain stricture of the erectile tissue. In most cases, if the time is right, the male and female will manage perfectly well on their own and there will be no need to disturb them. Discreet remote observation (or by CCTV link) will generally be enough to verify that the two dogs have accepted each other and that tying has occurred. Fertilisation can occur without tying, but litters will generally be smaller.

Despite advancements in the diagnosis of ovulation, it is always a good idea to repeat mating after 48 hours, although more than two matings will not be necessary if the female's ovulation has been monitored correctly.

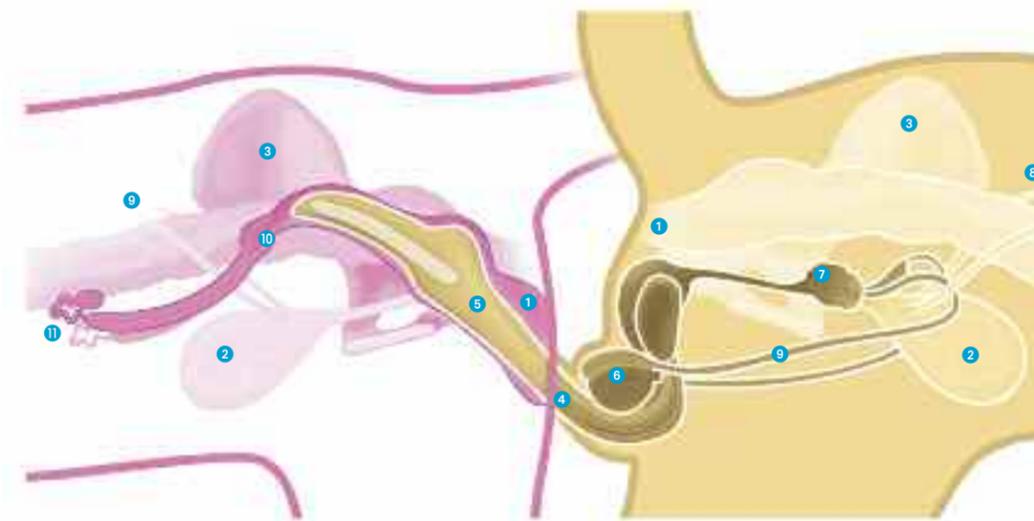
While the risk of superfecundation (fertilisation of a female by more than one male) is lower in dogs than in cats, it is advisable to isolate other males until all signs of oestrus have disappeared.

Superfertilation (fertilisation of an ovum in an already pregnant female mammal) does not occur in dogs.

Artificial insemination is available if natural mating between the selected male and female proves impossible for any reason.

Diagram showing the genitals during mating

The genital organs during the tying phase of mating. The dogs can be tied for up to an hour.



1. Anus
2. Bladder
3. Hip bone
4. Body of penis
5. Corpus cavernosum penis
6. Scrotum
7. Prostate
8. Urethra
9. Ureter
10. Cervix
11. Ovary

Female fertility problems			
	Origin	Symptoms	Responses
	Hormonal problems during growth	Late first oestrus, sometimes combined with growth and genital development abnormalities	Exclude from reproduction
	Pre-puberty anti-oestrus treatments	Stunted size, genital abnormalities	
	True obesity	Absence of or discreet oestrus	Weight loss programme
	Hormonal problems during adulthood (hypothyroidism, Cushing's disease, follicular cyst)	Hair loss, skin pigmentation, obesity, apathy, excessive thirst	Hormone tests (thyroid, adrenal, ovaries) followed by any treatment
Abnormal ovum (egg) production	Administration of some medications (androgens, progestogens, cortisone, anabolic steroids)	Low profile symptoms (sometimes clitoral hypertrophy with androgens)	Closely monitor indications and risks of hormone treatments (problems often irreversible)
	Ageing	Reduced prolificity	Retire from reproduction
	Ovarian tumour / cysts	Abnormal oestrus (e.g. prolonged, nymphomania)	Ovarian ultrasound, hormone treatment, possibly surgery
	Hormone deficiencies	Absence of oestrus or cycle without ovulation or late ovulation	Vaginal smear, progesterone treatment Stimulation of maturation and release of ova
Mating abnormalities	<ul style="list-style-type: none"> • Vulval or vaginal lesion • Genital or joint pain • Breed predisposition • Female aggression • Indifference • Clumsiness • Disproportion male/female 	Refusal of mating	Assist mating or practice artificial insemination
Fertilisation abnormalities	Poor ovulation / mating synchronisation	Infertile mating	Meticulous monitoring of oestrus, repeated insemination or induced ovulation
	Obstacle to fertilisation (infection)	Infertile mating	Check genital tract for obstructions and infection

Pathology of reproduction

Infertility in females

Fertility in a population is never 100% in any species. The maximum fertility observed in dog kennels where reproduction conditions are optimal does not exceed 85%. It is actually recommended that females do not mate during at least the first oestrus every other year.

With this in mind, infertility should not be suspected until the female has remained infertile during oestrus for two successive periods. That said, the veterinarian does not need to wait so long before running a few tests if fertilisation does not occur.

The veterinarian will start by checking the male's semen and investigating recent offspring. If this does not identify anything of concern, attention should be turned to the female. There are a great many potential causes of infertility in females. An extensive investigation, covering earlier cycles, any treatment (especially hormones), the date of mating, how it went and the nature of vulval discharge will help to identify the cause, be that a problem with egg production, fertilisation, implantation or gestation. Normal fertilisation requires healthy genitals, proper ovulation, copulation or insemination during the optimal period of fertility, good-quality semen and the maintenance of gestation for two months. Any abnormality in these areas can cause infertility.

• Ovum production abnormalities

Possible causes of abnormal ovum production:

- Linked to the absence or stunted development of oocytes in the ovary (oocyte maturation disorder), manifesting as non-existent, discreet or irregular oestrus.
- Due to an obstruction of egg release, sometimes manifesting as the appearance of cysts in the ovaries, which can result in nymphomania, extended or permanent oestrus.

- Consequence of hormone treatments (anabolic steroids, progestogens, corticosteroids) or excessive sports training (excessive secretion of male hormones in female sporting dogs).

- Consequence of hormone dysfunction (thyroid or adrenal gland disorders, obesity).

In dogs, hormones essentially cause all these disorders, so the veterinarian must complement the diagnosis with hormone measurements.

Treatment obviously depends on the origin. The absence of puberty cannot be treated in the same way as an androgen level disorder, even though the fundamental problem is the same (absence of follicular maturation).

Hormone treatments are prescribed to stimulate the defective glands or replace the deficient hormones. The veterinarian will always use hormones with prudence, as their administration can cause the glands normally responsible for producing them to shut down temporarily or for good. For example, the use of progestogens in prepubescent bitches to slow down the appearance of first oestrus can stunt growth and stop their cycles temporarily or permanently.

It is therefore vital to refrain from all preventive or curative hormone treatments unless the cause of the infertility has been clearly identified. Hormones are a last resort when all other treatments fail.

• Fertilisation abnormalities

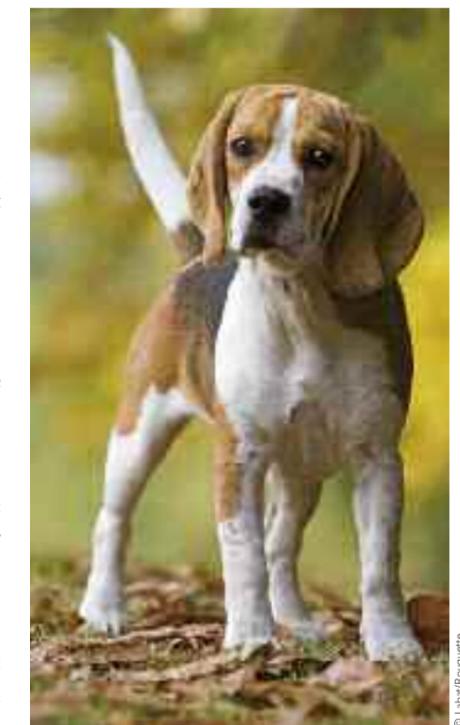
By far the most common reason for non-fertilisation of a female is the choice of the wrong date for mating or insemination. Once this potential cause has been eliminated the veterinarian will study any obstacles that may have prevented the gametes from uniting. Vaginal, uterine, urinary or even prostatic infection may provoke the destruction of spermatozoa or disrupt their advancement prior to fertilisation. Likewise, an obstruction of the fallopian tubes (oviducts) due to salpingitis (inflammation

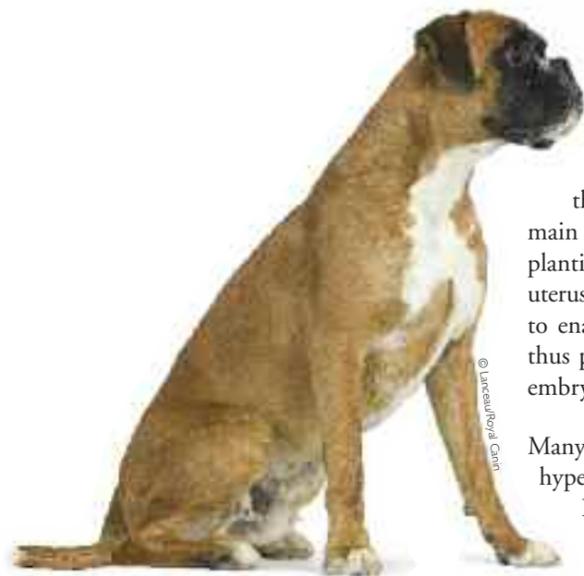
“Cysts can result in nymphomania, extended or permanent oestrus.”

Ovarian cysts



Section of an ovary





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of the fallopian tubes) can stop the ova from advancing.

• **Implantation abnormalities**

Once the ova have been fertilised the eggs divide several times but remain free in the uterine horns before implanting themselves in the mucosa of the uterus, which must be ready to receive them to enable the formation of placentas and thus provide the nutrition needed for the embryos to develop.

Many obstacles (infection, glandular-cystic hyperplasia etc.) can hamper this process. Likewise, if the interval between oestrus is too short the uterus will not have time to return to its initial shape and will not be able to accommodate embryos. Some treatments give the uterus the recovery time it needs.

Some dietary deficiencies (vitamins A and E) have an impact here, but they usually cause much more conspicuous symptoms suggestive of malnutrition before this stage.

• **Gestation abnormalities**

Embryogenesis is the process by which an embryo forms and develops, with the concomitant differentiation of tissues. During this process the foetus is particularly sensitive to any disease or poisoning that the gestating female may suffer from. The need to limit all risk of mortality or malformation is why no medical treatments are recommended during the first 20 days of gestation.

Gestation can be spontaneously terminated for many other reasons:

- Genetic incompatibility between the male and female when both have a lethal recessive genetic disorder that renders homozygote embryos non-viable.
- Some chromosome disorders.
- A large number of microorganisms that are reputed to be abortive or teratogenic:

- Viruses: herpes, canine distemper virus
- Parasites: toxoplasma
- Bacteria: salmonella, pasteurella
- Some of these are endemic, such as canine brucellosis in the United States.

• All traumas, either physical or psychological, can sometimes provoke complete or partial abortion (expulsion of part of a litter and continuation of the gestation to term).

• Involution of the corpus luteum, which secretes progesterone, an essential female hormone throughout gestation. This is known as luteal deficiency.

Pseudopregnancy and lactation

These disorders are not considered to be pathological insofar as they are more commonly observed in wild dogs than in domesticated dogs, where they recede spontaneously after a few weeks in the absence of treatment and generally have no after-effects.

Females suffering from pseudopregnancy (false pregnancy) present all the symptoms and hormonal changes expected in regular pregnancy without them being pregnant. This further complicates diagnosis because behavioural changes, such as a tendency to hoard objects, weight gain and even lactation cannot be used to determine the female's status.

The development of the mammary glands is stimulated by prolonged exposure to serum progesterone during dioestrus. At the end of gestation the drop in progesterone is accompanied by a rise in the concentration of prolactin, the hormone responsible for milk production.

This disorder is curiously rare among dogs living in kennels, affecting privately owned females to a greater degree. Pseudopregnancy does not seem to be an unappeased desire for pregnancy as it can also occur in females that have previously given birth.

“Embryogenesis is the process by which an embryo forms and develops, with the concomitant differentiation of tissues.”



Is it true that every bitch should have puppies at least once in a lifetime, for reasons of health and wellbeing?

There is no scientific evidence showing that pregnancy prevents genital tract diseases in the bitch.

The view, that having the puppies at least once in a life time is beneficial for the bitch's wellbeing is anthropomorphic.

In bitches not intended for breeding (pets) spaying should be carried out at a young age. When performed before the first oestrus (heat), it significantly decreases the risk of later development of mammary tumours. It is obvious that neutering prevents pyometra and false pregnancy.

For breeding bitches it is optimal to have one litter per year. When retiring, at 8 years of age, these bitches should be spayed (neutered) to prevent uterine and ovarian diseases.

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Unlike pseudopregnancy, spontaneous lactation is a common reason for visits to the veterinarian. Excitable females will constantly lick their mammary glands, which are swelled up with milk, prolonging lactation by a neuro-hormonal mechanism identical to the suckling reflex.

Lactation during pseudopregnancy is treated with anti-prolactin drugs. During treatment the owner must refrain from massaging the area around the mammary glands and prevent the dog from licking by fitting an Elizabethan collar. This will break the cycle. Removing the ovaries is the only way to ensure pseudopregnancy does not reoccur. This is generally performed as ovariohysterectomy (spaying).

Metritis

Metritis is a range of uterine infections that generally only affect females during a very specific part of the oestrus cycle. The most common cause is pathogens that enter the uterus when the neck is open, either during oestrus or after whelping. When the neck closes and dioestrus occurs (increased progesterone), metritis can be aggravated by the accumulation of pus in the uterus, known as pyometra.

Pyometra

The symptoms of pyometra may be inconspicuous if there is no purulent discharge from the vulva (closed pyometra). This is the serious form of pyometra because it does not drain spontaneously. There are three main reasons for this:

- The neck of the uterus is closed.
- Circulating progesterone maintains relaxation of the uterus as if gestation was ongoing.
- The horizontal position of the uterine cornua (horns) does not facilitate spontaneous drainage.

In clinical terms, pyometra often provokes lethargy combined with increased water intake and increased urination (polyuria/polydipsia). This can be complicated by an attack on the kidneys by the secreted toxins. The veterinarian can confirm pyometra with a vaginal smear, abdominal palpation, blood tests, X-rays and ultrasound.

A considerable quantity of pus (several litres) can accumulate.



© Doherty/Royal Canin

Rapid response is essential. Medical treatment involves the use of antibiotics and hormones (anti-progestogens, prostaglandins) that contract the uterus and open the neck to allow drainage. This treatment can only be given to less severely affected females that the breeder wishes to use in reproduction. The treatment of choice is the removal of the uterus and the pus it contains if the female is to make a full, fast recovery.

Ovarian and testicular tumours

In medical terms, a tumour is simply an abnormal growth of tissue. Tumours can be either benign or malignant (cancerous tumours). Watery or fatty cysts and abscesses are not tumours.

Cancerous tumours rarely grow in the ovaries of dogs (they account for around 1% of canine cancers), but they are more difficult to diagnose than testicular tumours, which are usually visible or palpable.

Most ovarian tumours secrete hormones that disturb the sexual cycle and lead to symmetrical and bilateral hair loss on the

flanks or thighs. This clinical presentation may be complicated by abdominal distension due to ascites (accumulation of fluid in the abdominal cavity). Diagnosis is possible by X-ray, ultrasound, laparoscopy or cytological examination of drained fluid. In the absence of peritoneal metastasis, removal of the ovaries is preferred to any other cancer therapy.

Testicular tumours are the second most common tumour in male dogs after skin tumours. They should be suspected even in the absence of pain or swelling if an older dog presents with hormone problems (feminisation syndrome), prostate hypertrophy, infertility or localised hair loss. The retention of one or both testicles in the abdomen classically predisposes older dogs to such tumours.

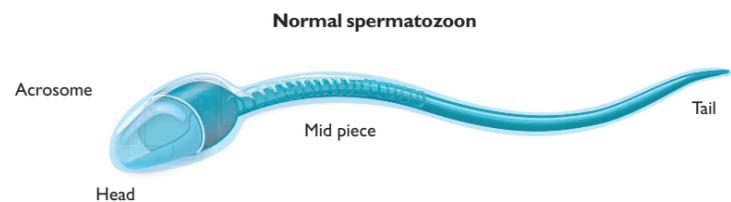
Undescended testis

In the embryo, the testes and ovaries are located in the same position in the abdomen behind the kidneys. While the ovaries do not move, the testes migrate through the inguinal wall to the scrotum under the influ-

ence of hormones and the traction of a ligament (gubernaculum testis). The testes need to be in the scrotum following puberty because spermatozoa production requires a lower temperature than body temperature. Migration actually occurs in the days immediately after birth.

Ectopia (malposition) of the testes is known as monorchidism when one testis is affected and cryptorchidism when both testes are affected. Inguinal cryptorchidism, for example, is a double ectopia of the testes, which can however be palpated by the veterinarian in the inguinal region.

The testes do not reach their final position in the scrotum until much later (six months on average) and they can sometimes move back up into the groin temporarily in cold weather or when the dog lies on its back. The veterinarian must always check for this abnormality when the puppy is first presented by the new owner and make a note in the puppy's records. Medical treatments to stimulate migration are generally ineffective, especially when they are started late (after six weeks).



Quantity of spermatozoa in ejaculate

The number of spermatozoa in ejaculate varies, depending on the ejaculation frequency, size and age of the dog. Large dogs produce more than small dogs. Old and very young dogs produce less than dogs in midlife. The total number of spermatozoa in dog ejaculate varies between 300 million and 2 billion. On average, a not inconsiderable probability of fertilisation is estimated when the ejaculate contains at least 150 million normal, mobile spermatozoa.

Criteria for good-quality semen

- Macroscopic appearance in the three phases:
 - Urethral phase: transparent to cloudy
 - Sperm phase: cloudy to milky
 - Prostatic phase: transparent
- Mobility: > 60-70% mobile spermatozoa
- Concentration:
 - Small breeds: around 250 million spermatozoa / ejaculate
 - Medium breeds: around 750 million spermatozoa / ejaculate
 - Large breeds: around 2 million spermatozoa / ejaculate
 - At least 150 million living spermatozoa are needed to ensure fertilisation
- Percentage of abnormal forms: < 30-40%
- Ejaculate pH: 6.3-6.7



Spermatozoon with two heads



Decapitated spermatozoon



Spermatozoon with cyst on the head



Spermatozoon with abnormally small head

Ectopia of the testes is common in dogs and it is a valid reason for cancelling a sale if confirmed at six months of age. Dogs suffering from monorchidism are perfectly capable of fertilising a female, but it is not advisable for them to mate as they can pass on this defect and they are not considered to conform to the breed standard.

There can be serious consequences for the dog's health too, as dogs with undescended testes are around ten times more likely to develop cancer during adulthood (around 5-6 years old on average). Removal of undescended testes in young adults is therefore highly recommended.

Infectious diseases

A large number of bacterial and viral infectious diseases can affect reproduction, causing infertility, metritis, abortion or neonatal death.

Most bacterial diseases that affect the genitals are difficult to diagnose with certainty, because, while it is easy to isolate bacteria in samples (from the vagina or prepuce, for example), it is much more difficult to prove they are responsible for the symptoms in question. The sample may simply be contaminated by urine, vaginal mucus or prostatic fluid.

Abundant abnormal discharge from the genitals in either sex must be analysed and treated by a veterinarian with the appropriate antiseptics or antibiotics. It should be noted however that antibiotics are not effective against viral infections, including canine herpes virus.

Ectopia of the testes.



“In medical terms, a tumour is simply an abnormal growth of tissue. Tumours can be either benign or malignant (cancerous tumours).”



An ultrasound scan is a painless, non-invasive procedure females tolerate very well.



Ovarian ultrasound scan of a female. It is easy to make out the ovarian follicles – the darker, round structures in the ovary.



Blood progesterone must be measured when determining vaginal resistance.

Assisted reproduction

Artificial insemination or assisted reproduction is regularly performed for anatomical reasons, incompatibility of mood or to improve the genetic pool in a breeding programme by using the sperm of a dead stud or a stud in another country.

Determining the best moment for mating or insemination

If artificial insemination or assisted reproduction is to be successful, it is essential to know when the female is most likely to be fertilised.

Ways of determining the best moment for mating

Bearing in mind that spermatozoa remain fertile for around 48 hours in the female's genital tract, it is possible to optimise the likelihood of fertilisation by ensuring that the gametes come together at the best time. Ideally, mating or insemination should be carried out in the 48 hours following the release of the egg to ensure fertile ova and spermatozoa meet at the best time in the oviducts (fallopian tubes). The ova remain fertile for two days after maturation (this appears to be more than four days in some breeds), which explains why superfecundation – the fertilisation of different ova in the same cycle by different dogs – is possible.

The trick is to closely monitor all the biological signs of ovulation, which are of varying reliability.

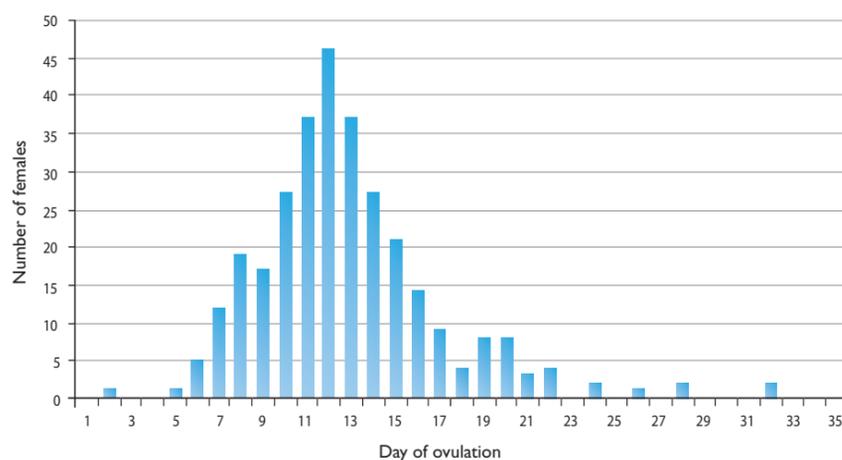
- Lighter vulval discharge is generally a sign of the end of pro-oestrus, although it is not a reliable sign of ovulation. Some breeds, such as Chows-Chows, can bleed right through to the end of oestrus.

- Mating practised systematically twelve days after the first blood loss and repeated two days later is a practical solution, provided the first blood loss is properly observed. This is, however, an imprecise method, because 20-30% of females ovulate outside of this period, which results in either no litter or a very small one.

- Acceptance of the male or the stud and the lateral deviation in the carriage of the tail are not very good criteria either. Some females will allow copulation at the start of pro-oestrus despite not actually ovulating for up to another thirty days. Females may also allow copulation when they are experiencing phantom oestrus during labour, urinary tract infections or in the event of oestrogen secretion by follicular cysts manifesting as nymphomania.

- The resistance of the vaginal mucosa can also be measured using a galvanometer to evaluate the fluidity of vaginal secretions to a fairly precise degree. However, due to the length of the vagina, measurements cannot always be taken in the same place, which means they are difficult to repeat. Furthermore, in daily use this device requires very careful disinfection to avoid initiating vaginitis.

Day of ovulation from the start of oestrus in 379 females



- Test strips to identify biochemical variations in the vaginal mucus are difficult to insert far enough into the vagina to avoid urine contamination. The results are generally imprecise (change in colour in the three days before or after ovulation) and therefore unreliable.

- Vaginal smears enable immediate visualisation of the changing appearance of the vaginal cells, shown by different colours, correlated to hormone variations – especially oestrogen. This simple, economic technique is routinely used by breeders and veterinarians to estimate the stage of the oestrous cycle.

Observation:

• Procedure for vaginal smears

First the swelling of the vulva is examined and the corners pulled down, before the swab is inserted along the caudal wall of the vagina to avoid bumping into the clitoral fossa. Once the roof of the vagina is reached, the swab is revolved horizontally and pushed as far as it goes without applying force. Due to the circular movements, secretions and cells are collected from around the neck of the uterus.

The swab is typically red at the start of oestrus, pinker at the best time for mating, brownish at the end of oestrus and purulent in the event of an infection of the vagina or uterus.

The end of the swab is delicately rolled onto a clean slide without smearing the same area twice, which could create a cell mass.

The sample is fixed with a natural agent for submission to the veterinary surgery or coloured for immediate examination.

Vaginal smears provide much more information than simply the time of ovulation. They can be used to look for any spermatozoa (which survive for up to six hours after mating) if the female has escaped or is suspected of mating through a fence. In this case, they also provide information allowing evaluation of the risk of fertilisation depending on the stage of the oestrous cycle. For example, the risk will be significantly lower if the female is in anoestrus, the start of pro-oestrus or dioestrus, in any event lower than the risk of early medical abortion.

Vaginal smears can also be used to confirm anoestrus, in the event of treatments that are contraindicated during periods of sexual activity, including most hormone therapies.

“Vaginal smears enable immediate visualisation of the changing appearance of the vaginal cells, shown by different colours.”



Colour of the vaginal swab through the course of oestrus.



Vaginal smear.



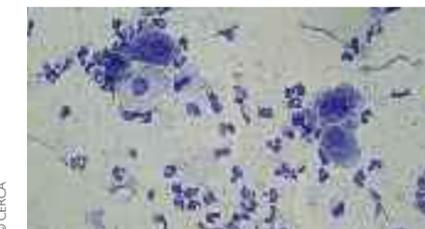
Pro-oestrus

Red blood cells are observed at the start of pro-oestrus. The vagina cells gradually accumulate keratin, becoming larger, more angular and acidophilic with red stain using the Harris Shorr method.



Oestrus

More than 90% of cells are acidophilic and very angular. The nucleus is very small compared with the size of the cell. In some cases it may even be absent. The cells form a cluster of varying size.



Vaginitis

In the event of vaginitis, the smear reveals the presence of a lot of neutrophils, a sign of inflammation. These neutrophils are easier to identify with Diff Quick stain.

As part of a hormone therapy they can be used to diagnose some causes of infertility (silent or anovular oestrus, persistence of a secreting corpus luteum, vaginal infection).

Vaginal smears are very useful in canine reproduction, not least because they are fast, economical and easy to perform. For most females, vaginal cytology is a very useful branch of biology and certainly a good way of identifying the period just before and after ovulation. When these females are mated with dogs with good-quality semen, there is a very good likelihood that fertilisation will occur. On the other hand, a more precise method for determining ovulation – such as measuring the blood progesterone level – will be needed if the smear is difficult to interpret, there is a lot of money involved, the quality of the semen is low to medium, or refrigerated or defrosted frozen semen is to be used.



Observation:

• **Measuring blood progesterone**

In some domesticated female animals (cows, cats) progesterone is typically only secreted after ovulation. In dogs, however, the ovaries start releasing progesterone at the

LH (luteinising hormone) peak, which is 48 hours prior to ovulation. The blood progesterone, which was basal during the whole of pro-oestrus, can be detected before ovulation. To benefit from the advantages of this technique, measurements should be started sufficiently early during oestrus and blood tests taken based on the veterinarian's advice. Between 2 and 5 measurements are often sufficient to monitor standard oestrus.

Blood progesterone at the moment of ovulation will be 4-9 ng/ml, depending on the female and the laboratory. It is important to note, however, that results can only be interpreted in relation to the norms of the laboratory that conducts the test.

The optimal time of mating is 48 hours after ovulation (which is the time it takes the ova to mature).

Advantages of monitoring oestrus

When a precise protocol is followed, the combination of vaginal smears and blood progesterone measurements is a very good way to monitor oestrus, which has many benefits.

- Increased fertility

50-80% of females that are not fertilised after mating are actually mated at the wrong time, so proper oestrus monitoring will resolve infertility in 50-80% of cases. When combined with a clinical examination, regular blood progesterone measurements in infertile females allow the identification of an anovular cycle, embryo resorption associated with the involution of the corpora

lutea, absence of puberty or androgen impregnation, which can have very different treatments.

- Larger litters. Mating the dogs at the best possible time ensures that the maximum number of spermatozoa comes into contact with the maximum number of ova, which leads to a maximum rate of fertilisation in physiological conditions.
- If mating demands a long journey, monitoring oestrus will optimise costs by limiting the risk of failure and the length of stay.
- Monitoring oestrus also improves mating conditions. The female will be happy to participate, minimising the risk of injury and the time needed.

- Because the day of ovulation can be precisely determined, so too can the day the female is likely to give birth (63 days after ovulation, give or take a day either side), which will allow the right preparations to be made in case a Caesarean section has to be performed. If the C-section is performed too early, the puppies will be premature and will typically die a few hours after birth due to respiratory failure. If it is performed too late, the brain will be starved of oxygen in the birth canal. The viability of the canine foetus is conditioned by the late release of a lung surfactant, which determines the respiratory capacities of puppies at birth. This pulmonary maturation is precisely concomitant with the drop in the progesterone level in the days prior to the ideal whelping date. If the ovulation date has not been precisely determined, the mother's blood progesterone level will provide the veterinarian with vital information for determining whether the puppies will be able to survive a C-section. Monitoring oestrus and, where necessary, using the progesterone level before a C-section significantly increases the survival rate of puppies born by C-section, especially Bulldogs, which account for more than 90% of all C-sections.



Collection of sperm for insemination in a fresh or defrosted state



Osiris vaginal catheter



Scandinavian catheters

Artificial insemination

Artificial insemination – which was first achieved in Italy in 1780 – is any reproduction technique that requires the assistance of humans.

Insemination with fresh semen

Artificial insemination with fresh semen involves taking the semen from the male in the presence of the female, checking its quality and inseminating it immediately. This technique is used when the male and female are unable to copulate, due to:

- Incompatibility of mood
- Wish to protect the male from STDs
- Inexperience of one or both of the dogs
- Narrowness of the genital tracts (vulvar atresia, vulvar or vaginal malformations, vaginal prolapse connected to oestrogen impregnation during oestrus)
- Pain suffered by one of the dogs during mating (in the vertebrae, hindlegs, penis or vagina)
- Lack of sex drive
- Disproportion in the size of the dogs (male too big or too small)

After checking that the female is receptive the veterinarian will take a semen sample from the stud in the presence of a female in oestrus (not necessarily the female that is to be inseminated). This is achieved as follows:

- The erectile bulbs must be uncovered under the prepuce before a sample is taken to ensure that their swelling does not prevent their total exteriorisation.
- The erectile bulbs are then massaged until the pelvis starts to move spontaneously.
- Stricture behind the bulbs enables the erection to be maintained during the three ejaculation phases, supplemented with massage of the perineum where necessary. The veterinarian then separates the three fractions of the ejaculate, which enables adjustment of the quantity of prostatic fluid (phase three) and use of an appropriate volume compared with the size of the female. Insemination of too little semen will risk failure; insemination of too much dilutes the spermatozoa and may cause the semen to flow beyond the genital tract.

Once the sperm has been harvested it is examined under the microscope on a heated plate to check the number, appearance and



Neutering

Ovariohysterectomy is almost a “standard” recommendation for bitches.

There are two medical reasons to spay bitches. First reason is the prevention of mammary tumours. When ovariohysterectomy is performed prior to the first heat in a bitches, the risk of mammary cancer later in life is less than 1%, compared with ovariohysterectomy performed after the second heat when the risk is about 25%. The second option is to avoid the risk of pyometra.

For males there are other benefits: decreased risk of prostate hypertrophy and all accidents related to females in heat.

Dr. Calin Serdean, DVM
Specialist in ultrasound examination
(Romania)

mobility of the spermatozoa. If the quality is satisfactory, the sperm will be introduced into the female's vagina or uterus using a catheter. Flexible insemination catheters equipped with a balloon (Osiris vaginal catheter) and rigid catheters (Scandinavian catheter) are available.

The female's hind legs should be raised for ten or so minutes at the end of insemination to favour the advancement of the spermatozoa and limit reflux. Allowing the female to urinate within a few minutes of insemination is not recommended for the same reason.

Precautions must be taken during the whole of this process to ensure the spermatozoa are not exposed to thermal, mechanical or chemical shock. If this is done and the oestrous cycle has been monitored, insemination with fresh semen will be just as successful as natural mating, with a fertilisation rate of 70-80% or above, as you can be sure that semen of good quality has been correctly deposited at the base of the vagina.

Insemination with refrigerated semen

Insemination with refrigerated semen is mainly used when the physical distance between male and female makes travelling difficult or expensive.

A veterinarian takes the stud's semen and refrigerates it at 4°C in a protective, nutritious solution after its quality has been checked. It is then sent in an isothermal receptacle to the female's veterinarian for insemination after a further check of its quality.

The process must be perfectly synchronised (availability of the stud, specific veterinary equipment and training, rigorous monitoring of the female's oestrus, speed of transport), taking no more than 48 hours in all. As a consequence, the distance should not be too great.

The results are comparable to those observed in natural mating, although successive manipulations may reduce the vitality of the spermatozoa.

Insemination with defrosted frozen semen

A team of veterinarians under the leadership of Dr Seager was the first to successfully produce a litter of puppies using defrosted frozen semen in Texas in 1973. The semen is taken in the same way as above. The quality and number of spermatozoa are strictly checked to ensure the semen contains at least 150 million mobile spermatozoa and no more than 30% abnormal forms. The semen is then diluted in a cryoprotective agent, packed in identified straws and pre-

served in receptacles immersed in liquid nitrogen at -196°C for an unlimited duration.

These straws cannot be used without the consent of the stud's owner, who can agree a price with the female's owner based on demand. The sperm bank is simply a service provider in these transactions.

It is better to take advantage of the stud's maximum vitality period to freeze semen, rather than waiting for old age, the threat of disease or of therapeutic castration to make use of it.

The dog breeding rules of some countries do not allow the recognition of puppies born as a result of artificial insemination with defrosted frozen semen. These authorities refuse to register such puppies in their stud book or issue a pedigree certificate. Despite that, this technique does have many advantages:

- It enables gene exchanges between two countries separated by quarantine rules or a large distance.
- It enables the unlimited preservation of the genes of good studs and use of their semen even if they are otherwise unavailable or dead.



After collection, the refrigerated semen is diluted in an appropriate environment and transported in an isothermal receptacle at between 4°C and 10°C. This step needs to be done with due care so as to avoid any sudden impact that could reduce the fertilising power of the spermatozoa.



After freezing, semen can be kept for an almost limitless time. This makes it possible to retain the gene material of high-quality studs.



Intra-uterine insemination can be performed using an endoscope. This technique is particularly well suited to very big or very fat females.

- It enables backtracking when genetic selection by a breed club leads to genetic dead ends. For example, the introduction of semen from less brachycephalic studs could help to correct the sometimes excessively squashed faces often seen in modern-day Bulldogs and thus reduce the incidence of dystocia.

- It enables some breeds close to complete disappearance to be saved.

Diagnosing pregnancy

Fertilisation of an ovum by a spermatozoon results in the formation of an egg, which migrates and divides a number of times before implanting itself in the mucosa of the uterus. On average, this implantation only occurs 17 days after fertilisation and results in the formation of embryonic vesicles, which cannot be seen by ultrasound until week three (18 days at the earliest).

From week three, meticulous palpation of the abdomen may sometimes detect the uterus, provided the female is not too fat and the abdominal muscles are relaxed. Between week five and six of gestation the diameter of the uterus will be about the same as an intestinal loop, which will make it difficult to distinguish between a pregnant uterus and a full large intestine.

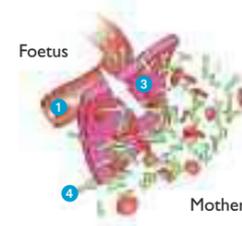
X-rays will only be worthwhile at the end of gestation when the foetal skeletons have calcified to become radio-opaque (from day 45).

Other techniques that detect changes in behaviour, the heartbeat of the foetuses by auscultation (audible in the first two weeks in some females), changes to blood (speed of sedimentation, haematocrit) or mammary development are too slow or too uncertain to be considered reliable.

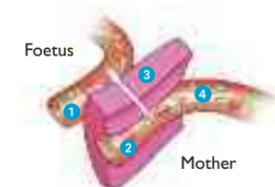
At the moment, ultrasound is the best method for early diagnosis of pregnancy, enabling the mating to be registered within four weeks with full certainty as to gestation.

Comparison of the placenta of primates, dogs and cattle

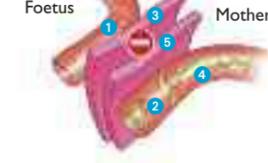
Humans, primates, rodents
70% of maternal antibodies reach the foetus.



Carnivores
Around 20% of maternal antibodies reach the foetus.



1. Foetal blood vessel
2. Maternal blood vessel
3. Trophoblast
4. Antibody
5. Endometrium



Ruminants, sows, mares
Less than 2% of maternal antibodies reach the foetus, which is very fragile at the moment of birth.



First cell division after the spermatozoon and the ovum join.



An ultrasound scan performed 25 days after ovulation can be used to estimate the size of the future litter.



Palpation of the uterus of a pregnant female is a delicate procedure between 35 and 50 days of gestation.

“X-rays will only be worthwhile at the end of gestation when the foetal skeletons have calcified to become radio-opaque (from day 45).”



Whelping

In the period just before and after whelping the bitch must be closely monitored. It is essential that the veterinarian see all bitches due to give birth for the first time and those in high-risk groups. This should take place in week 8 of gestation. A number of tests may be conducted.

Monitoring examinations

- A gynaecological examination to detect any obstacles to whelping, such as vaginal adhesion in first-time mothers.
- One or more abdominal X-rays to determine the number of foetuses with more precision than an ultrasound. It will also help to detect any abnormalities that often lead to dystocia, such as a narrow pelvis, foetal mummification (gas density, bone dislocations) or disproportion between

foetuses and mother. Foetus position in X-rays is not a good indicator of dystocia, as this can change at the last moment (180° rotation).

- Possibly genital ultrasound, which can help to determine the vitality of the puppies by visualising their heartbeats.

Signs of imminent whelping

The week preceding labour is marked by general changes in the bitch's behaviour.

She will appropriate objects to make a nest, go in search of a quiet place or seek out the companionship of her master or mistress. Reduced appetite, constipation and the development of the teats are unreliable signs, especially in first-time mothers, which do not begin producing milk until the day of labour or even in the days following whelping.



X-rays can be used to estimate the size of the future litter from at least 50 days of gestation.

Supervising the bitch between oestrus and whelping

- Check the condition of the vagina
- Check the health of the bitch
 - Age of the bitch
 - Presence of any abnormal vulvar discharge
 - Weight of the female (neither obese nor too thin)
- Monitor oestrus (vaginal smear, blood progesterone)
- Mate or inseminate
 - Mate twice if possible
 - Continued mating if no results are observed
- Herpes vaccination if necessary (ask your veterinarian for advice)
- Gestation diagnosis after 25 days (palpation, ultrasound or relaxin measurement)
- Gradually adapt the food ration (final third of gestation)
- Worming (ask your veterinarian for advice)
- X-ray to estimate the size of the future litter after at least 50 days
- Female enters the "maternity unit" (1-2 weeks prior to whelping)
 - Preparation of the nest
 - Grooming of the female
- Take the temperature daily (from 1 week prior to whelping)
- Stay alert for the first signs of labour

In the three days prior to labour, the vulva puffs out and the pelvic ligaments relax due to oestrogen impregnation. Her shape may change.

The rectal temperature drops by 1°C in the 24 hours prior to labour. This is a reliable indicator, provided the bitch's temperature is taken in the morning and evening every day for four days prior to the expected whelping date. A 1°C drop compared with the average temperature in those four days will be a sign that labour and birth are imminent.

A drop in the blood progesterone level accompanies this temporary drop in temperature. The measurements provide information on the maturity of the foetuses and indicate that they can be born naturally or by C-section without any great risk to them.

The leaking of the mucus plug – translucent liquid discharged from the neck of the vulva – is a sign of approaching labour, coming a few hours (never more than 24-36 hours) before the first contractions.

When the placentas start to detach themselves, the uterovagina (placental pigment) is tipped out into the uterus and a dark green vulval discharge is observed. This marks the start of labour.

Normal course of labour

Provided no special risks have been identified, there is generally no need to intervene in labour.

The first signs of labour typically appear 63 days after fertilisation. It will be a concern if labour does not start within 65 days. 70 days is certainly abnormal.

First the uterus contracts and often the only external sign is agitation – the bitch will often look at her sides and generally seek out a quiet corner to be alone and make her bed if a whelping box is not available. Anorexia (loss of appetite), and sometimes vomiting, is commonplace during this preparatory phase, which on average lasts 6-12

hours, although it can last up to 36 hours in the case of first-time mothers. Concerned owners can determine how dilated the uterus is by inserted one or two fingers of a gloved hand. The presence and position of a puppy may also be verified this way.

The introduction of the first whelp into the birth canal provokes visible contractions of the abdominal muscles (Ferguson reflex), which complements the expulsion efforts of the uterus and should result in the breaking of the first bag of waters (allantoids) in less than three hours. The second bag of waters (amniotic sac) holding the whelp can then appear in the vulva (no more than 12 hours after the first waters break). If the amniotic membrane has not ripped, mothers generally do this themselves within a minute of the expulsion, severing the umbilical cord and licking the newborn's thorax, which stimulates the first respiratory movements. Intervention at this stage is only necessary in the event of reverse presentation (around 40% of cases). In this case whelping will take longer and it may be necessary to help by lightly pulling the whelp in line with the abdominal contractions. The puppy's upper airways will have to be checked for obstruction – common in reverse presentations. They can be unblocked using an enema syringe or a nasal aspirator. If this does not help, the use of cold water or respiratory stimulants may be necessary.

The afterbirth generally follows the whelp within 15 minutes (except when the contractions are intense) and is most often ingested by the mother. Subsequent whelps follow at an interval of a few minutes to a half-hour. An interval longer than two hours is a sign of an abnormality, such as primary uterine disorder (connected with fatigue, hypoglycaemia or hypocalcaemia) or secondary uterine disorder due to obstruction (lateral presentation, introduction of two foetuses at the same time, congestion of the birth canal). A medical or surgical intervention will be necessary in this case.



The leaking of the mucus plug occurs around 24 hours prior to labour.



Appearance of the water bag in the vulva.



Use of a nasal aspirator, first in the puppy's mouth then in the nostrils, is a very good way of unblocking the airways.

Monitoring labour		
Chronology	Monitoring	Practical implications
Prenatal examination		
	Gynaecological examination	Detects any obstacles to whelping (especially in first time mothers)
Week 8 of gestation	Abdominal X-rays	Counts the foetuses, detects any signs of foetal death, disproportion between foetuses and mother, positional problems
	Uterine ultrasound	Assesses the vitality of the whelps
Precursor signs		
D (-7) to D (0)	Rise of milk (later in first-time mothers)	Plan labour
D (-2)	Relaxation of the vulva	Isolate the bitch Prepare her environment
D (-4) to D (0)	Drop of 1°C in rectal temperature	
D (-1) to D (0) premature whelps born before this date often suffer from respiratory failure	Drop in blood progesterone < 2 ng/ml	Schedule any C-section
D (0)	Leaking of the mucus plug	Imminent labour
Labour		
6 to 12 h (up to 30 h in first-time mothers)	Preparatory phase: nervousness, uterine contractions	Assess the dilation of the vagina
A few minutes to 3 h after the first contractions	Abdominal contractions Birth of the first whelp Tearing of the water bag	Intervene in the event of abnormal times or unproductive contractions. Birthing takes longer in the event of reverse presentation.
A few minutes to 4 h between two births	Rest Expulsion and ingestion of the placenta	Intervene in the event of uterine fatigue without obstruction (common in obese, ageing or agitated bitches and at-risk breeds)

Medical interventions

Systematic use of oxytocin (a hormone that stimulates contractions of the uterus), which is naturally released by the posterior pituitary gland, is strongly advised against. The unconsidered use of oxytocin in the absence of any exact diagnosis leads to the following risks:

- Tearing of the uterus if the inertia is secondary to an obstruction
- Asphyxia of all whelps still in the mother due to the premature constriction of the afferent blood vessels of the umbilical cord
- Complete lack of effect on the uterus, which is naturally resistant to oxytocin during periods of uterine relaxation (around a half-hour after each birth), resulting only in the manifestation of its side-effects (notably diarrhoea)
- Relaxation of the posterior pituitary gland, disrupting the secretion of milk
- Secondary eclampsia

Primary uterine inertia (i.e. without anatomical obstructions) is common in some predisposed females:

- Small (Yorkshire Terriers, Miniature Poodles, small Greyhounds) or giant breed bitches (Bullmastiffs, Dogue de Bordeaux),
- Very calm (Basset Hounds) or overly nervous bitches (Cocker Spaniels) during labour
- Obese or ageing bitches
- Mothers of big litters

In these cases, a calcium gluconate drip, while monitoring the heart rate, is generally enough to stimulate uterine contractions again. Massage of the mammary glands provokes automatic discharge of endogenous oxytocin, which is preferable to administration.

Surgical interventions

Obstetrical manipulations are very limited in dogs, so an episiotomy (an incision made at the opening of the vulva) or a C-section are essential interventions if medical treatments prove inadequate or the birth canal is clearly obstructed. The disproportionate size of the foetuses compared with the mother is the main indication of a C-section. They are common:

- In brachycephalic breeds: it is difficult for wide, flat heads to move into the birth canal and they are often the cause of lateral presentation, when the head is folded against the neck
- When the litter is overdue or only comprises two whelps: the size of the foetuses becomes greater than the diameter of the birth canal
- In miniaturised breeds
- When the father is much larger than the mother

The viability of the whelps depends on their maturity (which can be checked by measuring the blood progesterone level), the duration of unproductive contractions (leading to the holding up and anoxia of the whelp in the birth canal as well as any foetuses still in the womb), the speed of intervention and the type of anaesthesia used.

Post-natal care

If the bitch doesn't do so, each newborn should be guided to a teat so that it can suckle and take in colostrum. The antibodies in colostrum provide the puppy with passive protection rather than the active immunisation that follows vaccination or infection.

If the number of puppies is lower than expected based on ultrasound, the missing puppies can be located with a new ultrasound, avoiding an unnecessary C-section if they are in the mother's stomach. It is not uncommon for a mother to ingest stillborns along with placentas.

Some homeopathic products encourage emptying and involution of the uterus. Some simple hygiene precautions will help to prevent infections of the uterus during lochia discharge (normal greenish discharge during the first three days after whelping). Systematic use of antibiotics is unnecessary from an economic, medical or health perspective. They can be absorbed into the milk and affect suckling puppies, in certain cases causing the malformation of tooth enamel, or contribute to developing antibiotic resistance by bacteria.



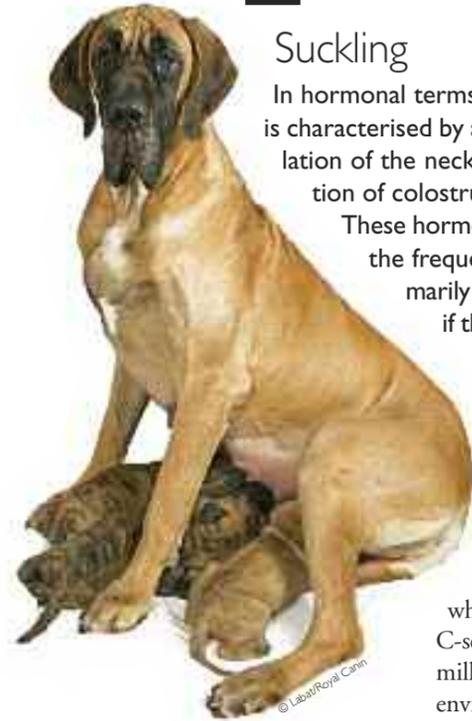
Colostrum.



Drying puppies off with clean or disposable towels also stimulates the breathing reflex.



Regular weighing is a way of checking they are in good health.



Suckling

In hormonal terms, the end of dioestrus (which corresponds to gestation or pseudopregnancy) is characterised by a drop in blood progesterone, a temporary rise in oestrogen leading to the dilation of the neck of the uterus and a rise in prolactin, the hormone that triggers the production of colostrum then milk.

These hormonal variations are similar in gestating and non-gestating females, which explains the frequency of pseudo-lactation. This is observed in packs of wild dogs, where it primarily affects females with low hierarchical status, which are thus able to provide food if the dominant females are unable to. This emphasises the importance of the mind in triggering lactation, which is also true for many species of mammals.

Lactation

Bitches that are not comfortable in the maternity unit, unhappy with the whelping box or anaesthetised ahead of a C-section will typically be slow producing milk. This can be managed by changing the environmental conditions, giving a homeopathic treatment or administering anti-vomiting medication to stimulate prolactin secretion by the central nervous system.

Once the first puppies have been whelped, milk production is maintained by a neuro-hormonal reflex mechanism, as the sucking or massage of the teats stimulates the secre-

tion of another hormone, oxytocin, which in turn drives the milk towards the milk ducts. This mechanism is naturally proportioned to the number of suckled puppies, ensuring that milk production is adapted to the appetite of the puppies, whose health to some extent has priority over the mother's.

Milk production

Colostrum is the first substance secreted by the mammary glands during the first two days after birth. Colostrum has a completely different appearance and composition to milk. It is yellowish and translucent, so much so that it can be confused with pus-

Colostrum has a much higher protein content than milk. In addition to its nutritional value, it also stimulates the puppies to defaecate for the first time and provides 95% of the antibodies they need to fight infection. In this way, mothers pass on their immune memory to their puppies for a term of between five and seven weeks, while they are still unable to defend themselves from infection.

The puppies are able to absorb these immune defences for no more than 48 hours after they are born. After this time, these antibodies will be destroyed in the stomach before absorption and will therefore be completely ineffective. At that point, the puppies' only protection will be the antibodies that were passed through their placentas during gestation (no more than 5%).

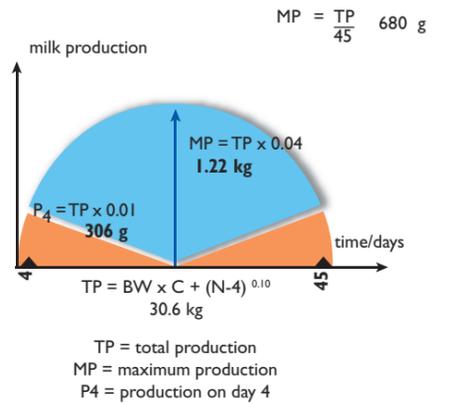
An absence of colostrum can be compensated for in various ways. Colostrum taken manually from the mother or another bitch – possibly frozen and defrosted at 37°C – can be administered orally. IV administration of antiserum (specific antibodies

against parvovirus or distemper) is available in some countries but it provides limited protection against these diseases. Otherwise, IV transfusion of serum from the mother's blood is an effective way of transferring a wider variety of antibodies to the puppy. Cow colostrum can be mixed with the mother's or formula milk. This provides a certain degree of non-specific local immunity, although it is a product from another species and as such incapable of protecting the puppies from canine diseases or ambient bacteria.

After a few days the colostrum is replaced by milk. Its composition depends on the size of the breed (milk from large breeds has a higher protein content), individual genetic aptitudes and the teat (the rear teats are more productive). On average, lactation continues for 6 weeks after whelping, with production peaking around week 3.

Over the next few weeks, the decline in milk production causes mothers to regurgitate food to supplement the diet of their puppies, which spontaneously begin to

Modelling of the female's lactation curve (e.g. 17kg female = 4 puppies)



Average composition of mother's milk in dogs (after Cloche, 1987)

Average composition of mother's milk in dogs (after Cloche, 1987)	
Dry matter (g/kg)	220-250
Protein (g)	55-80
Fat (g)	50-90
Lactose (g)	30-40
Energy (kcal)	1,200-1,500
Minerals (g) of which calcium (g) and phosphorus (g)	9-13 1.5-3 1-2.5



Why is my dog producing milk when it has not whelped?

The present-day dog's ancient ancestor is the wolf. In wolf packs only the alpha (dominant) individuals whelp. This increases survival chances, as even when food is scarce the dominant wolves eat

first, which means that dominant females are able to suckle their young.

When food is plentiful the female wolves lower down the hierarchy eat well too and they also produce milk to help suckle the young. This helps ensure that the young survive even if their mother dies. Our dogs are fed very well and their food is of a generally high quality, which means that they are able to start producing milk around six weeks to two months after heat, even if they are not fertilised. This is a normal physiological process, known as pseudo-pregnancy, which occurs in two of every three females. The milk they secrete is almost transparent, white or a little brownish. All of these secretions are normal.

Pseudo-pregnancies may be accompanied by enlargement of the teats and behavioural changes ("adoption" of objects, aggressiveness, construction of a "nest", nervousness, refusal to go out, fickle appetite). While it is a normal physiological process, it should not be ignored. It may lead to serious problems, such as mastitis and tumours. The veterinarian needs to examine the dog to check that it is not pregnant before deciding whether to start treatment or wait until the problem clears up of its own accord. Early neutering is the best way to prevent pseudo-pregnancy if the female is not going to be used as breeding stock or when its breeding days are over. In some cases, recently neutered females can also manifest this problem, if neutering is carried out at the end of the reproduction period.

Antonio Folch Mari, veterinary doctor (Spain)

Comparison of Cow's and Dog's milk					
Main nutrients	Whole cow's milk		Dog's milk		Difference (% by dry matter)
	(% of gross product)	(% of dry matter)	(% of gross product)	(% of dry matter)	
Water	85.5	0	78	0	
Dry matter	12.5	100	22	100	
Protein	3.33	26.64	7.5	34	-7.4
Fat	3.78	30.24	9	41	+ 11
Minerals	0.75	6	1.2	5.45	- 0.55
Lactose	4.54	36.32	4	18.2	- 18.12
Calcium	0.12	0.96	0.25	1.14	+ 0.18
Phosphorus	0.092	0.74	0.19	0.86	+ 0.12
Sodium	0.048	0.38	0.05	0.23	- 0.15
Potassium	0.157	1.26	0.10	0.45	- 0.81
Magnesium	0.012	0.10	0.012-0.02	0.05-0.09	- 0.02
Zinc	0.38	3.04*	0.9*	4.1*	+ 1

Amino acids	Whole cow's milk		Whole cow's milk		Difference (as % of protein)
	(% of gross product)	(% of protein)	(% of gross product)	(as % of protein content)	
Lysine	0.26	7.81	0.35	4.38	-3.43
Histidine	0.089	2.67	0.20	2.5	-0.17
Arginine	0.12	6.01	0.44	5.5	-0.5
Threonine	0.15	4.5	0.32	4	-0.5
Cystine	0.026	0.78	0.11	1.38	+0.6
Valine	0.23	6.91	0.38	4.75	-2.16
Methionine	0.084	2.52	0.14	1.75	-0.77
Isoleucine	0.21	6.31	0.335	4.19	-2.12
Leucine	0.35	10.51	0.93	11.63	+1.12
Tyrosine	0.17	5.11	0.27	3.38	-1.73
Phenylalanine	0.17	5.11	0.33	4.13	-0.98
Methionine + cystine	0.11	3.3	0.35	4.38	+1.08

*in mg/100 g
Total milk production (in kg) = BW x [C + 0.1 x (N - 4)]
BW = bodyweight of the female (in kg)
C = 1.6 for small breeds with adult weight less than 8 kg (e.g. Dachshund)
1.8 for medium breeds with adult weight 10-25 kg (e.g. Breton Spaniel)
2 for large breeds with adult weight more than 25 kg (e.g. Great Dane)
N = Number of puppies suckled

show an interest in the bitch's food bowl. This marks the start of a gradual weaning process that eventually leads to the puppy switching to a growth food around week 6. The quantity of milk produced by a bitch can be assessed by regularly weighing the puppies before and after they feed. These measures have enabled the establishment of a growth curve, based on the parameters that directly influence growth – size and weight of the mother, number of suckled puppies – and the proposal of an equation to estimate how much milk the mother passes on to the litter.

It is estimated that a female Labrador weighing 32kg that suckles eight puppies will produce 2.4 times her own weight in milk to raise the litter.

It is, however, very presumptuous to want to encapsulate milk production in an equation, which ought also to take account of such parameters as the temperature in the maternity unit, the mother's water consumption, the size of the litter and the level of stress. And these are just the main parameters.

This equation can, however, be used to precisely calculate the quantity of milk produced at peak lactation at 4% of total production. This same female will therefore produce around three litres of milk per day at peak lactation, which naturally demands a considerable nutritional adjustment to avoid excessive weight loss during this most testing and demanding part of the oestrous cycle.

How to prepare replacement milk

Example of a home-prepared recipe to compensate for the temporary absence of mother's milk

Evaporated milk	270 g
Fresh cream	70 g
9 eggs without shells	450 g
1 egg with shell	56 g
Mineral water	154 g
Total	1 000 g

Weight gain in the puppy

• Birth weight

The birth weight is an important factor for forecasting the newborn's survival chances. Birth weight varies depending on the breed (100-200 g in toy breeds, 200-300 g in medium breeds, 400-500 g in large breeds and over 700 g in giant breeds). The average weight of puppies varies depending on the size of the litter (the larger the litter, the lower the average weight of the individual puppies), infections (including parasites) and environmental conditions (cleanliness in the kennels and stress)

• Weight gain

Weight gain is another important factor, as a failure to put on weight can often be the first sign of a general health problem. With this in mind, it is worthwhile weighing each puppy in the litter on scales that provide information in ounces (grams) at birth, 12 hours after birth and then on a daily basis for the first two weeks. This data should be noted down so that the puppy's growth curve gain can be monitored and any abnormality quickly detected.

Puppies should normally gain around 2-4 g a day for each kilogram of an adult dog of the same breed (e.g. 50-100 g a day if the average adult dog weighs 25kg). 10-12 days after birth, the puppy should weight twice its birth weight.

If weight loss of more than 10% of the birth weight is observed, supplementation is recommended.

• What to do if a puppy does not put on weight or loses weight.

In general, a puppy that fails to gain any weight for two consecutive days should be monitored very closely. The breeder needs to identify the cause of any slowdown in the puppy's growth very quickly. This may be linked to the mother if the whole litter is affected (inadequate or toxic milk) or to individual factors if only selected puppies are affected (cleft palate, access to teats producing less milk and so on).



Callisto Twain/Fotolia



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can be limited. A bitch used to consuming 1kg of maintenance food cannot be expected to eat 4kg of the same food when suckling her litter.

The majority of suckling females will be perfectly well served with a highly digestible food containing at least 30% protein, 25% fat (by dry matter) and around 4,500 kcal/kg. It is recommended that females are able to feed ad libitum during lactation, provided there is no risk of the food spoiling or being contaminated by excrement.

Nutritional profile of a food for a lactating female (dry matter):

Protein 30-35% – Fat 20-30% – Crude fibre 1-2% – Calcium 1.5-2% – Phosphorus 0.9-1% – Vitamin A 10,000 IU/kg – Energy 4,200-5,000 kcal/kg – Protein/energy ratio 75-85 g/1,000 kcal.

Feeding lactating females

Unlike gestation, lactation significantly increases the bitch's nutritional requirements due to the exceptional richness of the milk (calcium, energy, protein) she gives to her litter (1,200-1,500 kcal per kg of milk depending on the breed and the day of lactation).

If the average energy value is 1,350 kcal/kg of milk and the yield is 80%, the bitch's energy requirements rise by $3 \times 1\,350/0.8 = 5,000$ kilocalories per day at the peak of lactation.

The priority during this period is to ensure that the bitch receives food of adequate quality and quantity to enable her to cover the growth needs of her litter without weakening herself. To do this, it is important to make sure the supply (lactation) is suited to demand (puppies' needs).

In some cases, such as very prolific breeds like the Irish Setter, finding the right balance will be very difficult, bearing in mind that demand is up to four times greater than the bitch's maintenance requirements.

During lactation, bitches need a highly palatable food with a high-energy content to meet their energy needs, so that the volume

The ideal solution is a complete starter-type dry food that has the huge advantage of covering the mother's nutritional requirements while also functioning as a perfect weaning food for her puppies.

To summarise, the following criteria must be taken into consideration when selecting a "lactation" food:

- Palatability, which primarily depends on the quality and quantity of fat and animal protein
- Digestibility, which permits the proper assimilation of the feeding amount in a reasonable volume (absence of abdominal ballooning after meals, smaller stools)
- Energy value, which needs to be high, orientating the choice towards a dry food
- Protein quality and quantity, which must cover the puppies' skeletal and muscular development
- Calcium, magnesium and vitamin D levels, which have to be high enough to limit the risk of eclampsia (convulsions during lactation), especially among small dogs with big litters.



In the event of the mother's inability to produce adequate milk, the puppies will have to be given special formula milk for puppies. If the litter is too large or the puppies are having trouble swallowing, intubation is an option, but it demands technical expertise.



If the mother fails to do so, the area around the anus must be stimulated to trigger defaecation after every feed.

The litter's harmonious growth is naturally a source of indirect information on the quality of lactation and so on the mother's health. It is important to remember that a balanced formulation is vital, as the addition of any supplement to compensate a deficit risks at the same time disturbing the absorption of other ingredients. Zinc deficiencies due to the ill-considered addition of calcium, or tetany during lactation related to unregulated calcium supplementation, are the most common examples in dog breeding.

Regardless of the quantity of food in the ration, females must never lose more than 10% of their healthy weight after one month of lactation. A 10% loss is often unavoidable, but that weight must be put back on in the months after the puppies have been weaned.

Supplementary feeding

If milk production is insufficient to meet the requirements of all puppies during the first three months, as is often the case with first-time mothers, it is advisable to provide the whole litter with an artificial substitute rather than isolating one or more individuals to feed them only artificial milk.

Palliative feeding

If the mother dies or produces no milk (agalactia), insufficient milk (hypogalactia) or toxic milk (mastitis) and the entire litter

needs feeding, special formula milk is available for puppies that will generally ensure the puppies survive, with only slightly lower growth compared with the average for their breed (less than 10% difference) This can, however, often be made up later by feeding them a weaning pap.

Puppies feed spontaneously more than twenty times a day and it will be difficult for the owner to maintain this pace. It is enough for the puppies to be fed every three hours during the first week at regular times, without interrupting sleep (over 90% of the time in the first week), which is essential for attachment and assimilation.

“The choice of powdered formula milk is much more appropriate, especially due to the controlled lactose intake.”

Recipe for a lactating female	
Ingredients (in g) for 1,220 kcal ME/kg	
Lean beef	450
Boiled rice	400
Carrots	150
Green beans	50
Bone meal	20

Composition by dry weight	
Protein	31 %
Fat	20 %
Calcium	1.5 %
Phosphorus	1 %

Example of a formula milk feeding regime for a puppy (complete Royal Canin formula milk)					
Age in weeks	24 H	Adult weight			
		Mini	Medium	Maxi	Giant
		1-10 kg	11-25 kg	26-44 kg	> 45 kg
1	x 8	3-10 ml	5-20 ml	10-25 ml	15-35 ml
2	x 5	10-30 ml	15-50 ml	30-70 ml	40-80 ml
3	x 4	20-50 ml	35-90 ml	60-120 ml	85-125 ml
4	x 4	25-60 ml	45-125 ml	90-170 ml	120-190 ml

“Rubbing the orphan against the puppies in this female’s litter will result in the puppy being impregnated with an odour that appears to favour acceptance.”

Although it is possible to modify cow’s milk to better meet the puppies’ requirements, the choice of powdered formula milk is much more appropriate, especially due to the controlled lactose intake.

As well as saving time and money, powdered formula milk limits the risk of diarrhoea in puppies, whose stomach acidity is still too low to effectively sterilise the bolus.

After it has been reconstituted and heated to 37°C, the milk is fed to the puppies in a bottle or by tube (urinary tube-type) if they refuse to suckle. Intubation demands technical expertise. The use of bottled water is recommended for reconstituting the milk, which should be prepared just before administration and not kept for more than a few hours, and even then in the refrigerator. If the milk is administered from a syringe in the mouth, it should have a firmer consistency like pap to stimulate the swallowing reflex and limit the risk of it going down the wrong way, or “false passage”, which can cause bronchopneumonia.

There is a simple way to establish how much formula milk the puppies will need:

- The energy value of a kilogram of mother’s milk is around 1,350 kilocalories.
- A puppy needs 3-4 ml of mother’s milk to gain one gram in weight.

- The maintenance requirement of puppies in the suckling stage is more than two and a half times greater than the maintenance requirement of an adult dog of the same weight.

So, a one-month old puppy weighing 3kg (adult weight 22kg) will need to put on 6 grams per day for every kilogram of its future adult weight, which works out at 130 grams per day. To do so, it will have to consume $4 \times 130 = 520$ g of milk per day or approximately $0.52 \times 1,350 = 600$ kcal.

Adoption by a suckling female

To avoid artificial feeding altogether, which is obviously preferable, the puppy can be “offered for adoption” to a female in the appropriate lactation stage, even in the event of pseudo-lactation.

Rubbing the orphan against the puppies in this female’s litter will result in the puppy being impregnated with an odour that appears to favour acceptance. While the puppies are not especially attached to their mother during the first two weeks after whelping, mothers are well able to recognise their puppies.

From week 3, you can gradually get the puppies used to a growth food in the form of a lukewarm pap alongside the mother’s milk, production of which will begin to decline. Some puppies instinctively start to develop an interest in their mother’s own food, starting to lap and imitate her feeding behaviour.

Just like fledglings that are fed crop milk, some puppies demand maternal regurgitations at this stage. Taken together, these observations show that it is time for weaning.



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First steps in the puppy’s development

The construction and maturation of several tissues drives the puppy’s growth. These tissues are different in nature and do not grow at the same rate or at the same time, which explains the variation in the nutritional needs of puppies in terms of both quality and quantity.

Physical development

We might compare a puppy’s physical development with that of a building site. There has to be a blueprint (nervous system), before the machines (skeleton) are brought in. In order to make everything function, we need labourers (muscles), who expect health and safety protection (fat).

While this is of course oversimplified, since these stages occur gradually and simultaneously, it nevertheless serves to emphasise the risks associated with each stage of the puppy’s development.

In particular it illustrates:

- The inadequacy of energy reserves in puppies at birth, since fat deposits are formed late in development, despite being the puppy’s main method for storing energy. Puppies can only rely on low reserves of glycogen (in liver and muscles) to cover their needs during the first twelve hours or so after birth and will therefore be dependent on external heating sources until the development of the shiver reflex (after six days), the growth of adipose tissue (end of the third week) and the processes of temperature regulation.

- The variation in eating requirements from one breed to another and of a single individual through the different phases of development. The body structure changes during growth: water and protein levels drop in favour of increased storage of fats and minerals.

- Obesity, which threatens small breeds far earlier in life than large breeds.

Most breed clubs have average growth curves for males and females that help to contextualise the weight development of a puppy from birth to adulthood. Depending on the breed and sex, the weight of a newborn puppy can vary between 70-700 grams. After post-birth weight loss, which must not exceed 10% on the first day, a puppy normally grows very quickly at a rate of 5-10% per day in the course of the first few weeks. Growth can be monitored by weighing the puppy at the same time every day. Large-breed puppies, whose adult weight is 100 times their birth weight, need very close attention.

Generally speaking, a puppy that fails to gain weight two days in succession requires close monitoring. The breeder should endeavour to identify the cause of any in-



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Development of minimal rectal temperature in puppies

Birth	35.5°C ±0.5°C
Week 1	37°C
Week 3	36-38°C
Week 4	38.5°C (adult temperature)



© Lancelau/Royal Canin

The different steps in the puppy's development		
System	Age	Development steps
Eyes	0-13 days	Eyes still closed
	5-14 days	Eyes open
	3-4 weeks	Normal vision
Ears	0-5 days	Closed ear canal – poor hearing
	10-14 days	Opening of the ear canal (complete typically on day 17) Abundance of flaky cells during the week following complete opening
Digestive	3-4 weeks	Eruption of the canines
	4-5 weeks	Eruption of incisors 1 and 2, and premolars 2 and 3
	5-6 weeks	Eruption of incisor 3 and premolar 4
Circulatory	0-4 weeks	Heart rate between 200 and 250 beats per minute
Respiratory	0-1 weeks	Respiratory rate between 10 and 18 breaths per minute
	1-2 weeks	Respiratory rate 36 breaths per minute
	3 weeks	Respiratory rate between 16 and 32 breaths per minute (adult rate)
Neuromuscular	Birth	Sucking reflex present Perception of pain through skin
	5 days	Front limbs able to bear the weight of the body
	14-16 days	Hind limbs able to bear the weight of the body
	20 days	Ability to sit
	22 days	Normal movement



stance of stunted growth as quickly as possible. It may have something to do with the mother if the whole litter is affected (insufficient or toxic milk) or with individual factors if only individual puppies exhibit growth delay (cleft palate, access to teats and so on).

Other parameters worthy of regular monitoring in this period when morbidity and mortality can appear suddenly are whining, feeding and the behaviour of the mother, the puppy's vitality, rectal temperature and state of hydration.

Behavioural development

Prior to weaning, the mother – much more than the father – participates actively in the puppies' physical and behavioural development. This is a decisive factor in their development into well-balanced puppies that will be able to integrate into a new social environment when the time comes.

Without going into all the steps in the puppy's development, bearing in mind that their chronology is different depending on the breed (small breeds develop earlier), a good number of mistakes and disappointments can be easily avoided through a simple understanding of when the puppy is receptive to training and when it is not.

The puppy is not born with a fully developed nervous system. It is blind and deaf, with a very rudimentary sense of smell and

its nervous system is mostly lacking the myelin that forms an insulating sheath around many nerve fibres, increasing the speed at which impulses are conducted. Knowledge of the different steps in the puppy's motor, physiological and sensory development plays a part in the early diagnosis of some disorders, but above all, it helps orient the puppy in the direction of their future use.

This means that deafness can be screened in predisposed breeds (Dalmatians, white Bull Terriers, dogs with merle coats or with a lack of pigmentation) from week four.

Generally, in the first two weeks, it is enough to check that the bitch has normal maternal instincts (especially how she grooms the puppies to stimulate their defaecation and urination reflexes) and to supervise feeding to ensure that the less spirited or more submissive puppies also get the opportunity to feed from the rear teats, which provide milk richer in nutrients. The puppies' nails may need to be checked as they can sometimes injure the teats, which may cause the bitch to refuse to let the puppies suckle.

Behaviourists generally divide the puppy's process of maturing into four successive stages.

Antenatal period

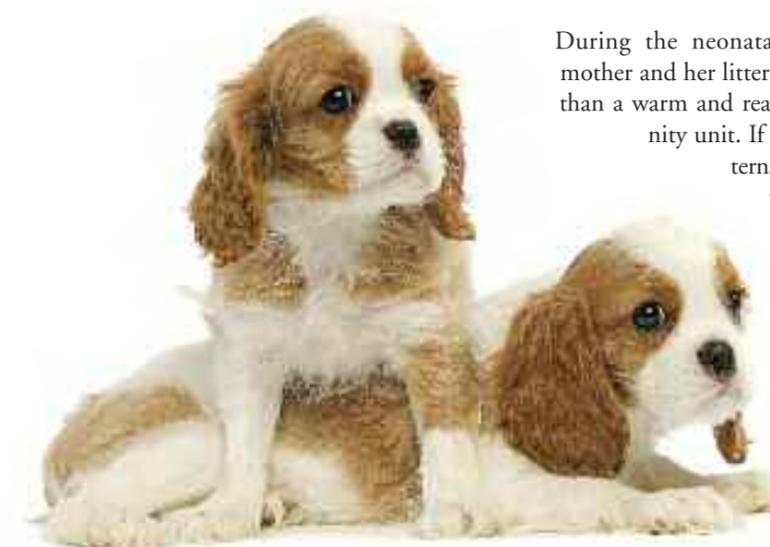
The foetus is not completely isolated from the outside world in the uterus. The development of ultrasound scanning techniques has made it possible to observe their reactions when palpating the bitch's trans-abdominal region from the fourth week of gestation. That shows that their tactile sense develops very early and they may even be sensitive to the breeder stroking their mother. Similarly, the puppies may feel the bitch's stress, which could cause miscarriage, intrauterine growth retardation, immune deficiencies or even learning difficulties after birth.

While smell does not develop until after the puppy's birth, taste is developed earlier. It would appear that the food consumed by the mother during gestation could form the puppies' future food preferences.

Neonatal period

The neonatal period extends from birth until the puppies open their eyes. It is often known as the vegetative phase as, externally, most of a pup's life seems to be dominated by sleep and a few reflex activities. The puppy reacts only to tactile stimulations and moves towards sources of warmth by crawling, which is made possible by the development of its nervous system. The myelin sheaths develop first at the front and then at the rear, which means the puppy can use its forelimbs before it can use its hind limbs.

During the neonatal period, the mother and her litter need no more than a warm and reassuring maternity unit. If the bitch's maternal instinct seems to be lacking or the litter is small, the mother's



tactile stimulation of the puppies could be complemented by checking their reflexes (defaecation, urination, feeding, taste education). Other stimulation (music, toys, colours and so on) sometimes found in breeding establishments should be limited at this age as they merely disturb the litter's sleep.

Transitional period

Also known as the 'waking phase', the transitional period starts when the eyes open (around 10 to 15 days) and ends when the puppy begins to hear, i.e. reacts to noises (in the fourth week). While sight is still not fully developed at this stage, the continuation of such behaviours as burrowing and tactile exploration will suggest possible sight problems.

During this period, puppies usually start to explore, play, follow their mother and recognise their immediate family (imprinting). The owner can take the opportunity to accustom the puppies to humans being around by playing with them and generally touching them. The puppies will grow to recognise and feel safe around human odours.

Socialisation period

As its name indicates, in the socialisation period puppies learn to live with others. It begins with a period of attraction (nothing scares them), generally followed by a period of aversion (fear of anything new). Puppies will gradually learn to communicate and acquire a sense of hierarchy by interpreting the reprimands and olfactory or postural signals of the mother.

If, due to lack of time or observation, full advantage is not taken of a puppy's period of attraction (generally 3 to 9 weeks) to get it used to its future environment, it will be far more difficult to eliminate any bad habits later on.

It is advisable to make the most of this period when the puppy is extremely sensitive and malleable to:

- encourage contacts with future owners (particularly children) if it is to be a companion animal, and other people and animals it will have to tolerate (mail deliverers, people in uniforms, people from different ethnic backgrounds, cats, sheep and so on).

- Accustom it to stimuli it will encounter (noises, clothes smells, gunshots if it is to be used as a setter, pointer or other type of gundog, cars, helicopters, vacuum cleaners and so on).
- Help it to learn the hierarchy by, where necessary, ensuring it adopts submission postures (pinning it down on its back or taking it by the scruff of its neck). The same method can also be used to reinforce desired behaviour and teach the undesirability of inappropriate behaviour. Praise and reward appropriate behaviours.
- Increase play activities between puppies and sanction those that fail to control their biting.
- Observe its behaviour so as to be able to advise buyers on its character. The tendency to dominate is easy to spot at this stage during play, simulated mating and mealtimes. In some breeds – especially Cocker Spaniels and Golden Retrievers – aggressiveness may even be a reason to exclude the dog from shows and competitions due to non-conformity with the breed standard.

Many natural aptitudes can be acquired during this period, especially if the mother is already used to such stimuli and therefore has a calming effect on her litter during the period of aversion.

It is always a good idea to recommend a puppy that will suit the future owner's situation (see Campbell tests) and provide advice on socialisation, complemented with veterinary leaflets & information during the purchase consultation. To ensure that the dog does not grow too attached to its owner – which can lead to it running amok when it is left alone – it is advisable to refer to the spontaneous natural breaking of the attachment between mother and puppy prior to puberty.



This three-day old puppy has a reflex to lift its hindlimbs.



This four-day old puppy scarcely has this reflex any longer. Puppies that develop normally lose this reflex after five days.



This three-day old puppy has a reflex to touch the ground with its front feet first, followed by the back feet.



Weaning

Weaning is a crucial period in the life of any animal, because it is the moment when it starts to gain its independence. In strictly dietary terms, it is a phase of digestive transition, a gradual physiological development enabling the puppy to slowly pass from a liquid milk diet (mother's milk or formula) to a solid growth food. At this stage, the food must be adapted to the development of the puppy's digestive functions and not vice versa.

Development of the puppy's digestive capacities

The puppy's growth is marked by many gradual changes, including those to its digestive capacities. For instance, the quantity of enzymes able to digest lactose gradually decreases, while the ability to digest cooked starch develops much more slowly. These variations explain why some puppies do not tolerate cow's milk (which contains three times as much lactose as dog's milk) and that simply reducing the quantity given to a puppy stops diarrhoea triggered by the saturation of its lactose digestive capacities.

This development is essentially determined by the genes and has little to do with any imposed dietary habits. It concerns the majority of the digestive enzymes, without which digestion would not be possible.

Choosing the weaning period

The topping out of milk production naturally imposes the beginning of the weaning period. Having reached maximum production, mothers are no longer able to meet the growth requirements of their puppies.

In small breeds, lactation covers the most intense part of the growth period of puppies and therefore meets their maximum requirements. Medium and large breeds, on



the other hand, are denied the nutrients they need at a critical moment in their growth, as their mother's milk production is unable to meet their requirements.

So, while gestation and lactation make more demands on small breed females, the risks facing the puppies are greater for large and giant breeds.

It is not uncommon to see a mother regurgitate food (which she partially predigests) for puppies aged four weeks. Around a week later the puppies' milk teeth start to erupt and the mother begins to rebuff their attempts to feed because of the pain these new teeth cause her.

How to wean puppies

However it is done – naturally or artificially – weaning must be a gradual process, commencing around week three and ending around week seven or eight. During this period mothers gradually disassociate themselves from the puppies, asserting their right to eat first. It is better not to completely separate the puppies from their mother before this time to avoid increasing their stress at an already difficult moment. The puppies could, for example, be isolated gradually during the day and returned to the mother at night.

“The topping out of milk production naturally imposes the beginning of the weaning period.”

The weaning process should be slow and gradual, along the following lines:

- At the beginning of week three, give the puppies formula milk (not cow's milk) in a bowl. A few "baths" are unavoidable, but they will also start to lap at the milk.
- After four days, start mixing a special weaning food in with the formula milk, in increasing quantities, until the start of week five.
- From week five, the puppies should only receive this weaning food, until week seven, when it should be gradually replaced by a complete dry growth food.

The nutritional requirements of weaning puppies are comparable to mothers' at the end of lactation (when they reconstitute their reserves), which makes the owner's work much easier.

If the owner does not have access to weaning pap, an alternative is to mix some puppy kibbles with lukewarm water and formula milk. As weaning progresses, less and less fluid should be added, until, at the end of the weaning period, the puppies are eating the kibbles in their original state.

Clearly, the ideal solution is a complete dry food that meets the suckling female's nutritional requirements, while also serving as a weaning food for the puppies, given that the nutritional requirements of mother and puppies are comparable at this stage. This starter food must be physically tailored to young puppies (kibble size, shape, form and hardness) and highly palatable, with a high energy and protein content, alongside clays and fermentable fibre (such as fructo-oligosaccharides) to improve digestion, and antioxidants, which ensure the puppies acquire a good level of immune protection.

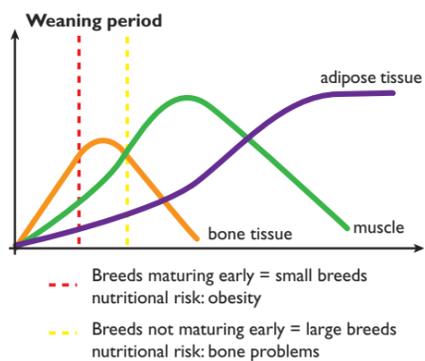
If the food is prepared by the owner a mineral supplement will always have to be added in the form of eggshell or bone powder to ensure bone mineralisation is not hampered. The quantity needs to be fine-tuned every day, which is why the practice is very unusual and not recommended these days.

Conversely, the addition of a mineral supplement to balance complete prepared food can lead to early and irreversible calcification, which will seriously compromise the puppies' growth and future health.

Successful weaning is made simple by following these steps, giving the puppies the best possible start for the growth phase.

“If the food is prepared by the owner a mineral supplement will always have to be added in the form of eggshell or bone powder to ensure bone mineralisation is not hampered.”

Differential growth of a puppy and pathological risks



The various tissues in the body do not grow at the same rate. Bone tissue develops fastest, ensuring a gain in size. The muscles develop slowest, although they speed up around puberty. A large breed dog therefore naturally has little muscle mass.



© Crossermy

Overindulging a puppy is not a kindness

Owners have a major part to play in the development of their puppy. The growth period is the most critical in the puppy's life, impacting on everything that follows. The period following weaning, which is when the puppy is most likely to find itself in new surroundings, is the most intense the puppy will experience and as such it is a time of high pathological risk. In this period, the puppy needs to meet its nutritional needs, it needs to be vaccinated and it needs to develop the right behaviour.

A crucial period

This growth period is characterised by various demands:

- Growth itself: weight gain, gain in size and speed of growth (weight gain per unit of time).
- Acquisition of the conformation and the various characteristics of the adult. This is related to the speed of development, enabling the adult stage to be reached more or less quickly depending on the puppy's eventual adult size.

The start of this period is also a time when the puppy is separated from its mother for good and given a new home by a new owner, which involves important changes in terms of feeding, lifestyle and emotional relationships.

Small, medium, large or giant in adulthood, puppies grow at different rates

Although they are all members of the same species, different dog breeds can be poles apart in terms of size and weight (from Chihuahuas to Great Danes) and nutritional requirements. These differences really come to the fore during the growth period.

Puppies are not all at the same stage of development when they are born

A puppy's birth weight depends on the size of the parents. A Great Dane puppy weighs in at about 600 g, while a Chihuahua puppy hits the scales at just 90 g. No sur-

prise there, then. But comparing these weights to the mother's weight, it becomes clear that the giant-breed puppy weighs around 1% of its mother's weight, while the small-breed puppy weighs just over 6% of its mother's weight. The giant breed is thus at an earlier stage of development. Small breeds are considered to mature early and large breeds to mature late. This means that the puppies are weaned and adopted at different stages in their growth, which clearly shows that the size of the breed has a major influence on how its growth should be managed, from the moment it is born.

Large breeds grow faster and longer

Puppies do not grow in linear fashion. Their daily weight gain varies with time, rising after birth to reach a plateau of variable duration before falling as the animal approaches maturity (adult age and weight).

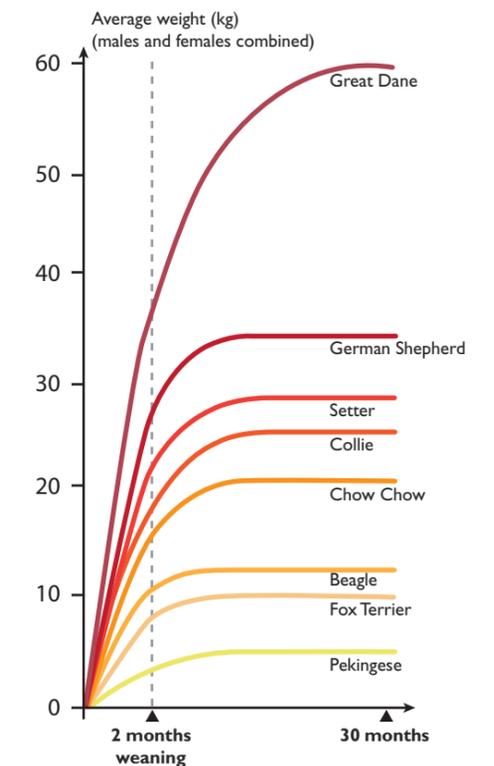
These reference curves show that at birth and during weaning small breed dogs, which combine slow growth and very early development, are already well developed in terms of weight and size compared with their expected adult weight. The growth-related risks will therefore be different during the period of adoption until adulthood: bone growth will be almost complete in small dogs, so dietary mistakes will have less impact on the skeleton. On the other hand, large-breed dogs will be more sensitive to the risk of developing a bone or joint disease, as they will continue growing for several months.



© Duhaier/Royal Canin

“Puppies do not grow in linear fashion. Their daily weight gain varies with time.”

Weight gain curves of various breeds



For example, a small-breed dog reaches 50% of its adult weight within about 3 months, while a large-breed dog takes 5-6 months to do the same. A Poodle takes 8 months to reach its adult weight, by which time it is 20 times its birth weight. But a Newfoundland does not stop growing until anywhere between 18 and 24 months, by which time it is 100 times its birth weight

A puppy's growth is differentiated: not all tissues develop at the same speed

The tissues do not develop at the same speed in the body during the growth phase. Bone tissue grows fastest, causing the puppy's stature to grow quickly in the first few weeks of adoption, which will certainly be noticed by owners. Muscle mass will grow more slowly than bone, which is why large-breed dogs look thin when they are young. The muscles develop strongly during puberty under the influence of the sexual hormones. This is important to remember, because it explains the different risks during growth of small and large dogs. Excessive weight gain should be avoided as it increases the risk of the immature skeleton being deformed. A large-breed dog needs to grow relatively slowly. A slightly restricted diet will slow down growth without affecting the final size of the animal. Large dogs therefore need a specially formulated food that supports longer, more tempered growth.



The main concern for small-breed dogs, whose growth is much more advanced and slows rapidly, is not the skeleton but obesity.

The puppy's specific nutritional needs based on its size

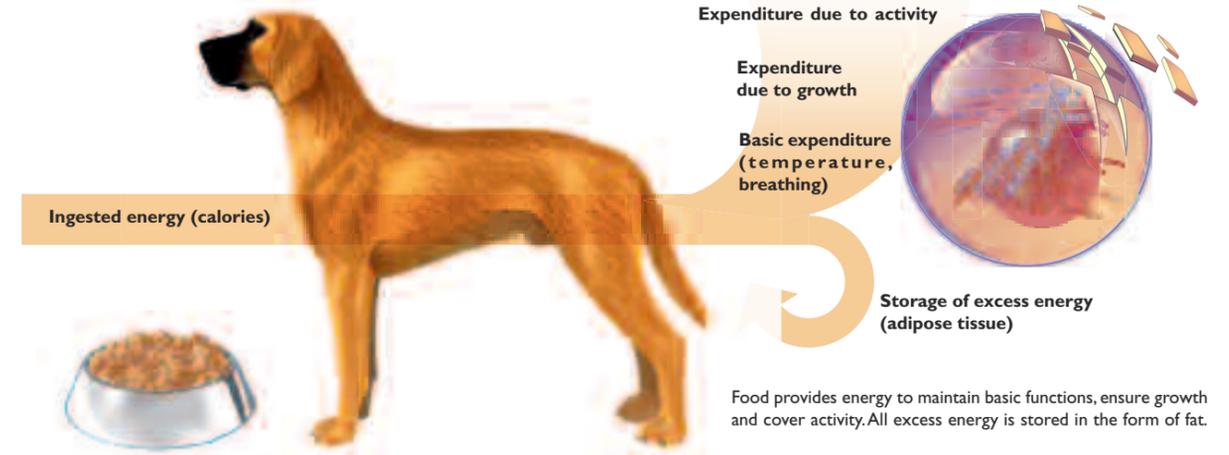
Generally speaking, the formulation of a puppy's food must take account of:

- the variety of breeds and growth curves
- the ability to properly digest the food, which can sometimes lead to digestive intolerance to well-balanced foods.

A dog takes energy from the food it consumes. This energy is first and foremost used to maintain its tissues and carry out its vital functions (breathing, heart beats). This is referred to as the basic energy requirement. Puppies also need energy to grow and to play. This is referred to as the maintenance energy requirement. If the dog takes in more energy than it expends, it will store the excess in its adipocytes, which are specialised fat storage cells. Dogs are capable of storing fat in this way at any stage of their life.

Whatever the puppy's breed or size, it always has greater energy and nutrient requirements than an adult per kilogram of body weight. It needs energy for maintenance but also for making new tissue (bone, muscle, blood, skin, hair), which makes it bigger. Its protein, mineral and vitamin requirements are also greater than an adult's, so it is not possible to feed a puppy food formulated for an adult without risk.

Puppy food must contain a high protein content, even more so in the case of large breeds (more than 30% by dry matter of the food for small breeds, 37-38% for large breeds), and it is essential that the protein is a high quality one. Young dogs are much more sensitive to insufficient protein intake than adults. Protein deficiency can lead to stunted growth, an irreversible conformation disorder, anaemia, a fall in blood



Food provides energy to maintain basic functions, ensure growth and cover activity. All excess energy is stored in the form of fat.

proteins and antibody deficiency resulting in a much higher susceptibility to disease. These are all situations that compromise the dog's life.

Calcium and phosphorus intake must be rigorously controlled to prevent serious bone disease (nutritional secondary hyperparathyroidism), which is the non-mineralisation of the skeleton. This is a familiar disorder among puppies fed exclusively with meat or a home-prepared ration without mineral supplementation. Furthermore, large-breed puppies are more sensitive to excessive calcium intake than small breeds. So, unless the veterinarian recommends it, supplementing calcium or any other mineral or vitamin can lead to serious bone disease. Complete puppy foods factor in specific growth requirements and particular sensitivities based on the size of the animal. A food must contain between 1.3% and 1.6% calcium and between 1% and 1.3% phosphorus by dry matter, depending on energy concentration and the size of the dog.

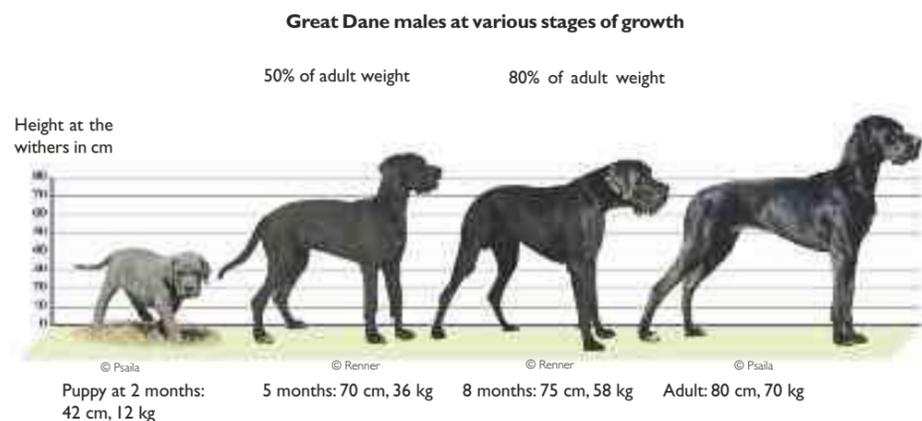
The digestive capacities of puppies and adults are different. Puppies are also very sensitive to the ingredients in the food they are given. For example, puppies have a limited tolerance to starch. The younger the puppy, the greater the intolerance (newborns cannot digest starch, but they have no problem digesting the lactose in mother's milk).

The puppy's capacity for digesting starch improves with time, as the quantity of starch in its food increases. Too much starch too early will put the puppy at risk of diarrhoea.

The composition of food for puppies will accordingly have common characteristics regardless of the breed: high energy density (energy per kg), high concentration of all essential nutrients compared with food for adults and an upper limit in terms of starch content.

However, the size of the breed entails particular adjustments. A large puppy eats more than a small puppy in real terms, but not on a kilogramme for kilogramme basis, which makes things difficult.

“A dog takes energy from the food it consumes.”



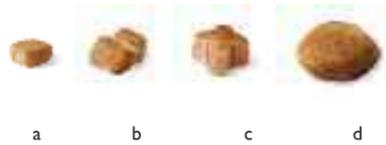
Bone mainly grows during the first few months of growth. The second phase involves muscle development until adult weight is reached. Accordingly, large and giant breed puppies are naturally less muscular prior to puberty.





© Duhaeren/Royal Canin

A 20kg puppy takes in just 1.5 times more energy than a 10kg puppy of the same age. If they consume the same food, the former runs the risk of developing a calcium deficiency, so the food for the large-breed puppy must contain a higher calcium concentration.



Kibbles for puppies are adapted to the size of the animal to improve consumption and minimise rejection and wastage: (a) for small puppies, (b) for medium puppies, (c) for large puppies and (d) for giant puppies.

As well as composition, kibble size, shape and hardness must also be adapted to suit the size of the puppy. At three weeks, a Terrier weighs 2-3kg, whereas a giant-breed puppy weighs around 20kg, which clearly means that their jaws will be different. Given that dry food is better suited to puppies, the smaller dog will have trouble grasping a medium-sized kibble in its jaws, while a giant one will waste a lot of kibbles. The most sensible solution is to use kibbles that

are specifically adapted to the size of the jaw. The breed also has an impact on how long a growth food is given to the puppy: 8-10 months in small breeds, 10-14 months in medium breeds, 14-20 months in large breeds and 16-24 months in giant breeds.

Feeding the puppy properly

The puppy must be fed properly to ensure that it does not develop any growth-related disorders. The important criteria here are quantity, quality and nutritional balance. The puppy must not eat too much or too little. It should never be given too much to eat just to “make it happy”. It is important to remember that its growth should be properly paced, especially if it is a large-breed puppy.

Dry, wet or home-prepared?

Wet processed food, which comes in cans or sachets, and food prepared at home are more likely to lead to overconsumption, due to their high palatability, so they should be fed with careful attention to feeding amounts. In fact, home-prepared rations should only be given if they are prescribed by a veterinarian, because the mixture of meat, vegetables and rice or pasta will not provide a proper balance of minerals and vitamins, which poses a threat to the animal's health. Random supplementation is also risk-filled.

The best results are achieved with kibbles or soups, because the puppy regulates its daily consumption and the owner is able to measure out the right feeding amount with greater precision. Dry food is also less expensive per kilogram and more hygienic, because it keeps longer.

At the end of the growth period, it is recommended that the dog makes the transition to a food formulated for adults, most often a maintenance food adapted to the size of the animal. Maintenance food has a lower energy, fat and protein content than puppy food. Obesity is the greatest risk, because the consumption of a high-energy food exposes the adult dog to the risk of weight gain unless it is very active, which tends not to be the case with sedentary companion dogs.



© Duhaeren/Royal Canin

Quantity and distribution

Ideally, growth curves should be used to work out the quantity of food to be given to the puppy, based on its weight. The puppy therefore needs to be weighed regularly so that any deviation from the growth curve can be quickly addressed. There is also a simple way of finding out whether the puppy is overweight: place a hand flat on each side of the thorax (around the ribs) and move them towards the back without applying pressure. All the ribs should be easily discernable. This technique can be applied at any age.

The number of meals changes as the puppy grows older. In the weeks immediately following weaning and during adoption, the puppy should be fed four times a day. This is reduced to three meals, then two midway through the growth phase, although there is no hard and fast rule for this: it all depends on the animal's appetite and the availability of the owner.

Specific diseases

Given that the formation of new tissues is rapid and intensive, the growth phase is a very demanding time and more so for large-breed puppies for which it is longer. Puppies are susceptible to specific diseases when they are growing, some of them nutritional in origin and so completely avoidable.

This is where preventative medicine comes into its own. This covers various areas, including nutrition, vaccination, behaviour

and parasite control. Nutrition is the branch of science that deals with nutrients and health. Any dietary imbalance – be that excess or deficiency – will produce shorter-term or longer-term effects on the animal's health, which will have an impact throughout its life. The consequences of poor diet are mainly related to bones and joints.

Bone disorders

Bones are constantly being renewed in both puppies and adult dogs. Furthermore, in the growth stage, new bone is created by specialised cells, which means that puppies are subjected to two phenomena that need to be perfectly orchestrated in time and space. The body needs different materials to complete both tasks. The formation of bone is tightly regulated by hormones, but also by nutrients (particularly calcium and vitamin D). Any nutritional issues can thus have adverse consequences for bone growth and hardness.

Dwarfism and stunted growth

Growth can be disrupted permanently in a number of cases:

- Chronic malnutrition due to a lack of nutrients in the diet
- Intestinal parasitism

“Bones are constantly being renewed in both puppies and adult dogs.”

There is a simple way of finding out whether the puppy is overweight: place a hand flat on each side of the thorax (around the ribs) and move them towards the back without applying pressure. All the ribs should be easily felt. If not, the puppy is overweight.



© Laurence Ynguan-Collard

What should I do to ensure the safe growth of puppies?



For the safe growth of a puppy, the food and the space in which it has been born and grows are very important. The space should be quiet and warm. The bitch should be fed with 2 high caloric meals per day, to maintain the health of herself and her infants during pregnancy.

In the 3rd week, a suitable milk substitute can be given to the puppies. After the 4th week, the puppies can eat dry food soaked either by using water or milk.

After vaccination has been completed (12th week), puppies should have access outdoors to get socialized.

Mr. Yiannoulis
German Shepherd breeder in Athens
(Greece)



© Lubau/Royal Canin

- Hormone dysfunction (pituitary dwarfism caused by a lack of growth hormone and hypothyroid dwarfism caused by deficiency of thyroid hormone)

- Genetic disorders in the synthesis of cartilage or bone

In practice, a puppy whose growth is stunted should be examined by a veterinarian at the earliest opportunity so the cause can be identified and, where possible, treated.

Calcium deficiency: nutritional secondary hyperparathyroidism

This is the most common deficiency disorder among puppies because it is due to a diet that is mistakenly regarded as ideal: the home-prepared diet. A mixture of meat, vegetables and rice or pasta will always contain too little calcium, as well as leading to an imbalance between calcium and phosphorus. Bone is 99% calcium, but meat contains virtually no calcium, although it does contain phosphorus. Only the proper intake of calcium together with correct balance between calcium and phosphorus will ensure that bone grows normally. Without calcium, bone is unable to calcify. At the same time, if calcium intake is inadequate, the body will leach calcium from existing bone, resulting in the decalcification of the skeleton.

These two phenomena lead to a disease characterised by bone and ligament disorders. The puppy's bones will soften and be deformed under the weight of the animal. This will be painful for the puppy. Weakened bone can break for no apparent cause, so-called "greenstick" fractures, which are very difficult to treat given the softness of the bone.

Treatment is simple and the results can be rapid and dramatic. A normal calcium intake and the correction of the balance between calcium and phosphorus can be achieved by adopting a diet of complete prepared puppy food, although some bone deformation may be irreversible.

Rickets

This is a well-known disease in human medicine and also affects dogs, although it has become extremely rare. It is characterised by imperfect bone calcification as a consequence of vitamin D deficiency. Bones need vitamin D to be able to calcify. Vitamin D needs to be provided to dogs in their diet as they do not synthesise it via the skin in sunlight as humans do.

Other nutritional deficiencies

Many nutrients impact bone growth, albeit not to the same degree as calcium or vitamin D, and a deficiency can result in long-term disorders. Vitamin A is essential to skeletal development during growth and a deficiency will lead to shortened or deformed bones. It is worth noting, however, that vitamin C does not prevent bone disorders in growing puppies.

Excessive vitamin D intake: hypertrophic osteodystrophy

In nutrition, you can often have too much of a good thing. Too much vitamin D is toxic and can lead to demineralisation of bone and calcification of soft tissues. The bones will "swell up" causing the puppy to limp. Unfortunately, excessive intake of calcium and vitamin D is much more common than it should be, especially in large-breed puppies. Hypertrophic osteodystrophy is virtually irreversible.

It is worth reiterating that a complete growth food specially formulated to suit the size of the puppy does not need to be supplemented with extra minerals or vitamins. Excessive calcium intake is still too often regarded as a way of straightening ears, but ears are composed of cartilage and so are not meant to calcify, which means that calcium is totally ineffective, although it will have a detrimental effect on the skeleton.

Excessive vitamin A intake

Vitamin A is fat-soluble vitamin that accumulates in the liver. Excessive vitamin A intake is much less common among dogs than it is among cats, due to certain bad habits indulged by cat owners, such as the



© Lubau/Royal Canin

regular feeding of liver. Hypervitaminosis A among dogs is most often due to daily intake of cod liver oil, which contains around 2000 international units (IU) of vitamin A per gram. The unnecessary vitamin A blocks calcification and ossification, causing the shortening of long bones and bone deformation. This process is generally irreversible.

Joint disorders: osteochondrosis

In the joints, bone ends are covered with cartilage, which helps them to move in relation to each other. Puppies are affected by various joint disorders, with large breeds more commonly affected. Disorders include painful cartilage hypertrophy, joint deformation and radius-curvus syndrome. Some very painful chronic limps cause the cartilage in the joint to crack. The classical case is the shoulder in Labradors.

Besides large-scale excessive calcium intake, overall excessive food intake is a major aggravating factor here. Excessive energy intake leads to the puppy gaining too much weight, which increases the stress on the immature joints. The owner may unwittingly encourage this excessive intake:

- Humans sometimes exclusively communicate with and train puppies on the basis of food. The owner supposes that the animal is hungry when it begs for food. If this leads to the owner giving the dog

too much to eat between meals it can result in the dog begging for food not because it is hungry but because it knows that this is a simple way of getting food on demand (positive reinforcement);

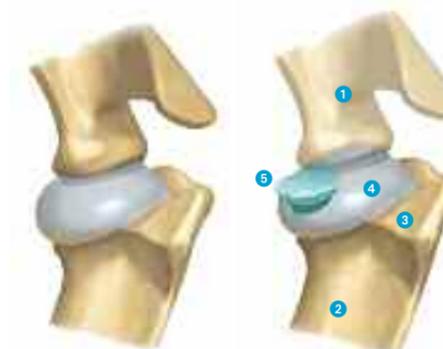
- A food that is very palatable will encourage the dog to consume more. Seeing the dog getting stuck into its food, the owner may wrongly assume it is hungry and so increase its ration.

To treat these disorders, regardless of any surgery that may be needed, the dog's diet will have to be reassessed in terms of quality (the balance between various nutrients) and quantity (based on the animal's body condition). Complete dry foods specially formulated to suit the size of the dog appear to be by far the most effective solution. A very strict diet needs to be drawn up by a veterinarian and closely followed, with due observance for the following:

- If the puppy is overweight for its age, the feeding amount will have to be reduced under veterinary supervision.
- Any treats should be included in the daily calorie intake, and should never account for more than 10% of that intake. The best approach is clearly to cut out treats altogether.

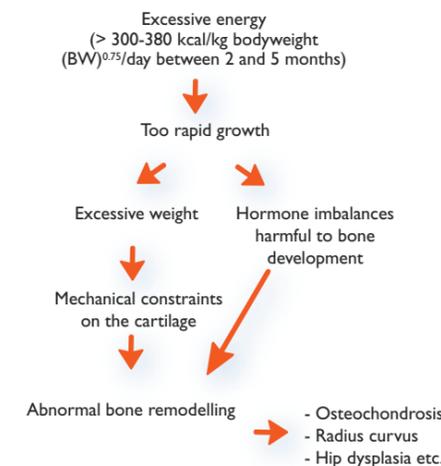
“Excessive energy intake leads to the puppy gaining too much weight, which increases the stress on the immature joints. The owner may unwittingly encourage this excessive intake.”

Osteochondrosis of the shoulder



1. Scapula
2. Humerus
3. Humeral head
4. Cartilage
5. Cartilage flap

Development of osteoarticular disorders due to excessive energy intake



X-ray screening of coxofemoral dysplasia.

The rate of growth is directly influenced by energy intake. Excessive energy consumed speeds up the advancement to adult weight or even beyond. The excess weight on still immature joints increases the risk of pathologies.



Obesity: a problem for puppies too

While large-breed puppies are predisposed to bone and joint problems, small-breed puppies are at greater risk of obesity. Growth is a period characterised by the multiplication of fat storage cells – adipocytes. Excessive energy intake accelerates this multiplication, leading to juvenile obesity and a predisposition to obesity in the adult dog, because once formed, the cells do not go away. Treats and leftovers are risk factors, as is the size of the dog. A 10 g piece of cheese corresponds to 10% of the daily energy requirement of a 3-month-old puppy weighing 2kg, but only 1.5% of the daily energy requirement of a Great Dane puppy of the same age.

Large breeds are also at risk of excessive weight gain, however, especially those that are very muscular in adulthood. As mentioned already, large-breed puppies are naturally “as thin as a rake” because their muscles do not develop until after puberty. Owners mistakenly think that they need to

feed up their dog, which results in excessive energy intake, speeding up growth – with all the related risks that involves – and often the development of fat mass around puberty, which aggravates any existing lesions.

Another cause of obesity in sometimes very young dogs is the idea that puppies are little darlings that deserve to be indulged. Labradors are especially affected by this.

To conclude, a diet not adapted to the individual dog in terms of quality or quantity is the main cause of specific growth-related diseases. These diseases can be easily prevented: the use of complete prepared foods specially formulated to meet the various requirements of growing puppies and good feeding practices ensure that the puppy grows properly, giving it the best possible start in life.

“A diet not adapted to the individual dog in terms of quality or quantity is the main cause of specific growth-related diseases.”



From maturity to old age

The dog will eventually pass the halfway point in its life. Externally, this life stage is generally no different to early adulthood. However cell modifications take place that, while invisible to the naked eye, pave the way for more conspicuous changes later. The ageing process is a slow, gradual one.

Before old age: maturity

Medical and nutritional measures should be put in place as quickly as possible for dogs suffering from a chronic disease, such as arthritis or heart failure, to help slow down its development. The dog’s weight should be monitored closely so that any change upwards or downwards can be quickly detected and the diet adapted to its breed, age and size. The dog’s teeth demand the same special monitoring now as they do throughout life.

Ageing

Ageing is a natural, gradual biological process that reduces the body’s ability to maintain its physiological balance and increases its susceptibility to disease. It is responsible for changes to cells, organs and metabolism in dogs that are increasingly being identified and described. As sad and inevitable as it is, there are ways to slow down the process or at least avoid speeding it up. The main thing is to prevent disease where possible, identify it at the earliest opportunity if it does strike and treat it vigorously to preserve the dog’s health as long as possible. Preventative medicine is the favoured approach here, too.

When is a dog considered old?

Age is a number not a condition. Maturity and old age are arbitrary concepts defined on the basis of life expectancy. A dog is regarded as mature when it reaches the midway point in its expected lifespan and it is old when it has three quarters of its expected lifespan behind it. Of course, dogs of different sizes do not age in the same way or at the same rate. Small breeds have a longer life expectancy than large breeds, so a small dog will age slowly. Conversely, large dogs take longer to grow to adulthood and age faster. That clearly means that they do not have the same needs.

Consequences of ageing for the body

Ageing is not a disease, it is a natural process that affects the entire body. No organ or system is spared. That said, individual susceptibility or the predisposition of an organ will contribute to the development of a disease. The main thing is to understand the ageing mechanism to slow down its effects.

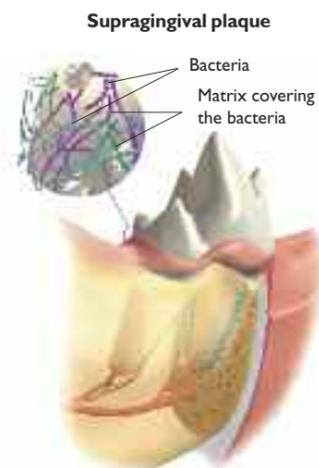


A	B	C	D
Size of the dog	End of growth	Adult	Elderly
1-10 kg	10 months	10 months - 8 years	over 8 years
11-25 kg	12 months	1-7 years	over 7 years
26 - 44 kg	15/18 months	15/18 months - 5 years	over 5 years
over 45 kg	18/24 months	18/24 months - 4 years	over 4 years

The duration of the various stages in the dog’s life differs depending on the size of the dog. While these concepts are somewhat theoretical, they do express a genuine physiological difference, which should ideally be taken into account.

Ageing has a number of effects on the body of a dog:

- Fat deposits increase. Dogs tend to put on weight as they grow older. The animal builds up its fat deposits at the expense of muscle mass. When a lot of muscle mass is lost, the animal's mobility will be affected, leading it to expend less energy. As a result, the dog puts on more weight, loses more muscle mass, and so on. This makes it vital to monitor the animal's body condition so that it is prevented from putting on weight and losing muscle mass. It is also essential to treat any pain the dog may have that might prevent it from exercising.



The germs in dental plaque and tartar spread out the body and can cause disease in any organ. This is also a risk for puppies whose mother is suffering from periodontal disease (through licking).

- The accumulation of fat is accompanied by dehydration. A newborn puppy is 85% water, while an ageing dog is just 60% water. This loss of water plays a role in the ageing process.

The digestive functions deteriorate:

- The teeth are a common source of problems in ageing dogs. Build up of plaque causes gum inflammation and infections (periodontal disease), which can lead to the teeth falling out. The animal will find eating more difficult because chewing is

painful. As well as the unpleasant bad breath this produces, the proliferation of bacteria that spread in the body can cause damage to other organs. The immune system is permanently working overtime, which puts a great strain on the body, making it more susceptible to infection. Dental hygiene is essential throughout the dog's life, but especially so in ageing dogs. Instigating dental hygiene in the puppy is a preventive measure that will help to preserve the quality and health of its teeth for the whole of its life. Diet has an important role to play here. The formulation and even the physical characteristics of kibbles – size, shape, hardness – can help to slow down the build up of dental plaque.

- Digestive transit (the progression of food from the stomach to the anus) slows down in older dogs, linked to reduced muscle tone in the intestine and a drop in digestive secretions. This exposes the dog to constipation often followed by diarrhoea. These problems can be controlled by means of an adapted diet (fibre content).

- Just like the rest of the body, the intestine starts to work less efficiently. Its digestive performance is reduced a little, it absorbs nutrients in lower quantities and it takes more time to adapt to a change of diet. A high-quality, easily digestible food minimises these effects.

Other bodily functions gradually lose their ability to adapt:

- Due to the reduction in immune protection, ageing dogs are more susceptible to infection.
- The kidneys, liver and heart gradually become less efficient, which can sometimes result in organ failure. The organs and the body as a whole can be given extra support by adapting the diet, thus slowing down the degeneration process and improving quality of life.
- Slow decalcification occurs, weakening the skeleton.



© Duhaier/Royal Canin

- Metabolism constantly produces toxins throughout the dog's life. Some of these cause the destruction of cell membranes in a process known as oxidative stress. The body has a number of mechanisms to repair this, but these are less effective in ageing dogs. This means that these animals are more open to attack. Again, however, there are ways to limit this stress, especially through dietary measures.

- Tumours, some but not all of them cancerous, start to develop.
- The hair loses its colour and the skin becomes less supple and more fragile.

The senses and behaviour are modified:

- Impaired sight, sometimes even blindness, is common.
- Smell may be impaired, possibly causing a loss of appetite.

It is important to keep making sure the dog remains active even as it (and perhaps its owner) grows older. An animal that moves around less, is less attentive or too quiet should be examined by a veterinarian. It is essential that the inevitable effects of ageing are not confused with a disability due to organ impairment.

Arthritis can have a severe impact on the dog's quality of life:

A dog with arthritis may not show obvious signs of discomfort, but it will be less inclined to go for a long walk or play. Arthritis involves dull, piercing pain, which must be relieved. Again, it is important to differentiate between the effects of a specific disease and the expected effects of ageing.

Any dietary errors during the final part of life, indeed at any time, can speed up the ageing process in dogs and so the following rules need to be followed:

- Obesity needs to be prevented. The daily feeding amount can be reduced by 10% in response to the dog's reduced physical activity. If that proves inadequate, the best

option is to consult a veterinarian about the choice of an appropriate food to reduce energy intake but ensure the dog is not exposed to the risk of nutrient deficiencies.

- The protein content in the diet needs to be at least 25% to ensure an optimal balance and enable the dog to fight stress and maintain its immune system. In dogs with kidney or liver disease, the veterinarian will prescribe a specific lower protein diet. It is important to remember that restricting protein intake will not prevent kidney failure and may even reduce the animal's lifespan.

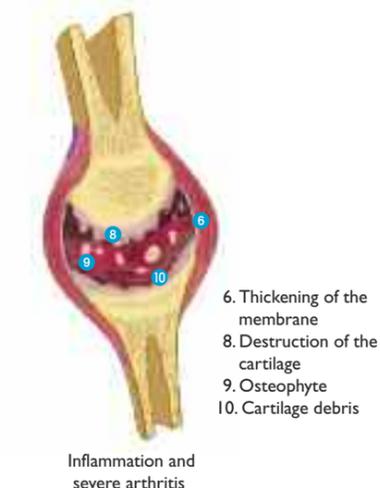
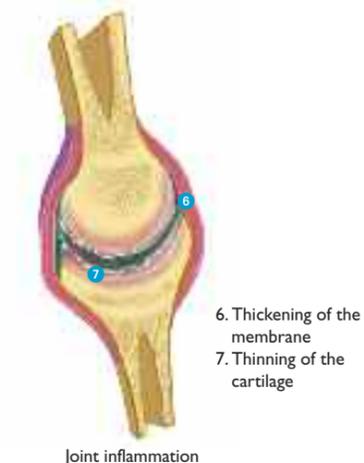
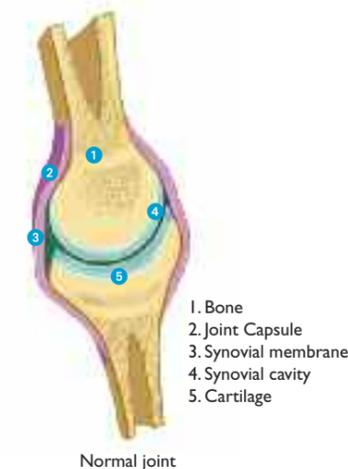
- Good digestive health can be achieved by increasing the content of dietary fibre. This also prevents constipation, which is common. When dietary fibre is added the energy density of the food is reduced without cutting volume.

The cells can be given extra help in their fight against oxidative stress through increased vitamins and trace elements, particularly antioxidants, such as vitamin E, vitamin C, green tea polyphenols and flavonoids.

Although home-prepared diets are an option for ageing dogs, as they can be fine-tuned based on the animal's specific problems, it is important to remember that a mixture of meat, vegetables and rice is not a balanced diet, being particularly deficient in calcium and essential fatty acids. The veterinarian's expertise should always be the owner's starting point.

Some complete dry foods are specially formulated to meet the requirements of a dog based on its size and lifestage, which can be advantageous. The size and density of kibbles, for example, are adapted to the more fragile teeth of ageing dogs, while the very high digestibility of the raw ingredients helps prevent diarrhoea.

These top quality foods ensure an even better match with the individual dog's requirements.





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to bite in the area of the pain, which might lead it to biting the person's hand. In fact these are physical and not behavioural disorders and should be treated as such.

A dog suffering from involuntal depression gradually loses its social skills. It will start to defaecate or urinate in inappropriate places, no longer heed commands or will eat everything it can find. It can have problems sleeping or it may start howling for no apparent reason. Effective medical treatments are available.

Ageing dogs may also be affected by dysthymic depression, which can include an inability to gauge the size of a passageway in relation to their own body. The dog will tend to want to force its way through and may be jammed for hours, growling and whining. Only one drug has been proven to be effective in the event of this disease.

A full check-up and appropriate treatment and management should be initiated in response to any apparent behavioural disorder in the older dog.

Heart failure

When an organ fails it is no longer able to do its work effectively. The dog will exhibit clinical signs that will worry the owner. In the event of heart failure, the dog will tire quickly and may cough. Depending on the part of the heart affected, it may also result in oedema (accumulation of fluid). This disease can be diagnosed early with regular monitoring of the heart function (auscultation, electrocardiogram, ultrasound), so that the dog can be treated with the appropriate medication and a diet can be initiated that supports heart function.

Kidney failure

The kidneys remove waste products, particularly urea, from the blood and excrete them via the urine. Chronic kidney failure can be defined as the gradual and irreversible loss of kidney functions: excretion, regulation and hormone production. It does

not become apparent until more than 75% of the nephrons (the functional units of the kidney) have disappeared, so diagnosis is always late in the progression of the disease. The first clinical signs owners will notice are an increase in water intake (polydipsia) and increased urination (polyuria). If it drinks a lot, the dog may not be able hold its urine overnight & urinate in the house. It will often lose weight, firstly because the increased urea in the blood adversely affects its appetite, then because the disease increases the use of body protein. The veterinarian will base a diagnosis on the clinical signs described by the owner and the results of supplementary tests (measurements of the quantity of urea, creatinine, protein and some minerals in the blood).

If diagnosed early during regular check-ups, kidney disease can be treated with a combination of medication based on the clinical signs and a diet that supports kidney function. Limiting dietary phosphorus intake is vital as it is toxic for the kidneys, inducing hormone changes that can damage bones and kidneys. Urea formation also needs to be reduced through the moderate intake of proteins of high biological value. Weight and body condition (especially muscle mass) need to be regularly monitored in dogs suffering from kidney failure. The increased intake of omega-3 essential fatty acids has also been shown to have a positive impact on failing kidney function. Complete nutritional foods are available specially formulated for dogs suffering from kidney disease with particular attention to high palatability to ensure the dog eats its food.

Diseases of the digestive tract

Plaque and periodontal disease are access routes for pathogens that can cause lung, heart, kidney or joint diseases, as stated above. Prepared food was long wrongly identified as the culprit in plaque formation & development of periodontal disease, but many recent studies have shown that dry kibbles are better at preventing dental plaque formation than wet food sold in cans or sachets. The latter tends to accumulate around the point where the tooth

enters the gum, while kibbles have an abrasive effect on the teeth, which helps to keep them clean. Together with regular brushing, for which many products are now available from veterinarians, kibbles are the best way of preventing this problem. Some chewing treats can also help to improve the dog's oral hygiene. Once tartar (calcified plaque) has built up on teeth, it will have to be removed by the veterinarian.

Constipation is a common problem among old dogs due to the slowing down of intestinal transit and the reduction in physical activity. This can be treated and prevented by giving the dog a diet with a higher fibre content. The administration of paraffin oil or laxatives should only be a temporary measure, unless advised and monitored by the veterinarian. Physical activity remains the best solution.

Cancer

Uncontrolled cell development leads to the formation of cell masses. Depending on their location, they will have differing consequences. Malignant tumours can spread throughout the body, making treatment uncertain. As in human medicine, chemotherapy with drugs and radiotherapy are available and are advancing all the time. Weight loss must be minimised, especially loss of muscle mass, as this helps the prognosis of the patient. Diet is a fully-fledged part of cancer treatment. The goal is to feed the dog and not the tumour, which is achieved by using very high quality ingredients and adjusting the formulation of the food.

In conclusion, owners can begin combating the effects of ageing in dogs when the puppy is still very young, by adopting preventive health and dietary measures. As it grows older the dog should receive regular check-ups so that any problems can be diagnosed early and treated as soon as possible. Monitoring and maintenance of a good body condition is a priority. Both obesity and muscle wastage must be avoided. A diet that takes full account of the individual dog's nutritional needs will ensure that this is achieved.

“Aggressiveness can be a problem in ageing dogs, which can be less patient and more aggressive, even resorting to biting.”

“Owners can begin combating the effects of ageing in dogs when the puppy is still very young, by adopting preventive health and dietary measures.”



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Diseases affecting ageing dogs

Advancements in veterinary medicine have significantly extended the life expectancy of dogs – and cats too – in recent years, especially in relation to better food and improved health. As a result, a new discipline has emerged in veterinary medicine. Geriatrics is the medical science of diseases associated with old age. It demands regular health checks to monitor the animal's health in the final years of life. Some major functions and organs need to be monitored regularly to ensure that any problems are identified quickly and appropriate action implemented rapidly.

Behavioural problems

With age comes a reduction in the capacity for adaptation, which also applies to behaviour. Behavioural specialists have identified three main disorders that are likely to appear in old age.

Aggressiveness can be a problem in ageing dogs, which can be less patient and more aggressive, even resorting to biting. Physical disorders can be the cause, so the dog should be examined by a veterinarian. If the dog is deaf it may be surprised and simply defending itself. Similarly, if a dog has arthritis in its hips it may feel pain if it is lifted up. The dog's natural reaction will be



Canine nutrition

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The fundamentals of canine nutrition

No living organism can survive without a diet consisting of a complex assortment of essential nutrients that enable its organs to function. More than 50 of these nutrients, starting with water, must be provided in the dog's daily diet if it is to remain in good health.

Understanding dogs

Huge advancements in canine nutrition have made a great contribution to improving the quality of life and the life expectancy of dogs. The concept of "Health Nutrition" for individual species, including humans, is proving its worth for dogs, which depend on their owner exclusively for their food.

The role of the nutritionist

Excess and deficiency are both just as harmful to canine health, which is one of the reasons why we need to understand canine nutrition and to identify dogs' needs in terms of quality and quantity, which are different to those of humans or cats. Contrary to a common misconception, dogs do not need any variety in their diet. They actually have very little sense of taste, mainly using their overdeveloped sense of smell to evaluate their food. As a result, the marketing of different flavours of dog foods is a totally irrelevant exercise. All they do is appeal to the owners' mistaken idea that they are doing their dog a good turn by giving it access to a wide range of different flavours. What the dog actually values most is the same food, in the same bowl, at the same location, at the same time every day.

which vary depending on its size (small, medium, large, giant), physiological status (maintenance, gestation, lactation, growth, ageing, neutered, sport or work), breed (some present certain characteristics that affect dietary adaptation) and even illness (when diet becomes one of the aspects in preventing relapse or deterioration and may be a key part of the treatment). The goal of nutritionists is to meet each of the animal's requirements perfectly, by providing all the essential nutrients in the right proportions, and maximising their digestibility and biological values by identifying the ideal preparation method. Anthropomorphism has no place in this approach. The owner is not the consumer, the dog is.

Of course, the best food in the world will do no good at all if the dog does not want to eat it, which is why palatability is so important too.



To assess the palatability of a food, it should be tested on dogs of various sizes and breeds in diverse environmental conditions (kennels or home, for example.).

Nutritionists are first and foremost interested in the dog's specific requirements,

The function of food

The goal of veterinary nutrition is to identify the essential nutrients, the roles they play and their optimal concentrations to ensure the animal takes in exactly what it needs from its diet. Progress is being made in this field all the time. New foods and nutritional formulas are marketed every year that provide not just the essential nutrients needed to keep an animal fit and healthy, but additional nutrients that can provide extra benefits, better protection and even help prevent certain diseases.

Advancements in dog food

Over the past four decades, foods prepared by the leading manufacturers of companion animal food have had a very positive effect on the quality of life of dogs. It is estimated that the dog's average life expectancy has been extended by around three years over the past 15 years.

First, we took the step from simple survival foods – the provision of the very minimum to ensure the animal stays alive – to specific food that brings out the beauty of the animal and allows it to be more active. The third stage is “nutrition”, which is based on ever-deeper knowledge of how the body works and the study of the health benefits of natural purified ingredients. It is now within our power to formulate foods that meet very precise requirements, helping fight deficiencies that threaten the animal in extreme climates or when disease strikes.

Our knowledge expands with each new scientific study. Diet is now recognised as a fully-fledged aspect in the care of some diseases and new specialisations are being defined all the time, including preventative nutrition, health nutrition and clinical nutrition.

Dogs are also facing a threat, however, and that threat is ignorance. Humans are inclined to forget that dogs are a different species, attributing human characteristics to them when it comes to dietary matters. It is essential for us to understand that dogs are not humans. Dogs are carnivores although not exclusively so, having some omnivorous ability, with a totally different dietary behaviour from humans.

Humans are omnivores with a very well developed taste palette. We love variety in our diet. Too often, we imagine that dogs are just like us in this respect. As a result, the way we feed our dogs has a lot to do with our own preferences rather than theirs. This is a serious mistake, because over ten thousand years of domestication has still not been enough time to transform the dog's gut into a human one.

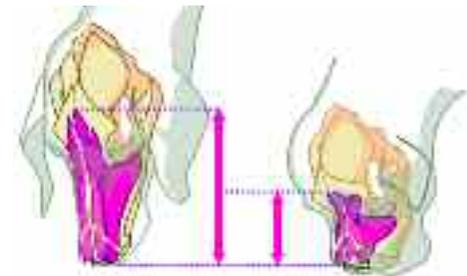
Originally highly active animals – some of them still are, happily – dogs get their energy from fat provided in their diet and do not suffer from human problems like high cholesterol and coronary disease. They can, however, suffer from obesity if they are not fed correctly, which has serious consequences.

Palatability – smell plays a big role

The number of olfactory receptors varies depending on the size...

	Labrador	220
	German Shepherd	200
	Fox Terrier	147
	Dachshund	125
	Bulldog	100

... and the breed.



The skin folds around the nose, short face and shortened muzzle of the Bulldog (on the right) results in less air flowing through the upper airways. This limits the circulation of smell molecules.

Are dogs strict carnivores?

Just like their ancestors the wolves, dogs should normally eat the whole of their prey, although this does not always occur.

Depending on the availability of nutritional resources, they eat more or fewer vegetables and are able to adapt to other diets. Due to their digestive system and metabolism, they can digest a large variety of food, within limits.

Much more than they used to be, dogs nowadays are almost totally dependant on humans for their food. That means that owners have great responsibility for ensuring their dog eats correctly.

Humanising the animal – or the mistaken belief that it has a certain disease – can lead to malnutrition and poor health.

Professor Jurgen Zentek,
Department of Veterinary Medicine,
Freie Universität, Berlin
(Germany)



Canine Nutrition is a Specialty In Its Own Right

The European Society of Veterinary and Comparative Nutrition (ESVCN) was created in 1995. This scientific organization is dedicated to improving knowledge in the area of nutrition for domestic animals. Its members include veterinary nutritionists from all over Europe and from the United States. Its principal areas of study and development include species and topics not studied in the fields of agronomy or human nutrition. Dogs are one of its main areas of interest. Studies range from food for the canine athlete to meeting basic nutritional needs during critical periods (such as after surgery). The ESVCN's affiliation with the European Society of Veterinary Internal Medicine shows the extent to which dietetics is now an integral part of medical treatment for many canine diseases. The ESVCN organizes an annual international conference that brings together several hundred veterinarians from all over the world.

*Professor Ellen Kienzle,
Doctor of Veterinary Medicine
University of Munich
(Germany)*

Food is a regulator of behaviour in dogs. As stated previously, the same food, in the same bowl, at the same location, at the same time every day is what dogs prefer. Dogs fed in this way will be well balanced and mentally healthy.

Veterinary research has driven the expansion of the traditional concept of nutrition as something that constructs and maintains the body by providing energy and building blocks to include prevention and often also therapy. Health nutrition has become an established idea in the dog world.

The goals

Nutrition has four well-defined goals:

- Building and maintaining the body: protein (specifically ten essential amino acids), minerals and

trace elements, vitamins and some lipids (those that form part of the cell membranes).

- Providing energy: mainly dietary lipids, but also non-fibrous carbohydrates.
- Nourishing and preventing: specific nutrients (antioxidants, clays, vitamins) that participate directly in the prevention of kidney and digestive disorders, as well as helping fight the effects of ageing.
- Nourishing and healing: specific nutrients that can participate in disease therapy and recovery.

Comparison of digestion	Human	Dog
Digestive tract weight/body weight ratio	10 – 12% for a human	2.7% for a giant dog and 7% for a small dog
Area of olfactory membrane	3 - 10 cm ²	60 to 200 cm ²
Olfactory cells	2 - 10 million	80 to 220 million
Taste buds	9 000 taste buds	1 700 taste buds
Dentition	32 teeth	42 teeth
Mastication	prolonged	very little
Salivary digestive enzymes	YES	NO
Food intake time	30 - 60 minutes	1 to 5 minutes
Daily energy need	1800 - 2500 kcal/day	130 - 3500 kcal/day
Stomach pH	2 - 4	1 - 2
Length of small intestine	6 - 6.5 m	2 - 6 m
Length of large intestine	1.5 m	20 - 80 cm
Average intestinal transit time	3 days	24 - 48 hours
Adult recommended carbohydrate intake	60 - 65% of dry matter	very low
Adult recommended protein intake	8 - 12% of dry matter	20 - 40% of dry matter
Adult recommended lipid intake	25 - 30% of dry matter	10 - 65% of dry matter
Diet	omnivorous	semi-carnivorous

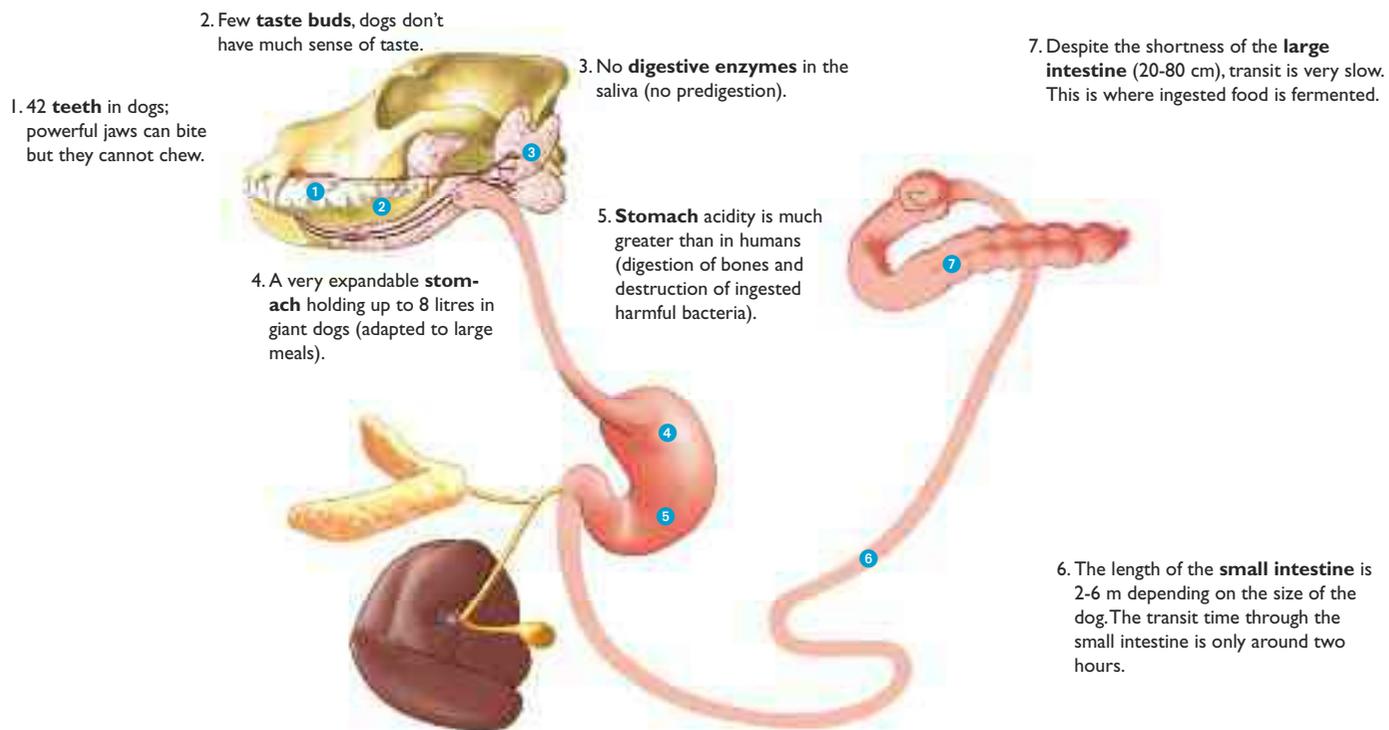
The nutritional approach

The nutritional approach involves solving a complex puzzle to formulate a single food containing around fifty nutrients – sometimes more – in the right proportions to achieve these four goals, while taking account of specific physiological characteristics in certain situations or in certain groups of dogs.

The ingredients approach

The ingredients approach is based on a simple list of raw ingredients in a food without any concept of balance between nutrients. Because of this, it is less precise and less able to meet the animal's strict requirements.

Key features of the dog's digestive tract



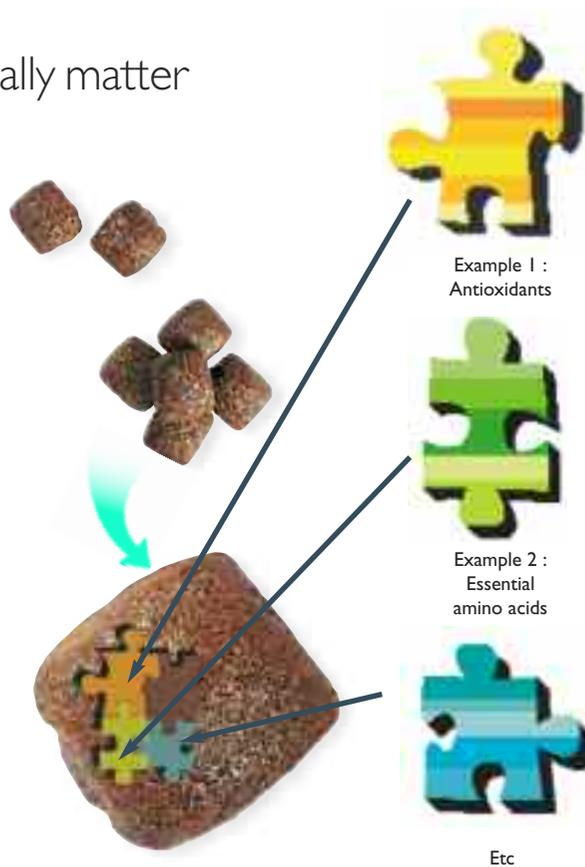
When it comes to food, nutrients are what really matter

Formulating a balanced food for dogs is a complicated task. Dogs have to take in around fifty nutrients through their food, in the appropriate proportions. These nutrients all have to fit together like jigsaw pieces, which demands knowledge of their complementary nature.

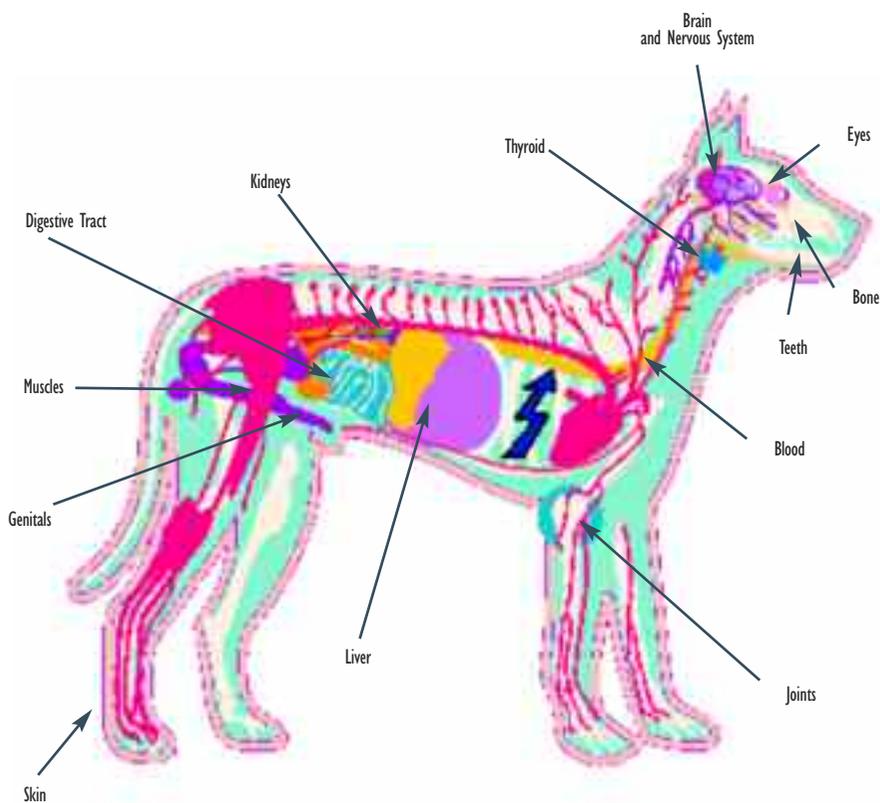
Like all animals, dogs are made up of tens of millions of cells, each of which produces the energy and the building blocks the body needs. The mitochondrion of each cell is a mini power plant, which runs on fuel provided in the diet and oxygen provided through respiration, conveyed by red blood cells. When this system works properly, the dog's temperature is maintained at a constant level and the body is able to continuously rebuild and repair itself.

Without a good understanding of the roles of nutrition, including all the exchanges between the body and the exterior environment, it will not be possible to provide the dog with all the nutrients it needs.

A guide to these essential nutrients follows.



Each kind of food, as a source of specific nutrients, ensures the proper functioning of the different organs



CARBOHYDRATES

Carbohydrates is a term that covers molecules composed of carbon, oxygen and hydrogen that have certain chemical characteristics in common. Carbohydrates are predominantly vegetable, with the exception of blood glucose, glycogen in the muscles and the liver, and milk lactose.

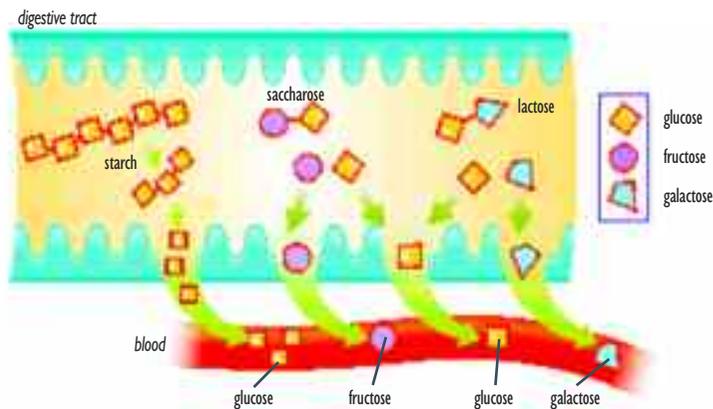
All vegetables contain carbohydrates, ranging from saccharose in beet to the most indigestible fibre in tree bark.

Dogs can live without carbohydrates in their food, as they synthesise the carbohydrate they need for the cells from amino acids. The intake of carbohydrates does however greatly improve the body's functioning.

While glucose, saccharose, lactose and starch have the sole function of furnishing energy, their botanical origin and how well they are cooked influence their digestion.

The presence in the food of poorly cooked starch can cause diarrhoea. Fibre, which is also a carbohydrate, is very good for transit and for the balance of bacterial flora. This is true of fructo-oligosaccharides (FOS) and mannan-oligosaccharides (MOS) for instance.

Digestion of carbohydrate and simple sugars



Starches

HEALTH & PREVENTION

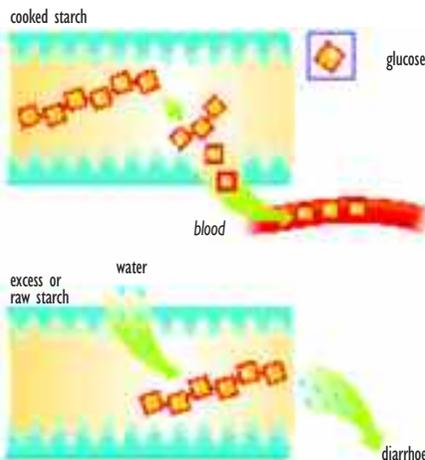
To be digested by dogs, starch must be very well cooked or it will ferment in the large intestine and cause diarrhoea. Too much starch can have the same result if the amount ingested exceeds the animal's enzymatic digestive capacity (in Nordic dogs for instance).

A little background information

Starches are carbohydrate molecules in which thousands of glucose molecules are linked together by simple chemical bonds.

Its role in the body

Starches are used only to provide energy to the animal, after being degraded by the digestive process to help the intestine gradually absorb the glucose molecules.



Starch is decomposed into glucose molecules by the enzymes (amylases) secreted by the pancreas and the digestive cells of the small intestine.

When there is a surfeit of starch or it is undercooked it is not completely digested. The undigested starch molecules ferment in the large intestine by generating an intake of water.

Sugars

also known as:
Simple carbohydrates, Di- and Tri-saccharides

HEALTH & PREVENTION

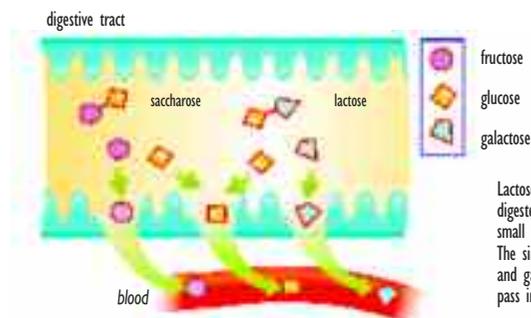
Sugars have no preventive or curative functions in dogs. But, when in excess in the food, they can lead to obesity and in some cases the development of diabetes.

A little background information

In everyday language, when we talk about sugar, we refer to the sweetening power and taste of carbohydrates like saccharose (sucrose) or fructose. With no qualifier, this term usually refers to saccharose (beet or cane sugar), but it could just as well refer to glucose (grape sugar), fructose (fruit sugar) or lactose (milk sugar).

Its role in the body

While lactose provides immediate energy to unweaned puppies, a digestive enzyme, lactase, is necessary to make it biologically available; lactase disappears once the animal stops feeding on milk. Since later on dogs cannot taste "sweet" things and since they can synthesise their own blood glucose from proteins autonomously, sugars have no nutritional value for them.



Lactose and saccharose are digested by enzymes of the small intestine brush border. The simple glucose, fructose and galactose molecules then pass into the blood stream.

Cellulose

also known as:
Total dietary fibre (TDF)

HEALTH & PREVENTION

Thanks to recent advances in scientific knowledge on the raw fibre components of food, diseases like obesity, diabetes, constipation or diarrhoea can be prevented or cured more effectively by adding these components in the right quality and amount to an animal's diet.

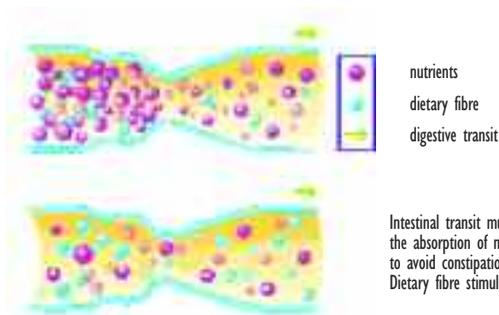
A little background information

Cellulose is a very large molecule consisting of thousands of glucose units linked together by stronger chemical bonds than those found in starch. But cellulose represents only part of the total fibre in food. The term includes other soluble or insoluble fibrous plant substances, such as hemicelluloses, pectin, lignin and oligosaccharide fibres. On its own, cellulose does not have much of a nutritional effect, despite the raw cellulose content being stated on labels.

Its role in the body

The role of fibres in the body is dependent on their nature. Indigestible and insoluble fibres (pure cellulose, lignin) act as ballast in the bowels, helping them to function mechanically by stimulating contraction (peristalsis). Soluble fibres can be important for the health and hygiene of the digestive tract (FOS, MOS).

The intake of sufficient fibre is important to produce a feeling of satiety in animals at risk of becoming overweight.



MOS

also known as:
Mannan-oligosaccharides

HEALTH & PREVENTION

MOS contribute to an adequately balanced bacterial population in the bowels, and have a direct and indirect effect on the health of the digestive tract. Thus, they are very effective in preventing diarrhoea and contribute to the prevention of digestion-related infectious diseases.

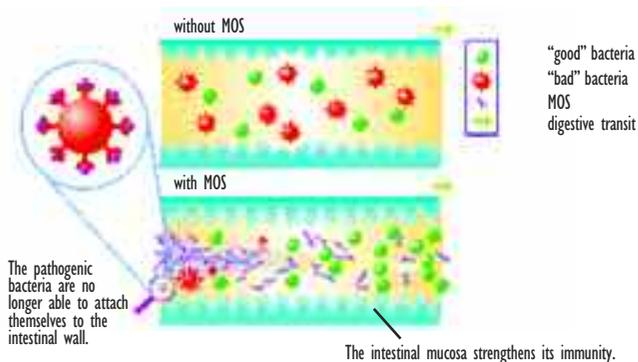
A little background information

Mannan-oligosaccharides belong to the large category of fibre, which means they are non-digestible carbohydrates. Just like FOS, they are effective against harmful bacteria living in the intestinal lumen, but have a different mode of action. They are composed of two sugars: glucose and mannose.

Its role in the body

These yeast fibres are beneficial to the digestive tract by acting in two ways :

- they prevent the development of pathogenic bacteria by stopping them from attaching themselves to the intestinal mucosa ;
- they directly enhance the effectiveness of the body's immune system, helping the body resist pathogenic agents.



FOS

also known as:
Fructo-oligosaccharides, Prebiotics

HEALTH & PREVENTION

The addition of FOS to a food prevents infectious diarrhoea caused by the proliferation of dangerous bacteria in the intestine, while providing adequate nourishment to intestinal cells to facilitate their regular regeneration.

A little background information

Fructo-oligosaccharides (FOS) are fermentable fibres. They are not digested, but are nevertheless rapidly fermented by the bacteria in the colon, resulting in the release of small-sized fatty acids (known as volatile fatty acids) that:

- acidify the intestinal medium ;
- are excellent nutrients for cell maintenance and renewal ;
- line the walls of the large intestine.

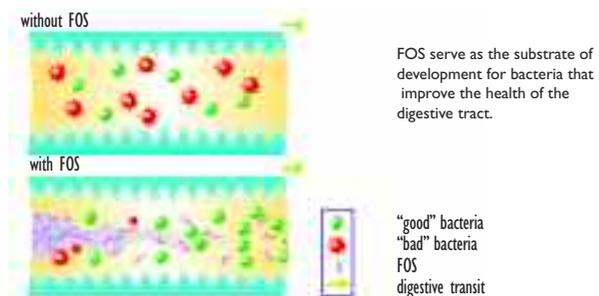
But they particularly promote the growth of specific bacterial flora (bifidus and lactobacillus) that have well-known beneficial effects on the health of the digestive tract :

- they inhibit the development of pathogenic bacteria ;
- they improve digestion and nutrient absorption.

FOS supplementation in the food of bitches used for breeding helps increase the antibody count (IgM) in the milk, which promotes good immunity in the puppies.

Its role in the body

Through fermentation, FOS are a direct source of nourishment for the cells of the large intestine.



Mucilage

Example: psyllium fibre

HEALTH & PREVENTION

Mucilage is the soluble fibre used to treat problems of digestive transit. It regulates transit and facilitates faecal elimination.

A little background information

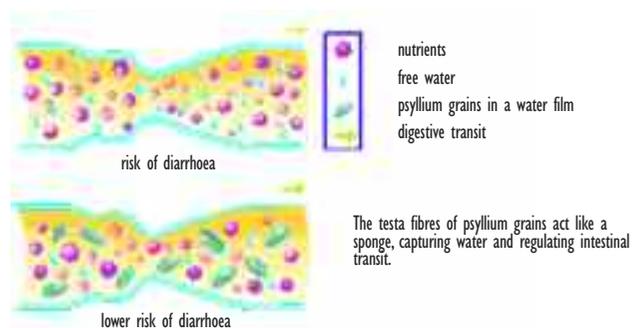
Psyllium grains are a very good source of mucilage. Psyllium comes from the Greek "psyllia", which means flea. The grains, black or golden depending on the species, resemble tiny psyllids. Psyllium is very commonly used in the food of sled dogs, to prevent stress diarrhoea.

creating a gel that increases the viscosity of the contents of the intestine (chyme). Psyllium improves digestive transit.

It therefore combats constipation, which is its main indication in human medicine. The advancement of faecal matter through the colon is more regular and the lubrication induced by psyllium facilitates faecal elimination.

Its role in the body

The mucilage that makes up the exterior layer of psyllium grains has a large water retaining capacity. It puffs up by capturing water and



LIPIDS

Dogs are naturally attracted to foods rich in lipids, but they must be limited when the animal does not get a lot of physical exercise.

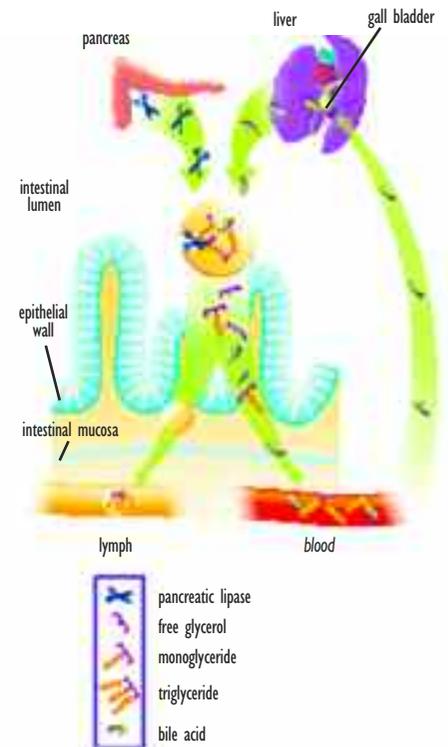
In the absence of very strict rationing an excess intake of lipids leads to obesity, but animals cannot do without them, as they provide energy and essential fatty acids.

Lipids constitute a family of organic substances more commonly known as fats. Fatty acids and glycerol, which together form the triglycerides, are the main elements. Lipids may be simple (triglycerides, waxes) or complex (containing many other elements). Cell membranes for example are composed of phospholipids.

Fats are the benchmark energy source for dogs, which oxidise them to extract the energy they need. A gram of lipids represents approximately 9 kcal of metabolisable energy, two and a half times more than that provided by a gram of carbohydrates or proteins.

Some fatty acids – termed essential – also have structural roles for the cell or act as precursors to specific hormones.

Dietary lipid sources are all foods rich in animal fats (butter, tallow, lard, eggs, poultry fat, fish oil) and vegetable fats (oils, oilseeds).



In the intestine, dietary fats are emulsified by bile acid and digested by pancreatic enzymes (lipases). The fatty acids are then absorbed into the blood stream or lymphatic circulation.

Fatty acids

HEALTH & PREVENTION

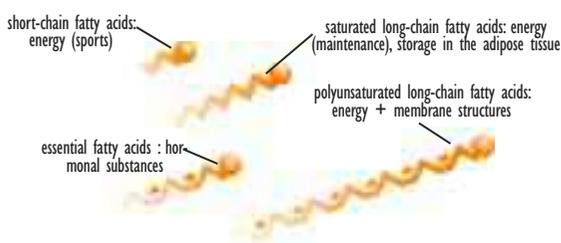
Polyunsaturated fatty acids, which are abundant in dietary oils, are degraded by oxygen, heat and light. This phenomenon of rancidity may become dangerous due to the formation of complex compounds (hydroperoxides). This is why the addition of antioxidants to food is indispensable.

A little background information

Fatty acids are the main constituents of lipids. They are characterised by the number of carbon atoms they possess, hence the expressions short-, medium- or long-chain fatty acids. They can be saturated (no double chemical bond between 2 carbons) or unsaturated (with 1 to 6 double bonds). Though the latter, more fragile, are subject to rancidity, they include many fatty acids that are essential to vital functions.

Its role in the body

Saturated fatty acids are exclusively energy sources (referred to as “empty” calories since they play no other role). Short-chain saturated fatty acids (6-10 carbon atoms) are a very good source of fast energy for sports dogs, diabetic animals and newborn puppies. The function of polyunsaturated fatty acids is structural (in membranes or in blood lipoproteins); they include the omega 3 and omega 6 chemical series that have vital functions and cannot be synthesised by the body.



Omega 6 fatty acids

HEALTH & PREVENTION

The intake of linoleic acid is indispensable to the synthesis of cell membranes. Deficiency provokes the appearance of dry, brittle and thin hair. It also affects the integrity of the skin barrier: the skin becomes more sensitive to dehydration and infection.

A little background information

The omega 6 series of fatty acids are biologically indispensable fatty acids that are derived from an essential fatty acid containing 18 carbon atoms and two chemical double links, known as linoleic acid. Two other long-chain fatty acids are derived from linoleic acid: gamma-linolenic acid (GLA) and arachidonic acid.

Its role in the body

Indispensable to the synthesis of prostaglandins, hormonally active molecules, omega 6 fatty acids have a positive effect on the health of the skin and the quality of the hair, as well as the animal's reproductive system.



Gamma-linolenic acid

also known as: GLA

HEALTH & PREVENTION

Gamma-linolenic acid (GLA) can play a significant role in combating all inflammatory problems, particularly dermatological diseases. The positive effects are particularly clear in allergic animals.

A little background information

GLA is used in cosmetics products that claim to restore the skin's elasticity. It is especially good for dry skin or when excessive sebum is produced (seborrhoea).

Its role in the body

Enriching the food with GLA helps its incorporation in the liver, red blood cells and the vessel walls.

Unsaturated fatty acids such as GLA help the cell membranes maintain their fluidity, which is an essential condition for vital exchanges between cells. GLA supplementation intensifies the production of hormones with well-documented anti-inflammatory effects, type 1 prostaglandins. This production is at the expense of the synthesis of type 2 prostaglandins, which have a pro-inflammatory effect.



Omega 3 fatty acids

HEALTH & PREVENTION

Due to their biological roles, omega 3 fatty acids are used in food for sports dogs, ageing dogs, and animals suffering from chronic inflammatory disorders (osteoarthritis, chronic renal failure, inflammatory diarrhoea, skin diseases).

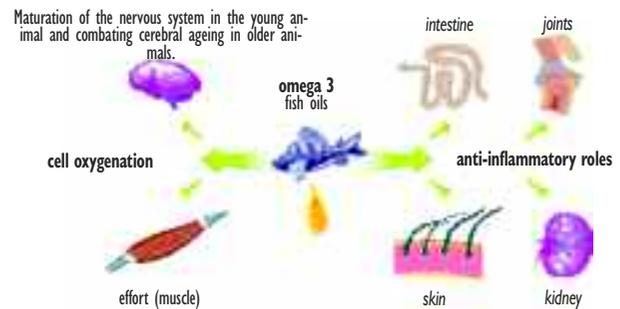
A little background information

Omega 3 fatty acids form a specific family in the class of polyunsaturated fatty acids. This family is derived from alpha-linolenic acid (ALA), a fatty acid containing 18 carbon atoms and three double chemical bonds. Two other longer but very important fatty acids, EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) are derived from ALA.

Its role in the body

The essential functions of omega 3 fatty acids make them interesting in many respects :

- they are anti-inflammatory agents, inhibiting the synthesis of certain chemical inflammation mediators ;
- they improve brain oxygenation (especially in old animals) and enhance the performance of dogs active in sports ;
- they stimulate the learning capacity of puppies.



EPA and DHA

also known as: eicosapentaenoic acid and docosahexaenoic acid

HEALTH & PREVENTION

Very long-chain omega 3 fatty acids (EPA and DHA) are especially known for their anti-inflammatory role. Enriching the food with EPA and DHA has many other benefits however:

- they protect the cardiac and kidney functions (blood thinning and anti-hypertensive action)
- they limit the risk of tumours.

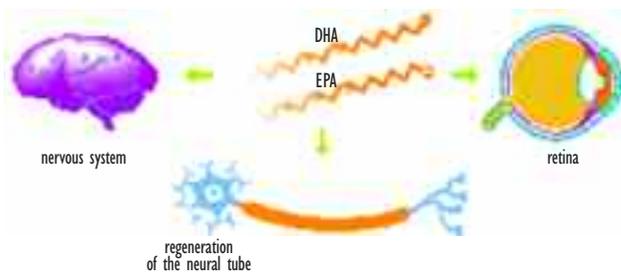
There is a high concentration of EPA and DHA in the retina: supplementation during gestation and the first weeks of life increases the animal's visual acuity.

A little background information

DHA is sometimes known as cervonic acid, because the brain is the organ with the highest concentration. Wild carnivores, especially felines, consume DHA when they eat the brains of their prey.

Its role in the body

Present in maternal milk, EPA and DHA are indispensable to the development of the embryo's and the foetus's brain and retinas. The higher the DHA concentration in the maternal milk, the greater the maturity of the young animal's nervous system.



Conjugated

fatty acids also known as: CLA

HEALTH & PREVENTION

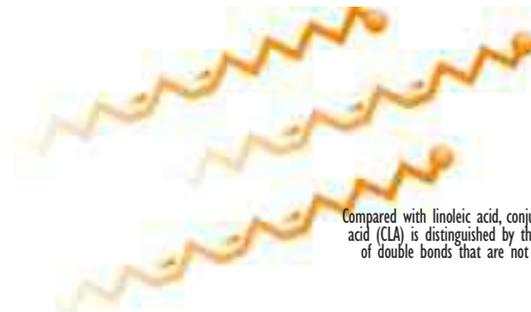
Conjugated fatty acids derived from linoleic acid – conjugated linoleic acid (CLA) – have been studied as part of the fight against obesity. A particular form of CLA (or isomer) prevents the build up of triglycerides in adipocyte cultures.

A little background information

CLA does not reduce the body weight of human obesity patients, but it does help increase the lean mass (muscles) at the expense of fat (adipose tissue). CLA also has a positive effect on the body composition of dogs fed ad libitum.

Its role in the body

CLA's anti-adipogenic action is said to be due to an effect of the regulation of glucose and fatty acid metabolism in the adipose cells. The various CLA isomers have been widely studied due to their potential beneficial properties: effects on cancers, atherosclerosis, the immune function and diabetes.



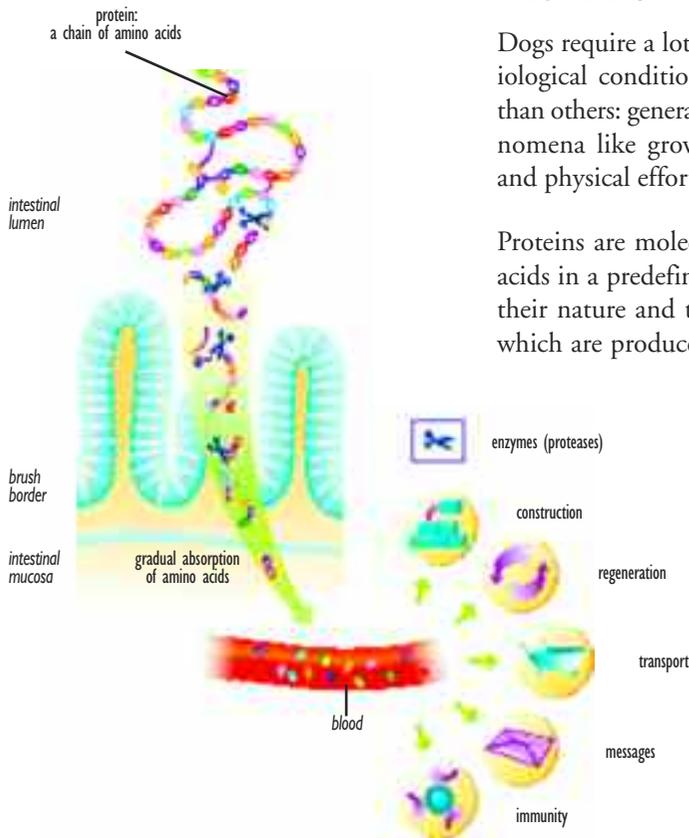
PROTEINS

Dogs require a lot of proteins. Some physiological conditions are more demanding than others: generation or regeneration phenomena like growth, gestation, lactation and physical effort for example.

Proteins are molecules made up of amino acids in a predefined chain that determine their nature and their roles. Amino acids, which are produced by the degradation of

dietary proteins in the digestive tract, then serve as a basis of the body's synthesis of the proteins it needs to build or regenerate its organs and structures, convey certain molecules, send messages from one organ to another (hormones) and combat disease (antibodies), among other things.

Proteins are found in concentrated form in animal products (meat, fish, eggs, dairy products) and some vegetable products (cereal gluten, lentils, peas, soy, yeast). The cereals added to dog food also help provide proteins.



Amino acids

HEALTH & PREVENTION

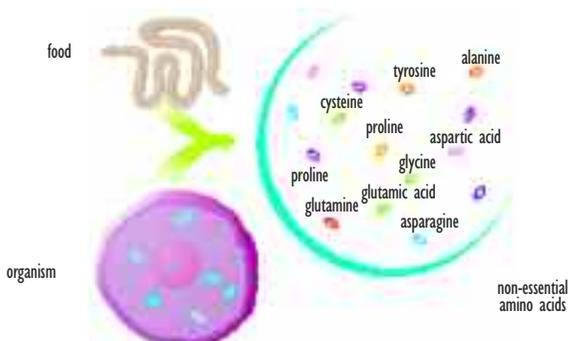
Some proteins are so complex and chemically "solid" that they cannot be broken down by digestion so the amino acids cannot be absorbed in the intestine. They accordingly have no dietary or nutritional value for the animal. This is the case with feathers and hair for example.

A little background information

Amino acids are the building blocks of proteins and their derivatives. Proteins contain a total of about 20 amino acids, only 10 dogs of which must be provided in dog food as they are not produced by the body. Other amino acids must also be provided in food, but they make up a relatively smaller proportion of the total protein intake, as their role is less specific.

Its role in the body

Amino acids from dietary proteins are the building blocks of all proteins synthesised by the body to ensure its vital operation and physiological functions.



Essential amino acids

Arginine, Histidine, Isoleucine, Leucine, Lysine, Methionine, Phenylalanine, Threonine, Tryptophan, Valine

HEALTH & PREVENTION

The absence in the diet of any of these essential amino acids stops the synthesis of life-sustaining proteins. The animal then uses its natural proteins to synthesise what it needs, which gradually puts its survival in danger.

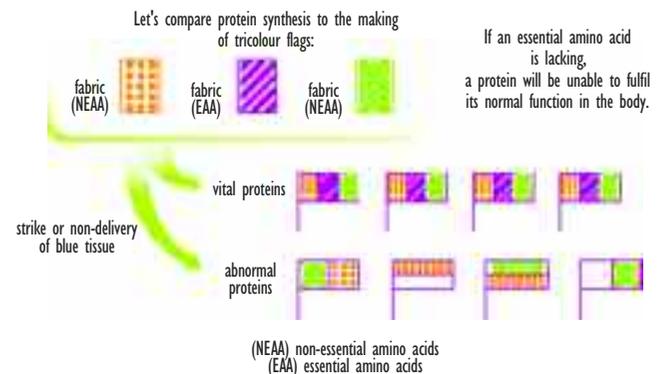
A little background information

Essential amino acids cannot be synthesised by the body and must therefore be provided by the food in appropriate quantities.

The growth of puppies will be slowed down, while essential functions such as nitrogenous waste elimination and haemoglobin synthesis will be disrupted in adult animals.

Its role in the body

Essential amino acids are aptly named, since, without them, the body cannot realise any normal protein synthesis.



Sulphur amino acids

Methionine and Cystine

HEALTH & PREVENTION

Sulphur amino acids are essential to the synthesis of the main hair protein keratin. A sulphur amino acid deficiency results in hair loss, a slow down in growth and a generally dry, brittle appearance of the hair.

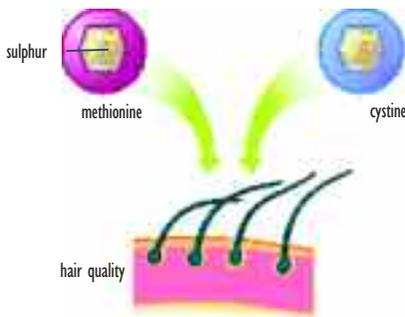
A little background information

The synthesis required for the maintenance of the skin and the hair may represent up to 30% of an adult dog's daily protein requirement.

Its role in the body

Only methionine is considered to be an essential amino acid. If cystine is provided in sufficient quantities however, it helps free up

methionine for other functions. The metabolism of sulphur amino acids produces sulphuric acid, which is eliminated through the urine. A carnivore's natural diet, which is rich in sulphur amino acids therefore tends to produce acidic urine.



Cystine (formed by the association of two cysteine molecules) and methionine are the most important amino acids for the structure of the hair protein keratin.

Glutamine

HEALTH & PREVENTION

Glutamine is a very important amino acid for the metabolism of rapidly regenerating cells, like those in the digestive tract and the immune system. While it is not normally an essential amino acid, glutamine can become essential in certain circumstances. That is why it is termed a conditionally essential amino acid.

A little background information

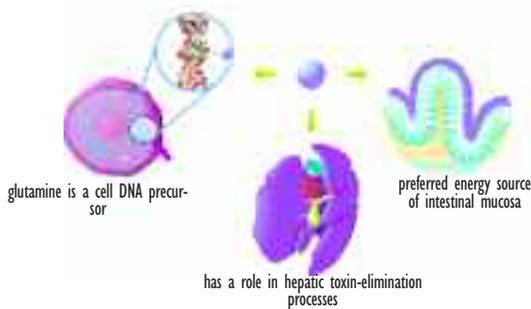
In conditions of disease or intense stress, the consumption of amino acids speeds up and the blood glutamine concentration falls. The integrity of the intestinal mucosa is then put at risk, allowing intestinal bacteria to move into the bloodstream.

Its role in the body

Glutamine exercises many functions connected with protein synthesis, as a precursor of compounds that enter into the composition

of cell DNA, a regulator of hepatic syntheses and a role-player in the detox process.

Glutamine is utilised by the cells of the intestinal mucosa as a source of energy. A low intake by an animal with a high requirement in a critical phase may compromise the integrity of the intestinal barrier. Glutamine supplementation may help reduce the risk of atrophy of villi. It may also be beneficial during convalescence after a period of digestive problems.



Arginine

HEALTH & PREVENTION

Arginine is an essential amino acid for dogs. Newborn puppies fed with mothers' milk with an arginine deficiency soon develop cataracts that lead to blindness. Arginine is also a nitric oxide (NO) precursor, which relaxes the smooth muscles of the blood vessels. Arginine supplementation may accordingly have beneficial effects in case of heart or kidney disease.

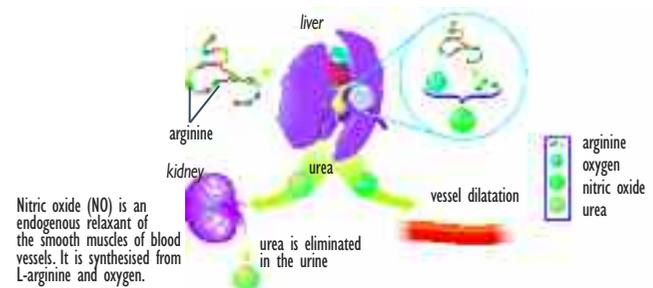
A little background information

Arginine plays a part in the synthesis of urea from ammonia.

suffering from severe chronic heart failure. Arginine also plays a role in the immune mechanisms.

Its role in the body

It has been shown that arginine reduces the respiratory problems caused by the increased production of CO₂ during effort in humans



Lysine

HEALTH & PREVENTION

Lysine is an essential amino acid, which must be provided in the diet for the synthesis of all the proteins the body needs. Lysine deficiency in puppies slows down growth.

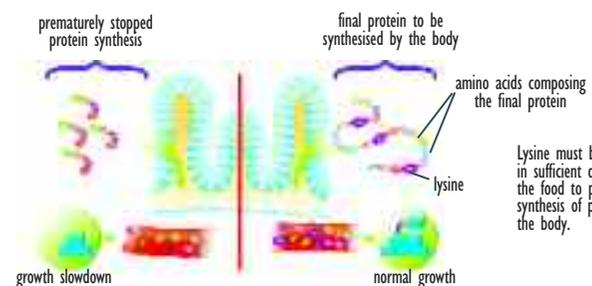
A little background information

Lysine is very sensitive to heat, which means that overly aggressive thermal treatments provoke a reaction with the sugars (Maillard reaction), which makes lysine unavailable to the body. Milk that is too warm for example causes a reaction between lysine and lactose.

This particular sensitivity makes lysine a good tracer in the control of cooking of food.

Its role in the body

It has a major role in protein synthesis.



Tyrosine and phenylalanine

HEALTH & PREVENTION

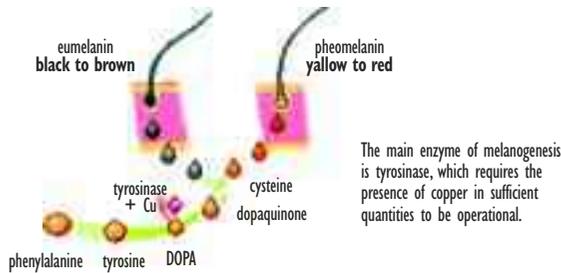
The colour of the coat depends on the presence of pheomelanin grains (yellow to red pigments) and eumelanin grains (brown to black). The production of these pigments requires the presence of tyrosine and phenylalanine, two aromatic amino acids (so-called because of their ring structure). A default in the animal's intake in dark or black subjects provokes a reddening of the hair. Tyrosine supplementation even helps increase the intensity of hair colouration.

A little background information

Studies on Newfoundland and black Labrador puppies show that the phenylalanine and tyrosine levels needed for optimal coat pigmentation are twice that of the corresponding growth-related requirements.

Their role in the body

Besides its role in hair and iris pigmentation, tyrosine is also a dopamine, noradrenalin and adrenalin precursor. These molecules are involved in the proper functioning of the brain and in reproductive function. Tyrosine supplementation therefore has a positive effect on fertility.



Taurine

HEALTH & PREVENTION

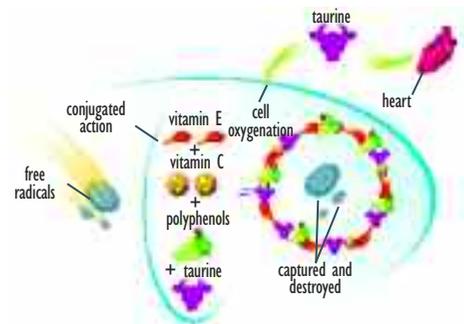
Taurine is used to prevent and treat a serious heart disease known as congestive cardiomyopathy. It provides protection against free radicals, making it also a first-rate antioxidant in the fight against ageing.

A little background information

Taurine was discovered in 1826 in the bile of cattle (*Bos Taurus*), hence its name. It is an amino acid containing sulphur that is found in most animal tissue, and concentrates in the muscles. Contrary to traditional amino acids however, it does not have any role in protein synthesis.

Its role in the body

Taurine enables the liver to synthesise bile salts. It also works by regulating calcium flows into and out of the cells and as a consequence it acts on cardiac function. It has a major antioxidant action in the cell, as well as playing a role as a precursor for the synthesis of complex skin lipids (glycosphingolipids), which have antibacterial properties.



Branched chain amino acids

also known as : BCAA

HEALTH & PREVENTION

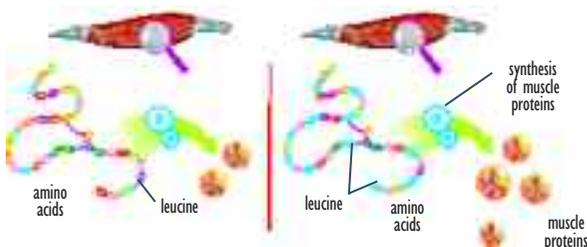
Leucine, isoleucine and valine constitute the class of branched chain amino acids (BCAA) within the essential amino acid family. They are studied because of their potential role in slowing down tumour growth. Clinical studies in humans have shown a link between BCAA supplementation and length of survival.

A little background information

The body is unable to synthesise leucine, isoleucine and valine sufficiently quickly, so the animal's needs must be met through its diet. The blood content of these three, more than other amino acids, varies depending on intake.

Its role in the body

Valine, leucine and isoleucine are able to stimulate the synthesis of proteins and slow down their degradation in the muscles. This property has been specifically attributed to leucine, which proves to be as effective on its own as a mixture of all three amino acids. Sensitivity to leucine appears to diminish with age. BCAAs help increase lean mass and prevent muscle atrophy in cachectic and cancer affected animals.



Compared with other amino acids, leucine shifts the protein balance of the cell towards anabolism rather than catabolism.

Carnitine

HEALTH & PREVENTION

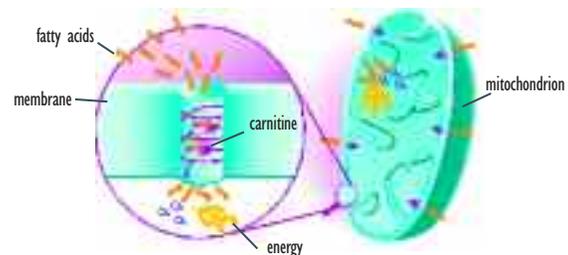
Physiologically speaking, carnitine helps turn fats into fuel for the cells. It is consequently very useful and effective during physical effort, especially when it is sustained. In some dog breeds (Boxers, Dobermans, Cocker Spaniels, etc), a serious heart disease is often related to a deficient production of carnitine by the body. Weight loss can be accelerated in obese animals by adding carnitine to the food.

A little background information

Carnitine is a non-essential amino acid normally made by the body from two other amino acids, lysine and methionine. It becomes essential in food only when the body is unable to synthesise enough of it to cover its needs. Its chemical structure allows two forms of the molecule, D and L. Only L-carnitine is active and effective.

Its role in the body

Energy is mainly produced in dogs through the oxidation of fat in the mitochondria, which are tiny power generating plants in the cells. The role of carnitine is to shuttle fatty acids through the membrane around each mitochondrion. Carnitine also has an important role to play in reproduction. In some species, carnitine supplementation during gestation and lactation increases the weight of newborns and the number of animals in a litter.



MINERALS

A complete food does not require any mineral supplement. An excess in mineral salts has an adverse effect on good digestibility and may even produce effects contrary to expectations.

Minerals are provided by the different ingredients in the ration. They may also be included in the form of purified salts: iron sulphate, zinc oxide, manganese oxide, copper sulphate, sodium selenite, calcium iodate, etc.

“Macroelements are the minerals that are present in the food in a high content (calcium, phosphorus, potassium, sodium, magnesium etc), whereas trace elements are present in very low quantities.”

When a food is burnt the ashes produced are the minerals that were in the food, which generally represent 5-8% of a dry food.

Each mineral is involved in several different functions. To keep things simple, we limit ourselves to some of the main roles the most important minerals play in the body :

The minerals that are present in high quantities (calcium, phosphorus, potassium, sodium, magnesium) are called macro elements. Those present in very low quantities – trace elements – represent a few mg/kg or ppm, but they are essential to the functioning of the body (e.g. iron, zinc, manganese, copper, iodine, selenium).

Macro elements		Trace elements	
calcium phosphorus potassium/sodium magnesium	ossification energy transfer cellular ionic balance sensory impulses	iron zinc manganese copper iodine selenium	synthesis of haemoglobin in red blood cells health of the skin formation of cartilage and skin synthesis of skin pigments functioning of the thyroid gland antioxidant



Calcium



HEALTH & PREVENTION

A calcium intake adapted to the animal's size and physiological condition prevents diseases caused by nutritional deficiency or excess. The growth and suckling periods require a high calcium intake.

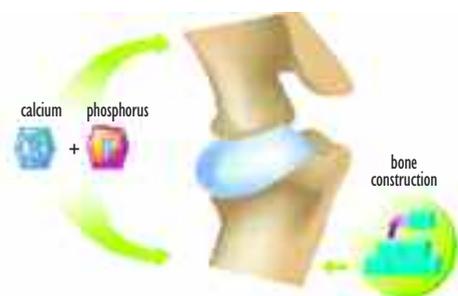
A little background information

Calcium is a major mineral element, an alkaline-earth metal known in nutrition as a mineral macro element because of the large amounts needed by the body. Calcium (Ca) and phosphorus (P) intake ratios must be perfectly balanced in the food.

Its role in the body

Calcium plays two fundamental roles in the body. 99% of the body's calcium is retained in

the bones, where it is responsible for making the skeleton solid together with phosphorus. Together they form the "cement" of the bone. It also allows the transfer of information between the cells and the transmission of sensory impulses. If the calcium level in its food is very high a young puppy is unable to adapt to the excess, continuing to passively absorb at least 30-40% of the calcium ingested, which brings a risk of abnormal skeleton development.



Phosphorus



HEALTH & PREVENTION

An adequate phosphorus intake adapted to the physiological stage and size of the animal and perfectly balanced with calcium intake, promotes harmonious growth and enhances body functions. In ageing animals, phosphorus intake should be reduced as it might aggravate chronic renal failure.

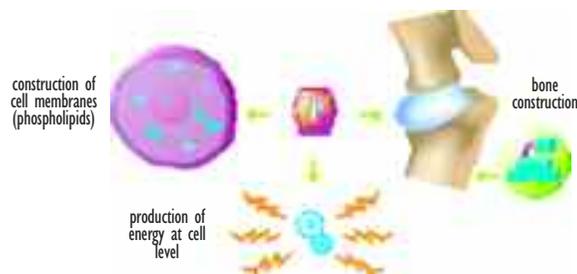
A little background information

Etymologically speaking, the word phosphorus means "light-bearing." It was discovered in 1669 by a German alchemist, who released phosphorus in the form of a vapour that glows in the dark by evaporating urine and burning off the residue in a retort.

Its role in the body

Phosphorus has multiple roles, each of which is as important as the other. 86% of the body's

phosphorus is retained in the bones, where together with calcium, it is responsible for making the skeleton solid. It is a constituent of the cell membranes and a mineral that the body needs to dispense energy (through adenosine triphosphate, ATP). Phosphorus is also incorporated into the major molecules, DNA and RNA, which carry the cell's genetic programming.



Potassium



HEALTH & PREVENTION

There is no particular problem related to potassium intake, except in the case of diarrhoea which causes high potassium losses. Some heart or kidney diseases demand a modification of the dietary amounts. During diuretic treatment, the potassium content should be increased.

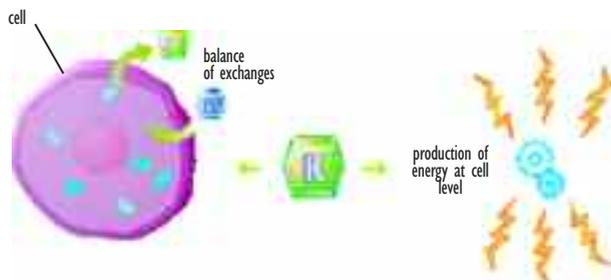
A little background information

Potassium is a major mineral element, an alkaline that nutritionists call a mineral macro element because of the large amounts needed by the body.

Its role in the body

This mineral element is essential to the functioning of the cell, together with sodium maintaining the balance in internal and external pressure and playing important roles in its energy metabolism.

Potassium has a major role in cardiac function. An excessive acidification of the urine can lead to potassium deficiency.



Sodium



HEALTH & PREVENTION

Sodium intake does not pose any particular problems, as dogs do not sweat, even in case of intense physical effort, unlike humans and horses. Only some heart diseases require a reduction in the dietary sodium intake. During severe diarrhoea, hydration powders should be used in the animal's drinking water. These must be isotonic, to compensate for electrolyte loss, especially sodium.

A little background information

Sodium is a major mineral element, an alkaline metal, that nutritionists call a mineral macro element due to the large amounts needed by the body.

Its role in the body

This mineral element is essential for the cell's functioning :

- it maintains the pressure balance between the inside and the outside of the cell ;

- it plays major roles in the cell's energy metabolism.

Sodium is also the element that regulates water balance: sensation of thirst or urinary elimination. Its role is very closely linked to that of potassium. Slightly increasing the sodium chloride content in the food encourages the consumption of water and stimulates urine output.



Sodium phosphates

HEALTH & PREVENTION

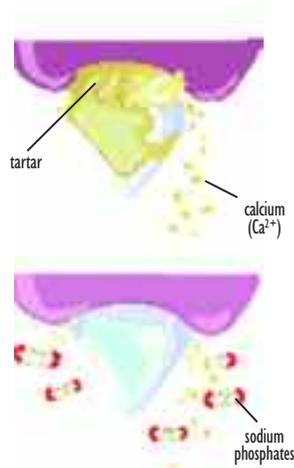
When they are released in the oral cavity some forms of phosphate bind with the calcium ions in saliva, limiting the mineralisation of dental plaque. This slows down the formation of dental tartar. The tartar deposits in dogs fed daily with kibbles coated in sodium phosphates are significantly lower than those of animals fed with the same diet without sodium phosphates.

A little background information

Sodium phosphate salts are used in many human toothpastes to improve oral hygiene. In animals, phosphates must be incorporated in the coating of kibbles or in a chewing bar, to facilitate their release during mastication and promote their contact with the calcium in the saliva.

Its role in the body

The calcium ions in saliva are liable to form calcium hydroxyapatite crystals, the mineral form of calcium used for the formation of tartar. Sodium phosphates have the capacity to chelate the calcium, significantly reducing tartar deposits on the teeth. The calcium phosphate complexes disassociate during digestion and the calcium and the phosphorus are released into the digestive tract where they are absorbed in accordance with the needs of the animal.



The complexed calcium ions are unavailable for the formation of tartar.

Magnesium

HEALTH & PREVENTION

Magnesium deficiency is expressed by the appearance of nervous problems. It was long recommended as a way of curbing the formation of struvite (or ammonium-magnesium phosphate) stones. Nowadays, it has been shown that maintaining an acidic urine pH is a much more effective preventative measure. Magnesium inhibits the formation of calcium oxalate stones. Sports dogs require a higher magnesium intake.

A little background information

Magnesium is a major mineral element, an alkaline-earth metal, qualified in nutrition as a macro element because of the large amounts needed by the body.

Its role in the body

Magnesium, like calcium and phosphorus, is a constituent part of the skeleton, to which it imparts solidity, albeit to a lesser degree than the other two. Magnesium is also essential to the good working order of nervous conduction and muscle contraction, contributing to the body's general energy metabolism.



Chelated trace elements

HEALTH & PREVENTION

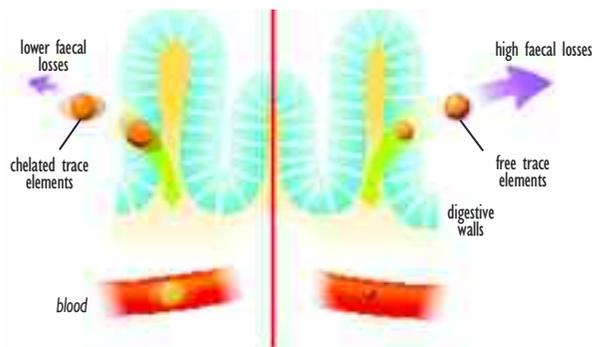
Chelated elements, bound to an organic molecule, are absorbed more easily by their target organ and are thus more effective. Chelated zinc for instance is more easily attached in the hair than free zinc, stimulating hair growth. Improving the nutritional quality of the food using chelates helps better cover the animal's requirements with respect to each trace element.

A little background information

A chelated trace element is made up of a metallic ion and three amino acids.

Its role in the body

The use of this form of trace elements simply improves their digestion and especially digestive absorption, which is typically lower than 30% (70% of the mineral is found in faeces). When the trace elements are chelated, the absorption rate can exceed 60%.



Zinc

HEALTH & PREVENTION

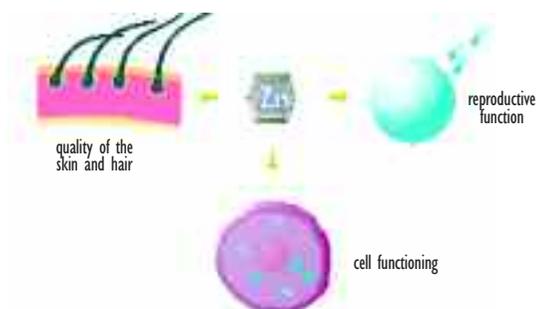
Besides its overall effect on the body, this trace element is crucial for collagen and keratin synthesis. It therefore has healing qualities and promotes beautiful coats. Zinc deficiencies most often occur in foods of poor quality, rich in bran and minerals that prevent the normal absorption of zinc.

A little background information

Zinc is a minor mineral, a transition element, qualified in nutrition as a trace element due to its low quantitative importance, although it is vital for the body. Nordic breeds of dog sometimes have problems assimilating zinc.

Its role in the body

Zinc is the coenzyme in a great many metabolic systems. It is essential to the transport of vitamin A in the blood and plays an important role in reproduction. It is also a fundamental element for the integrity of the skin and so also the quality of the hair. Lastly, zinc helps the elimination of lactates produced during short, intense muscle effort.



Iron



HEALTH & PREVENTION

Iron is an essential nutrient in the prevention and treatment of anaemia.

A little background information

Iron is a minor mineral, a transition element, qualified in nutrition as a trace element due to its low quantitative importance, although it is vital for the body.

Its role in the body

Iron is an essential constituent of haemoglobin, the pigment that transports oxygen in the red blood cells, and of myoglobin, which does the same job in the muscles (explaining the red colour of blood and muscle). It also has many enzymatic functions, especially with respect to cellular respiration.



Manganese



HEALTH & PREVENTION

Manganese contributes to the quality of the bone and cartilage, which means it must be especially monitored in puppies, as well as ageing animals and animals suffering from osteoarthroses.

A little background information

Manganese is a minor mineral, a transition element, qualified in nutrition as a trace element due to its low quantitative importance, although it is vital for the body.

Its role in the body

Manganese is a trace element that plays an active part in the functioning of the mitochondrion, the cell energy plants and an important role in the formation of bone and joint cartilage.



Copper



HEALTH & PREVENTION

This trace element is one of the anti-anaemic factors that include folates, vitamin B12 and iron. Stored in the liver, it can be toxic for a very small number of dog breeds. It participates in the synthesis of melanin, which is a hair pigment.

A little background information

Copper is a minor mineral, a transition element, qualified in nutrition as a trace element due to its low quantitative importance, although it is vital for the body (<10 mg/ kg of body weight). Most of the body's copper is stored in the liver. It can be toxic in excessive quantities, as stored by some predisposed breeds or lines of dog.

Its role in the body

Copper acts in the body to facilitate the intestinal absorption of iron and its incorporation in haemoglobin. It is an active element in many enzymes, especially those that promote cellular oxidation. It also plays a part in the synthesis of collagen in the tendons and the myelin of the nervous system.



Iodine



HEALTH & PREVENTION

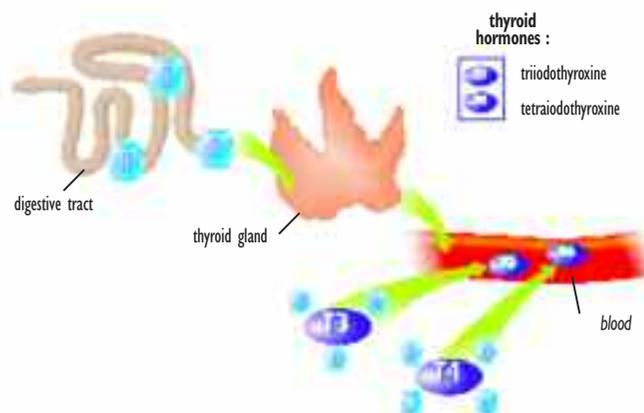
Without iodine the thyroid gland would not be able to function, and the resulting goitre would severely disrupt all metabolism.

A little background information

Iodine is a minor non-metallic mineral, qualified in nutrition as a trace element due to its low quantitative importance, although it is vital for the body.

Its role in the body

This trace element enters the body in the composition of the thyroid hormones, which it helps synthesise.



Selenium



HEALTH & PREVENTION

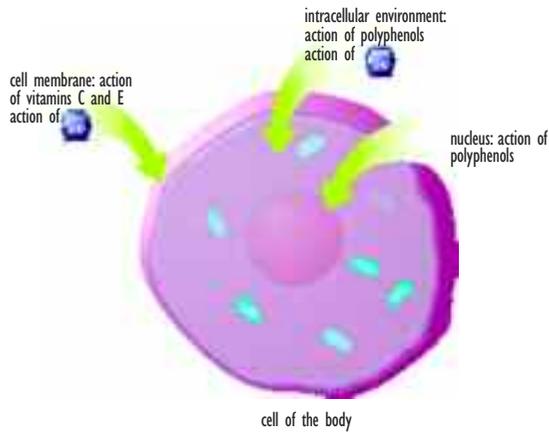
Like other antioxidants, selenium plays a complementary role in the fight against all states of oxidative stress the body is subjected to, such as ageing, intense physical effort, pollution, cancer and inflammatory diseases.

A little background information

Selenium is a minor non-metallic mineral, qualified in nutrition as a trace element due to its low quantitative importance, although it is vital for the body.

Its role in the body

This trace element is an antioxidant that acts in synergy with vitamin E to protect the cell membranes, especially those of the muscle cells.



VITAMINS

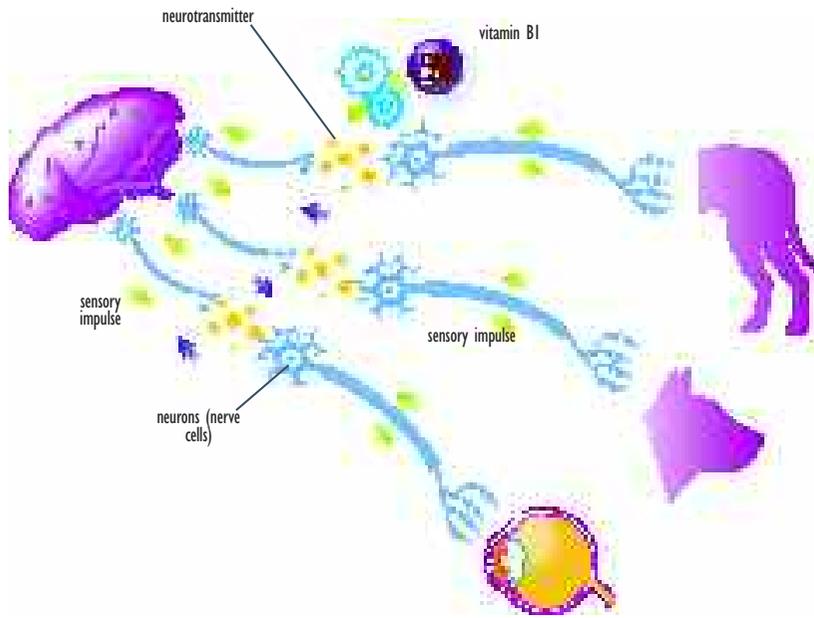
The word vitamin is derived from thiamine, which was the first substance to be referred to as such. Thiamine is an amine, which has a vital role for the body in preventing beriberi. By extension, other substances that play a similar role are also referred to as vitamins.

The vitamins are split into two families: vitamins that are soluble in fats – liposoluble vitamins (A, D, E, K) – and vitamins that are soluble in water – hydrosoluble vitamins (B, C). If they are consumed excessively, liposoluble vitamins accumulate in the body and can become toxic.

Vitamins are provided in various ingredients and they can also be included in pure form. As naturally fragile substances, sensitive to light, heat and oxidation, vitamins need to be protected during the cooking process.

Each vitamin is involved in several different functions, though to keep things simple we have listed their major roles in the body.

Fat soluble vitamins	
Vitamin A Vitamin D Vitamin E Vitamin K	vision, skin regeneration calcium and phosphorus metabolism protection against cell oxidation coagulation
Water soluble vitamins	
B1 (thiamine) B2 (riboflavin) B5 (pantothenic acid) B6 (pyridoxine) Choline B12 (cyanocobalamin) and folic acid PP (niacin) H (biotin) C (ascorbic acid)	nervous system skin growth, skin cell energy synthesis of phospholipids formation of blood cells skin, cell energy skin, hair antioxidant



“The word vitamin is derived from thiamine, the first substance to be referred to as such. Thiamine is an amine, which has a vital role for the body in preventing beriberi.”

Vitamin B1 helps synthesise acetylcholine, a neurotransmitter.

Vitamin A

also known as: Retinol

HEALTH & PREVENTION

Vitamin A deficiency causes :

- eye problems (reduced night vision, opacification of the cornea, dryness of the conjunctiva) ;
 - skin problems (dry skin, atrophy of the sebaceous glands) ;
 - reproduction anomalies ;
 - greater sensitivity to infections and pulmonary complications.
- An excess of vitamin A is also harmful to the body (joint problems, reproduction problems).

A little background information

In antiquity, liver was used to treat some visual disorders. Vitamin A was isolated in 1913 and its chemical structure was mapped in 1931. It is a long-chain alcohol that is soluble in fat. It is absorbed in the small intestine and stored in the liver. Beta carotene is a vitamin A precursor for dogs.

Its role in the body

- Vision: adaptation to darkness.
 - Reproduction: synthesis of certain hormones.
 - Metabolism: synthesis of proteins.
 - Skin and hair : regulates the growth of epidermis cells and the production of sebum.
- Vitamin A helps fight seborrhoea and the dandruff that often forms after pruritus. It acts in synergy with zinc and sulphur amino acids.



The different forms of vitamin A (eg retinol) play a role in the synthesis of the retinal pigments needed for the perception of colour (iodopsin of the cones) and night vision (rhodopsin of the rods).

Vitamin D

also known as : Calciferol
Vitamin D2 : ergocalciferol
Vitamin D3 : cholecalciferol

HEALTH & PREVENTION

Vitamin D deficiency causes :

- rickets (rare in dogs) ;
- osteomalacia (joint and muscle pains, bone fractures).

In large-breed puppies, an excess of vitamin D is more common than a deficiency. Excessive intake causes severe ossification problems (osteochondritis).

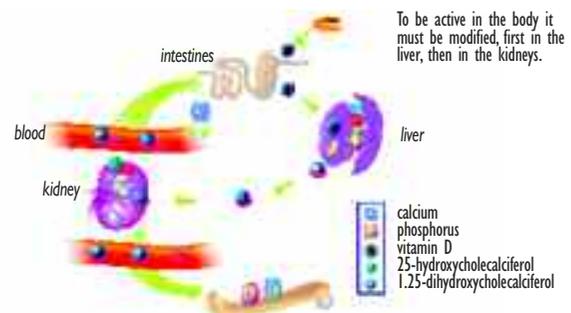
A little background information

The rickets-fighting power of fish liver oil was discovered in 1782 and vitamin D was isolated in 1932. This liposoluble vitamin is provided in the diet. It is naturally synthesised by humans and herbivores by the conversion of skin sterols under the action of sunlight. To be active in the body it must be modified, first in the liver, then in the kidneys.

Its role in the body

Vitamin D plays an essential role in the regulation of calcium and phosphorus metabolism:

- increase in the intestinal absorption of calcium and phosphorus ;
- optimisation of calcium bonding (or un-bonding) by the bone ;
- reduction in the loss of calcium and phosphorus in the urine.



To be active in the body it must be modified, first in the liver, then in the kidneys.

Vitamin E

also known as: Tocopherol

HEALTH & PREVENTION

Vitamin E is used in nutrition to prevent or treat many diseases caused by oxidative stress in the cell (physical effort, pollution) and caused by ageing (cardiovascular diseases, cataracts, degenerative neurological diseases).

A little background information

Vitamin E was discovered in 1920 as a factor in fertility and it was isolated in 1936. It was not until the eighties that its major antioxidant role for the cell was proven. Vitamin E is a generic term that covers several substances, of which alphatocopherol is the most widespread and the form that is the most active biological antioxidant in the cell membranes.

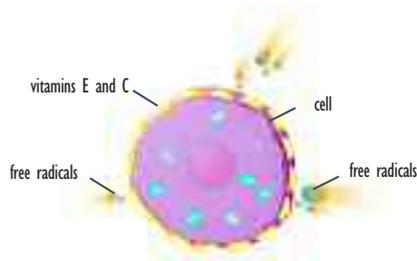
Vitamin E is stored in the body's fat tissue, in the liver and in the muscles.

Its role in the body

Vitamin E protects the cell against the action of free radicals. More properly known as "oxygen-reactive species," free radicals are natural products of the cells during biological oxidation. They are normally part of the body's natural defences, but when the balance between antioxidants and free radicals is disrupted, the result is oxidative stress.

Generally speaking, vitamin E helps :

- protect the cell membranes ;
- fight against the biological effects of stress ;
- improve the immune defences.



Thiamine

also known as:
Vitamin B1, anti-neuritic factor

HEALTH & PREVENTION

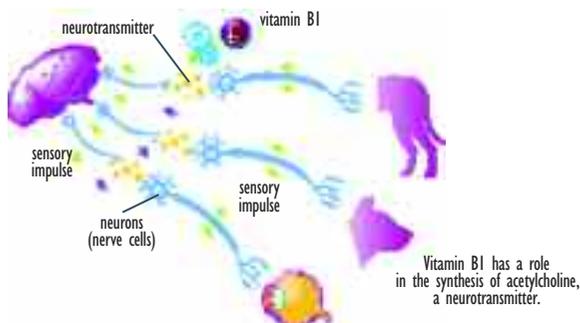
Vitamin B1 deficiency causes beriberi in humans and animals (fatigue, muscle weakness, problems with gait and vision). A balanced diet helps prevent this disease. Vitamin B1 is also an important substance in the prevention and treatment of nervous degenerative diseases and some heart diseases, among other things.

A little background information

Thiamine was the first vitamin to be discovered. Beriberi was known among rice eaters in China 2600 BC, but it was only in 1885 that its nutritional origin was proven and not until 1910 was thiamine identified. Thiamine deficiency causes the disease. This vital amine – given the name "vitamin" – is soluble in water and concentrated in the heart, the kidneys, the liver and the brain.

Its role in the body

Thiamine is an essential substance involved in many complex biochemical reactions that help generate energy for the cell. But it is above all indispensable to the functioning of the nervous system, where its role is in the synthesis of the neurotransmitter acetylcholine, which transmits sensory impulses from one neuron to the other.



Vitamin K

also known as:
Phylloquinone, Menaquinone-7 (MK-7)

HEALTH & PREVENTION

A vitamin K deficiency is responsible for digestive, nasal, skin and cerebral haemorrhages, as blood coagulation is no longer possible. In time, these minor, sometimes imperceptible haemorrhages lead to anaemia (lack of the red cells that transport oxygen in the blood). An appropriate intake through the diet helps prevent these risks.

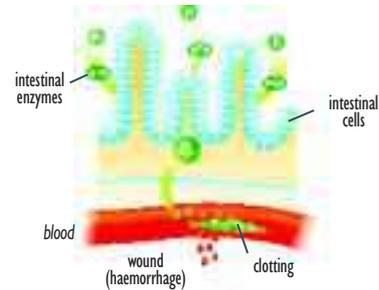
A little background information

The existence of an anti-haemorrhagic dietary factor was proven in 1929 and isolated in 1936. It was given the name vitamin K, but in fact it is a group of several similar liposoluble substances that permit blood coagulation in certain conditions through complex biochemical mechanisms.

Vitamin K is traditionally administered by injection following poisoning by anticoagulants (e.g. accidental ingestion of rodenticides).

Its role in the body

Vitamin K is a co-factor for many enzymes, which means that these enzymes cannot be active without it. As a consequence, it is essential to some blood coagulation factors. It also has a role in protein metabolism, helping to bind calcium in bone.



Riboflavin

also known as: Vitamin B2

HEALTH & PREVENTION

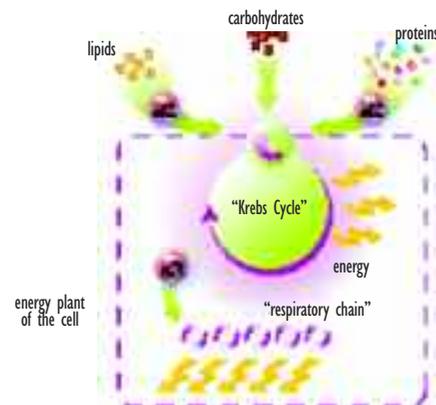
Vitamin B2 contributes to the quality of the animal's skin and coat. A deficiency produces changes to the skin around the eyes and the abdomen.

A little background information

After being confused with vitamin B1, riboflavin was finally discovered in 1937, but it was only in the eighties that a number of disease were identified with very general symptoms, caused by a deficiency of this vitamin. It is water-soluble.

Its role in the body

Riboflavin is a coenzyme, which means it is essential to the functioning of a given enzyme, with a role in many biochemical reactions, including the production of energy from fat, the catabolism of amino acids and the functioning of the cell's energy plants.



Pantothenic acid

also known as: Vitamin B5

HEALTH & PREVENTION

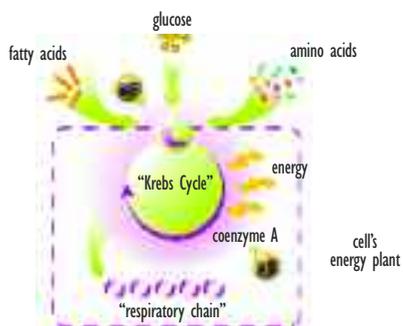
This vitamin is very common in food, so vitamin B5 nutritional deficiencies are exceptional and their symptoms are general in character.

A little background information

Lipman's discovery of pantothenic acid – composed of a pivotal molecule for the functioning of the cell's energy production (coenzyme A) – was rewarded with the Nobel Prize for Chemistry in 1953, which underlines the importance of this vitamin.

Its role in the body

Pantothenic acid enters the composition of coenzyme A, which is involved in almost every metabolism (carbohydrates, lipids, proteins) to produce energy for the cell.



Associated with other group B vitamins (niacin, choline and inositol) and histidine, a particular amino acid, pantothenic acid plays a very effective role in skin protection. It promotes the synthesis of skin lipids, especially ceramides, and helps limit skin dehydration.

Pyridoxine

also known as: Vitamin B6

HEALTH & PREVENTION

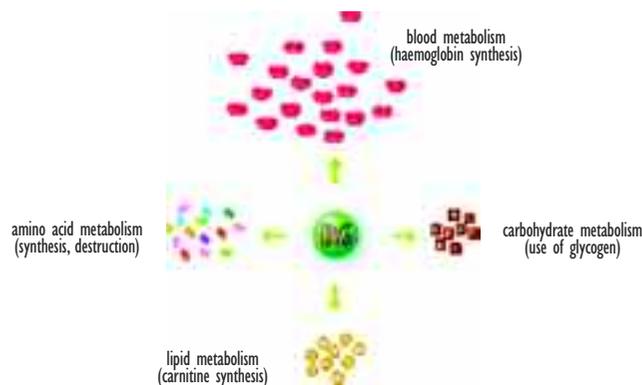
A pyridoxine deficiency is expressed by skin, nerve and blood anomalies. Pyridoxine helps prevent or treat some diseases affecting the corresponding organs.

A little background information

Pyridoxine or vitamin B6 was not discovered and isolated until the mid twentieth century and scientists continue to map its roles in the body, which would appear to be manifold.

Its role in the body

Vitamin B6 acts as a coenzyme of many enzyme systems, thus playing multiple roles in different metabolisms, especially that of amino acids.



Vitamin B12

also known as: Cobalamin

HEALTH & PREVENTION

Ageing, vegetarianism and digestive diseases are liable to generate vitamin B12 deficiencies, which must be compensated for through the diet. The same goes for some types of cancer.

A little background information

The anti-anaemic virtues of veal liver were discovered in 1925. At the time, an extrinsic dietary factor was identified, which was not isolated until the middle of the century, when it was given the name vitamin B12. It is the only vitamin that incorporates a mineral (cobalt) in its composition.

Its role in the body

Vitamin B12 is involved in many essential biochemical reactions as a coenzyme and plays a primary role in the synthesis of proteins and the production of red cells.



Niacin

also known as:
Vitamin PP, nicotinic acid, Nicotinamide

HEALTH & PREVENTION

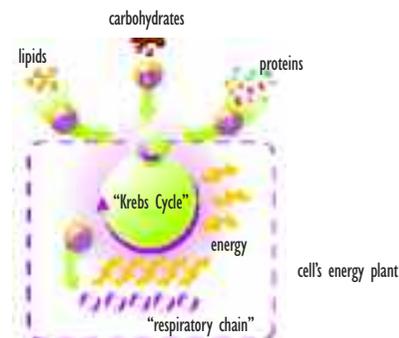
Niacin helps prevent pellagra, a serious disease combining signs of skin, digestive, psychic and haematological disorders. In dogs and cats it contributes to skin health and hair sheen.

A little background information

Vitamin PP is so named because it prevents pellagra in humans. Pellagra is a disease that makes the skin rough. A niacin deficiency in dogs causes dermatitis around the abdomen and the hindlegs, which may appear when the food is low in animal ingredients and group B vitamin supplements.

Their role in the body

The activation of niacin helps the body complete all the oxidation-reduction reactions that are essential to the production of energy from fats and sugars. Associated with other group B vitamins (pantothenic acid, choline and inositol) and histidine, a particular amino acid, pantothenic acid plays a very effective role in skin protection. It promotes the synthesis of skin lipids, especially ceramides, and helps limit skin dehydration.



Biotin

also known as: vitamin B8 or vitamin H

HEALTH & PREVENTION

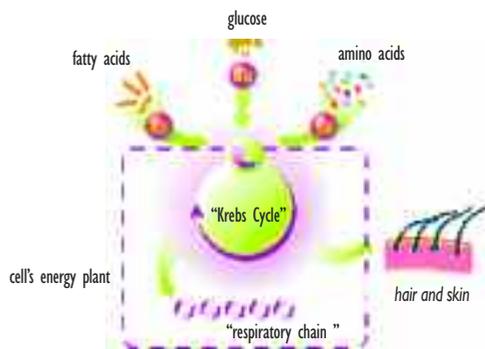
This is one of the most active vitamins for a glossy coat and healthy skin in animals. It is also directly involved in the smooth running of the nervous system.

A little background information

Biotin was discovered at the turn of the last century in research on "egg white disease": the consumption of large amounts of raw egg whites induced skin lesions, hair loss and neuromuscular disorders. The disease can be cured by cooking the whites, associated with yeast distribution. The intestinal absorption of biotin, a vitamin included in yeasts, is actually inhibited by an antibiotin substance present in raw egg whites, avidin.

Its role in the body

Biotin is involved in the catabolism (chemical breakdown) of glucose, fatty acids and some amino acids. It is essential to the synthesis of some other fatty acids.



Folic acid

also known as: Folate, Vitamin B9

HEALTH & PREVENTION

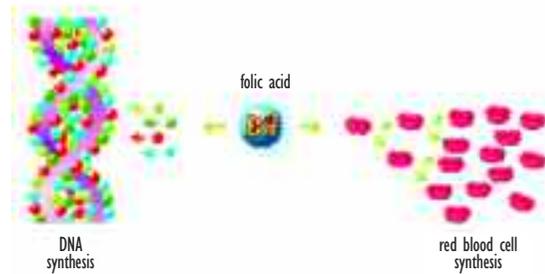
Folic acid is involved in the development of the tissues of the nervous system. A deficiency causes malformation (such as spina bifida) in the foetus. Folic acid supplementation in gestating bitches appears to have a very beneficial effect on reducing the incidence of cleft palate in newborn puppies. Folic acid also has a preventive role with respect to anaemia.

A little background information

Discovered in the middle of last century, folic acid is a water-soluble vitamin stored in the animal's liver. For some years now, it has been better known as vitamin B9, but folates used to be called vitamin M or vitamin Bc or L. casei factor.

Its role in the body

Folic acid is a group B vitamin that is essential for fast cell multiplication (e.g. foetus). It is involved in the synthesis of essential DNA components. During embryogenesis, the fetus works like a folic acid pump and a deficiency can easily develop in the female if she does not receive enough of it.



Choline & Inositol

HEALTH & PREVENTION

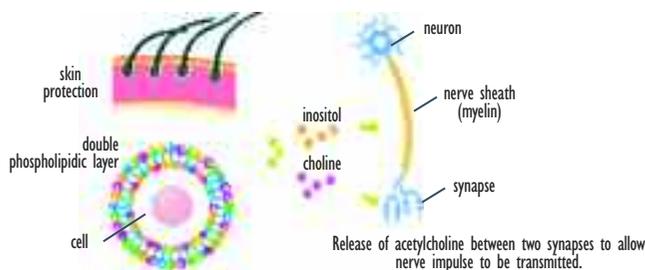
Choline and inositol help prevent the pathological accumulation of fatty acids in the liver. These substances, which can easily be assimilated in vitamins, are lipotropic factors.

A little background information

Choline and inositol are not vitamins in the proper sense of the word, even when they are attached to group B vitamins. The body is able to synthesise choline in the liver, but production is not always sufficient to cover requirements and it is wise to add it to the diet. The body's cells and the intestinal bacteria on the other hand are able to convert glucose into inositol.

Their role in the body

Choline and inositol work together to build the cell membranes. Associated to other group B vitamins and to histidine they play a positive role in protecting the skin from dehydration. Combined with phosphorus, choline becomes lecithin, a particular form of phospholipid in the cell membranes and blood lipoproteins. Choline also enters the synthesis of acetylcholine, a very important mediator in the nerve endings. Inositol is an integral part of the myelin sheath covering the nerves.



Vitamin C

also known as: Ascorbic acid

HEALTH & PREVENTION

Generally non-essential in dogs, it is important to provide vitamin C in the food when the animal's liver cannot produce enough. It helps prevent or treat diseases related to ageing, cell stress induced by physical effort and joint degeneration (arthritis) etc.

A little background information

While scurvy – vitamin C deficiency – has been known for a long time in humans (sailors consumed lemons to prevent it), ascorbic acid is not an essential vitamin in the strict sense of the word in dogs, which can synthesise it in normal conditions.

Its role in the body

Ascorbic acid is responsible for various vital bodily functions, such as:

- neutralisation of free radicals (anti-oxidative stress effect); vitamin C permits the regeneration of vitamin E, a powerful natural antioxidant itself;
- metabolism of iron;
- selected anti-infection immune reactions.



OTHERS NUTRIENTS

Nowadays, some foods have more ambitious goals than simply meeting nutritional requirements by avoiding excesses and deficiencies. In terms of health nutrition it is worthwhile examining selected nutrients that can have added value in the prevention of some diseases, in slowing down degenerative processes like ageing, or simply in improving the animal's wellbeing.

The terms "Nutraceutical" and "Health Nutrition" are sometimes used in connection with nutrients that are not essential but that can improve quality of life.

This highly heterogeneous family, which is being enlarged all the time as our knowledge of nutrition increases, comprises substances as varied as antioxidants to fight free radicals, substances to protect the joints, vegetable extracts to strengthen the skin protection, bacteria to balance the intestinal flora, etc.

The list is very long, but we have selected a few key examples.

These other nutrients can have short-term or long-term effects. Short-term goals are improving the functioning of the body or reducing undesirable phenomena, such as painful joints, skin irritations or digestive disorders. In the longer term, the goal is to minimise the incidence of external attacks and curb the effects of the ageing process on selected organs.

These nutrients work on the animal's body and mind – the cognitive capacities. The provision of antioxidants from an early age for example helps fight against the development of cataracts in the ageing dog and the appearance of some behavioural problems connected to the loss of these adaptation capacities. Many studies in humans have proven the effectiveness of antioxidants in the prevention of some neurological diseases, such as Parkinson's and Alzheimer's.



Water

HEALTH & PREVENTION

Free access to clean drinking water helps prevent dehydration, the signs of which are dry skin that lacks elasticity when pinched, blood capillaries that do not fill up easily, a higher heart rate and high fever. Dogs that are 10% dehydrated are more likely to die. It is important to monitor an animal's water intake, especially when it is getting on in years. Increased intake can be a sign of diabetes mellitus or the start of kidney disease.

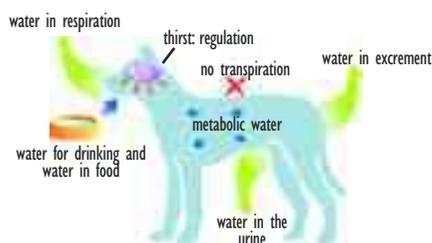
A little background information

Water (H₂O), the most well known of organic substances, is a major constituent of the animal's body (75% at birth and 60% in adulthood). It is the most important nutrient to life, in absolute and relative terms, participating in all major physiological functions. Body fat contains just 15% water, the skeleton 50%, muscles 75% and blood 83%.

Its role in the body

Water has many essential roles for life :

- ideal dispersion environment for nutrients and waste ;
- optimal environment for all biochemical reactions ;
- regulation of body temperature ;
- lubrication of the joints, the eyes and the inner ear (transmission of sounds) etc.



Antioxidants

HEALTH & PREVENTION

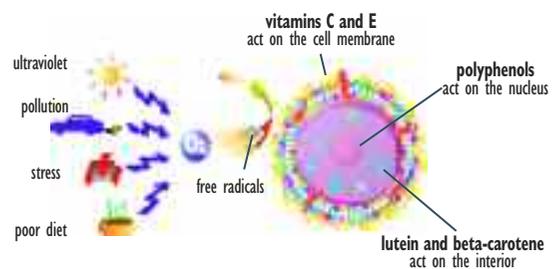
The mapping of the roles of antioxidants is one of the main subjects of medical research at this time. They include the fight against ageing, the prevention and treatment of cardiovascular disease, some cancers, nerve diseases, cataracts and problems induced by physical effort.

A little background information

Antioxidants help the body fight the destructive effects of free radicals (more properly known as "oxygen-reactive species"), which are unstable substances derived from oxygen that are being produced by the body all the time. The production of free radicals is increased during inflammation, stimulation of the immune system and exposure to toxins.

Their role in the body

Antioxidants protect the cell membranes and nucleus against free radicals, which bombard them without penetrating them. The body has a large force to defend itself against these attacks, armed with enzyme mechanisms (superoxide dismutase, glutathione peroxidase and catalase) and endogenous and dietary antioxidant substances. The disruption of this natural defence system leads to oxidative stress.



Carotenoid pigments

Examples : beta-carotene (or pro-vitamin A), lycopene, lutein and zeaxanthin.

HEALTH & PREVENTION

The carotenoids are a family of yellow-orange pigments that have an antioxidant role. Lutein and zeaxanthin are pigments in the crystalline lens and the retina that absorb UV rays and act as a filter for the retina cells. In humans, the risk of cataracts is inversely proportional to the quantity of lutein ingested. Supplementation is also recommended in people suffering from retinal degeneration (macular degeneration). Lutein specifically protects the rod cells, while zeaxanthin protects the retinal cones.

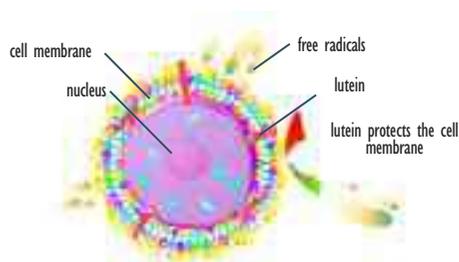
A little background information

Dogs can convert beta-carotene from vegetable sources into vitamin A.

Their role in the body

Carotenoids are natural antioxidants that stimulate the immune system. In bitches, beta-carotene promotes the synthesis of progesterone and oestrogen, hormones involved in behavioural changes during oestrus

and in preparing the uterus for possible gestation. Through these hormones, beta-carotene in food provides a favourable environment for the development and growth of the embryo. There is a synergy between the various carotenoid pigments: lutein permits the regeneration of zeaxanthin, which regenerates beta-carotene, which in turn regenerates lycopene.



Glucosamine

HEALTH & PREVENTION

This nutrient is recommended for the prevention and treatment of osteoarthritis in large-sized dogs, dogs active in sports or ageing dogs. The earlier it is added to the diet, the better the chances of limiting the inevitable degeneration of cartilage.

A little background information

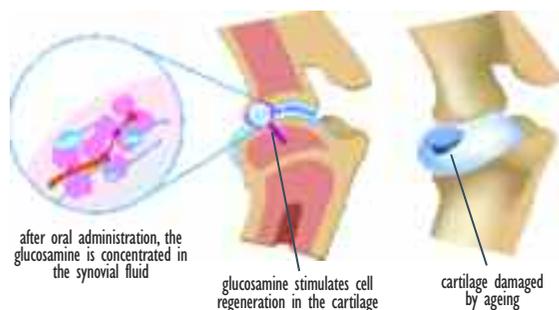
It enters into the composition of glycosaminoglycans (GAGs), which are base components in the formation of joint cartilage.

Its role in the body

Glucosamine is one of the main substances involved in the elaboration of joint cartilage and

contributes to its elasticity. Its main action consists of stimulating the formation of new cartilage. Hence it acts in perfect conjunction with chondroitin which inhibits the destruction of older cartilage.

Glucosamine has minor anti-inflammatory effects.



Polyphenols

HEALTH & PREVENTION

Polyphenols form a family of major antioxidants, which protect the cell membranes and DNA, preventing some mutations that cause cancer.

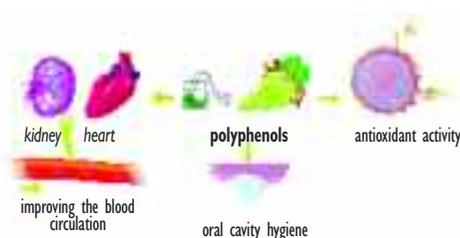
A little background information

Some epidemiological studies in humans have shown a positive correlation between the regular moderate consumption of red wine - a concentrated source of polyphenols - and a lower incidence of cardiovascular disease (e.g. atherosclerosis).

This is currently known as the French paradox. Dogs on the other hand are rarely affected by atherosclerosis, as they possess less LDL cholesterol ("low-density lipoprotein cholesterol") than humans.

Their role in the body

The major positive of polyphenols is their impact on free radicals, limiting the harmful effects of oxidative stress. The incorporation of green tea polyphenols in the diet can improve oral hygiene. Some compounds inhibit the growth of dental plaque bacteria, which cause periodontal disease, a common complaint among ageing animals. The positive effect of flavonols, a special category of polyphenols, has also been observed in kidney and heart disease. They stimulate nitric oxide production, relaxing the smooth muscle fibres of the blood vessels. Daily administration of flavonols is associated with a fall in blood pressure.



Chondroitin

HEALTH & PREVENTION

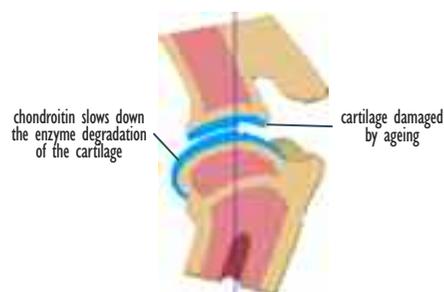
This substance prevents and treats osteoarthritis in large-sized dogs, dogs active in sports or ageing dogs. The earlier it is added to the diet, the better the chances of limiting the inevitable degeneration of cartilage.

A little background information

Chondroitin sulphate is a carbohydrate that enters the composition of glycosaminoglycans (GAGs), which are base components in the formation of joint cartilage. GAGs are sulphate derivatives with a high molecular mass that control the water retention capacity of proteoglycans. In the cartilage matrix GAGs contribute to the nutrition of cartilage.

Its role in the body

Chondroitin is one of the main GAGs, which are essential components of cartilage. They contribute to its elasticity and absorb impacts suffered by the joints. Its main action is inhibiting the effect of the enzymes that cause the permanent destruction of cartilage. Its action perfectly complements that of glucosamine, which promotes the production of new cartilage.



GLM

Green-Lipped Mussel

HEALTH & PREVENTION

The Green-Lipped Mussel (GLM) extract has interesting properties for the prevention and treatment of osteoarthritis. Several studies show a reduction in pain and an improvement in joint mobility in canine patients when it is administered. GLM helps limit inflammation, preserve the integrity of the cartilage and fight against oxidative lesions.

A little background information

Fresh, raw mussels are traditional ingredients in the diet of the Maoris living along the coast of New Zealand. The incidence of osteoarthritis is lower among these people than those living inland, which led to a number of studies on the phenomenon and the anti-inflammatory properties of this mussel were soon proven.

Its role in the body

The mussels harvested along the coast of New Zealand benefit from a constantly renewed supply of marine nutrients brought by the current. The mussels act as a sea-water filter, tending to retain the essential nutrients. As a result, GLM contains a large number of potentially active substances that fight arthritic inflammation: omega 3 fatty acids, chondroitin, glutamine, vitamins E and C and trace elements (zinc, copper, manganese).



GLM exhibits some very potent anti-inflammatory effects in animals suffering from painful joints (osteoarthritis).

Aloe vera

HEALTH & PREVENTION

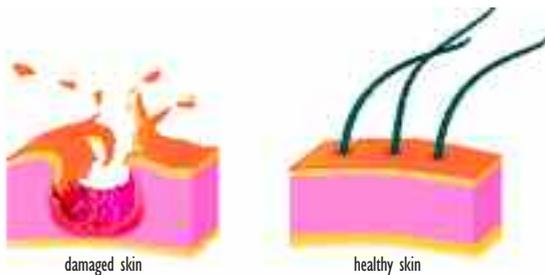
Aloe vera has several properties that combine to have a very positive action on the skin. It activates the synthesis of collagen, which is a very useful healing promoter when used locally on burns. Aloe vera also has an anti-inflammatory action, stimulating the immune function (preventing local infections) and fighting against cell oxidation mechanisms.

A little background information

The therapeutic virtues of aloe vera were utilised in 1500 BC by the ancient Egyptians to treat burns, infections and skin parasites. In Latin, aloe means plant, while vera means true.

Its role in the body

Aloe vera exercises its healing properties in localised application or by oral administration. These properties are probably due to a synergistic effect of specific polysaccharides – like acemannan – and high concentrations of amino acids, vitamins E and C, zinc and essential fatty acids.



The effects of aloe vera can be exercised by local application but its administration in the diet means that its stimulating skin healing property can also be made use of.

Fruit acids

(Garcinia cambodgia)

HEALTH & PREVENTION

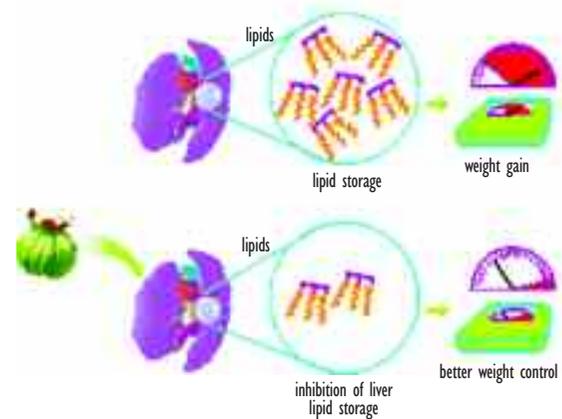
Extracts of Garcinia Cambodgia are used to limit lipogenesis in humans.

A little background information

The active ingredients are hydroxycitricates (alpha hydroxy acid), commonly known as “fruit acids.”

Their role in the body

The expected benefits are inhibition of lipogenesis in the liver and reduction of energy ingestion. The mechanisms of action have yet to be clearly established.



Curcumin

HEALTH & PREVENTION

Curcumin is one of the substances in turmeric extracts with recognised beneficial effects on the skin and skin lesions. Its other benefits include its protective action on the liver and its anti-amyloid effects, which can protect humans from atherosclerosis. The latest results from the laboratory would indicate that it also has antitumour properties.

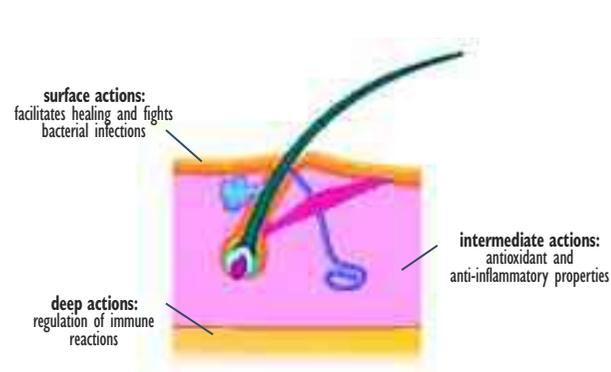
A little background information

The colour of curcumin is bright yellow-orange and it is used in the food industry as a colorant, in mustard for instance.

Its role in the body

Curcumin acts in several different ways to facilitate the skin healing process:

- it has antioxidant and anti-inflammatory properties
- it facilitates the healing process.
- it regulates immune reactions, especially in atopic and allergic states.
- it has an antibacterial action.



Probiotics

HEALTH & PREVENTION

A probiotic is a living organism administered orally with beneficial effects on the balance of intestinal flora that can help prevent or treat digestive problems in animals. The regular consumption of probiotics can even have a beneficial impact on health in general and immunity in particular.

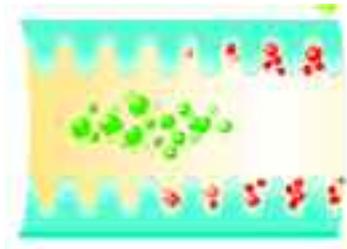
A little background information

More than 90% of the body's cells are actually bacteria in the digestive tract. The colon can contain up to 10^{12} (ten followed by twelve zeros) bacteria per gram!

Their role in the body

Probiotics are "beneficial" bacteria that are able to colonise the intestine at the expense of potentially pathogenic bacteria if they are ab-

sorbed with the food. In humans, the regular consumption of fermented milk products (like yoghurt) is based on the same principle. A special strain of lactobacilli (*Lactobacillus acidophilus*) can accelerate the recovery of dogs that have suffered from clinical enteritis caused by bacteria.



In the intestine, probiotics act as a regulator of bacterial flora in general, preventing some bacteria from proliferating, thus limiting the risk of infection or undesirable fermentation.



Zeolite

HEALTH & PREVENTION

The incorporation of zeolite in the food is a good way of preventing and treating diarrhoea. Zeolite absorbs the surplus water in the digestive tract that characterises diarrhoea, but it also binds certain toxins responsible for the increased secretion of water towards the intestinal lumen.

A little background information

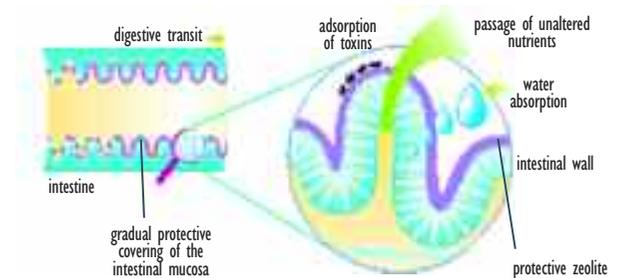
Zeolites are clays, natural minerals composed of microscopic leaves of aluminium silicate. They have been used for some years in the treatment of diarrhoea in the same way as smectite, another clay. Zeolites are insoluble mineral salts that, compared with other clays, are highly porous – which means they can absorb 50% of their volume – and have a large surface area – more than 100 m^2 per gram.

Their role in the body

Zeolites have three main effects in the animal's digestive tract :

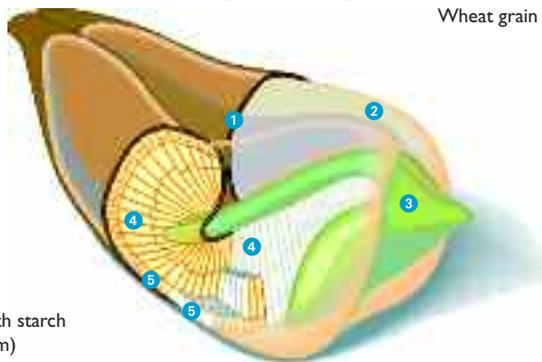
- they form a protective coating on the surface of the intestinal mucosa ;
- they absorb surplus water ;
- they adsorb toxins.

Zeolites help improve the sturdiness of bone by facilitating the absorption of calcium. They do not disrupt the digestive absorption mechanisms.



Origin of wheat gluten

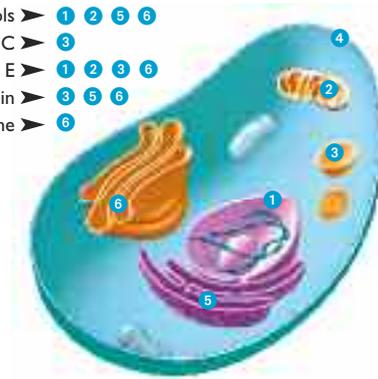
Wheat grain



1. Bran
2. Kernel
3. Germ
4. Cells saturated with starch (starchy endosperm)
5. Aleurone cells (source of gluten)

Sites of action of antioxidants

- Polyphenols ➤ 1 2 5 6
- Vitamin C ➤ 3
- Vitamin E ➤ 1 2 3 6
- Lutein ➤ 3 5 6
- Taurine ➤ 6



1. Inside nucleus (DNA)
2. Mitochondrion
3. Lysosome
4. Cell membrane
5. Endoplasmic reticulum
6. Golgi apparatus

A very diverse intake of antioxidants can act synergistically to better protect the cell and to optimise protection against oxidation.

MINI GLOSSARY OF NUTRITION

Carbohydrates

Organic compounds whose role is essentially energy-related, although some carbohydrates still play a structural or hygienic role in the digestive tract. They are split into two categories according to their function :

- simple carbohydrates, aka sugars (glucose, fructose, saccharose, lactose, etc) are found in fruit, flour, milk, sugar and sugar products
- complex carbohydrates, which include starch (energy source) and dietary fibre (needed for general hygiene in the digestive tract).

Energy

In order to function smoothly, an animal's body needs the energy contained in its food (whether animal or vegetable in origin). During digestion, food is broken down into nutrients that, once absorbed and metabolised by the body, provide energy. In a premium dog food:

- 1g proteins provides about 4 calories,
- 1g carbohydrates provides about 4 calories (excluding fibre),
- 1g lipids provides about 9 kilocalories.

Energy requirements

The varying amount of energy required to compensate the body's daily energy losses. This amount depends on age, physiological status (growth, gestation, lactation, etc.), physical activity, size of animal.

Enzyme

An organic molecule with the ability to speed up or trigger biochemical reactions in the body.

Dietary fibres

Components found in plants, including cellulose, hemicelluloses and pectins, that cannot be assimilated by the body. Although of no direct nutritional value, dietary fibres are nevertheless very important: insoluble fibres facilitate intestinal transit while soluble or fermentable fibres help protect the intestinal wall and combat bacteria that cause diarrhoea.

Ingredients

The "visible" elements (the raw materials of food) in a recipe. An ingredient can be a source of several nutrients, and improved by eliminating its components with no nutritional value.

Kilocalorie

Also known as calorie. The unit of energy used in calculating an animal's energy requirements and the food's energy density. 1 kilocalorie = 4.18 kilojoules.

Lipids

The main component of fat, lipids have a high energy content in a small volume (fats, oils). They also play a functional role in the body by means of the vitamins dissolved in them (vitamins A, D, E and K) and the presence of essential life-sustaining lipid molecules (essential fatty acids).

Metabolism

All the biochemical processes occurring in a living being so that it may develop and survive. Some reactions make construction processes possible by means of synthesis (anabolism), others are degradation or breakdown processes (catabolism).

Micronutrients

Nutrients present in tiny amounts in food (vitamins, trace elements).

Minerals

In a food, anything which is not organic matter or water consists of minerals. Collectively they are also referred to as ash. According to their level of incorporation in food, one calls them "macronutrients" (eg: calcium and phosphorus) or "trace elements" (iron, copper, zinc, etc.).

Nutrients

Simple mineral elements or organic molecules that are the components of food, each one of them being essential to the functioning of the body. According to the condition of the latter, preparing a balanced food involves making a complex jigsaw, each piece of which is a different nutrient.

Nutrients are divided into families: proteins, lipids, carbohydrates, minerals, vitamins, without forgetting the most important one of all: water. Nutrients are prime elements, just like there are prime numbers, from which all concept of a balanced diet must derive.

Nutrition

All the phenomena by which the body breaks down food to absorb and use it for the purpose of development and survival in a given environment. Nutritional balance in food:

- provides the energy constantly required by the body,
- provides the materials needed to continuously build and renew organs,
- provides small amounts of those substances that are essential to the smooth functioning of the biological phenomena permanently occurring in the cells.

Proteins

Proteins are the only substances in the body that contain sulphur. They provide life-essential elements: amino acids, which are the building blocks of the cells that make up the body. They have a number of vital functions allied to growth, reproduction and immunity to name but three. Proteins are also required to manufacture the enzymes that trigger chemical reactions in the body.

Vitamin

A vitamin is an organic substance needed by the body, with no energy value of its own, and that the animal cannot synthesize in sufficient amounts to function normally. Therefore, an adequate daily supply of it must be provided by the diet.



Basic nutritional requirements

The maintenance level of nutrition represents the minimum nutritional requirement of an adult dog with a “normal” activity level, living in an ambient temperature of around 20°C and without exceptional energy expenditure related to a specific physiological condition, such as gestation, lactation or growth. The maintenance nutritional requirement of a medium-sized dog (10-25 kg) serves as the benchmark. This is then adapted to the individual, based on size or breed, activity level, age, physiological condition and health.

Maintenance energy requirement

The first step in the process is establishing the dog’s energy needs, which is what it needs to cover its vital functions and lead a reasonably active life. This is known as the maintenance energy requirement (MER).

This is based on the dog’s metabolic weight ($W^{0.75}$, where W is the weight in kg) calculated as 130 kilocalories of metabolisable energy per kilogram of metabolic weight. The term metabolic weight is used for dogs to enable the comparison of animals whose weight can vary between 1 kg and 100 kg, depending on the breed but also on the individual. A dog’s energy requirement does not develop in tandem with its weight. The maintenance energy requirement of a 30-kg dog is not three times greater than a 10-kg dog’s, far from it. This energy must be provided through the food.

As stated above, MER is measured at a comfortable ambient temperature, so energy intake will always have to be adapted to the climatic conditions. A dog that lives outdoors in winter will have an MER that is double the normal value.

Good maintenance food: respecting the dietary balance

Once the energy requirement has been calculated, the various nutrients will be added to the formulation in such a way as to avoid any deficiency or excess, both of which could have adverse effects on the dog.

When feeding an adult dog in the maintenance stage of its life the main goals are:

- Keeping it at its healthy weight by using highly digestible ingredients and keeping the fat content at a sensible level

Maintenance energy requirement of an adult dog (MER), expressed in kcal of metabolisable energy per day (kcalME/d)

Weight of the dog kg	MER kcalME/d
2	220
3	295
4	370
5	435
7.5	590
10	730
15	990
20	1 230
25	1 455
30	1 665
35	1 870
40	2 065
45	2 260
60	2 800
80	3 475

Changes in the maintenance energy requirement of a dog living outdoors, depending on its lifestyle and the season

Increase in calories ingested (%)	Continental climate	Oceanic climate	Mediterranean climate
January	100	60	30
February	100	60	30
March	70	30	15
April	40	15	10
May	10	5	0
October	10	5	0
November	40	15	10
December	70	30	15

- Preserving the health and beauty of the skin and coat with the enriched provision of essential fatty acids, essential amino acids and B vitamins.

This food must be properly balanced in terms of nutrients. The following proportions serve as a starting point for a medium-sized adult dog:

- 25% protein
- 12% fat
- 5-7% dietary fibre
- 1.1% calcium
- 0.8-0.9% phosphorus

Quantity is not the only factor, of course. The dog also needs to be able to digest the ingredients easily. Digestibility is strongly related to quality. The higher the quality, the more digestible the food will be.

The figures here are just average values and do not correspond to the needs of all dogs. Size, physiological condition and lifestyle are all variables in the equation, which will have to be fine-tuned to find the energy requirement and the nutritional requirement of an individual dog.

“The first step in the process is establishing the dog’s energy needs, which is what it needs to cover its vital functions and lead a reasonably active life. This is known as the maintenance energy requirement (MER).”

Digestibility

The digestibility of a food, known as the coefficient of digestibility (CD), is an expression of how well the dog digests the food it eats, expressed as a percentage of the food eaten which is digested, absorbed and utilised by the body. While digestibility can be regarded as a fundamental criterion of a food’s nutritional quality by both the veterinary nutritionist and the owner, these two people will take two wholly different approaches.

For nutritionists, digestibility is a measure of what the dog retains in its body (digests) compared with what it consumes. For owners, digestibility is a matter of the quantity, frequency and quality of defaecation.

Two parameters determine the overall appearance of dog faeces, reflecting the nutrition it takes in and its condition:

- 1) The digestibility of dry matter (DM) in a food, expressed as the coefficient of digestion (CD):

$$CD, DM = \frac{DM \text{ ingested} - DM \text{ excreted}}{DM \text{ ingested}}$$

So, if a dog consumes 100 g of dry matter (which is what is left of the food after the water is removed) and evacuates 20 g of dry matter in its faeces, the digestibility of the food is 80%.



If the dog retains 85 g of the food rather than 80 g, digestibility will be 85%, improved by five points, which represents a reduction in excreted dry matter from 20% to 15%, i.e. a reduction of 25%. A slight improvement in the digestibility of a food (5%) can therefore lead to a large reduction in the daily quantity of faeces (one quarter), which explains why serious manufacturers are conducting research in this field.

- 2) The water content of the faeces (65-75%) is also important. A drop in the water content will significantly reduce their volume and improve their consistency. The inclusion of different types of dietary fibre in the food will help achieve this.

Many parameters can affect the digestibility of a food, not least the dog itself. If a Beagle and a Fox Terrier are given the same food, the Fox Terrier’s digestibility will be about five points better than the Beagle’s. Likewise, the quantity of the food consumed also has an impact on digestibility. The greater the quantity at a single sitting, the lower the digestibility, which is why the splitting of the daily feeding amount into several sittings is often recommended for dogs with a sensitive gut or with a high nutritional requirement (sporting activity or suckling, for instance).

Digestibility is accordingly a highly significant factor for dogs, playing a major role in determining whether a food is good or bad.

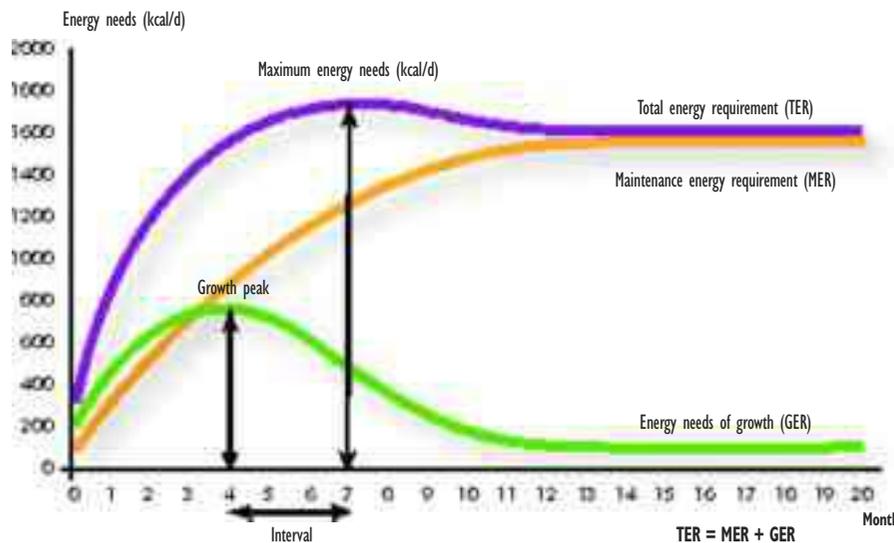


Adapting the dog's food

The figures above correspond to the nutritional requirements of a young or mature adult dog of medium size not in a reproductive phase. These requirements can be rather lower (ageing, neutered or inactive animal) or much higher (growth, gestation or sporting activity), so it is important to adapt intake to the individual. The choice of food will be guided by these considerations.

Adapting the food to the dog's age

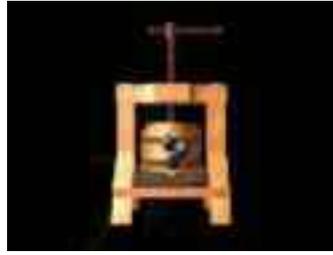
Growing puppies, adults in the maintenance phase and ageing dogs all have different nutritional requirements. As a consequence, a diet needs to be adapted in every stage of life to ensure the dog remains as healthy as possible.



The puppy's energy requirements are higher than those of an adult dog. It must maintain its body and grow at the same time (GER).
 Example of growth of a medium-size puppy.
 MER = maintenance energy requirement; GER = growth energy requirement; TER = total energy requirement; kcal ME/d = kilocalories of metabolisable energy per day.

Nutrition and puppies

Whatever the breed, a puppy's requirements in terms of energy, protein, minerals and vitamins are much greater than those of an adult dog. It needs energy and nutrients to maintain its body, but also to grow and build it. Its digestive functions are different to an adult's, too. It is much less able to digest starch, for example. Similarly, the puppy's teeth – starting with the milk (first) teeth, then the permanent teeth – are an important factor that needs to be taken into account when choosing the size, form and hardness of kibbles. The formulation of puppy food must take all of these factors into account. To cover these hefty energy requirements the food must have a high-energy content (expressed in kilocalories of metabolisable energy per 100 g of food), while concentrations of all other nutrients will also be higher than normal in a specially formulated growth food.



The oil extracted from borage seeds is very rich in essential fatty acids (GLA).

Nutrition and ageing dogs

Good care is essential if a dog is to remain in good health throughout its life. Regular physical activity will ensure that the dog maintains its muscle mass and controls its weight. The condition of the teeth and the coat should also be monitored. In terms of energy requirement, intake should be adapted to the animal's activity level, which depends on its age and any health concerns. An arthritic dog will move around less and so expend less energy, putting it at risk of unhealthy weight gain. A low energy diet is only imperative if the dog is overweight. It is very important not to simply assume that reduced enthusiasm for physical exercise is a normal consequence of ageing. The dog must be examined to check whether it is suffering from a chronic disease. Regular weighing and medical check-ups are the best way to ensure that ageing-related problems are detected at the earliest opportunity.

Ageing is also accompanied by the modification of digestive capacities and particular nutritional requirements, so food for ageing dogs should have the following characteristics:

- Higher vitamin C and E content. These nutrients have antioxidant properties, protecting the body's cells against the harmful effects of the oxidative stress linked to ageing.
- High-quality protein. Contrary to a widely held misconception, lowering the protein content gives no benefit. Older dogs are less efficient at using dietary protein than younger dogs. Another fallacy in some countries is that protein is responsible for kidney failure. Improving protein

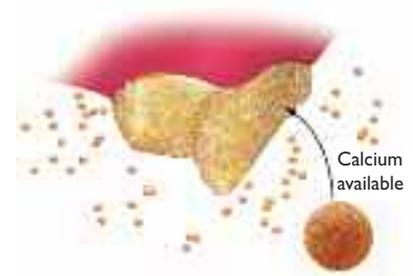
quality is the main goal here. Reducing the phosphorus content is the only way of slowing down the gradual deterioration of kidney function, which can be monitored by regular biochemical tests.

- Higher proportion of the trace elements iron, copper, zinc and manganese to maintain good condition of the skin and coat. Their inclusion in a special chelate complex in the form of organic salts, which are much easier to assimilate than mineral salts, makes it more likely that they will be used in the metabolism of dogs with a less effective digestive system.
- Higher quantity of polyunsaturated fatty acids (soy oil or, even better, borage oil, fish oil) to maintain the quality of the coat. Dogs normally produce these fatty acids, but ageing can affect this physiological process.
- Slightly higher fibre content to act as “ballast”. This will help limit the risk of constipation, which can accompany the reduction in the ageing dog's physical activity.

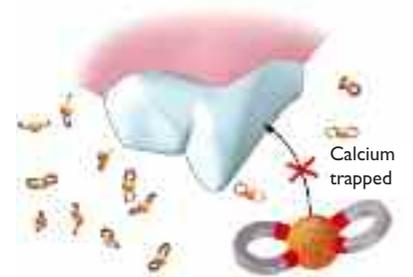
As they age, dogs increasingly suffer from teeth problems. To ensure they continue to eat in sufficient quantities, the shape, size and hardness of their kibbles need to be tailored to their jaw.

“A diet needs to be adapted in every stage of life.”

Without sodium polyphosphate



With sodium polyphosphate



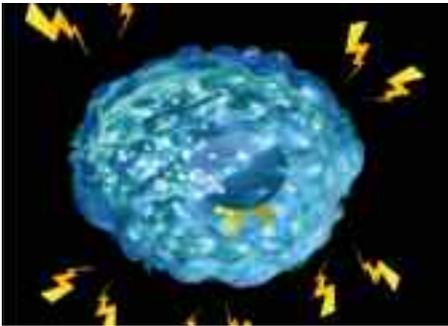
Foods for ageing dogs

A dog that reaches three quarters of its expected lifespan is regarded as an ageing dog. The signs of ageing will start to become more and more apparent and therefore easier to recognise from 12 years for a small dog, 10 years for a medium-sized dog and 8 years for a large dog.

Dietary measures to help combat the signs of ageing need to be intensified when dogs enter this life stage. This will help them stay healthy for as long as possible. The following factors are especially important:

Antioxidants: vitamins E and C, beta-carotene

• Helping to combat cell ageing



Cell damaged by oxidation due to free radicals.



Free radicals neutralised by antioxidants. Protected cell.

• Improving immunity and increasing resistance to infection

vitamins E, C, beta-carotene, zinc, vitamin B6

Vitamins E, C and B6, zinc and beta-carotene support and stimulate the immune system, which is weaker in ageing dogs.

• Improving the beauty of skin and coat

essential fatty acids: fish and borage oil, zinc

The health and beauty of the skin and hair is dependant on the adequate and regular intake of specific substances. Borage oil has a positive effect on the sheen of the hair and the elasticity of the skin. Zinc (in chelated form to improve assimilation) is recommended for ageing dogs with a coat in poor condition.

• Combating development of cataracts, degenerative diseases, tumours

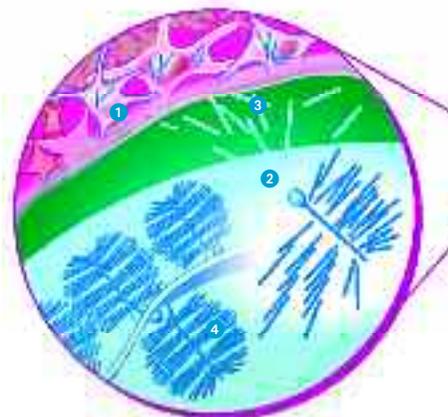


vitamins E, C and beta-carotene

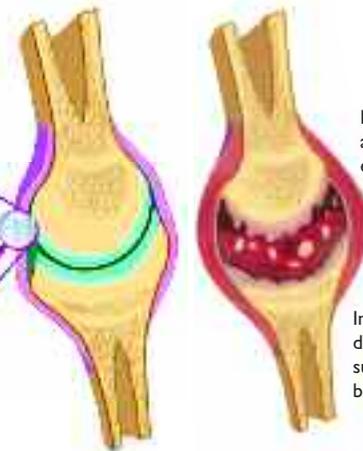
Vitamin E plays a role in preventing degenerative diseases of the nervous system. Together with vitamin C and beta-carotene it helps prevent cataracts. Vitamin B6 is indicated for neuromuscular deficiencies in ageing dogs.

• Alleviating arthritis

glucosamine and chondroitin sulphate, essential fatty acids



1. Synovial cells
2. Cartilage
3. Chondroitin sulphate
4. Glycosaminoglycans (GAGs)



- Epiphyses approach each other
- Cartilage lesion
- Increased bone density of the subchondral bone plate

Chondroitin sulphate slows down the enzymatic degradation of cartilage. Glucosamine stimulates the synthesis of cartilage (cell regeneration). Chondroitin sulphate and glucosamine help improve joint mobility in ageing dogs.

Ageing dogs do not form a homogenous group. A healthy ageing dog should not be on the same diet as an ageing dog with health issues. Regular check-ups and health screens will ensure that any kidney, heart or other problems are detected at the earliest opportunity. In many cases, diet can play a role in preventing or at least limiting the expression of the clinical symptoms of chronic disease in ageing dogs. The veterinarian will be able to recommend the most appropriate food.

High Digestive Security: prevention through nutrition

On average, digestive problems account for one in every five visits to the veterinarian. In many cases, an appropriate nutritional response will be enough to end the symptoms. The veterinarian is in the best possible position to prescribe a food that provides this response.

• Protecting the intestinal mucosa

Clay has three very beneficial properties:

- Coating ability, reinforcing the protective power of the mucus barrier
- Absorbing ability, neutralising substances that are toxic for the intestinal mucosa
- Combating infectious agents by supporting the intestinal flora by providing nutrients that promote the growth of bacterial populations favourable to the optimal functioning of the digestive tract, e.g. fructo-oligosaccharides (FOS), which promote the proliferation of lactobacilli.



The intake of all energy, water and essential nutrients is dependent on the proper functioning of the digestive system.

• Facilitating starch digestion

Rice is the most digestible cereal used in dog food. Even if the starch in the food is extremely digestible and very well cooked, it is always a good idea to limit the starch content to 25% by dry matter.

Fibre promotes healthy digestion

The 500 species making up the bacterial flora of the digestive tract must live in harmony. Highly fermentable fructo-oligosaccharides (FOS) maintain the equilibrium of intestinal flora.

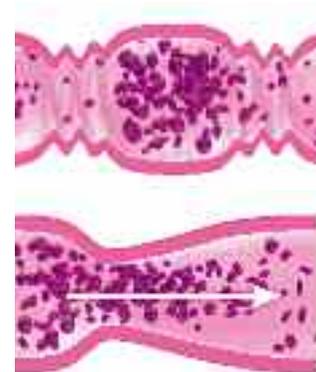
Intestinal transit must be slow enough to allow absorption of nutrients, but fast enough to avoid constipation.

• Preventing too high an intake

The energy concentration of the food will have to be adapted to the animal's requirements, based not only on its age, but its size too, which is a very important criterion.

Digestive sensitivity increases with age

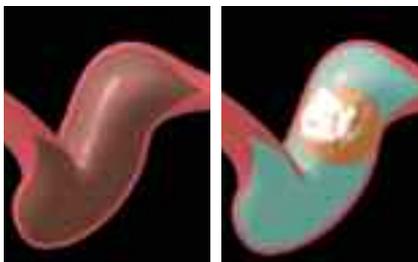
Decrease in digestive capacity of the digestive tract. Increased frequency of diseases of the digestive tract.



Nourishing the colon cells

The integrity of the mucosa depends on the regular intake of essential nutrients through the diet.

Volatile fatty acids produced when fibre (FOS) is utilised nourish the intestinal cells and ensure they can regenerate.

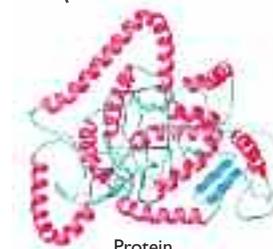


Without soluble fibre, dissolution of the bolus in the stomach and intestinal transit is accelerated.

By providing "ballast", beet pulp (in yellow), which is moderately fermentable, this acts as a regulator of intestinal transit.

• Regulating intestinal transit

Beet pulp is a good source of fibre if the dog has a sensitive digestive system. It slows down digestive transit slightly without compromising digestibility. Because it is only moderately fermentable it is not totally degraded in the gut, which enables it to contribute to motor control by providing "ballast".



Protein

• Limiting protein fermentation

The choice of protein sources has a clear impact on digestive tolerance. Casein is a reference protein, as is fishmeal.

Adapting the food to the dog's size

If you're looking for an example of the range of sizes among dogs, imagine a Great Dane next to a Chihuahua. This huge difference in size also has consequences for how their bodies work. Duration and magnitude of growth, size of jaws and teeth, energy requirement and physical activity, relative weight of the digestive tract, predisposition to certain diseases and

average life expectancy are all affected by the dog's size, and all these factors must be taken into account when choosing its food. Obviously, the main principles are the same, but the differences between dogs of different sizes and sometimes between breeds means that tailoring the food to specific demands is beneficial in every stage of life.

Fundamental differences between large and small dogs

Differences	Mini (Chihuahua)	Variation factor	Maxi (St Bernard)
Duration of growth	8 months	3 times as long	24 months
Magnitude of growth	weight at birth x 20	5 times as big	weight at birth x 100
Size of teeth	length of a canine: 4-5 mm	3 times as long	length of a canine: 5-16 mm
Energy requirement	132 kcal/kg of body weight	3 times as much per kg	45 kcal/kg of body weight
Relative weight of the digestive tract	7 % of body weight	more than twice as big	2.8 % of body weight
Life expectancy	> 12 years	almost half as long	7 years

Tailoring nutrition to the puppy's size

Differences in size between puppies are noticeable as soon as they are born. A Poodle whelps one, two or three puppies each weighing 150-200 grams (around 5% of the mother's weight), whereas each of the eight to ten puppies in a Newfoundland's litter weigh 600-700 grams (1% of the mother's weight). While a giant-breed adult weighs 25 times as much as a small-breed adult, in newborns the same ratio is just six to one. This explains why giant breeds have to grow much more and for much longer than small breeds. The duration and magnitude of growth are in proportion to the final weight of the body.

Small, medium and large breeds

The variation in weight and size between the various dog breeds (ranging from 1 kg to 100 kg) is one of the biggest in the natural world. Adult dogs are classified into one of four groups: small breeds weighing less than 10 kg, medium-sized breeds weighing between 11 and 25 kg, large breeds weighing between 26 and 45 kg, and giant breeds weighing more than 45 kg. This size variation involves morphological, physiological, metabolic and behavioural differences between the various breeds.

Average lifespan is 15 years for small breeds, 13 years for medium-sized breeds, 10-11 years for large breeds and often less for giant breeds.

Magnitude and duration of growth: by the time it reaches adulthood, a member of a small breed will weigh twenty times its birth-weight, a ratio that is fifty in medium breeds

and eighty or more in large breeds. A small breed reaches adulthood at 8 months, whereas a large breed does not do so until between 18 and 24 months.

The weight and number of puppies in a litter also differ. Small-breed females will whelp on average three puppies, each weighing almost 5% of their mother's body weight, whereas large breed females will whelp between eight and twelve puppies, each weighing barely 1% of their mother's body weight. Proportionally, the size of some organs differs too. For example, relatively speaking a large breed dog's digestive tract is half the size of a small dog's.

The energy requirement of a 50 kg dog is not five times greater than that of a 10kg dog but instead it is 3.3 times greater, because the dog's metabolism is adapted to its weight.

The energy requirement depends not on body weight but on metabolic weight (75% of the former), which takes account of body shape and surface area.

Temperament also differs with size. Large breeds are generally calmer than small breeds, although they do need more living space.

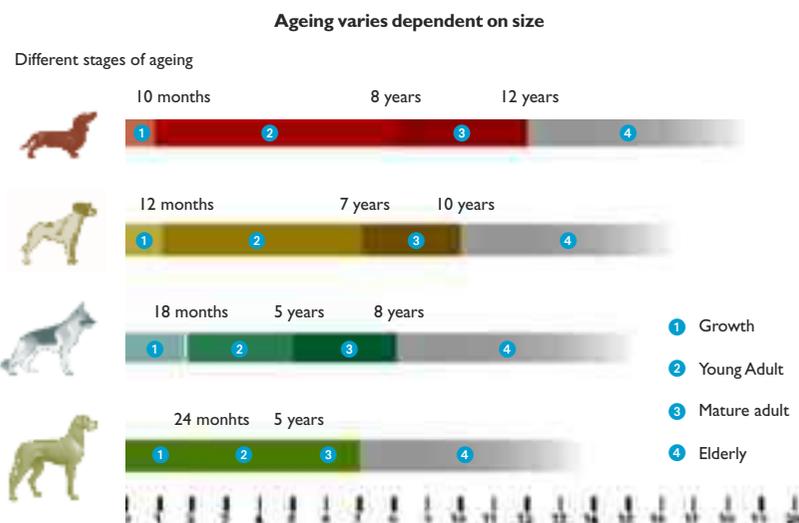
Some hereditary diseases, such as hip dysplasia, are more likely to affect large dogs.

These differences between small, medium and large breeds have major consequences for health, diet and relationships between humans and dogs.

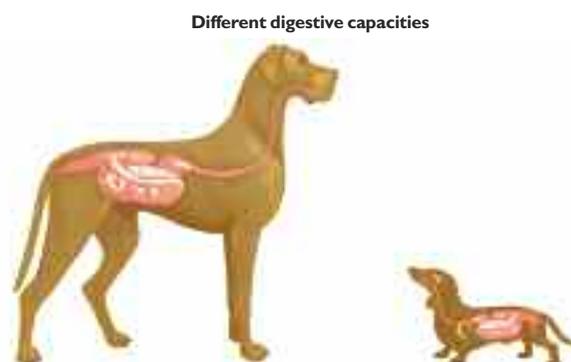
- By the age of three months, a small-breed puppy weighs half of its adult weight. A large-breed puppy will not reach this milestone until it is five or six months old.
- A Poodle reaches its adult weight around eight months of age. By that time it weighs twenty times its birthweight. A Newfoundland will continue to grow for at least another ten months, and by the time it is fully grown it will weigh around a hundred times what it did at birth.

The size of the breed demands special adaptation.

- At 3 months old, a Terrier puppy weighs 2-3 kg and a giant breed puppy 18-20 kg. One obvious difference will be the size of their jaws – the Terrier puppy will find it difficult to grasp a medium-sized kibble, which will often result in it rejecting its food, whereas the giant breed puppy will spill a lot of its food. It is therefore a much better idea to serve kibbles that are tailored to the size of the breed, be that small, medium, large or giant.
- Large-breed puppies, whose growth period is long and intense, are especially susceptible to skeletal and joint problems, including limb defects, bone deformities and joint lesions. The first part of growth is mainly concerned with bone development, although the muscles also start to grow. This means that a puppy that eats too much (i.e. takes in too much energy) will put on too much weight and grow too quickly. This extra weight on the skeleton will increase the risk of bone deformity and joint problems (dysplasia). Limiting the energy concentration of a food for large breed puppies and feeding a correct daily amount will help control the speed of growth and so minimise these risks.
- A large breed puppy needs more calcium than a small breed puppy. A 20 kg puppy only eats one and a half times the amount of a 10 kg puppy of the same age. If it eats the same food there is an obvious risk of calcium deficiency. The calcium content in the food therefore needs to be increased for large breed puppies. On the other hand, large sized puppies are also more sensitive to excessive calcium intake. It is important to emphasise here that adding a dietary complement to a complete food formulated for the growth phase is at best unnecessary and at worst dangerous for the animal, unless prescribed by the veterinarian.

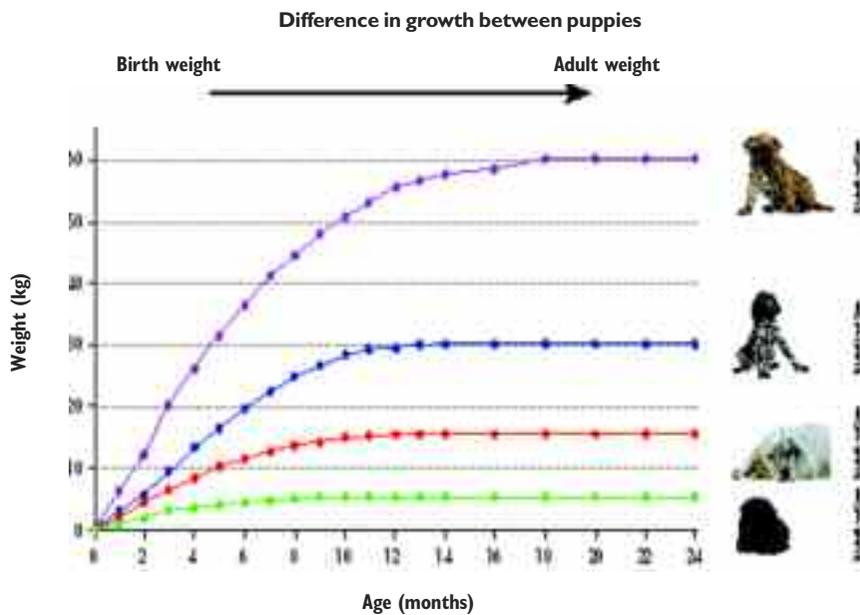


Ageing occurs earlier in large dogs. With a shorter life expectancy, large dogs become mature at around 5 years old.



The digestive tract of a large dog is proportionately shorter than that of a small dog: a large dog therefore has a lower digestive capacity than a small dog.

Equivalent age between man and dog			
Age of the dog	Corresponding age in human years:		
	Small breeds (less than 10 kg)	Medium breeds (10-25 kg)	Large breeds (more than 25 kg)
6 months	17 years	12 years	6 years
12 months	22 years	20 years	12 years
18 months	25 years	23 years	16 years
2 years	27 years	25 years	22 years
4 years	29 years	39 years	40 years
6 years	36 years	51 years	55 years
8 years	46 years	63 years	75 years
10 years	55 years	75 years	94 years
12 years	62 years	85 years	
14 years	68 years	95 years	
16 years	76 years		
18 years	87 years		
20 years	99 years		



Birth weight depends on the size of the dog. Large dogs are proportionally smaller at birth (as a percentage of the mother's weight) and subsequent growth is intense and long. The nutritional needs and risks of growth differ from those of small dogs.

Energy requirement according to the weight of the dog		
5 kg dog	100 kcal/kg	= 500 kcal/d
10 kg dog	70 kcal/kg	= 700 kcal/d
20 kg dog	60 kcal/kg	= 1 200 kcal/d
30 kg dog	50 kcal/kg	= 1 500 kcal/d
70 kg dog	45 kcal/kg	= 3 150 kcal/d

Energy needs per kg weight are twice as high for a small dog as for a large dog.

Should a growing puppy be given calcium supplements?

Wild carnivores eat entire carcasses, including the intestines and their contents, flesh and bone. Bone contains calcium, which is needed for essential processes such as blood coagulation and the nerve function, as well as bone calcification during growth. Bone can release calcium if the animal does not consume enough to cover what it needs to keep vital processes running. The skeleton can therefore serve as a calcium store.

When a dog eats only meat, its bones cannot mineralise correctly and cannot provide calcium for the vital processes. The bones will be weakened. To prevent this, dogs need calcium (and other mineral) supplements alongside their regular meat diet during growth.

Should a puppy be given calcium supplements when its diet is balanced and adapted?

Young carnivores absorb calcium from their food so their bones can mineralise during the growth phase and to keep other vital processes running. During growth, puppies absorb almost 100% of the calcium in their food if they receive too little calcium and 40% of the calcium in their food if they are on a diet specially formulated for puppies, containing 1-1.3% calcium by dry matter.

However, research has shown that puppies continue to absorb 40% of the calcium in their food in the event of excessive consumption. As a consequence, they absorb 40% of the excessive calcium. This surplus disrupts the growth and development of the skeleton, with such consequences as osteochondritis (including shoulder dysplasia), curved bones and panosteitis (growing pain).

Should a puppy be given vitamin D supplements when its diet is balanced and adapted?

Most vitamins are contained in foods or can be synthesised by the dog (such as vitamin C). However, the dog is not able to make vitamin D through the skin, unlike many mammals (including humans). If a dog does not find enough vitamin D in its food it will develop severe skeletal abnormalities: rickets (fragile, curved bones and cartilage proliferation).

Balanced foods for puppies provide 500 IU of vitamin D per kg, with a certain margin for safety's sake. However, excess vitamin D in a puppy's food can lead to disruptions in cartilage development similar to osteochondritis. As a consequence, excess vitamin D intake must be avoided. Vitamin D supplements alongside a balanced dog food can be harmful.



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Adapting the food to the dog's breed

Thanks to recent advancements in our understanding of the canine species we now also know that these differences are accompanied by metabolic characteristics that can sometimes be significant. This means that food can be tailored to a specific breed to ensure that the dog expresses its full potential and, in particular, to effectively help prevent certain specific diseases that a particular breed is susceptible to.

As knowledge evolves nutrition becomes better and better

It has now been well documented that there are major differences between the physiology of the various dog breeds and the specific diseases that affect them. With every year that goes by, the origins of more and more poorly understood dog diseases become clear, leading to new treatments and, where possible, new forms of preventive and even curative nutrition.

It is therefore no surprise that scientific advancements are continually providing food for thought to nutritionists as they look to design and formulate food more directly adapted to a given breed.

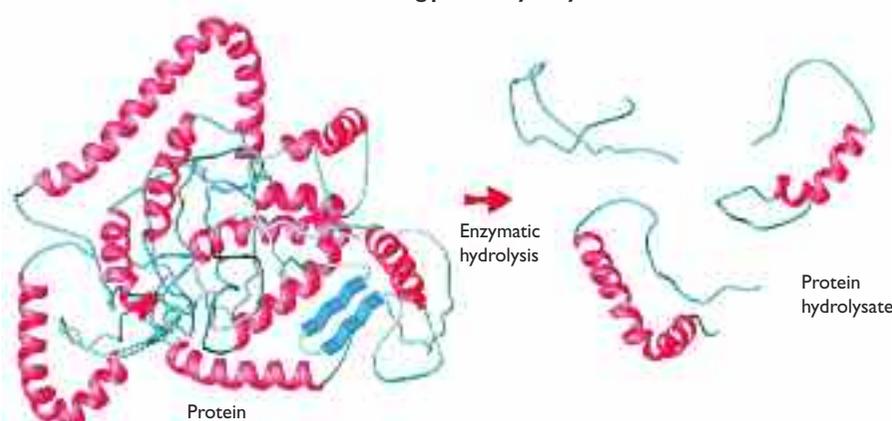
Some breeds demand specific nutrition

This is not the place to list the specific characteristics of all the breeds that merit specially formulated food. Instead, the following pages provide information on those phenomena that have been thoroughly studied by scientists and for which proven nutritional solutions exist. Some breeds are genetically predisposed to suffer disorders of a given organ (although by no means all dogs of that breed will be affected). Preventive nutrition is recommended in those cases.

Digestive fragility

German Shepherds, Boxers, Great Danes, Bulldogs and English Setters can all have a fragile digestive system, expressed by fairly frequent diarrhoea or excessive flatulence. Digestion can be significantly improved in these dogs by giving them highly digestible food with high FOS (fructo-oligosaccharides) and MOS (mannan-oligosaccharides) contents. These fermentable fibres promote a good balance in the digestive flora and improve the quality of the immune defences in the gut.

Obtaining protein hydrolysate



Protein hydrolysate is obtained via the enzymatic digestion of the isolates. The purpose of enzymatic hydrolysis is to reduce the size of protein molecules (hydrolysates), thus improving their assimilation. Soya and poultry isolate hydrolysates are more than 96% digestible.

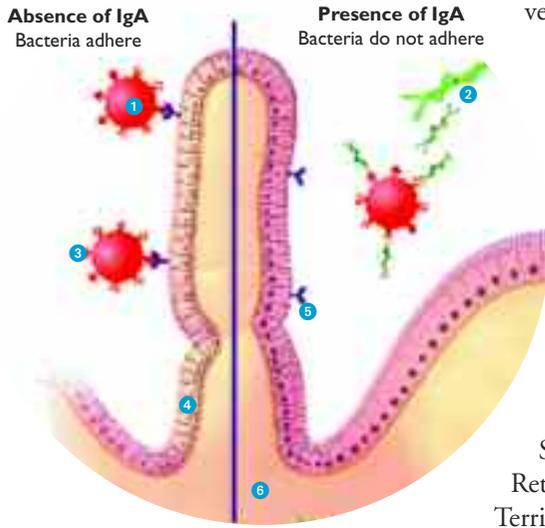


Star-shaped kibble adapted to German Shepherds.



Dujoyer/Royal Canin

Protective action of immunoglobulin A (IgA) in the intestinal barrier



- 1. Bacterium
- 2. IgA
- 3. Bacterial receptor
- 4. Gut cell
- 5. Membrane receptor
- 6. Intestinal villi

Predisposition to skin problems

The body's protective barrier, the skin, is a very complex organ that is responsible for hair growth and sebum secretion (dogs do not sweat, of course). Some breeds have very sensitive skin (including German Shepherds, Boxers, English Bulldogs, Pugs and Westies), while others may spend a lot of time in water (Labradors, Newfoundlands) or may simply have an owner who finds the quality of their skin important (German Shepherds, Poodles, Cavalier King Charles Spaniels, Cocker Spaniels, Golden Retrievers, Setters, Shih Tzus, Yorkshire Terriers).

It is now known that omega 3 fatty acids (eicosapentaenoic acid or EPA and docosahexaenoic acid or DHA) enable skin inflammation phenomena to be controlled by altering the synthesis by the body of pro-inflammation intermediaries derived from prostaglandins. Likewise, it is also possible to adapt mixtures of B complex vitamin and trace minerals to optimise skin regeneration and hair growth.

Special facial morphology

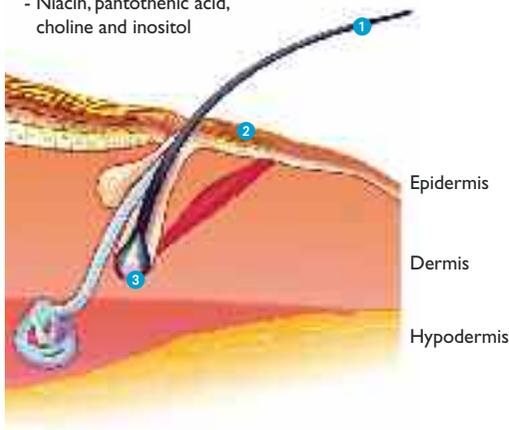
Brachycephalic breeds (which include the Boxer, Bulldog and Pug) and breeds that have small jaws (such as the Yorkshire Terrier and the Chihuahua) sometimes find it difficult to grasp their food. Either they are unable to use their incisors properly or they are unable to keep the food in their mouth. On the other hand, other very large breeds, such as the German Shepherd and the Rottweiler, have wide jaws.

Adapting the size and shape of kibbles to suit the anatomical characteristics of such dogs ensures they are able to properly grasp, masticate and so digest their food.

Adopting this approach with regard to the form of kibbles for giant breeds also reduces the ingestion of air and slows down consumption, which are two factors that help prevent bloat.

Action of nutrients in the skin

- 1. Section of hair
 - Tyrosine, phenylalanine
 - Copper, iron zinc
 - Linoleic acid
- 2. Skin barrier
 - Histidine
 - Niacin, pantothenic acid, choline and inositol
- 3. Cell regeneration
 - Biotin
 - Vitamin A
 - Proteins
 - Fatty acids



Many nutrients are essential to the complex organ that constitutes the skin and coat. This is just a small selection of the numerous substances essential for normal skin function.

Predisposition to formation of dental tartar

Some dogs with overlapping teeth (including Bulldogs and Pugs) or small jaws (including Yorkshire Terriers and Shih Tzu) express a natural tendency to produce tartar in the gums and teeth, which causes pain during mastication for the dog and unpleasant effects for the owner (bad breath). After toothbrushing, the most effective way to combat this harmful deposit is through the food (including polyphosphate salts, zinc salts and polyphenols). The same goes for texture. When kibble texture and ergonomics are right, the dog will bite into them in just the right way to subject its teeth to a light abrasive action.



Wave-shaped kibble, which facilitates prehension by brachycephalic (flat-faced) breeds and restricts the amount of air ingested.

Predisposition to excessive weight gain and its consequences

The well-known gluttonous qualities of such breeds as the Labrador and the Beagle predisposes these dogs to weight gain linked to a maintenance energy requirement that is lower than that of most other breeds, which affects Rottweilers, Golden Retrievers and Cocker Spaniels, among others. This weight gain can be prevented by giving the dog a food with a moderate energy density, so that the volume of food ingested can be kept at a comfortable level.

The main visible consequence of excessive weight gain is the appearance of the joint problems that large breeds and all dogs with a natural inclination to corpulence are predisposed to. The introduction of nutrients helps protect the joints.

Many specific diseases can be prevented

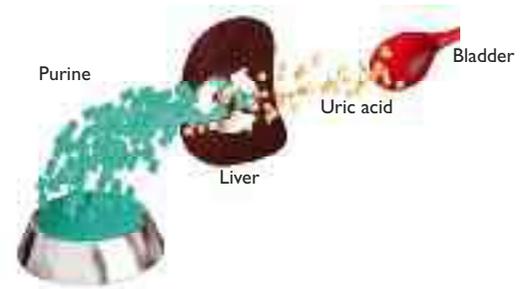
It is rare to find a breed that is not predisposed to one pathology or other, but it is also rare that nutrition is unable to prevent

or improve these pathologies. Without the enzymes that are needed to transform uric acid into urea, Dalmatians, for example, cannot consume metabolic precursors of uric acid due to the risk of uric acid crystals being deposited in the bladder or joints. It is accordingly easy to understand that sources of purine (a nitrogenous base in DNA) must be avoided in their food by excluding such ingredients as liver, yeast and the meat of young animals, and that this justifies (together with other arguments) the existence of complete foods specially formulated for this breed.

So many examples, too many to mention here

There is a scientific basis for specially formulated foods for certain breeds in terms of nutritional balance and the choice of ingredients. This is the way to improve the well-being and expand the life expectancy of dogs bred for beauty or working traits.

Higher risk of calculus



Reducing the risk



Giant kibble adapted to the size of the Great Dane's jaw.



Kibble adapted to the preferences of the Cocker Spaniel.



The hole in the middle increases the volume of this kibble without making it too hard to bite into. This helps reduce ingestion speed, especially in Labradors, which are well known for wolfing down their food.



Adapting the food to the dog's physiological condition

The term physiological condition (or state) refers to the dog's natural life stages. This includes its age, which has already been discussed, as well as sexual status. For instance, gestating and lactating females have very high, very specific nutritional requirements. Although artificial in origin, neutering (the removal of the testicles or the ovaries & uterus) is also a physiological condition. In this case, the dog's metabolism will be modified for the greater part of its life. As a result, it will have specific nutritional requirements.

Stud dogs require high-quality food



Stud dogs do not have any particular specific nutritional requirements, although, even more than a dog in the maintenance phase, they will require a high-quality balanced food to ensure they are in perfect shape. Stud dogs must be in optimal physical condition – neither too skinny nor too fat – as this will have an adverse effect on semen quality, with a healthy skin, (no scabs or dandruff) and a glossy coat. As explained above, the dog's oral hygiene needs to be impeccable, bearing in mind that the bacteria that cause periodontal disease can spread to other parts of the body. This can affect the prostate, which plays a major role in reproduction.

A high-quality highly digestible balanced food is essential, as even when there are no clinical signs, any imperfections will have an inevitable impact on semen quality and therefore fertility.

While not having special nutritional requirements, stud dogs must be given high-quality food to ensure they remain healthy and all their nutritional requirements are covered.

Preparing the bitch for mating

Bitches, preferably young adults, must always be in optimal physical condition when they are mated. They should not suffer from a chronic disease or any other problem that could have an adverse impact on gestation or lactation and even put their life at risk. Unfortunately, some owners are less scrupulous than others. Body condition is a fundamental criterion, both in terms of fertility (the capacity for reproduction) and prolificacy (the capacity for producing larger litters). The reproduction parameters will be below average if the bitch is overweight or underweight. Show females are often felt to look more pleasing if they are a little overweight – in itself contentious – so it is advisable for them to slim down a little before being mated. If weight adjustment is necessary, the diet should be adapted during anoestrus, which will give bitches plenty of time to reach their optimal weight. In practice, energy (calorie) intake should be increased (where a bitch is too thin) or decreased (where a bitch is too heavy) by approximately 10% in the months prior to oestrus.

In a technique known as flushing, the bitch's energy intake is increased during the pre-ovulation phase to stimulate oocyte maturation and release. Flushing is of little or no benefit to bitches with optimal body condition or those who are already overweight. Energy intake may be increased by 5-10% during pro-oestrus to optimise fertility and litter size if the bitch is underweight. While this is common practice with livestock (sheep and cows), its effectiveness is yet to be proven in dogs. Again, the best approach is to ensure that females are in perfect physical condition.

As with stud dogs, bitches used in reproduction must always be given high-quality, highly digestible food to ensure that their requirements – comprising over fifty nutrients – are met in full. The most important thing here is that intake is tailored to the size of the bitch, regardless of physiological state.

Gestation: the need to adapt the food gradually

The quality and quantity of food given to gestating bitches needs to be adapted to the physiological requirements of gestation, which differ depending on the expected number of puppies in the litter. Clearly, a bitch pregnant with nine puppies will have different requirements from one carrying just three. The size of the dog is also important, of course. If the litter size is the same, the demands will be greater on a small-breed female than on a large-breed female. This becomes clear when we compare the birth weight of the puppy with the weight of its mother, a ratio that is four times higher in Yorkshire Terriers than it is in Saint Bernards. In small breeds, the puppies are more mature at birth.

Nutritional requirements remain unchanged until week five of gestation. This is the period of organogenesis, when the foetuses' internal organs develop. A high-quality maintenance food adapted to the bitch's size will usually be sufficient during this phase. Foetal growth speeds up in week six, growing exponentially. A foetus will put on



At the end of gestation, the uterus containing the foetuses takes up a lot of space in the bitch's abdominal cavity, leaving little space for the stomach and the gut. The food must meet the bitch's higher nutritional requirements in the smallest possible volume. This Beagle bitch, Truffe, has given birth to 11 puppies two days earlier than expected.

80% of its birth weight in the final three weeks of gestation. The quality and quantity of the mother's intake needs to be increased to cope with this intense growth. Her uterus will also have to expand, leaving less room for the stomach and the gut. As a result, nutritional requirements increase just as the "processing space" decreases. This challenge is solved by feeding bitches a food with a higher energy and nutrient concentration around the end of gestation. Increasing fat content is a common way of concentrating intake. This also improves the food's palatability, which can at least partially offset the lack of appetite observed in mothers towards the end of gestation.



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“The quality and quantity of food given to gestating bitches need to be adapted to the physiological requirements of gestation.”

Energy intake

The energy content of a food must take due account of the reduced stomach capacity of bitches at the end of gestation and enable the storing of glycogen reserves (glucose storage) in the liver of the foetuses. Without these reserves, newborns will be at risk of potentially lethal hypoglycaemia.

Indeed, more than 50% of foetal development is fuelled by glucose. So while it is theoretically possible to feed dogs a glucose-free diet (bearing in mind that as carnivores they are able to make glucose from protein and fat), this practice is highly inadvisable in females at the end of gestation, due to the serious risks to them and their puppies.

Selected examples of dietary imbalance that have repercussions on gestation and the newborns

Malnutrition in gestating females	Consequences for the litter (neonatal period)
Energy deficit (malnutrition)	<ul style="list-style-type: none"> • Smaller litter size • Low birth weight • Increased puppy mortality and morbidity • Reduction in milk production • Reduction in puppy immunity and vaccine response
Obesity	<ul style="list-style-type: none"> • Silent oestrus, anoestrus • Longer interval between oestrus • Smaller litter size • Reduction in milk production
Protein	<ul style="list-style-type: none"> • Low birth weight • Increased puppy mortality and morbidity • Reduction in puppy immunity
Carbohydrates (if intake is inadequate)	<ul style="list-style-type: none"> • Hypoglycaemia in the mother • Low birth weight • Increased puppy mortality and morbidity • Higher number of stillborns • Reduction in milk production
Zinc deficiency	<ul style="list-style-type: none"> • Smaller litter size
Vitamin B, iron	<ul style="list-style-type: none"> • Reduction in puppy immunity and vaccine response
Excess vitamin A	<ul style="list-style-type: none"> • Congenital abnormalities • Smaller litter size
Excess vitamin D	<ul style="list-style-type: none"> • Calcification of soft tissue

The total energy requirements of gestating females are made up of their own maintenance requirements, the growth and maintenance requirements of their foetuses and the requirements of the placenta and the distended uterus. These total requirements will gradually increase from week six of gestation. By the end of gestation they will have increased by 30-50%, depending on the size of the litter. For example, the energy requirements of a 12kg Cocker Spaniel carrying six foetuses will increase by 40% by the end of gestation.

Just before labour, bitches often lose their appetite, due to tiredness or discomfort, so they should be given a highly digestible, palatable food with a high energy content. The daily amount should preferably be spread over several servings over the course of the day. Those with a finicky appetite may be given free access to their bowl, although the daily ration must, of course, never be exceeded. Excessive fat build-up in the birth canal will hamper birth, possibly leading to unwanted complications. The size of the litter and the size of the bitch need to be taken into account, but, on average, her weight will increase by 25% during the gestation phase. About half of this weight will be lost during whelping (puppies, liquids and umbilical sacs). Females only recover their optimal weight at the end of lactation. During at least the first six weeks of gestation, ad libitum feeding should not be practised.

Protein intake

Newborn puppies are about 80% water, 15% protein (around 75% protein by dry weight), 1.5% fat and around 2% minerals. The intake and deposition of protein is an essential part of gestation. The body does not build up protein reserves, as it does carbohydrate reserves (in the liver and muscles as glycogen) and fat reserves (in fat tissue). All protein is put to immediate use. The synthesis of protein requires an intake of energy and protein in the diet. The foetuses will continue to grow in gestating bitches that do not take in sufficient protein, because it will be taken from the mother's muscle mass. This muscle wastage will be easy to see on the lower back. If the vertebrae are visible the dog is suffering from energy and/or protein deficiency. While this is not life-threatening for the mother, it does put the puppies at mortal risk and it will compromise the mother's capacity for lactation when the time comes. It is therefore essential to increase the bitch's protein intake at the end of gestation.

Mineral and vitamin intake

First and foremost, it is important to realise that all nutrients have the ability to be potentially harmful, depending on the intake quantity (immediate toxicity) and the intake term (accumulative or chronic toxicity).

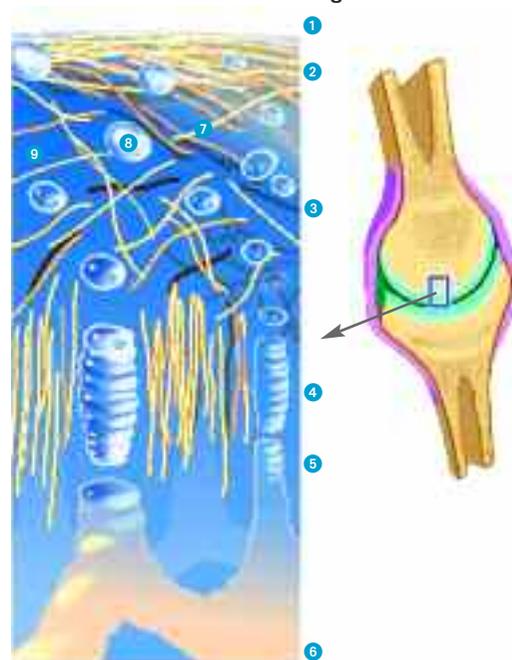
Gestating females need to take in more calcium (around 60% by the end of gestation) so that the bones of their foetuses are able to calcify. On the other hand, excessive intake of calcium is extremely harmful. Various hormones rigorously regulate the blood calcium level, including parathormone to increase it and calcitonin to reduce it. An excessive intake will increase blood calcium for a limited time, triggering a counter-regulation mechanism to repress parathormone. If this occurs, when calcium is required, due to labour or lactation, the bitch will be at risk of hypocalcaemia (eclampsia), a condition that threatens both mother and puppies.

Particular attention to the food's vitamin A content is important, as this vitamin passes through the placental barrier, providing protection to the epithelium of newborns. At the end of gestation, the vitamin A content can be twice the recommended content in a maintenance food. Again, however, an excessive vitamin A intake can have toxic effects. At 40,000 IU/kg and above, it can lead to foetal deformity and death. Sensitivity to vitamin A is greater at the start of organogenesis, between days 17 and 22 of gestation.

To summarise, the following points should be remembered when feeding a gestating bitch:

- Her energy requirements will increase by around 10% per week from week six of gestation. Kibbles are strongly recommended, as wet food contains 80% water (compared with 10% water in kibbles), which requires a much higher volume of food.

Mineralisation of bones through calcification of cartilage



1. Joint space = synovial fluid
2. Joint zone
3. Transitional zone
4. Deep zone
5. Base zone
6. Bone
7. Collagen fibre
8. Chondrocytes
9. Fundamental substances = proteoglycan gel

Good appetite and a rapid growth were highly appreciated in nutritional studies in the past. Is it time to revise that in the light of what we know today?

Although appetite and growth still are to be considered indicators of health and nutritional balance, we have learned to know that maximal growth is not compatible with optimal skeletal characteristics in large sized dog breeds and other mammals (like poultry, fowls and swine) selected for growth performance.

Maximal growth is achieved by nutritional composition and amount fed. Unfortunately also a balanced diet can be overfed and result in skeletal disturbances despite an optimal composition. Young rapidly growing individuals therefore should be fed a balanced diet but in amounts restricted to allow proper skeletal development.

In large sized dog breeds meant to live a long and healthy life that is even more important as the nutrition during growth also prepares for sustainability later in life.



Professor Ake Hedhammar,
Veterinary doctor
University of Veterinary Medicine Upsalla
(Sweden)

Although home-prepared food is an option, it needs to be formulated or checked by a veterinarian, and it also entails a very high volume intake.

– The energy concentration of this food must be high (metabolisable energy between 3,800 and 4,300 kcal/kg of food, based on weight, activity and temperament) and its digestibility should be easy to evaluate based on the volume and consistency of the faeces.

– The protein content must be increased (to between 25% and 36% depending on the expected litter size).

– The calcification of the foetal skeleton at the end of gestation demands increased intake of the minerals that make up bone (mainly calcium and phosphorus). The calcium content must be based on the energy concentration of the food, which determines the volume ingested by the female. It must never be more than 4 g per 1000 kilocalories ingested, so as to limit the risks of the parathyroid glands failing to respond adequately, which may lead to eclampsia. The phosphorus content is generally adjusted to maintain the

phosphorus to calcium ratio between 1.2 and 1.4 (physiological proportion for bone constituents).

– The mother's weight at the end of gestation must not exceed 25% of her maintenance weight to reduce the risk of difficulties during birth due to excessive fat deposits in the birth canal.

A high-quality complete dry food specially formulated for puppies – with a high-energy concentration and increased calcium and protein content – is generally appropriate from week five onwards, bearing in mind that puppies have similar requirements to gestating females. It should never be supplemented. Food adapted to the size or breed of the bitch is also worth considering, because small breeds do not have the same requirements as large breeds.

“Lactation involves a considerable increase in the nutritional needs of the bitch, given the exceptional richness of the milk she produces”

Lactation is the most demanding life stage

Unlike gestation, lactation involves a considerable increase in the nutritional needs of the bitch, given the exceptional richness, in terms of calcium, energy and protein, of the milk she produces for her litter (1,200-1,500 kcal per kg depending on the breed and the day of lactation, compared with just 750 kcal per kg in cow's milk). The quantity produced will depend on the number of puppies feeding. The moment of peak milk production comes during week four of lactation. Throughout the period of lactation, the goal will be to limit the mother's weight loss, which is inevitable when the litter is large.

Lactating females often continue to eat the same food they consumed at the end of gestation, with the following characteristics:

- High palatability to stimulate her appetite, which is often lost at the start of lactation. The fat and protein content contributes to this.

- Kibble shape, size and hardness tailored to the dog's size to ensure she has no problems eating.



© Grosvenor

Calculating the quantity of milk the bitch will produce



© Nathalie Pilymenko

$$TP = (W \times c) + 0.1 \times W \times (N - 4)$$

TP: total milk production in kg
 W: maintenance weight of the female in kg
 c: coefficient of the female's size
 N: number of puppies feeding

Coefficient c	Female's weight
1.6	Less than 8 kg
1.7	Between 8 kg and 14 kg
1.8	Between 14 and 20 kg
1.9	Between 20 and 26 kg
2	26 kg and above

Week of lactation	Milk production	Quantity of milk produced (kg)	Equivalent in energy (1350 kcal/kg of milk)	Lactation energy/maintenance energy per day
Week 1	1 % PT	6.7 kg	9 045 kcal	+ 86 %
Week 2	2 % PT	13.4 kg	18 090 kcal	+ 170 %
Week 3	3 % PT	20.1 kg	27 135 kcal	+ 260 %
Week 4	4 % PT	26.8 kg	36 180 kcal	+ 345 %

For example, a Golden Retriever with a maintenance weight of 27kg has a litter of 9 puppies and has a total milk production of around 67kg (where W = 27 kg; c = 2 and N = 9) over a period of two months, corresponding to energy expenditure of almost 9110 kcal (1350 kcal/kg of milk). If this energy expenditure is spread over the two months of lactation, the female needs to take in an average of 1500 kcal per day to produce that milk...and her maintenance energy requirement is around 1500 kcal. The female's milk production can be calculated for the first four weeks of lactation as follows.

Water intake should not be forgotten. Maternal milk contains almost 80% water, so 67 kg of milk corresponds to more than 50 litres of water or just less than 1 litre per day on average for this Golden Retriever; just to meet milk production needs. The ambient temperature also needs to be taken into consideration, as it is higher for the benefit of the puppies, so the female must have permanent access to plenty of clean water.



© Grossemy



© Grossemy



© Dubayer/Royal Canin

reasons, the bowl should be emptied, cleaned and replenished at least twice a day, even if not all the kibbles have been eaten. Having more than one bowl is undoubtedly the most practical solution.

The puppies may begin to consume the bitch's lactation food after three to four weeks, initiating the weaning period. A bowl should always be placed at head height for the exclusive use of the mother, so that her intake can be monitored; this is important as weaning begins at the time of peak lactation.

A starter food is a better solution at this point, as it covers the suckling mother's requirements while also enabling the puppies to wean independently.



© Grossemy

- Very high energy concentration (more than 4000 kcal/kg) to ensure she can take in large quantities of energy and nutrients in small volumes. Although home prepared food is possible, a massive increase in the fat content would be needed to increase the energy concentration sufficiently to keep the feeding volume down to a reasonable level and some bitches may not be able to tolerate this. There is also a health risk, associated with the difficulty of conserving these preparations at ambient temperature.

The harmonious growth of the litter – i.e. lively but satiated puppies – is naturally an indirect source of information on the quality of lactation and thus the mother's health. Breed-specific prepared foods are available that are specially formulated for females in this life stage, ensuring that their nutritional requirements are fully met. Mothers of large litters will inevitably lose weight; the main thing is to ensure that they begin to recover their optimal weight when their puppies are weaning. If they do not, their diet will have to be reviewed. A bitch should not be mated again until she has returned to her optimal weight.

- Higher protein, fat, mineral and vitamin contents, depending on the size of the dog.

Neutering changes the nutritional needs of both males and females

Neutering is a form of surgical contraception that can be carried out on either sex. Castration specifically refers to the removal of the male testicles.



© Naguiyan-Collard

- High-quality ingredients to ensure optimal digestibility (smaller, well-formed faeces, no bloat or flatulence).

Clean water should always be accessible in large quantities and replenished several times a day. Remember that milk is almost 80% water.

Females with large litters must also have unlimited access to food, so that they can eat when they want. This should be placed close by (the bitch will not leave her puppies during the first few days) and off the ground (at head height, for example). For hygiene

Studies show that the reduction of sexual hormones (testosterone in males, oestrogen and progesterone in females) following neutering will lead to a lowering of the maintenance energy requirement by 20-30%. At the same time, appetite will most often increase, which is why weight gain is often seen after neutering.

Weight gain after neutering is not inevitable. This three-year-old Beagle bitch was neutered at six months.

This is not always the case, however, and should not be viewed as inevitable. Weight gain can be avoided in recently neutered dogs of either sex if a few precautions are taken.

The animal should be weighed every fifteen days during the first three months after surgery, then every month for the next three months. Any weight gain after six months of normal weight is not related to neutering. It is important to keep a record of these measurements, preferably in the form of a graph, which is an easy way of visualising the situation. It is just as easy to monitor body condition: simply place a hand flat on each side of the animal's thorax, behind the elbows, and move them towards the back without applying pressure (the skin will move at the same time). If the ribs are clearly discernable without applying pressure everything is as it should be and the animal will be at its optimal weight. If pressure has to be applied to count the ribs the animal is overweight, and if they cannot be counted when pressure is applied the dog is obese. This simple examination enables action to be taken quickly if the dog is putting on weight.

Weight gain in excess of 5% in one month (i.e. 500 grams in a 10kg dog) is a reason to visit a veterinarian, who will fine-tune or even radically change the dog's food. Reducing daily intake by 10% is a possible first step if the animal has put on just a little weight. The problem is that the dog's appetite actually increases after neutering, so neither dog nor owner are likely to be happy with this. Reducing the maintenance intake by more than 10% may result in deficiencies, since nutrient intakes are reduced across the board. The best solution is to discuss the situation with a veterinarian, because there are prepared foods available specially formulated for neutered or sedentary animals. These foods have a low energy concentration compared with maintenance foods, which ensures that the volume of meals remains reasonable. This reduction in the energy concentration must

not lead to a reduction in nutrient intake (protein, minerals, vitamins), which is why these foods have a higher nutrient concentration. Lastly, studies into satiation (the feeling of fullness) have led to the formulation of foods that seem to satisfy the dog's hunger more quickly and cause it to consume smaller quantities. These are all important factors in this field.

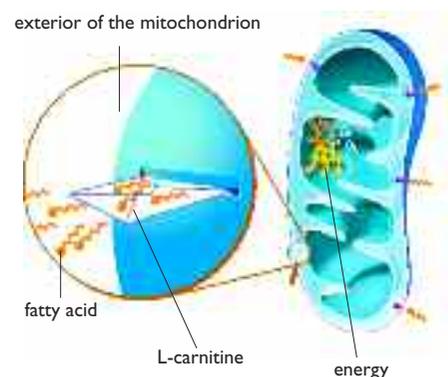
Neutered dogs certainly need plenty of exercise. It is a good idea to increase the activity level, as physical exercise leads to more energy being expended, countering the effects of neutering.

It is worth reiterating that dogs should not be fed leftovers and that any treats should be specially made for dogs and should not represent more than 10% of their daily energy intake. Fruit, such as apples, makes a good treat used in moderation, and many dogs like it. Given in a reasonable quantity (for example, half an apple a day for a Labrador), fruit can be used as a reward, without running the risk of weight gain.

Grapes and raisins are toxic to dogs.

“Neutered dogs certainly need plenty of exercise. It is a good idea to increase the activity level, as physical exercise leads to more energy being expended, countering the effects of neutering”.

L-carnitine: how fatty acids are transported within cells



L-Carnitine transports long-chain fatty acids into the mitochondrion, where they are oxidised to produce energy

How can you tell whether your dog is allergic to certain foods?

A food allergy in dogs is expressed by itching in the feet, ears, face, abdomen and anus. Secondary infections caused by yeast or bacteria are common. Here the itching is persistent or becomes more intense. In some cases, as well as skin problems, there are gastrointestinal problems, which may be indicated by watery faeces, chronic diarrhoea, gut noises and vomiting.

Diagnosis is by elimination. Blood tests are not diagnostic. Based on the dog's precise dietary history, a single source of protein and of carbohydrate is chosen that the patient has never eaten before. If the symptoms clear up after 8 to 12 days of this strict diet, the dog should be fed the original food in a provocation test. If the red blotches and itching come back within 14 days, the diagnosis is confirmed.

**Claudia Nett,
Doctor of Veterinary Medicine
(Switzerland)**



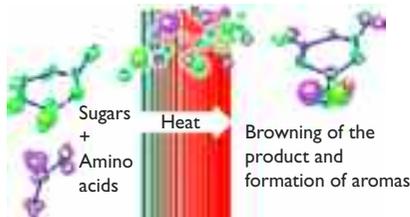


Feeding behaviour

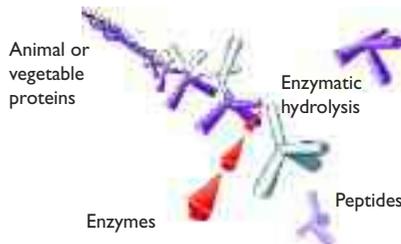
With a good understanding of the aspects that determine a dog's normal feeding behaviour we can more easily identify any feeding abnormalities and determine whether they are due to the dog itself (illness or disease, for example), the food or an environmental factor. Feeding behaviour comprises all the actions leading to the ingestion of food. For a predator like the dog, it comprises searching (hunting), selection (of prey), capture (and killing) and consumption. In domesticated animals, which receive their food from humans, feeding behaviour is primarily expressed in the conditions of access to the food source, any competition between animals and the characteristics of the food. All of these aspects have an impact on the ingestion of food by the animal.

Technologies for developing aromas

1. The **Maillard reaction** is used for flavouring different products (coffee, biscuits, roast meat etc);



2. Poultry protein **hydrolysates** are obtained by heating and acidification then enzymatic hydrolysis of the proteins.



For the dog, food given by the owner has a greater value than that found in the bowl. This is why it is often possible to feed by hand dogs whose appetite is reduced, for example by illness.



Dogs are hierarchical social animals

Dogs live in a hierarchical social group and hunt in packs. The dominant animals eat first, in full view of the others, taking the best bits and eating as much as they want. The subordinate individuals eat last and have to make do with whatever is left. This feeding hierarchy is established in a litter during weaning, before the puppy is adopted.

Feeding behaviour is a strong hierarchical signal that the owner must take advantage of to impose food on the dog without it ending up starving itself. This social aspect is also used to promote feeding by hand in ill dogs with little appetite.

Prey only turns up once in a while in nature, so it is normal for dogs to consume a large quantity of food in one go and then not eat for several days. As a result of this, dogs are sometimes called greedy.

They also adapt to different types of food, which has earned them the label “opportunistic”, because they will eat anything they find or are given.

Perception of food and palatability

Step 1: Sound of the bowl

The first sense to come into action at meal-times is the dog's hearing. The dog hears the sound of its bowl and the can of food or bag of kibbles being opened. The dog starts to salivate (in some breeds this can be quite spectacular), in what is known as the cephalic phase of digestion. Pavlov first described this reflex (“psychic secretions”) at the beginning of the 20th century (he was awarded the Nobel Prize in 1904). These auditory stimuli prepare the digestive tract for the arrival of the food. The dog also starts producing saliva in the mouth, gastric secretions in the stomach and pancreatic secretions in the small intestine.

Step 2: Food aroma and temperature

While the colour of the food and the presence of “chunks” of meat or vegetables makes more of an impression on the owner than the dog, which could not care less about these things, smell is a very different proposition. At feeding time, aroma is paramount for the dog, which will smell its food to evaluate its aroma and temperature. If the dog’s nasal cavities are blocked for any reason – including a simple cold – it will eat less. Its sense of smell is far better than a human’s, and it is even keener when the dog is hungry. That is why dogs that work with their nose should never be fed just before working.

Some breeds have a much better developed sense of smell than others. German Shepherds, Labradors and Belgian Shepherd Dogs are among the breeds with the best nose. Brachycephalic breeds have a short skull, which hampers air circulation and reduces the surface area of the mucous membrane in the nose, which has an adverse impact on the sense of smell. This sense is often the first to diminish in ageing animals, although it is not discernible. Dry air, air fresheners and heat (panting) all have an impact on the dog’s sense of smell. The same goes for some medication.

Increasing the aroma of a food by warming it up will improve the chances of it being consumed by a sick dog with a poor appetite. Ideally, the food should be warmed to body temperature (38-39°C). Above this temperature, the dog may burn itself, which could lead to it developing an aversion to the food. When microwaving food it is important to mix it well before serving to ensure it is all the same temperature. Lukewarm water is a cheap, efficient and simple taste enhancer.

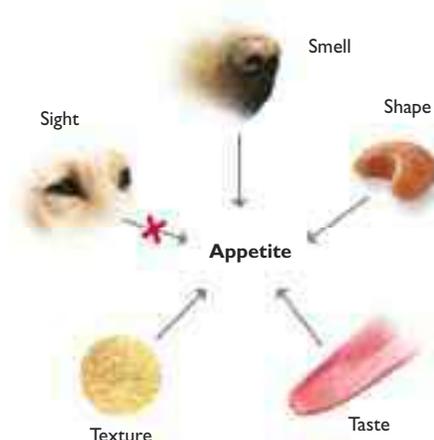
The puppies’ favourite aromas are influenced by the mother’s food. Some of the ingredients will be contained in the mother’s milk, which influences the puppies’ taste preferences later in life. The aromas emanating from the food bowl also help imprint



© UNIVES

Dogs that work with their nose (search and rescue, hunting, police work and more) should never eat immediately prior to going to work. Digestion reduces olfactory acuity for an hour after eating.

Criteria for acceptance of food by a dog



the litter’s sense of smell from the fourth day after whelping. As a consequence, the puppies will prefer food that gives off similar aromas, which means they can be accustomed to the food they will be weaned on at a very early age.

Successive stages in the sequence of food consumption by the dog

	Phase	Sense used	Food characteristic experienced by the dog	Ways of improving food palatability
	1 Selection	Smell	Odour	Choice and quality of ingredients, aromas, fat coating
	2 Prehension	Feel	Size, shape, texture	Technological process, grinding, cooking, drying
	3 Chewing	Taste	Flavour	Quality of ingredients
	4 Digestion	Physiological reaction	Digestive security	Nutritional quality of the finished product

Given that aroma is such a vital aspect of the dog's food, canned foods should be consumed within a short space of time and kibbles should be stored in a cool, dry place in a sealed container.

Step 3: Prehension

Prehension is the action of grasping food. Dogs use their incisors, their tongue and their lips to grasp their food. Prehension can be different from one breed to another, due to the diversity in facial morphology. While the shape and size of a mouthful or a kibble has less of an influence in dogs than in cats, these aspects do have an impact on how fast a food is consumed and how long it is chewed. By adapting the shape of a kibble, these parameters can be adjusted to improve the dog's eating experience.

For example, the size of a kibble must be suited to the size of the dog's mouth. More and more complete dry foods are being adapted to the size of the animal (small, medium, large or giant) or better still to its breed.

Why do dogs eat grass?

No one knows why dogs eat grass. Some dogs seem to simply enjoy the taste, while others will consume grass when they feel sick. It is fine if your dog likes to eat grass, but ensure that the grass has not been treated with herbicides or other chemicals, and that only a small amount is eaten. If your dog seems ill, see your veterinarian.

*Jennifer Larsen,
Doctor of Veterinary Medicine
University of California,
Davis Nutrition Department
(USA)*



These aspects are even more important in ageing dogs, which typically have less than perfect teeth and often swallow their food without chewing. If ingestion occurs too quickly or too much food is ingested at the same time, the dog is likely to vomit.

Step 4: Taste and texture

The consistency of the food and how it alters once it is in the mouth are also important factors affecting how the dog eats. When it chews – which is not very much – and swallows, it blocks its breathing, which means that it is unable to smell the food any more; it has to rely on taste, texture and temperature. Dogs distinguish five flavours: sour, bitter, salty, sweet and umami.

Umami, which can also be translated as savouriness, is a flavour discovered in 1908 by Professor Kikunae Ikeda. This is the flavour of an amino acid known as glutamic acid, which is a natural ingredient of many foods.

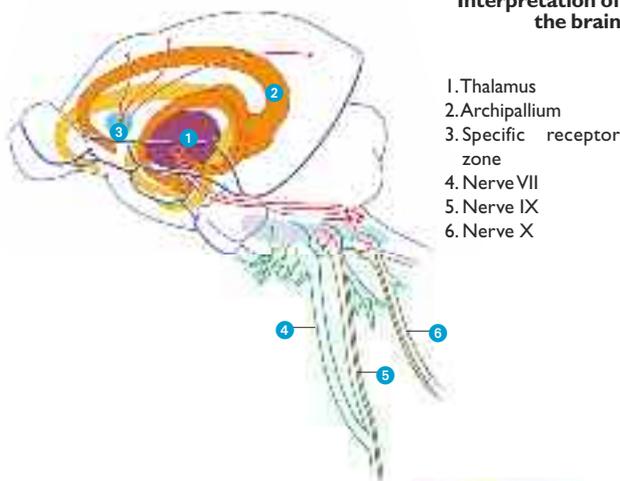
To summarise, when it comes to eating, dogs sniff, smell then swallow. Indeed, dogs are able to remember several thousand different aromas.

Most common feeding behaviour disorders

The dog does not eat

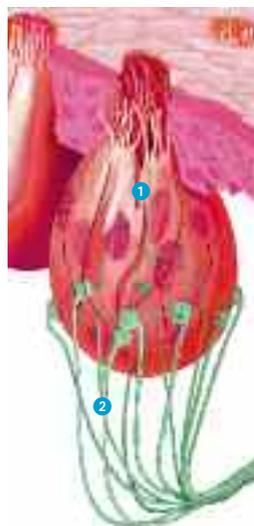
Dogs suffer from anorexia for many different behavioural or medical reasons. Behavioural causes in healthy dogs include sexual excitement in males in the presence of a female on heat, and competition at mealtimes when a dominant dog does not

Interpretation of taste by the brain



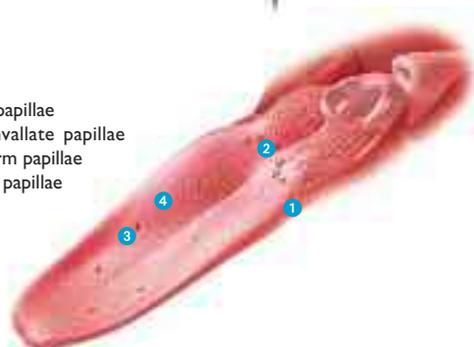
1. Thalamus
2. Archipallium
3. Specific receptor zone
4. Nerve VII
5. Nerve IX
6. Nerve X

Taste bud



1. Taste cell
2. Nerve fibre

1. Foliate papillae
2. Circumvallate papillae
3. Fungiform papillae
4. Filiform papillae



My puppy continuously asks for food, what should I do?

One must learn to feed the puppy according to its weight evolution, not each time the pup begs for food.

For optimal digestion, meals are best rationed as follows:

- 3 meals per day until the age of 6 months
- 2 meals per day from the age of 6 months

“Free service” is to be avoided since this encourages nibbling and makes the puppy capricious!

Pups that have free access to food at all times, may eventually suffer obesity or experience growth problems...

Bénédicte Flament,
Doctor of Veterinary Medicine
(Belgium)



allow another dog to eat from its bowl. As we have seen, dominant dogs eat what they want, when they want.

Dogs that consider themselves to be at the top of the hierarchy in the home are often not big eaters, despite being otherwise normally active and not manifesting any other behavioural disorders. Anorexia is a factor in many diseases. If the dog is not eating and seems not to be itself, it should be taken to see a veterinarian.

It eats too much

In this case, the owner should be most concerned if the dog's feeding behaviour changes. A dog that eats too much without putting on weight (and especially if it loses weight), despite being otherwise normally active, must be checked by a veterinarian. Some diseases stimulate the appetite at the beginning of their development, including diabetes mellitus. Regular worming is also important, as is quantifying what the animal eats, weighing the dog regularly, and checking the faeces to verify that they are the right colour and consistency.

It eats anything it comes across

Pica is a tendency or craving to eat non-food substances such as wood or plastic. The consumption of grass, sometimes followed by vomiting, is not related to a psychological

disorder or a nutritional deficiency. While dogs with digestive problems do tend to eat grass more (some say it is a form of purging), the precise significance is unknown.

Dogs tend to explore their environment with their mouth, although this behaviour can become excessive. Due to the risk of the bowels being blocked by a foreign object, it is advisable to contact a veterinarian if this behaviour is observed at any time in the dog's life.

It eats excrement

Coprophagia is the act of consuming excrement. It is natural behaviour in bitches,

who clean their puppies and stimulate their digestive functions by licking their anus. The consumption of the excrement of herbivores (horse dung, cow pats) is also quite natural, as it contains flavours that dogs find palatable. The same will go for cat excrement.

On the other hand, a dog that eats its own or another dog's excrement should be examined. Behavioural problems and medical disorders need to be differentiated. Puppies that lack stimulation in their environment often play with the only “toys” they have – their own faeces, which they ultimately consume. In general, this behaviour will clear up fairly easily, but if faecal matter contains undigested nutrients – especially fat – it can be attractive. In that case, there may be a digestive assimilation disorder and the faeces will have to be examined to find out whether they contain undigested fat, starch or parasites.

Owners are often good at monitoring their dog's health and feeding behaviour is an important aspect of this. Generally speaking, if the dog's appetite is good, the chances are that it will be in good health.

Is chocolate good for dogs?

Chocolate is not good for dogs. It is even toxic for dogs.

Chocolate is a mixture of cocoa beans and cocoa butter. It contains theobromine and caffeine, which are both classified as methylxanthines. Unfortunately dogs are sensitive to the effects of methylxanthines. The amount of methylxanthines present in chocolate varies with the type.

Depending on the dose, methylxanthines can cause hyperactivity, increased heart rate, tremors and potentially death. Other effects seen with chocolate overdose include vomiting, diarrhoea, increased thirst, increased urination and lethargy. Early treatment including decontamination procedures is extremely helpful with chocolate poisoning.

Karin Holler,
Doctor of Veterinary Medicine
(Austria)





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Misconceptions about dogs and food

Whatever the species, food is certainly one of the fields of biology with the largest number of received or mistaken ideas. This erroneous information often takes on a life of its own, especially on the back of new mass communication technologies. It is important to review this information and separate the true from the outright false when it comes to dog food.

Beliefs and assumptions

The internet is a vast source of information in every field, and veterinary medicine is no exception. Unfortunately, however, people can publish whatever enters their head and the information provided on many websites lacks any scientific basis. As a result, a number of misconceptions with regard to dog food have gained currency and need to be strongly refuted.

True or false?

Dogs should fast once a week

This is false. Wild canids do fast, but this has nothing to do with “good habits”. There is no justification whatsoever for not feeding a dog every single day of the week.

Dogs work better when they haven't eaten

This is false, but is a stubborn misconception in some fields. If the dog is expected to perform an activity that requires endurance, such as hunting or a sled race, it should preferably be given a light meal (a quarter to a third of its daily ration) around three hours before it starts. Putting a dog to work that has not eaten for a long time will not only result in it performing poorly, it will also put it at risk of physical suffering, which could have dangerous consequences.

If it's good enough for me, it's good enough for my dog

This is just as false as the opposite! Dogs are carnivores, though not exclusively so, whereas humans are omnivores, which

means that their metabolism is different. Unlike humans, dogs have no real need of carbohydrate, although they can use it as a source of energy. They are also less able to tolerate high sugar foods. The regular ingestion of simple sugars will cause metabolic changes that can result in obesity or diabetes. Similarly, although a recognised antidepressant in humans, chocolate is highly toxic to dogs. The two species also have very different requirements in terms of minerals and vitamins. Puppies, for example, require much less vitamin D than children, who require four times as much. All of this is clear evidence that dogs need food specially formulated for them if they are to live a long and healthy life.

Dogs are like us: they get bored of the same food day after day

This is false. This is anthropomorphism pure and simple. Dogs naturally have a very poorly developed sense of taste. Owners that introduce their dog to lots of different foods are creating difficulties. Food and feeding are key to the hierarchical status of

the dog within the family, so behavioural problems are bound to follow. Regularly changing the food can also be detrimental to the dog's health. The dog's digestive system (enzymes, bacterial flora) needs about a week to adapt to a new food. Frequent or sudden changes of food in terms of the brand or the ingredients will result in impaired digestion, causing digestive problems (vomiting, flatulence, diarrhoea), which may require veterinary treatment.

Meat needs to be added to complete foods

This is false. As the name suggests, complete foods are formulated to fulfil all the dog's nutritional needs. The proteins used in these foods come from the human food industry and are of a high quality. As a general rule, 10% of the dog's energy requirement can be provided in the form of treats and rewards (dog biscuits, chews). Anything over and above this will result in an imbalanced diet, which presents health risks.

“The uncontrolled supplementation of minerals and vitamins in puppies, especially in large breeds, constitutes a great risk”



© Duhner/Ceigis

Too much protein will cause kidney failure

This is false. Studies on rats showing that a long-term high protein intake results in chronic kidney failure have long been improperly extrapolated to dogs. There have been many studies in France since 1975 (by Paquin and Pibot in association with the National Veterinary College Alfort and Royal Canin, published in 1979 and 1986) and in the United States over the past twenty years (e.g. Churchill, published in 1997) showing that this is completely wrong. The severe restriction of protein intake from an early age, as advocated in some quarters, actually harms the puppy’s immune system, undermining its health.

Calcium needs to be added

to straighten the ears

This is false. The ears of breeds with prick ears, such as German Shepherds and Malinois, will often become less firm between four to six months around the time their milk teeth are replaced with permanent teeth. There is a stubborn misconception that calcium – often as part of a cocktail of vitamins – needs to be added to the diet to straighten the ears again. When the ears straighten after a couple of weeks, the owner concludes that this supplementation has had the desired effect. In fact, it is a physiological impossibility for calcium to straighten the ears in this way, given that ears are made up not of bone but of cartilage, which does not calcify.

The uncontrolled supplementation of minerals and vitamins in puppies, especially in large breeds, constitutes a great risk as explained above. There is no way of straightening the ears via dietary intake. The ears actually become less firm when the body is at peak growth and its nutritional requirement is at its greatest.

All nutrients have the potential to cause harm, which is why it is so important to always abide by the nutritional requirements, adapted to the size and breed of the dog in question. Nowadays, owners have access to many complete foods that are perfectly balanced and adapted to the requirements of their dog.



Osteochondritis in the shoulder



Osteochondritis results from the abnormal development of growth cartilage. The process of ossification is altered and cartilage is retained in certain areas. Osteochondritis may develop into osteochondritis dissecans when a fragment of cartilage becomes loose or even detached in the joint. A chronic excess of calcium in the diet is a risk factor for osteochondritis.



© Duhayer/Royal Canin

The golden rules of the rational dog diet

Back in 1985, Professor Wolter of the National Veterinary College Alfort set out his rules for feeding dogs. Although they are a quarter of a century old and Professor Wolter himself is long gone, these rules continue to be as relevant today as they ever were and owners that follow them will avoid the most common canine dietary problems.

1. Make sure the dog drinks enough water

The dog should always have access to clean water, which should be replenished regularly. Average consumption is 60 ml/kg of body weight per day, higher in puppies and suckling females, in warm climates and during work.

“The dog should always have access to clean water, which should be replenished regularly.”



© Pissal/Royal Canin

Dietary transition table

2 to 3 meals/day after the humans have eaten! At set times.

Day 1 and 2:
75% former food and 25% new food

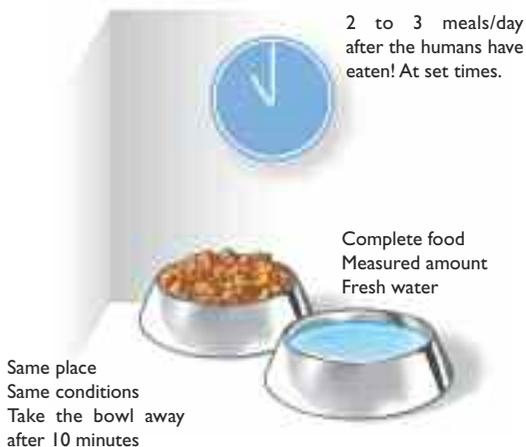
Day 3 and 4:
50% former food and 50% new food

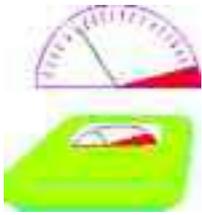
Day 5 and 6:
25% former food and 75% new food

Last day:
100% new food

2. Do not implement sudden changes

Any change to the dog's food should be made gradually over the period of a week. This is the time needed for the dog's taste, digestion and metabolism to adapt, to ensure that it does not refuse to eat or experience digestive problems.





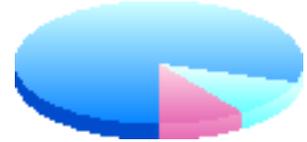
3. Monitor the quantities given to the dog

Daily feeding amounts are calculated on the basis of the dog's energy requirements and the calorie content of the food, so they should be weighed to avoid a slow slide towards obesity. The dog should be weighed regularly, too, so that the feeding amount can be adjusted if need be.

“There are three criteria for selecting a dog food: age, activity level and size.”

4. Give the dog a balanced food

No matter whether it is prepared by the owner or shop-bought, the food must contain all the nutrients the dog needs in adequate quantities, adapted to the dog's size (small, medium, large or giant), physiological condition (maintenance, reproduction, sport), age (puppy, young adult, mature adult, ageing adult) and its pathological condition (if the veterinarian prescribes a clinical diet).



5. Select the right food for the individual dog

The choice of a food is an important one, which should be based on the best nutritional balance. There are three criteria for selecting a dog food: age (puppy, young adult, mature adult, ageing adult), activity level (maintenance, reproduction, sport) and size (small, medium, large or giant). The dog's weight, coat and faeces quality, appetite and everyday behaviour are gauges of how well suited the food is to the dog and whether it should be adapted.



6. Use common sense

When serving prepared food the manufacturer's instructions should be followed in full, although the quantities may be tailored to the dog's activity level. In the event of home-prepared food, it is vital that the dog is never fed with leftovers, sweets, cakes or chocolate (poisonous to dogs). Dogs are not humans and should not be fed like humans. If treats are given, they should be specially formulated for dogs and must not exceed more than 10% of overall energy requirement.

7. Proper hygiene is essential

Prepared food is always the most hygienic option. Opened cans and fresh or frozen food may be stored in the fridge for a limited time, whereas kibbles should be kept in a sealed bag in a dry, cool place. If the dog does not finish its meal, any leftover should be thrown away and the bowl should be cleaned every day.

Sources of bacterial contamination causing diarrhoea in puppies



8. Never hesitate to consult a veterinarian

Veterinarians are trained to be dog dieticians. They know what dogs need, whether they are ill or in the best health. The veterinarian should be consulted in the event of any change to the dog's appetite (anorexia or bulimia) or weight (loss or gain), any digestive disorders (vomiting, diarrhoea, flatulence) and, of course, any change to its food. The first sign of many diseases is a change in thirst, appetite or weight.





© Duhaier/Royal Canin

Prepared complete or home-prepared food? Which is best?

Since they first appeared on the market, prepared complete pet foods have often been contrasted with home-prepared foods, sometimes dividing owners and canine health professionals. The advocates of one are often the critics of the other. But the important thing is not where the food comes from, but whether it covers all the dog's nutritional requirements. When it comes to food and diet, nutrients are the only things that count.

Today's food manufacturers work with research centres and universities to produce complete foods adapted not only to the species, but also the size and physiological condition of the dog, as well as the diseases it may suffer from. Home-prepared food can also be of excellent quality provided strict hygiene rules are followed. What should not be forgotten, however, is that a complete food must provide all of the fifty or so nutrients dogs need – all in the right proportions. Here, we examine the two forms in detail, noting the pros and cons of both.



© Duhaier/Royal Canin

Home-prepared food

Preparing food at home is more expensive day-to-day than pre-prepared food, even if the quality is comparable. This is mainly due to the price of meat. It also takes more time to prepare on a daily basis, although it is possible to prepare and freeze portions in advance.

Formulating the food

In home preparation, five families of nutrients are essential:

- Protein, provided by fish or meat, with a high enough content of essential amino acids
- Essential fatty acids, provided by the appropriate oils
- Minerals and vitamins, provided in special veterinary formats

- Fibre (vegetables) is not critical, but it does ensure good digestive transit and adds volume to the ration
- Polysaccharide carbohydrate, primarily in the form of starch

Let's now examine the principles behind the formulation of a home-prepared food, based on the nutritional requirements described above.

Calculating energy requirement

The first step is establishing the animal's energy requirement. This is calculated on the basis of its ideal weight, adjusted by coefficients of breed (Labradors require 20% less energy than other breeds of the same size, for example), activity, physiological condition (growth, reproduction, neutered) and any illness.

Calculating protein requirement

All protein the body takes in is used immediately and no protein reserves are built up, so the body needs to take in protein every

day to meet its requirements and produce new protein, during growth, for example. If it does not take in sufficient protein the body will use its amino acids to produce the protein it needs to cover its most essential requirements.

Not all meat has the same protein or energy content. A distinction has to be made between lean meat (beef containing 5% fat, chicken, turkey and lean pork) and fatty meats (beef containing 15% fat, fatty pork, mutton).



© Duhayer/Royal Canin

Home-prepared rations for different-sized adult dogs in good health, each with 1000 kcal of metabolisable energy

The simplest method for working out the feeding amount is to select a ration type and start from there. Those in the table each contain 1000kcal ME. These are just a few examples, as recipes can be adjusted almost endlessly. It is simply a matter of applying a coefficient corresponding to the ratio of energy intake between the animal's energy requirement and the energy concentration of the ration-type ($Q = ER/1000$) to determine the feeding amount for the dog in question, where Q is the coefficient, ER is the animal's energy requirement and in this case the energy concentration of the ration is 1000kcal ME.

The difference due to the size of the dog is mainly based on protein intake, which increases with the size of the dog. This means that a small dog can be fed any of the rations, but medium-sized and large dogs should eat ones designed for them.

Ingredients	Small (< 10kg)		Medium (10 -25kg)		Large (> 25kg)	
Lean meat (5% fat)	200 g	0	250 g	0	275 g	0
Hake or coley	0	240 g	0	260 g	0	300 g
Rape or soy oil	24 g	32 g	24 g	32 g	20 g	24 g
Cooked green vegetables	350 g	350 g	400 g	350 g	400 g	450 g
Cooked white rice (or dry rice)	360 g (120)	360 g (120)	290 g (95)	330 g (110)	290 g (95)	330 g (110)
Mineral and vitamin supplement Ca/P = 2 (15.5% Ca)	12 g	12 g	12 g	12 g	12 g	12 g

Example: Adult Poodle, entire, two years old, weighing 7kg, normal activity level

$$ER = 130 \times 7^{0.75} = 560 \text{ kcal ME}$$

$$Q = ER/1000 \text{ i.e. } 560/1000 = 0.56$$

This coefficient is applicable to each ingredient or for the daily ration

Example for small dog fed on meat ration

$$\text{Meat: } 200 \times 0.56 = 110\text{g}$$

$$\text{Oil: } 24 \times 0.56 = 12\text{g (3 teaspoonfuls)}$$

$$\text{Vegetables: } 350 \times 0.56 = 200\text{g}$$

$$\text{Rice: } 360 \times 0.56 = 200\text{g cooked or 65g dry before cooking}$$

$$\text{Mineral and vitamin supplement: } 12 \times 0.56 = 6\text{g}$$

Lean meats contain more protein, whereas fatty meats contain more energy for the same weight, so the choice of meat will depend on the goal. To preserve its nutritional qualities, it is important not to boil or over-cook the meat.

The regular consumption of liver or kidney is dangerous, because these organs store vitamins A and D as well as some toxic metals, so eating these meats entails a significant risk of poisoning. A dog should not be fed liver more than once a month.

Calculating essential fatty acid requirement

Vegetable oil – preferably rape oil – and fish oils – which are available in special veterinary formats – provide the essential fatty acids needed for optimal body function and the quality of the skin and coat. At least 5% of the energy requirement must be provided by oil. This ingredient determines the volume of the ration, because lipids are the most energy-rich family of nutrients (9 kcal/g versus 4 kcal/g for carbohydrate and protein).

The more fat in a ration, the smaller it will be, which makes it a good way of tailoring the volume of the serving to the dog's appetite.

Calculating fibre requirement

Fibre is a carbohydrate resistant to the action of the dog's digestive enzymes. While it is not essential, it does play a role in ensuring the good health of the digestive tract (transit, bacterial flora). It is generally recommended that it makes up at least 5% of energy intake. It is provided in cooked vegetables.

Calculating starch requirement

Starch is added to complement the energy provided by the meat, oil and vegetables. Rice and pasta are commonly used. It is important that the starch is properly cooked: rice and pasta should be sticky. Rice should not be rinsed after it is cooked, as the sticky substance is actually gelatinised starch, which dogs find very easy to digest. Potatoes can be used, although their starch is less digestible, so they need to be cooked and mashed.

My dog is ageing, he just turned 9 years old and has problems with osteoarthritis. How can I help him?

Joint degeneration (osteoarthritis) is common in dogs as they get older. It is a combination of an inflammatory process with chronic degeneration which produces changes in the joints and adjacent tissues. The consequence is a reduction in wellbeing of the dog. There are predisposing factors, such as breed (e.g. Retriever) and sex, also situations which lead to excess force (mechanical overload) on the joints such as excessive exercise or obesity. On the other hand, ageing leads to a natural loss of hydration and elasticity of joints. We can help our dog to age with the best quality of life. There are 4 important points to consider.

* Maintenance of body condition and optimum weight. This is one of the most important factors, as excess weight exerts a direct action upon damaged joints as pro-inflammatory components derive from fatty tissues. Ideal weight is unique and specific to each individual dog and the veterinarian can evaluate this. This means a change in the feeding habits of dog owners towards their pets.

* Dependent how advanced the condition, light or moderate exercise and physiotherapy are recommended.

* Use of nutritional supplements or food enriched with specific nutrients helps with joint remodelling and control of inflammation; specifically omega-3 fatty acids (EPA, DHA and ETA), chondroprotectives (glucosamine sulphate, chondroitin and green-lipped mussel extract) and certain vitamins and minerals with antioxidant properties.

* Use of analgesics and/or anti-inflammatory medications during certain periods and under the control of a veterinarian.

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Supplementing minerals and vitamins

The recipe above is deficient in calcium. Meat does not provide any calcium, 99% of which is found in bone. The recipe does, however, have a high phosphorus content. With this in mind, two to three times more calcium than phosphorus needs to be added to the recipe to balance it. Other essential minerals and vitamins are generally included in specialised veterinary supplements. Human supplements are not suited to dogs and there is a risk of both deficiency and toxicity if they are used.

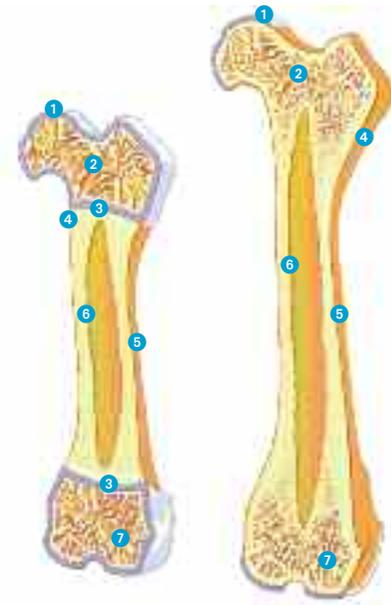
In the event of particular physiological demands (growth, gestation, lactation, intense activity, ageing) the nutritional requirements will be different to those in the maintenance stage. For example, protein content needs to be higher during growth and reproduction, whereas energy content needs to be lower for overweight puppies or giant-breed puppies in the growth phase.

The formulation of the food must be just as precise as with maintenance food. The quantity of the various ingredients has to be measured with great accuracy. This entails a lot of laborious calculations and requires a definitive list of the nutritional values of all raw ingredients.

Some owners prefer home-prepared food, which dogs can find very palatable. On the other hand, as mentioned above, ensuring it is nutritionally balanced is a very complicated process. Use of a complete pre-prepared food is therefore highly recommended during the critical growth phase.

Everyone is free to choose home-prepared food, but this decision must never put the dog's health at risk. A veterinarian should check recipes for all home-prepared rations to ensure that they are properly balanced.

Bone growth



1. Joint cartilage
2. Epiphysis
3. Growth cartilage
4. Metaphysis

5. Diaphysis
6. Compact bone

Pre-prepared food

As stated above, achieving the right nutritional balance in a home-prepared ration is a complicated process. Supplements have to be properly managed to ensure the dog does not suffer from any deficiencies or excesses. The advantages of pre-prepared foods are nutritional balance (provided the quality is good, of course), convenience (complete foods, preservation) and cost.

Most owners feed their dog a pre-prepared food. While figures vary from country to country, generally speaking, three in every four buy this pre-prepared food in a supermarket, while most of the rest go to specialist outlets, such as pet stores and garden centres. Less than one in ten buy food from a veterinarian.

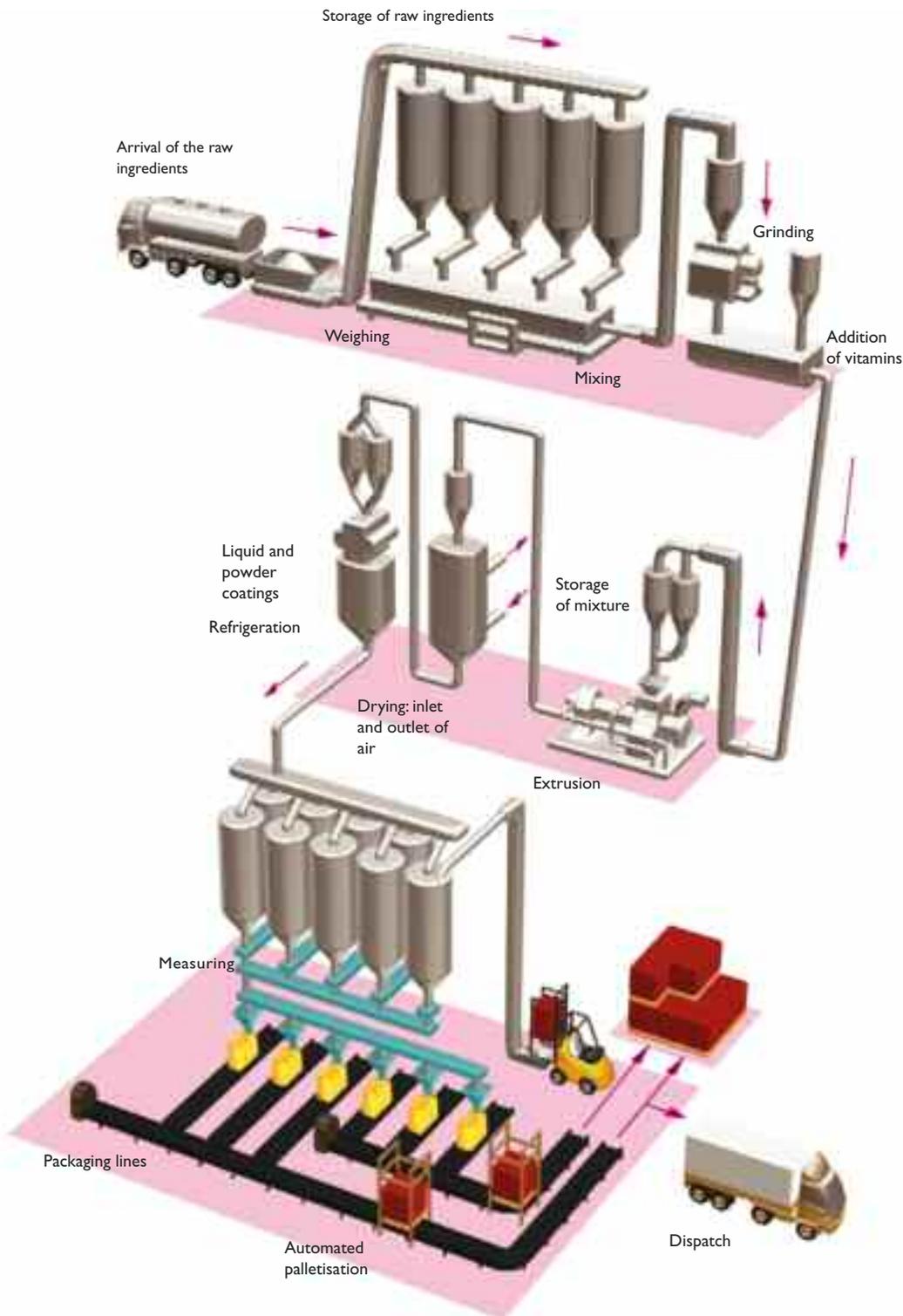
Raw ingredients, production and food safety

The information stated on the pet food label is governed by law. Some information is obligatory, some optional. A manufacturer's code of regulations and good practice lists the various national and international laws and specifies the conditions they impose on the use of raw ingredients (animal by-products, vegetable meal), how these ingredients must be identified, the composition of foods, their designation and the packaging of finished products.

Meat products not used for human food are used in dog food. These are surplus products (meat, livers, kidneys, hearts), cuts that are not usually consumed by humans (lungs and udders), by-products from production of suet or lard, off-cuts from fowl (carcasses, by-products) and off-cuts from fish filleting. All of these products are from animals slaughtered in abattoirs and certified as fit for human consumption. The industry does not use meat meal from rendering plants, which is incinerated.



**Kibble production process
(example at Royal Canin)**



The entire dog food production chain – from the collection of raw materials, through production plants, to storage of the finished product – is strictly regulated (ISO 9000 certification). The most efficient plants using these foodstuffs (in refrigerated, frozen or dehydrated form) follow the Hazard Analysis and Critical Control Points (HACCP) management system. They guarantee the quality of the products that enter and leave their plant, conduct regular quality controls and implement a system that enables tracing of every batch. They are also regularly checked by government bodies.

Foods are also analysed to ensure they comply with the recommendations of the AAFCO (Association of American Feed Control Officials) and the NRC (National Research Council), two US organisations that set the standards in animal feed.

All the nutrients the dog requires are provided by mixtures of meat, fish, cereals, vegetables and supplements (vitamins and minerals, purified nutrients).

In wet food, which is packaged in cans, sachets or alutrays, the raw ingredients (meat, cereals, minerals, vitamins, gelling agents) are mixed, cooked, packed and sterilised. Wet foods typically have a high protein and fat content. Additives can be used to change the texture, giving them a jelly-like appearance, for example.

The mixed raw ingredients in dry foods undergo a process of cooking-extrusion, a technological process in which they are subjected to high temperature and high pressure for a short time before being passed through a die to form the mixture into kibbles. The cooking and expansion of the starch is what enables the production of food in the form of kibbles. The kibbles thus retain all the starch (at least 30% of their dry matter). Coating ingredients that cannot survive this process (vitamins, fats, natural aromas) are then sprayed onto the kibbles. The kibbles are immediately packaged in airtight bags, sometimes in a modified atmosphere (replacing oxygen with nitrogen), which guarantees a longer shelf life & preservation of the aroma of the food.

Ideally, the kibbles should be consumed within about a month of opening the bag, and stored in a dry, cool, dark place. Small bags are therefore preferable for small dogs.

Food labelling: available information

There are four categories of pre-prepared dog food:

- Complete foods, which fulfil all the nutritional requirements of a dog in good health, except for water.
- Complementary foods (e.g. flakes, meat sausages, mixer), which must be combined with other foodstuffs to make up the dog's complete ration.
- Specially formulated clinical diets for dogs suffering from illness (e.g. obesity, kidney failure), available from veterinarians.
- Treats, which are not an essential part of the dog's nutritional requirements and should be given in small quantities.

Legal framework

As stated above, according to law, the label must contain certain information about the product.

Is obesity always a result of organic causes or lack of physical activity?

No, there are behavioral causes, some related to attitude (behavioural problems), and some with communication rituals regarding food. For example, development disorders, accompanied by lack of self-control, anxiety, hierarchy disputes, etc.

It's very easy to develop rituals regarding food as part of the communication with our pets. With dogs, it's very easy to get their attention with palatable food, and food is also a communication resource: the dominant dog has the food prerogative, it has, divides and organizes the food for the whole group. Regarding the social communication issues, it is usual that the dog demands food from its owners, a lot of times not out of hunger, but to access the resource. This last, makes it easier for the dog to over-eat and be obese.



Maria de la Paz Salinas,
Doctor of Veterinary
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(Argentina)

The label must also clearly identify the product as a "complete food" or a "complementary food".

The ingredients must be listed in decreasing order of weight. The more detailed the list, the better.

If the list is vague the manufacturer will have more leeway to substitute ingredients based on supply, which will mean that the composition could vary from one batch to the next.

Where an ingredient is highlighted in the product presentation – chicken, for example, - the percentage must be stated in the list of ingredients.

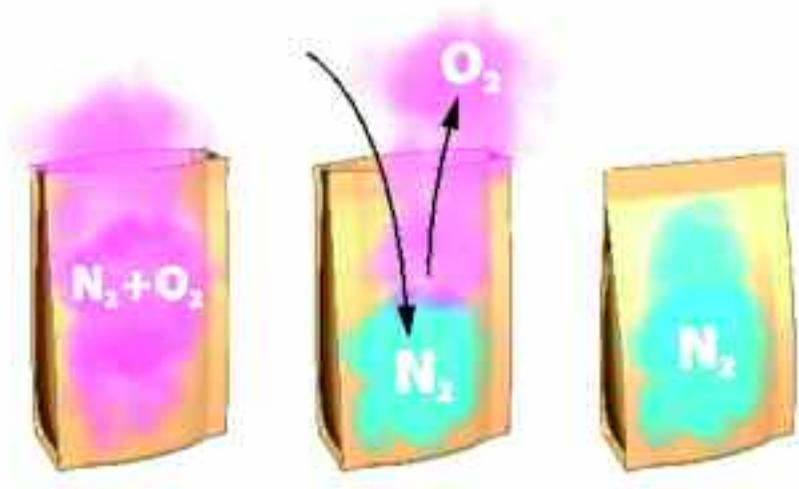
Average analysis

The average or guaranteed analysis of ingredients comprises the content of protein, fat, ash, crude fibre and water (optional for kibbles). These values are most often given in grams per 100 grams of food.

Other substances (e.g. sodium, calcium, phosphorus) do not have to be specified. If they are, the manufacturer is obliged to ensure that their stated contents are strictly adhered to.

Ash (total minerals) is what remains after the total incineration of the food (3 hours at 550-600°C).

Modified atmosphere principle



Packaging in a modified atmosphere is a technique that ensures the preservation of a food's organoleptic and nutritional qualities.

“The kibbles are immediately packaged in airtight bags, sometimes in a modified atmosphere (replacing oxygen with nitrogen), which guarantees a longer shelf life & preservation of the aroma of the food.”

The water content of a food determines which category it is in: a dry food (kibbles) contains less than 14% water and a wet food (cans, sachets, alutrays) more than 60% water. Semi-moist foods (e.g. “sausages”) are somewhere in between.

All additives (colouring agents, preservatives, antioxidants) must be approved for use in the country in question. In the European Union approved additives are standardised as E numbers. If vitamins are used, only the content of vitamins A, D3 and E need to be stated. All contents must be correct until the best-before date. Any copper additive must be specifically named and quantified.

The manufacturer’s name, address, country of origin and registration number are obligatory. The codes are sometimes difficult to understand, but they need to be noted down and stated in any complaint. The batch number and best before date are also invaluable information.

Instructions for use

The label will also provide instructions for use of the product based on the physiological condition of the animal it is intended for (puppy, adult, senior), the importance of providing clean water with kibbles and the recommended storage conditions. The suggested daily intake in volume or grams, based on the age and weight of the dog, may also be stated. The owner should adjust this to the individual dog. This is where professional advice adds value, compared with supermarkets.

Is the information on the label enough to make an informed choice?

The label must contain the legally required information which leaves a limited amount of space for further details and so labels provide limited information from which to make an informed choice from a selection of products.

Where a dog is suffering from a specific disorder, veterinary advice should be sought over the use of a veterinary clinical diet.

Comparison of the list of ingredients of two canned dog foods	
Complete canned food for adult dogs, retail outlet	Complete canned clinical diet for adult dogs, veterinary practice
Ingredients: meat and animal derivatives (min 4% beef, min 4% poultry), derivatives of vegetable origin (pasta), vegetables (spinach), wheat germ oil	Ingredients: chicken, chicken livers, rice, fish oil, sunflower oil, cellulose fibre (only the first six from the list are mentioned here)

Rules governing terms used on prepared food labels	
Term	Content stated in the list of ingredients
“chicken flavour”	Chicken content < 4%
“with chicken”	Chicken content between 4% and < 14%
“rich in chicken”	Chicken content between 14% and < 26%
“chicken brand”	Chicken content between 26% and <100%
“all chicken”	100% chicken

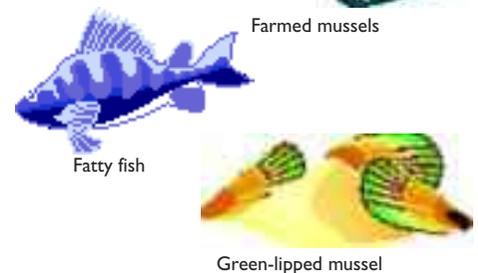
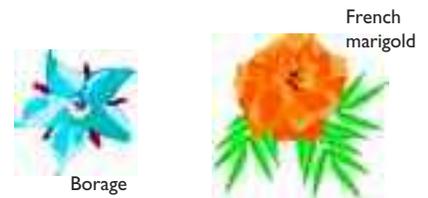
For example, it is not obligatory to state the sodium (Na), i.e. salt, content of a food, so owners will find it difficult to choose a low salt food where required.

The protein content provides no information whatsoever on protein quality, of course. The protein provided by good meat chunks is of a higher quality than protein from animal by-products. That is why it is important to read the list of ingredients.

Two products cannot be compared on the basis of the quantities of the raw ingredients. For example, does a wet food with 7.5% protein and 81.5% water have a higher, lower or the same protein content as a food containing 8.9% protein and 78% water?

The correct answer is the same. These two foods both contain around 40.5% protein by dry matter, although you need to be good at maths to get to the bottom of it.

Selected nutrient sources used by Royal Canin



Pros and cons of different foods		
Food type	Pros	Cons
Dry processed (kibbles)	<ul style="list-style-type: none"> Keeps for a long time unopened Keeps after serving Ease of serving a specific quantity Daily cost Moderate serving volume Nutritional balance Palatability 	<ul style="list-style-type: none"> Need to monitor water intake Sometimes low serving volume
Wet processed	<ul style="list-style-type: none"> Keeps for a long time unopened Ease of serving a specific quantity Water content High serving volume Palatability 	<ul style="list-style-type: none"> Keeps for a short time after serving Deteriorates quickly after opening High serving volume in larger pets Bulky and heavy in storage Daily cost
Home-prepared	<ul style="list-style-type: none"> Water content High serving volume Palatability Pleasure of the owner 	<ul style="list-style-type: none"> Difficult to ensure nutritional balance Dog finds it easy to pick out its preferred bits Need to monitor nutritional and hygiene aspects Deteriorates quickly after serving Deteriorates quickly after preparation Sometimes too high serving volume Preparation time Daily cost



© Royal Canin

There are a great number of brands and formulas and the market is expanding all the time. Supermarkets and some specialist outlets have also introduced their own brands.

A range is made up of all the products sold by a particular brand and tailored to the physiological stage or activity level of the dog. The same brand can have more than one range, depending on the distribution channel. So, the same brand may sell its products through supermarkets, specialised stores and veterinarians under different names. Clinical diets are sold through veterinarians, to ensure the dog receives the correct choice of product along with appropriate health checks, screens and medical care.



© Royal Canin

The texturometer measures the force needed to break the kibble and the penetration of the tooth (mechanical brushing).

There is actually no easy way of comparing foods based on the information on the label (average analysis), other than the comparison of ingredients. The dry matter or energy concentration must be the basis of all calculations and comparisons.

The feeding amounts stated on packaging are approximate. The only way to know whether the energy intake is satisfactory is regularly weighing the dog to ensure that its weight is stable. Problems such as dull hair, scaly skin and persistent digestive disorders (soft, foul-smelling faeces, flatulence) are reasons for reviewing the dog's food.

Generally speaking, supermarkets carry products of either low or medium quality, while specialised shops carry a wider and sometimes excellent technical range of products. Clinical nutritional products, curative in some cases, in addition to life-stage ranges, are available from veterinarians.

There are many forms of wet food, in terms of both packaging and texture. Clinical diets are available in wet as well as dry form. The texture of wet food (gel, gravy, mousse) is more important to the owner than the dog. It has no impact on nutritional quality, except in certain very specific cases.

Food ranges and distribution channels

Dog food is sold by various types of outlet: supermarkets, specialist stores (pet shops, grooming salons, garden centres, agri merchants), veterinarians, breeders and online.

So what's the trick to choosing a complete food? Basically, you get what you pay for. Low-priced products typically contain lower-quality nutrients and raw ingredients. Supermarkets sell so-called "premium" products, too. Here, it is interesting to compare the price per kilogram and feeding cost per day, which is



© Royal Canin

Modules simulate the teeth of puppies and adult dogs of different sizes.

generally less good value than the products sold through veterinarians. Included in the ranges sold in specialist outlets and veterinarians, some brands offer foods specially formulated for certain breeds or groups of breeds with specific sensitivities. All these foods meet the animal's needs and are formulated on the basis of extensive studies of such parameters as kibble texture, hardness and shape, and the specific nutrients to benefit the health of specific breeds.

When dealing with prepared foods, owners need to be on their guard for weasel words, such as “balanced” and “tasty”. When choosing a prepared product it is important to weigh up the pros and cons and not to be swayed by anthropomorphic arguments.

The dog is of course the best judge of whether a food is good or bad. With this in mind, the suitability of a particular food to a given individual can be checked on the basis of some simple observations:

- The animal's appetite, which is an expression of its good health and the food's sensory qualities (aroma, taste, consistency).
- The quality of the faeces, in terms of volume, consistency, wetness, colour and odour, which provides information on digestibility and the dog's digestive system.
- The animal's weight, which should be measured every week (puppies) or every month (adults) to ensure it does not gain or lose too much.
- The integrity of the skin and the beauty of the coat, which closely reflect the health of the dog, revealing any dietary imbalances or general health problems.
- The dog's behaviour, which should be happy and active, depending on its habits.

Hair and skin qualities

Elasticity, solidity = keratin



Sheen, protection = cutaneous lipids



Colour = pigment quality and quantity



“Generally speaking, supermarkets carry products of either low or medium quality, while specialised shops carry a wider and sometimes excellent technical range of products. Clinical nutritional products, curative in some cases, in addition to life-stage ranges, are available from veterinarians.”





Dog and owner



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© Labat/Rouquette



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Living with a dog

The decision to share your life with a dog is not one to be taken lightly. A dog has an average lifespan of twelve years, so it is important not only to choose the right dog, but to be sure you can live with your choice too.

Choosing a puppy

Dogs have always been the epitome of loyalty for humans, so for many they are the very best of domesticated animals. However, taking a dog into your life demands careful consideration of a number of important questions.

Which breed?

Certain breeds are known for having a dominant character; German Shepherds are said to be obedient, Labradors affectionate with children, Greyhounds independent. But despite their innate nature, dogs cannot be classified in such a categorical way, because experience plays a big part in how the dog's character develops. Likewise, we need to be

cautious about claims that a particular breed is hardy or delicate. Dogs are individuals too, so Chihuahuas can be hale and hearty, while Fox Terriers can sometimes be fragile.

It is best to choose a breed with a weight and height suitable for your lifestyle. It is probably not the best idea to choose a

Yorkshire Terrier if you are looking for a guard dog, or a Great Dane or Border Collie if you plan to leave it behind in a flat all day. Generally, while smaller breeds can be more highly strung, they require less living space than medium breeds. Large and giant breeds always require a lot of living space.

Price will also be a factor. Price depends on its pedigree and how rare the dog is. Obviously, some people cannot afford a purebred and choose a crossbred puppy instead. The problem here is that it is difficult to gauge how big the dog will eventually become.

Regardless of the breed and the purchase price, it is vital to bear in mind that throughout its life a dog costs money and demands care and attention.

Male or female?

Females are generally calmer and gentler than males. They are also smaller. Another advantage is that they receive preferential treatment from males in any encounter. Males often become more manageable and less aggressive in their presence.

Sweden: One way to choose a dog...

The Agria Dog Breed Profiles provide statistics on health problems, causes of death and survival rates to 10 years of age in over 200,000 dogs yearly (1995-2002) for each of 80 pure breeds, mongrels and all breeds combined. The material is presented in graphs and tables with basic interpretations easily understood by dog owners and breeders. The findings highlight the specific health problems experienced by each breed and differences between breeds, genders and ages. There are 11 CDs each with profiles for 3 to 12 breeds and all breeds, available at:

www.agria.se or from Terese.Olofsson@Agria.se.

This work is the result of long-standing partnerships between Agria Pet Insurance (Agria Djurförsäkring), the Swedish Kennel Club and researchers from the Swedish University of Agricultural Sciences and the University of Guelph in Canada, coordinated by Brenda Bonnett, DVM, PhD.



The main disadvantage with a bitch is oestrus (heat or season), which generally occurs twice a year, although the frequency varies depending on the breed. This also attracts groups of persistent males that wish to mate. An ovariohysterectomy (spaying), which can be carried out before the first oestrus, will prevent the female from becoming pregnant: this process is irreversible.

Males, which tend to roam more than females, can undergo a complete character change in the presence of a female in oestrus. A normally calm dog can become nervous and aggressive, even starting dramatic fights with other dogs.

A dog which lives alone can get bored, so having more than one dog may be considered. It is of course important to give each dog the individual attention & training it needs and they need to have a lot of space. More than two might be difficult. Even if they click well as puppies, you never know how well they will get on when they are older. Having a male and a female is a good solution, but you will have to think about family planning if you do not want any puppies.

Two males is not a good idea: they are likely to become rivals for the affection of females as soon as they reach sexual maturity. Two females, on the other hand, can often get along well together. In every case, owners need to be aware of the potential difficulties of having two dogs.

Where to buy?

There are many different options for dog buyers, including private sellers, specialised stores and kennels. However, some places should always be avoided. If you buy from a private seller at a market you will have no information on the dog's medical history or the parents and you will have no one to go to if it turns out to have any problems. This type of sale is banned in many countries.

The situation with specialised stores is highly variable. Some specialised stores do provide warranties, are able to furnish information on puppy origins and take care to ensure that puppies develop normal behaviour. Proof of origin and traceability are essential points that buyers must insist on. They should also carefully inspect how the puppies are housed. If there is any doubt, a veterinarian should always be asked for advice on the quality of a given outlet.

If you want a specific breed the best option is to contact a registered breeder. Kennel clubs, veterinary surgeries and breed clubs can provide a list. Individual breeds have a predisposition to a specific range of genetic diseases, so it is important to check that the parents have been tested for these, depending on the tests available.

Another option is to go to a dog shelter or a breed rescue organisation, which will have dogs of all ages looking for a new owner.

The ideal age?

Good breeders know about every aspect of their dogs. It is important to check the living conditions of the puppies. The more contact they have with people of all ages, the less chance they will have any problems with children. This also goes for other animals.

It could be that no puppies are available the first time you visit. However, this shows you are dealing with a serious breeder. At some times of the year no females will be pregnant and even if there are a few litters, the puppies may not be ready to leave their mother.

The puppy goes through a number of stages before it can move to its new home. It needs to live long enough with its mother to learn what it is to be a dog. Contact with humans is also important. This can start as soon as the puppies leave the confines of the whelping box. By around seven weeks old the puppy can begin contact with strangers. Even then it remains vulnerable and some breeders may be unwilling to let the puppy go to a new home until it is three months old. Buying a puppy under eight weeks old is against the law in some countries.

“Good breeders know about every aspect of their dogs. It is important to check the living conditions of the puppies. The more contact they have with people of all ages, the less chance they will have any problems with children.”



© Laboufhouquette

Which puppy in the litter?

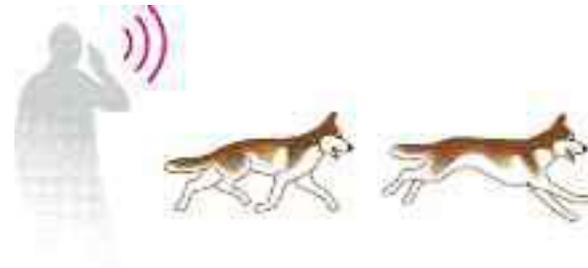
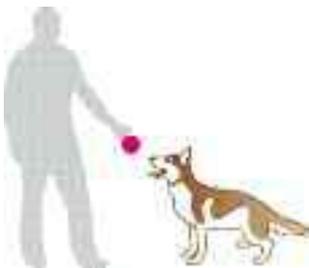
The health and character of the dog are two good criteria for choosing a puppy. The puppy should have a pedigree certificate (if appropriate), and may have ID and a bill of sale (obligatory in some countries). A vaccination certificate is preferable, although vaccination is not obligatory and depends on the age of the puppy. A veterinary certificate may also be needed, depending on the country.

pleasant or dirty. Its stools should be well shaped without any traces of blood. It should have bright eyes and a clean nose and ears. The coat should be neither dull nor brittle. Character-wise, the puppy should be happy and playful with both its littermates and humans. It is advisable to take the puppy for a veterinary check after you have bought it to confirm that it is healthy.

“It is important to develop, from a very early age, the puppy’s motivation for an object – a ball say – which will be used during the various stages in the learning process.”

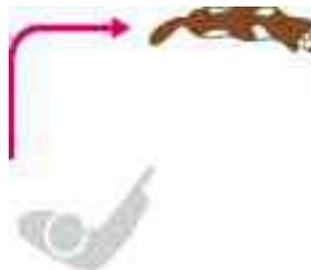
The breeder should show all the puppies from the litter as well as the mother. The mother may be a little thin and have sensitive teats from suckling the pups, but she should look content, well cared for and affectionate. The puppy should not smell un-

You should also check how much living space the puppy has. It will of course find it strange moving to a new home, but it could have some serious adaptation difficulties if it has been kept in a confined space without opportunities to go outside.



The puppy can be taught to follow a command to change pace...

“A certain degree of discipline can be rapidly developed in a playful way, using the puppy’s motivation for the object, including such commands as heel, sit, down and fetch.”



... change direction



... wear a muzzle



... retrieve an object



... and work in a group

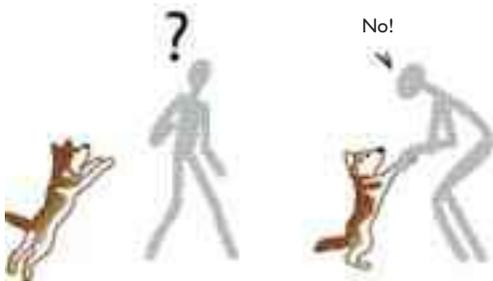
It can be hard to make a choice if all the puppies are healthy. This is where the tests designed by the American animal behaviourist William Campbell can be helpful. They should preferably be carried out on seven-week old puppies. Prior to this, the mother has too great an influence on her puppies; after this the puppies go through a period of emotional vulnerability.

The tests should be conducted in a quiet, enclosed space unfamiliar to the puppy. The person conducting the tests should remain neutral throughout, displaying no joy, anger or irritation.

“Once the dog has mastered the basics of discipline, which will not be before eight months of age, you can teach it obedience exercises such as heeling with or without a leash, changing direction, changing pace, assuming positions (stand, down, sit)...”



If the puppy bites, take it by the scruff of the neck (as its mother would) and say 'no' firmly.



If the puppy jumps up without warning, take it by the front legs and say "no" firmly.

A better understanding of your dog improves your life together

When it comes to training a dog, it is often said, "You have to train the owner before you can train the dog". I myself feel you have to educate owners, teach them how a dog functions and how it might react in a given situation, so they are better able to anticipate and prevent any problems. You also have to teach owners to communicate with their dog – to understand and to make themselves understood. Most problems or conflicts stem from a lack of understanding and mutual ignorance of the rules and social behaviour of the other species. Owners and dogs have to learn to live together.

Owners have to create a language of signals that their dog understands. They cannot begin training their dog until this language has been established. The purpose of this training is to establish the dog's hierarchical position and the house rules it must abide by in its new "family pack".

It is important to develop, from a very early age, the puppy's motivation for an object – a ball say – that will be used during the various stages in the learning process.

Initially, the focus will be on discipline rather than obedience. Ground rules need to be laid down: no food at the table, no access to certain rooms and the designation of where the puppy is permitted to go to the toilet.

A certain degree of discipline can be rapidly developed in a playful way, using the puppy's motivation for the object, including such commands as heel, sit, down and fetch.

Once the dog has mastered the basics of discipline, which will not be before eight months of age, you can teach it obedience exercises such as heeling with or without a leash, changing direction, changing pace, assuming positions (stand, down, sit), staying, recall (very important), wearing a muzzle (if necessary) and group work to develop sociability towards people and other dogs.

Dogs need authority if they are to be well rounded. It is, however, important to understand that they need to obey, but not to fear. Excessive submission or strictness will be counterproductive - the dog should be willingly obedient. The relationship will develop positively in a climate of trust, which will help the dog to overcome its natural apprehension in all circumstances.

It is vital to follow a number of rules:

- * Maintain a consistent attitude, always react in the same way in a given situation. This will help the dog to quickly understand what it can and cannot get away with. Inconsistency breeds a lack of understanding and defiance.
- * Trust is the foundation of all communication. Dogs have an acute sense of fairness, so be sure to be even-handed.
- * Display your feelings. Be very positive if the dog does something good and be severe and dry when saying "no" to be sure the dog knows it has done something wrong. Dogs soon learn to gauge the satisfaction or dissatisfaction of their owner.
- * Be patient and above all very attentive, and learn to recognise tiredness, excitement, curiosity and fear. This will help you to anticipate and avoid incidents.
- * Finally, take on the guise of a good "pack leader" with all the authority and responsibility that entails.

Owners should be given this advice, while being reminded that, first and foremost, dogs should be a source of pleasure and joy in their life; that they should appreciate their dog's company, and not simply put up with it, which is unfortunately all too often the case.

**J.-P. Pettidier,
Education of the dog,
education of the owner,
From The Adolescent Dog,
SFC, Paris, 1997**

Campbell tests

Campbell tests can be used to determine the main character traits of a puppy. Other behavioural tests are available too.

Bear in mind also that the new owner can modify even dominant innate traits in the way in which he or she cares for the dog, reinforcing some personality traits and discouraging others.

Test	Situation	Responses
<p>Attraction test</p> 	<p>This test can be performed with a puppy at about seven weeks old.</p> <p>After carefully placing the puppy on the ground, step back a foot or two, clap your hands softly and observe the behaviour of the animal:</p>	<ol style="list-style-type: none"> 1. It immediately runs to you with its tail held high, jumps on you and licks your hands. 2. It immediately runs to you with its tail held high and scratches your hands with its paws. 3. It immediately runs to you, wagging its tail. 4. It comes hesitantly with its tail down. 5. It does not come.
<p>Test to see how well the puppy accepts dominance</p> 	<p>This test must be conducted by a person unknown to the puppy.</p> <p>With the puppy lying in a sphinx position, pet it, applying pressure to its head and back:</p>	<ol style="list-style-type: none"> 1. It struggles by scratching, turns over, growls and bites. 2. It struggles and turns over to scratch you. 3. It struggles at first and then calms down and licks your hands. 4. It turns over onto its back and licks your hands. 5. It moves away.
<p>Test for ability to follow</p> 	<p>This test should be performed on one puppy at a time without using your voice.</p> <p>Stand up and move slowly away, staying within view of the puppy:</p>	<ol style="list-style-type: none"> 1. It follows you immediately with its tail held high, biting at your feet. 2. It does the same without biting. 3. It follows you immediately with its tail down. 4. It follows you hesitantly with its tail down. 5. It does not follow you and moves away.
<p>Standing position test</p> 	<p>This test must be conducted by a person unknown to the puppy.</p> <p>Place your hands under the chest of the puppy and stand it up. Hold it in this position for 30 seconds:</p>	<ol style="list-style-type: none"> 1. It struggles forcefully, growls and bites. 2. It struggles forcefully. 3. It struggles at first and then calms down and licks your hand. 4. It does not struggle and licks your hands. 5. It does not struggle.
<p>Test of dominance by constraint</p> 	<p>This test must be conducted by a person unknown to the puppy.</p> <p>Lay the puppy on its back and hold it in this position for 30 seconds by placing your hand on its chest:</p>	<ol style="list-style-type: none"> 1. It struggles forcefully and bites. 2. It struggles until it is free. 3. It struggles at first and then calms down. 4. It does not struggle and licks your hand. 5. It does not struggle.
<p>Results</p>	<p>Majority of answers are 1: Dominant-aggressive. Not recommended as a pet. Could be a good work or guard dog if properly trained.</p> <p>Majority of answers are 2: Headstrong. Work dog that requires strict training.</p> <p>Majority of answers are 3: Sociable and adaptable.</p>	<p>Majority of answers are 4: Submissive. Animal ill-suited for work.</p> <p>Majority of answers are 5: Inhibited. Poorly socialised dog; unpredictable.</p> <p>The results may appear to be contradictory. If so, it is advisable to redo the tests as the setting may not have been exactly right (puppy too young, stress, too soon after or in need of meals or sleep, etc).</p>

The Dog at home

Whether it is an adult dog or a puppy just separated from its mother, it is important to follow certain rules from the outset. Dogs clearly add value to our day-to-day lives, but they can also be a real source of problems, which is why adopting a dog is not to be taken lightly. Fortunately, with good training most problems can be avoided.

The basics

First of all, the dog needs time to get used to its new home. It will meet the family members and explore its new home. It generally needs a couple of days for this. It will soon choose the places it feels most comfortable in, although it should not be allowed to do whatever it pleases just because it is young or, if it is older, because it needs to settle. Dogs quickly learn what they can and cannot do. If a puppy is allowed to lie on the sofa or bed when it first arrives, it will be virtually impossible to change its behaviour when it grows to full size. This concern applies not only to large dogs: despite their size Yorkshire Terriers and Dachshunds can cause considerable damage in a very short space of time.

As a consequence, it is vital to let the dog know who is master from the outset by not allowing it to jump on the bed and assigning it its own toys. A place will need to be designated where the dog will eat and it will have to be taught – by ignoring the behaviour – that begging for food is not tolerated. The dog should always eat last. In the pack, the dominant animal eats first and this behaviour has to be reproduced in your proxy pack. The dog also has to have its own place to sleep – a rug, basket or box – well away from doors and windows, so the dog does not feel it has been given the authority to monitor the comings and goings in the home.

These few simple rules will help orientate the dog to life in a pack, which is its natural environment. It must understand that it is subordinate and the owner is dominant. This stable pack hierarchy is where the dog finds its balance.

This holds true for all dogs, regardless of size. It will help ensure that a Dachshund, for example, does not become a tyrant that shows its teeth whenever anyone approaches its sofa and snaps at the calves of passers-by. The important thing is to be consistent. Do not allow the dog to do something one day if it is not normally allowed to do so. You must be firm, although not excessively so. This is how trust can be established between dog and owner over time.

To establish authority, the owner should start training the puppy before it reaches three months of age, starting with simple commands using simple words.

Teaching the puppy some simple commands

Two methods are generally recommended:

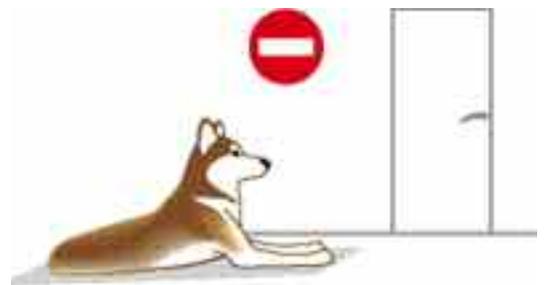
- The owner leaves the initiative to the puppy. So, when it sits, the owner says “sit” and praises it. The same pattern is followed for “down” or “stand”. The dog will gradually associate the command with the action and its owner’s satisfaction.
- The owner takes the initiative by placing the dog into the given position while giving the command. For “sit”, the owner simply places one hand on the puppy’s head, pushing its bottom or its hocks to the ground with the other. This will ensure the dog sits. For “down”, the owner then gently pulls the dog’s front limbs forward. Repeating the session for several minutes each day will generally produce good results. The dog should be praised when it does what is expected of it.



Barbara Helgason/Forolia



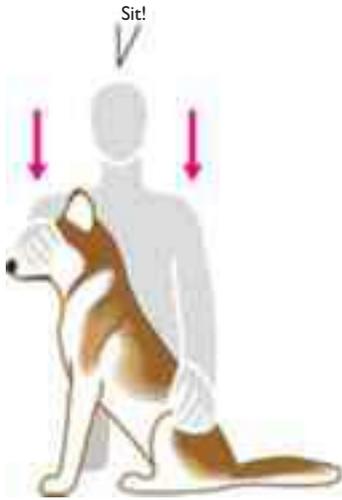
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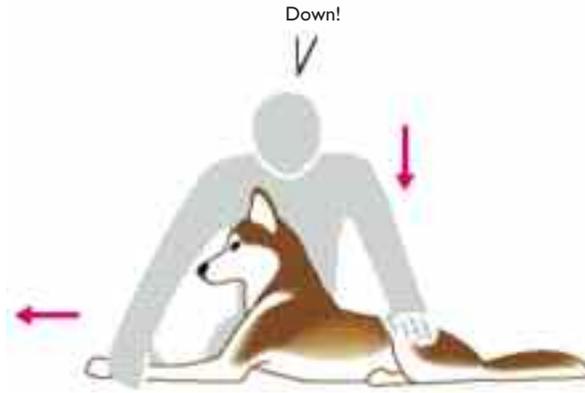
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Karim miri/Forolia



Teaching the dog to sit = no.



Teach the dog to lie on command.



Congratulate it when it does so.

It is more difficult to teach the dog to stay, because this command takes time to learn, so it's advisable to wait until the puppy is older before attempting it. Start by telling the puppy to sit, then place an object (such as its collar) on its head or nose. Tell it to stay and show displeasure if it lowers its head and the object falls to the ground. If it keeps its head still for a few seconds you should praise it. From here, you can gradually require the dog to stay still for longer and longer. The last step is commanding the dog to stay while you walk away, then getting it to come on command.

As soon as it arrives at its new home, the puppy has to be taught not to bite hands or ankles. A puppy can quickly turn a seemingly playful game into a test of which animal is the dominant one in the family. If not stopped, this can be the source of huge problems when the dog grows into an adult.

How to house train a puppy?

The only way to housetrain a dog is to reward when he runs to the right place, but never punish when he is wrong.

To promote quick learning it is in the owner's interest to walk his dog regularly and often.

The reward should be given exactly when the puppy turns to sniff its droppings or urine. The reward must be motivating.

Continence increases with age. A normal puppy, educated in this way can be completely housetrained even during the night (for 7 hours) from the age of four months.

Gérard Muller, DVM
Dog behavioural specialist,
(France)



First visit to the veterinarian

The puppy will normally have been given at least an initial vaccination and perhaps identification before it is sold or adopted. The seller should provide the new owner with the dog's vaccination and ID card.



The first check-ups

It is always preferable to have a complete veterinary examination carried out on the puppy after purchase. In fact, if problems come to light and you wish to withdraw from the purchase this examination is obligatory. The veterinarian will do a full check up on the dog, verifying that it is not suffering from any infectious diseases, parasites or physiological problems. He or she will also give the puppy any vaccinations it may need, microchip it if required (electronic ID tag) and provide advice on diet and preventative worming treatment.

Life and daily care

Once it has become part of the family, the dog will require some care – sometimes daily, sometimes less often, depending on its breed, age and coat type. In addition, all dogs need to receive at least some education to ensure they are well balanced mentally and minimise impact on everyone they share the home with.

The future owner should prepare a little “welcome home pack” containing everything the new puppy or dog needs, starting with a collar and leash and two bowls – one for food and one for water. Stainless steel or ceramic bowls are preferable because they are easy to clean and some dogs are allergic to plastic. Whatever the material, the bowls must always be clean. The dog should always have access to fresh drinking water.

The dog's coat should be brushed several times a week, depending on the type of dog. This is much more than simply a matter of hygiene because it enables the owner to check for wounds and parasites, while also strengthening the bond of trust needed to ensure the hierarchy is maintained.

Feeding time is an essential part of the day. The dog should be given food appropriate to his size, age and lifestyle. Between 3 and 8 months the number of meals can be reduced from three to two a day, and by the time it reaches adulthood the dog should expect one or two meals per day. It is better to feed larger and older dogs twice a day, both to reduce any risk of bloat or gastric torsion and assist digestive transit. Competition between dogs should also be avoided at mealtimes & each dog should have its own feeding bowl.

The dog is subordinate in the hierarchy, which means it must not growl when the owner touches its bowl. This is especially important if the family has children. From



the outset, it is also important to interrupt the meal by lifting the bowl and making the puppy sit before putting it back down. The puppy has to learn that it cannot touch its food until the owner gives the command. This training requires a lot of time, given the ferocious appetite of dogs, but it is essential if the hierarchy is to be maintained and to enable the removal of a foreign object or poison from the dog's mouth, if needed. In addition, no food should be given to the dog outside fixed meal times. This, of course, requires everyone's participation.



The puppy should not growl when its bowl is taken away.

A dog is a social animal, which means it needs the company of other animals and it needs to be able to explore. Whether the dog lives in a flat or a house, it will not be happy if it only gets five minutes to do its business during the TV adverts or is shut up in the garden the whole time. Dogs need at least an hour's walk per day if they are to expend all their energy and not take it out on the furniture. This also enables them to get to know the other dogs in the neighbourhood and form a sort of substitute pack. A particularly athletic dog, such as a Husky, will obviously need even more daily exercise.

In most countries, dogs must be on a leash when out in public and kept within arm's reach to ensure the handler has full control of it. If an unleashed dog is run over by a car the owner will be liable for any damage caused. The same is true if the dog bites another dog or a person. These risks can be avoided by teaching the dog to walk on a leash, heel without dawdling and socialising it from a very early age. Dogs should only be unleashed in designated areas or in the countryside.

Dogs should be taught to walk on a leash at the earliest opportunity. Even very small puppies tend to want to follow their master and every chance to get the dog to heel should be taken. The next step is to put the leash on. It will take a short while for the puppy to adapt. It will tend to lag behind at first but, gradually, it will start to walk in front, although it should never be allowed to pull on the leash. This is a disagreeable habit that can be dangerous in some circumstances. The simple way to stop this from happening is to turn round and pull the dog in the opposite direction. The puppy will be caught off balance and after tumbling a couple of times will no longer walk in front. Once the puppy has learned to walk on a leash, try walking without a leash.



Tinka/Fotolia

Introducing a second animal into a home

When a new dog comes to live in a place that another animal already calls home, the most important thing will be to ensure they can live together in peace.

It's important to understand that the first animal needs to be treated like a master in its own home. It should maintain its relative dominance by getting most attention – it should be petted first and fed first, for example. The new arrival should not disrupt its habits; rather it should be integrated into the family as discreetly as possible. The situation needs to be monitored to ensure that scuffles do not break out. The best solution is to help the animals get used to each other and live together.

If the first animal is a dog, it will not take much time to come to an understanding. The two dogs will soon become playmates.

If it is a cat, there should not be too many problems if one of the two animals is very young (either they will become friends or they will agree to stay away from each other). If this is not the case, there could be some wrangles, so the best solution is to separate them. This is not something that has to be done very often, however, as they will most often just avoid each other.

The dog's home is its territory, which it will guard by barking. This behaviour is more or less pronounced depending on the breed. Barking may also be an expression of boredom when the dog is left alone all day. This can be a real test for the neighbours. Good education is the key to good relations with the neighbours. Teaching a dog to bark and be silent on command is easy. Start by commanding the dog to bark, rewarding it when it does. When the dog stops barking tell it to stop in a firm voice.

If the dog is left in a garden a sturdy high fence that is also well anchored in the ground is essential to prevent it from escaping. If it does get out, the owner is responsible for any damage it might cause. With this in mind, good civil liability insurance is a must, regardless of the dog's breed.

Walks

Regardless of its size, every dog needs to go for a walk at least twice a day. Small breeds can make do with three daily half-hour walks, while bigger dogs should be out around an hour at a time. The purpose of walks is to give the dog an opportunity to do its business and expend some energy, so the best place to go is somewhere away from traffic where it can be let off the leash. A long two-hour walk at the weekend in the park or the woods will enable the dog to break its daily rhythm, discover a new environment and meet new dogs.



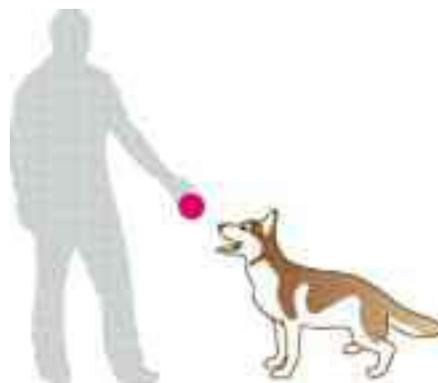
Alena Yalushewa/Fotolia

The amount of exercise needs to be adapted to the dog's age, of course. Puppies need a lot of short walks, while old or sick dogs will be happy with two 'constitutionals' a day. The dog should be thoroughly checked upon return.

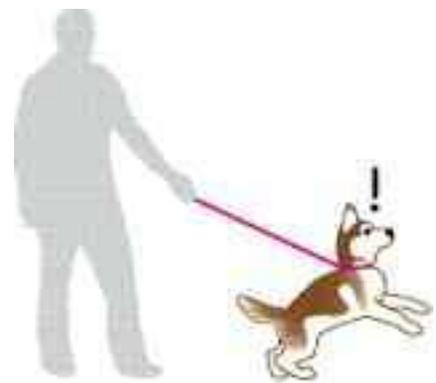
“Regardless of its size, every dog needs to go for a walk at least twice a day.”



Learning to bark and to be silent on command.



If it does well, always congratulate the puppy with a treat or a pat.



If the puppy pulls on the leash when walking, stop abruptly to surprise it and help it break this habit.

Insurance

Civil liability

A dog can escape or run away and cause damage without the owner being able to stop it. Unfortunately, the owner will be liable in these cases. Generally, third party insurance will cover these claims, but it does not cover any damage the dog causes to the owner's property or family, so extra cover may need to be taken out. The same applies if the owner leaves the dog with anyone for an extended period of time. It is worthwhile contacting insurers to work out the right cover.

Specific liability

It is not possible to include any special coverage that may be desired as part of a civil liability contract so, again, it is worthwhile contacting insurers to study special clauses that cover dog owners and handlers.

The beneficiary is the owner or any other person who handles the dog without receiving payment.

The beneficiary is insured against the financial consequences of damage caused by the dog to third parties, be that bodily injury, physical material damage or less intangible inconveniences, such as noisy and persistent barking.

This type of insurance can be tailored to the purpose the dog is used for, such as guarding, hunting or other work. It is vital to notify the insurer immediately of any accident or incident, providing full details, including the following:

- Date and place
- Causes and circumstances
- Name and address of injured parties and any witnesses
- Estimate of the damage

Health care fees

Insurance covering major health care costs is available for dogs. There are various plans, from basic cover for accidents and surgery to complete cover which includes vaccinations, veterinary costs and hospitalisation.

It is a good idea to shop around for the best deal, as products can vary quite extensively depending on the insurer. Some things are not covered by any policies – congenital defects and diseases, poor treatment, injuries pursuant to organised dog fights, labour, neutering, plastic surgery, diseases for which there are vaccines, teeth scaling, microchipping, food, anti-parasiticides, earlier diseases or accidents, etc – while things like vaccines and certain kennel expenses are included in some policies.



Dogs in the city

Walking a dog in the city is a very different proposition to walking one in the countryside. Certain rules need to be observed to minimise inconveniences to other people – not least with respect to hygiene. Not everyone likes dogs, after all.

First and foremost, the dog needs to be appropriately vaccinated. The dog should also have regular veterinary health checks to ensure that it does not pose a disease risk to humans or other dogs, so as to minimise the risk of epidemics or epizootics.

Dogs should be kept on a leash at all times with a collar or a harness suited to the size and character of the dog (a non-pull head collar may be used with highly excitable dogs).

It's obviously essential that dogs do not foul the pavement. Sometimes there are designated dog toilet areas in cities or special bins in which to dispose of dog waste and it is usually a legal requirement that owners clean up after their dogs. If dogs are fed on a complete dry food diet, their excrement will be fairly hard and small and as a result is a lot easier to clean up with a poop-scoop or a small plastic bag, which can be disposed of in the bin.

If you take your dog abroad with you, remember that the rules may be different there and therefore it is essential to check before you go.

Daily care

By checking the dog on a daily basis, the owner will be able to keep it clean and hygienic, while also hopefully identifying any early signs of disease.

Paws

In summer, the footpads should be checked for lesions caused by thorny or sharp objects such as brambles or shards of glass. It is also important to check for any grass seeds that might have become lodged between the toes. Grass seeds are shaped like microscopic harpoons and can puncture tissue, producing wounds and migrating into soft tissue. In winter, dogs that walk on grit-treated snow and ice risk developing cracked pads, so the paws should be rinsed with lukewarm water upon return.

Nails

Dogs have two types of nail – dewclaws and toenails – both of which grow constantly. Toenails should wear down naturally, but if they do grow too long (i.e. they start to clack when the dog walks), they need to be clipped. This should be done without cutting the quick – the vascularised part – at their base, which forms a pink triangle in clear nails. If the nails are dark, the quick can be identified by the marks it leaves under the nail.

If you accidentally clip the quick and the dog's nail bleeds, apply hydrogen peroxide, a styptic pencil or even a small dab of superglue, and a bandage for an hour.

Dewclaws, which are often covered with hair, should be clipped in the same way. Ingrown dewclaws can be painful and cause lesions.

Nose

The nose should be wet and cool at all times, although it can become dry when the dog is sleeping. The important thing is that it becomes moist again when the dog wakes.



The footpads should be checked for lesions caused by thorny or sharp objects.



Cutting the nails.

To a large degree, this wetness is the result of tears secreted by the eyes, which flow towards the cheeks through a dedicated duct. A chronically dry nose together with the reddening of hairs at the corner of the eye may be a sign that the duct is blocked. This will require veterinary treatment.

Noses do not require any special care, although veterinary help should be sought in the event of scaling, cracking or major discharge, as this is a sign of disease.

Oral cavity

The lips should be clean and relatively watertight. They may hang more in some breeds than others. Cracking, redness (especially in German Shepherds, which have fragile skin) or foul smells may be a sign of a skin infection.

The teeth should be white with minimal tartar. Dogs are rarely happy to allow people to manipulate their mouth, so it is a good strategy to get a puppy used to this from an early age.

The gums should be pink. Redness around the teeth is a sign of inflammation and disease, which can cause a loss of appetite if it is painful or the dog is unable to grasp or chew its food. In this case, the dog's teeth



“The nose should be wet and cool at all times.”



The most effective way of cleaning the teeth is by brushing them several times a week with a toothbrush and toothpaste specifically designed for dogs.

will have to be cleaned. This can be done in various ways, the most effective of which is brushing them several times a week with a toothbrush and toothpaste specifically designed for dogs. Palatable tablets which release active ingredients when the dog bites into them are also available and could be considered if the dog will not allow its teeth to be brushed. Chewing bars and objects made of cartilage that slow down the formation of plaque and tartar by acting mechanically on the teeth when the dog chews are another alternative. Ideally, the dog should be given two or three of these chewing bars a week to help prevent plaque and tartar build-up. Some bars of this type also contain active ingredients that prevent tartar build-up. Kibbles with beneficial dental properties are also available, which have a light abrasive action and contain nutrients that prevent plaque and bacteria from using calcium in the saliva to produce tartar.

There may, however, come a time when the dog will need to visit a veterinary surgeon for removal of plaque and tartar.

Eyes

The eyes should be bright and moist, with pale pink mucosae. There should be no coloured discharge from the inside corner of the eyes.

Dirt or mud around the eyes can be removed gently with cotton wool & clean, lukewarm water.

Ears

Dogs carry their ears in one of two ways, either drop or prick. Drop ears should be examined more often because the ear canal is less well ventilated.

Ears may be cleaned under the advice of a veterinary surgeon with a specially formulated solution. Place the tip into the ear canal (its L-shape precludes the risk of perforating the eardrum) and gently squeeze in 1-2 drops. Withdraw the tip and massage the base of the ear very gently for thirty seconds, preventing the dog from shaking its head, before wiping the ear flap with cotton wool.



Veterinary surgeon applying drops to a dog's eye.

© Duhyer/Royal Canin

Longhaired dogs often have hair in their ears, which can prevent earwax from draining properly, so these hairs can be gently trimmed.

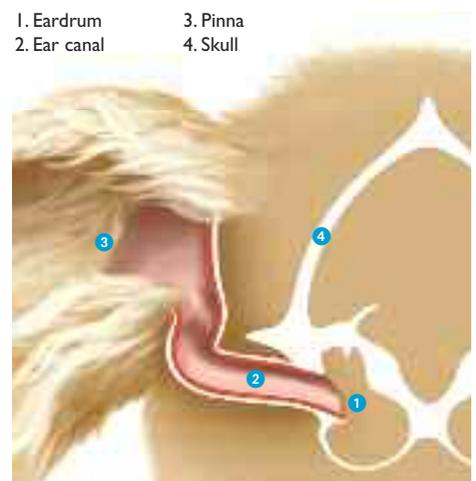
Ears are also the place most likely to attract grass seeds. These can be removed from the ear canal with tweezers but as this is often painful for the dog, it is advisable to visit the vet who can use special forceps to extract the grass seed.



© Labat/Rouquette

The dog's ear canal is L-shaped

- 1. Eardrum
- 2. Ear canal
- 3. Pinna
- 4. Skull



Genital organs and anus

Regular inspection of the genital organs in males and females will help ensure they are kept clean. A veterinary surgeon should be consulted in the event of any discharge. The anus should be clean and there should be no traces of diarrhoea.

Coat care

Coat

If the dog likes swimming, its coat should be rinsed afterwards. Particles from river and seawater remaining on the coat may cause irritation, and careful rinsing will get rid of them. If the dog gets tar on its coat, oil-based cleaning products should not be used as they are highly toxic. Apply vegetable oil to affected areas, wait a few minutes for it to dissolve the tar, then bathe the dog.

When winter sets in, a coat will protect the dog from the cold, but most dogs are perfectly adapted to cope with the drop in temperature – with the obvious exception of hairless dogs. If they get into the habit of wearing a coat when they go out, there may come a time when they don't want to leave home without one.

Moulting

It is in the nature of hair to grow and die. Dogs that live outdoors moult twice a year – in spring and autumn – triggered by light changes. Dogs that live indoors are less ex-

posed to light changes and so tend to moult all year round, although moulting does generally increase in spring and autumn. Regular brushing and bathing helps remove dead hairs. The appropriate frequency and equipment depends on the type of coat.

Close-cropped hair

While close-cropped hair does not require regular grooming, it does need to be brushed once or twice a week. Dead skin and hair is loosened by brushing against the hair with a rubber brush. The debris can then be removed by using a bristle brush in the direction of the hair over the whole body. Finish by adding sheen to the coat with a damp chamois.

Short, coarse hair

These dogs should be brushed every other day due to the density of the coat, which comprises both an undercoat and a topcoat. Use a slicker brush, working against the hair to loosen as much dead hair and skin as possible and strip the undercoat. A bristle brush can then be used in the direction of the hair to remove this debris.

A wide-tooth comb can be used on the tail and paws. The coat of coarse-haired dogs needs to be stripped four to five times a year with a stripping knife. Dead hairs are trapped between knife and thumb. This is not at all painful if done properly, working in the direction of the hair.

“Finish brushing by adding sheen to the coat with a damp chamois.”



© Hermeline/Difimedia

Long hair

Although beautiful, longhaired coats require daily brushing. This can take up to an hour a day in Afghan Hounds, for example. Use a slicker brush, working in the direction of the hair, to loosen knots and mats. Because the hair is so long, this may pull the skin, so care should be taken.

Using a bristle brush on dogs with silky coats, like Yorkshire Terriers and Afghan Hounds, will add sheen to the coat.

A wire brush can be used to remove impurities from the coat of dogs with an abundant undercoat, like Rough Collies.

A wide-tooth comb can be used to untangle hair behind the hocks. The hair can be trimmed to equal length with scissors, which can also be used to remove hairs that are most likely to form knots or attract foreign bodies (hocks, chest, between the toes and pads).



© Hermeline/Difimedia

All grooming tools should be cleaned and stored in a dry location after every use. Keep wire brushes from rusting by wiping them well and rubbing them with a rag soaked in vegetable oil.

Bathing

The frequency of baths depends on the hair texture. Close-cropped hair should only be washed if dirty, short hair twice a year on average and long hair approximately every one to three months.

Small dogs can be bathed in a bowl or a baby bath, while big dogs can be washed in the bath or outdoors, weather permitting. A rubber mat will protect the dog from slipping, which could result in injury or a permanent aversion to being bathed. Lukewarm water should be used, together with a special dog shampoo. Human hair care products – even those specially formulated for infants – are too acidic and irritate the skin. Rinse thoroughly at the end of the bath.

Bathing the dog

Start by brushing the coat thoroughly to get rid of any knots and mats before bathing the dog. Then wet the coat all over and apply the shampoo, working it into a lather, while taking care that it does not get in the dog's eyes or ears. Allow it to act for a few minutes, then rinse with copious water. It's a good idea to rinse the head last, as the dog is likely to want to shake its head dry. Wipe it down vigorously and leave it in a warm room. In summer, an alternative is putting it in the garden or taking it for a walk, as long as it does not like rolling around in the muck. A hairdryer can be used if the dog is happy with that, but care should be taken not to burn the dog and the hair should be brushed at the same time.



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Grooming

The first dog groomers – or, more correctly, “shearers” – started appearing in France in the mid 19th century, when Poodles were all the fashion among the middle classes. This is when the various clips that are still around today started to be developed. In those days however, the lion or continental clip was given to dogs used in duck hunting so as to protect them from the cold and provide greater buoyancy. These shearers were later to set themselves up in the street with a wooden box, providing rather superficial grooming services which we would nowadays describe as general care.

They would gradually evolve into professional groomers with specialised equipment. Nowadays, they are no longer even regarded as a luxury, bearing in mind that some breeds cannot do without proper grooming.

The coat is the first thing anyone notices about a dog. The state of the coat is a reflection of its general health, so it needs to be taken care of. However, everyday grooming – which is what the owner does to keep the dog clean – should not be confused with beauty grooming – the purpose of which is to bring out the best of the dog’s morphology and character while also hiding any faults to produce a perfect profile. For professionals, good grooming is inconspicuous and respectful of the animal.

Companion dogs seldom require grooming, except for a few selected breeds such as the Poodle. Most grooming is for the simple pleasure of the owner. The story is very different when it comes to show dogs though, which are assessed by experts. In a show, the dog represents an entire breed, so it has to be perfect.

Clearly, only healthy dogs can be groomed. Dogs suffering from a contagious disease or skin problems should not be groomed. The same goes for dogs that lack up-to-date vaccinations. (In some countries, dogs must have current anti-rabies vaccinations).

Equipment

Specialist grooming requires a high table with a strap that attaches to the collar and possibly a second one securing the thighs

and attached around the abdomen to prevent the dog from making sudden movements when scissors are being used. Other equipment includes clippers with various combs, essential for Poodles; a large-tooth comb for long or curly hair; several pairs of scissors (straight, curved, trimmers); a hand comb to puff up the hair; and a stripping knife.

Technique

Equipment is not everything of course; you also need to know how to use it. Grooming has come on leaps and bounds down the centuries. Today it is split into three stages:

- First a mild shampoo, adapted to the dog’s hair, is applied to remove dirt and dead skin that can tarnish the coat. It may also boost the colour.
- The hair is trimmed in several steps:
 - Clipping, which is often reserved for Poodles, requires great care to ensure no comb marks are left and the hair grows back evenly everywhere.
 - Stripping, which is the removal of hairs by hand or with a stripping knife; this is especially useful for coarse-haired dogs.
 - Trimming, or styling, which is part of general grooming.
- Other care tasks regularly performed by the owner include keeping the eyes clean, removing excessive hair from the ears (to minimise the risk of grass seeds in summer



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Migallice/Fotolia



MagicalFootia

Finally, the Poodle is a much more complicated story. Several clips are acceptable, although the Lion or Continental clip (top-knot, leg bracelets, pompom), the English Saddle clip (combed back hair in a ribbon, shaved muzzle) and the Modern clip are the three official ones. The Lamb clip (shaved feet and body, fluffy head, shaved muzzle and ears) is rather commercial.

Because of the huge range of clips and grooming styles, groomers need to be very knowledgeable about the morphology and general character of the various breeds so they can select the right approach for a particular dog. They can pick up the theory at college, but they will learn most things during the job. Part of the groomer's job is to hide any defects. If a dog is too tall, the hairs on the legs will be left longer to give the impression that the dog is shorter than it is while if the limbs are curved, the groomer will cut more from one side than the other to even things up for the eye.

Groomers must have a good technique and good knowledge of the breed standards, but they also need more intangible qualities, such as patience, tact, a good touch and a good understanding of psychology.

“Groomers must have a good technique and good knowledge of the breed standards, but they also need more intangible qualities, such as patience, tact, a good touch and a good understanding of psychology.”

and make it easier to keep the ears clean), cleaning teeth, clipping the nails if needed and checking the footpads.

This is the normal grooming procedure, although different dogs obviously require a different approach.

For example, dematting is unnecessary in shorthaired dogs (such as Dalmatians and Labradors) and coarse-haired dogs (Beagles, Short-haired Pointers). At a pinch, a simple stiff bristle brush will suffice during moulting. A leather glove followed by a chamois can be used to add the characteristic sheen to the coat.

In dog with long and semi-long hair (German Shepherd, Spitz, Spaniel), it is important not to remove living hairs or to break them with too hard a brush. A currycomb is much more appropriate.

Dematting is essential in dogs with straight or curly long hair (Afghan Hound, Chow-Chow, Bichon Frise) to remove dead hairs. In the Chow-Chow, the coat should be brushed up the wrong way to add volume; in the Fox Terrier, the beard should be trimmed to produce a square head.



© Grossemy

Only lacking the power of speech...

At some stage, everyone must have said this about their dog, confident that it is able to understand everything they say. However, when it comes to canine intelligence, it is important not to anthropomorphise.

Dogs have been shown to possess both logical and verbal intelligence. Since Rico, a German Border Collie who looked for objects in order, scientists have been able to prove that a dog can remember up to 200 words. The breeds have even been ranked by intelligence. The Border Collie claimed first place, whereas the Afghan Hound was in 79th and last place. This ranking is first and foremost based on working aptitudes and the capacity for becoming good working dogs. When all is said and done, however, dogs do not have the intellectual capacities of humans and it is much more than the power of speech that separates the two species. The relationship between the dog and its owner continues to be an essential factor in its capacity to memorise commands, but all told a dog is a dog and not a small human.



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Identification

With the rise in the number of dogs and increased travelling, it is important that dogs can be easily identified so that they can be returned to their owner if they should get lost.

Electronic tagging

While tattooing continues to be practised in some countries, the electronic tagging (microchipping) of companion animals for identification purposes has become increasingly widespread. The technique involves implanting a microchip the size of a grain of rice under the dog's skin with a syringe. The microchip is implanted in the right or left side of the neck or between the

shoulder blades, depending on the country and serves as a transponder that can be read by a scanner from a distance of 10-20cm (4-8 inches). The scanner sends a signal to the microchip which turns it into an electronic impulse corresponding to a specific numerical code, unique to the animal, which is then sent back to the reader. All these numbers are held in a national database –

the national databases will be consolidated into a European or even a global database in time – making it possible to trace lost dogs more easily.

The system, which was initially pioneered at the major international sled dog races in 1989, is now used to store permanent ID records of millions of dogs around the

Electronic ID for dogs

Animals are tagged electronically by implanting a microchip (or transponder) with a unique numerical code under the animal's skin.

Injection

A needle-like trocar is used to implant the transponder and an ejector pushes it under the skin.



Various types of injection device.

Reader

An electronic device which emits an electromagnetic wave to activate the internal components of the transponder and transforms the signals it receives back into readable format on a liquid crystal screen.

The implanted transponder enables identification of the animal using a scanner.

Transponder (microchip)

An electronic device contained in a bio-compatible capsule. It is able to store and release information on demand, due to a numerical code identifying the individual animal it is implanted in.



Microchip.



Various types of reader.

world. Indelible, impossible to forge, painless and totally passive, it is governed by ISO 11784 and ISO 11785, which cover implanted microchips and readers respectively, enabling every dog to be assigned its own unique global ID number, which can be read in most countries and certainly the whole of Europe. Some countries, including the United States, have opted for a different standard, which entails owners having their own reader when they travel to countries that have introduced the ISO standards.

New generations of microchips allow the storage of information readable by the same technology to be used for vaccination records and records about treatments for chronic diseases.

What is the role of transponders in dog identification?

A microchip transponder is no larger than a grain of rice. It is used in the electronic identification of pets, possible for animals of each race and at any age.

The implantation of the microchip transponder by the veterinary surgeon is generally pain-free and requires no anaesthesia.

The microchip transponder includes an electronic system, cast in in glass. It does not react with the body tissues and can be implanted by the means of an injection under the skin of the animal. The transponder is electrically inactive and emits no radiation. The stored number only becomes activated and legible via a hand-held reader. The stored number only becomes activated and legible via a hand-held reader.

Microchip numbers according to ISO-Norm have 15 digits, are unique worldwide and guarantee therefore a clear method of identification. The repatriation of a found animal to its owner in the case of loss or theft is only possible if the microchip number is registered in a publicly accessible data base which is available around the clock and tracking is open for everyone.

Online registration and online tracking guarantee immediate and world-wide security for registered pets with ANIMALDATA.COM. The linkage with more than 50 European microchip data bases by EUROPETNET and PETMAXX supports the search abroad.

Responsible pet-owners have their animals identified by microchips. Veterinary surgeons and shelters check found animals to see whether they are identified by microchip and find the owner of the pet directly by online tracking with ANIMALDATA.COM.

Online-tracking with ANIMALDATA.COM is available worldwide, 24 hours a day, 365 days a year.

Herbert Mueller,
Doctor of Veterinary
Medicine, (Austria)



“Keeping a pet is an educational factor which cannot be overlooked and which becomes increasingly important as urban man strays further and further from nature”.

Konrad Lorenz,
Nobel Laureate,
1973



Humans, companions of the dog

Like owner, like dog

In the 1980s, a weekly veterinary review inverted this popular saying for use as the title of a humorous column. “Like dog, like owner” was accompanied by a number of photos. In one, a dog suffering from nervous twitches was pictured alongside its owner, who clearly had the same problem. The

second depicted a huge ball of hair next to a podgy man, while the third pictured an aggressive little pooch at the feet of an unpleasantly aggressive lady. Every veterinarian recognised these clients, and even perhaps themselves.

Animal protection and legal issues

A new animal protection law has been passed in Austria codifying the rights of our favourite animals. Animals now have rights that owners have a duty to protect.

From a philosophical point of view, the intrinsic value of every life must be recognised on principle, independent of considerations with regard to usefulness. Besides the absence of suffering, a ‘successful’ animal existence also demands the application and achievement of the behaviour and development stages of the species in question.

While most owners are at pains to properly look after their animal companions and do not normally need laws to make sure they do it, the existence of a law of this kind is very reassuring.

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Advantages of owning a dog

In an increasingly urbanised society, while being great companions, dogs do also have some inconveniences. First, though, let’s look at the advantages.

- The social benefits the dog can have, inducing people to talk, play and take an interest in it, which can have a positive impact in a family.
- The companionship dogs provide, which can be especially important for people who live alone.
- The relaxation that comes from walking, playing with and stroking a dog (studies have shown that a person’s heart rate slows down when petting a dog).

Risks for humans

All animals, including other humans, can pose a risk to human health and that includes dogs, which might occasionally bite people or pass on diseases, although such cases are relatively rare.

Bites

The mouth is a means of expression for dogs, but also a means of defence. Any dog that feels threatened is likely to resort to biting, even if it is normally gentle and docile. Owners therefore need to take some basic precautions, especially around unfamiliar children, who can startle their dog even when they do not mean to, causing it to snap in defence.

The prevalence of aggressive dogs that were originally bred for fighting – Staffordshire Bull Terriers and Bull Mastiffs, for example – on the streets of towns and cities is also a matter of great concern. At the same time, it is important to understand that it's most often not the dogs that are at fault, but the owners who train their dogs to be aggressive. They need to be stopped and punished where necessary. Countries have their own laws and regulations, but dogs that are most likely to bite people, regardless of the breed, are often monitored closely by veterinarians and should undergo behavioural assessment & management.

Some countries have not yet passed laws to deal with “dangerous” dogs. It is not our intention to discuss the matter here, but simply to stress that dogs are not born dangerous, they are trained to be dangerous by dangerous breeders and owners.

Zoonosis

A zoonosis is an infectious or parasitic disease that can be transmitted to humans from animals. It is important to know what these diseases are because of their health consequences. They involve bacteria, viruses, fungi and parasites. For example, *Pasteurella* is a genus of bacteria found in the dog's mouth which will infect any bite wound, causing a severe, painful inflammation if the wound is deep enough and could eventually lead to an abscess with intense swelling. Because of this risk, which is linked to rabies – all but eradicated in some countries but still a problem in others – any bite wound must be cleaned with soap and water and disinfected with copious amounts of antiseptic.

Bite victims should also visit their doctor for appropriate treatment; this is of vital importance in countries where rabies is still endemic.

In extremely rare cases, dogs can also transmit *Staphylococcus* and diseases such as leptospirosis, (which dogs are vaccinated against as part of their routine vaccination programme) as well as tuberculosis, brucellosis and even leishmaniasis in tropical and subtropical areas.

Although benign, ringworm can be transmitted to humans from dogs. Ringworm is a skin disease occurring in small circular patches, caused by microscopic fungi. It does not always involve itching, but treatment is long for both dogs and humans.

Dogs can also pass on digestive parasites (worms) to humans through their faeces, which is why dogs should be kept well away from play areas for young children, such as sandpits.





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- The sense of security the dog provides the whole family in its role as guard and protector.
- The sense of responsibility that comes with owning a dog.
- The undeniable benefit the dog has on the education of children. Psychologists also use dogs to help young delinquents to find their place in society.
- The understanding and sympathy the animal seems to exude, which can sometimes cause people to think of them as humans.
- The sense of self-worth and fulfilment people might have when they show off their dog.
- The facilitation of social contacts in an increasingly individualised society where strangers no longer talk to each other. People out walking their dog are often more likely to exchange a few words with each other.

- The prestige people might feel because they own a given breed (although it is worthwhile wondering whether this is such a good thing, bearing in mind that dogs are not sports cars).

Duties and inconveniences

Sharing your life with a dog is not always a bed of roses, of course. Would-be owners also need to consider the potential inconveniences before taking the decision to get a dog.

- Reduced flexibility & mobility because the dog needs to be taken into account at all times, including weekends and holidays. Some people realise this too late and end up abandoning their dog when the holiday season comes round.
- The expense involved in caring for a dog, including food, vaccination and other expected and unexpected medical costs.
- The time a dog demands.

- The hygiene issues that come with having a dog in the family.
- Potential problems with the neighbours. Every owner can expect to have a run-in with the neighbours at least once in their life.
- The family problems that can come with separation, divorce, illness or death.
- The risks for others who may be afraid of dogs or who the dog may be afraid of if they are rough with it without realising. The result may be a nasty bite, even if the dog is normally very docile.



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Profile of the owner

Potential owners need to give all these matters due consideration before taking their decision. They also need to think about what type of owner they would be. There are many different ways to classify owners. The four main types are described here:

- The humanist, who takes a lively interest in companion animals and forms a strong emotional attachment to them.
- The moralist, who is mainly concerned with how well animals are treated and responds violently to animal cruelty and exploitation.
- The utilitarian, who is especially concerned with the animal's material and practical value.
- The negativist, who rejects animals based on fear and disgust.

This classification may appear somewhat technical and cursory, but there is an alternative system that draws on a more detailed analysis of human typology which was designed following an international survey by a private company active in the companion animal sector. It is based on two concepts:

- Animal as object: the dog may have a purely material function or it may be regarded as a means for people to achieve an ideal.
- Animal as socialiser: the dog enables people to assert themselves or integrate into society to some degree.

Eight groups were defined on the basis of the dog itself: "clown", "old companion", "fashion item", "children's friend", "property protector", "nature-lover", "clear conscience" and "symbol of established order".

In a less colourful but more realistic survey, owners were grouped according to how they behaved towards their dog, ranging from rational to emotional. The results were as follows:

- 15% of owners said they were totally indifferent to the current and future life of their dog.

Must we be the absolute masters of our dogs?

We owners, trainers and veterinarians have long taken for granted that the canine social structure was based on strict domination. Relatively recent studies show that we were wrong and claim, in the face of new data, that the capacity of “prediction based on experience” brings real cohesion to the wild dog pack.

Away from the world of science, in the animal’s day-to-day life, this is expressed in the fact that commands – which many say serve to subjugate our dog – do not really subjugate it but function as keys to a better understanding of what human society, its “pack”, expects of it and what it can expect in return.

Our companion animal will take on these common keys or norms with a view to avoiding continuous conflict with the individuals it lives with, thus enhancing its emotional stability and feeling of well-being.

Javier Astorga,
Doctor of Veterinary Medicine
Specialist in Clinical Aetiology
(Spain)



“18% said they loved their dog and felt a greater emotional attachment to it than to people.”

- 18% said they considered only their dog’s health, which they felt was the key concern.
- 18% said they loved their dog and felt a greater emotional attachment to it than to people.
- 15% said dogs served only a strictly utilitarian purpose.
- 14% said they loved their dog as much as any member of their family.
- 12% said their dog was an important factor in their self-esteem.
- 8% said dogs had their place in the family and deserved good health, but should not be treated as humans.

This survey shows that more than one in three owners classify themselves as either hyper-rational or ultra-emotional when it comes to how they view their dog. In reality, the attitudes of a good owner to their dog should be somewhere in the middle.

Owners should take on board the rules of behaviour, hygiene, lifestyle, nutrition, good health and respect for the animal in its natural role. A dog is not a little person. It cannot speak, but nature has given it other ways of expressing itself which are just as effective. It is up to humans to behave in a way that dogs understand, rather than treating them like children. People who understand that life on earth is better because of the diversity of animal species will enjoy their dog for what it is without feeling a need to force a human character upon it.

What would man be without the dog?

What would man be without the dog? One dare not think. The dog being the friend of man, man would have no friend? The blind man would grope in vain at the edge of a street to cross, the traveller would perish in the snow on the slopes of Mount Saint Bernard, without having drunk the rum of the Good Fathers; we would no longer see the Water Spaniel in the circus playing dominoes, reading the newspaper, and counting to twelve; young children, disorientated,

would be obliged to attach pans to the tail of a royal tiger; poor cousins would shamelessly enter the villa of their rich cousin. There would be no more healthy distraction, tranquillity, police, pleasantries, friendship.

Alexandre Vialette,
Chronicle of the Dog,
From Thus Allah is Great,
Ed. Julliard, Paris

The death of a dog

Generally, dogs do not live as long as humans, so owners need to prepare themselves for the inevitable tears that will come, not least among the children in a family.

In the best-case scenario death will be quick, but sometimes, in the case of a long and painful illness, you may have to summon the courage to end your dog's suffering by having it put to sleep.

The relevant authorities should be informed of the death of dogs registered in a stud book.

Dogs with a market value over and above the priceless sentimental value they have for their owners – such as show or assistance dogs – may in certain circumstances be insured.

It is obviously against the law to dump a dead dog in a public place or in the bin. Owners have several options to choose from, based on their convictions and what they can afford.

The dog can be buried in the garden, although it is a good idea to contact the relevant authorities for their advice in connection with public health.

Animal cemeteries are another option. These facilities are becoming more widespread in some countries. Prices can vary significantly, as do the services provided, from cement and marble tombstones to vaults and full-blown monuments. One of the most opulent animal cemeteries is on Île des Ravageurs in France, a listed site that accommodates more than 100,000 dogs (over 40,000 graves) including the famous film star dog Rin Tin Tin and Barry, the legendary assistance dog from the Great Saint-Bernard monastery.

• Generally the body will be taken to a veterinary surgery for collection by & cremation at a pet crematorium.

• Where individual cremation has been arranged, owners can ask for the ashes to be returned.

While it is perhaps only natural to grieve for a companion dog when it passes away, everyone has their own way of getting over their loss without going to extremes by putting up a monument.



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The danger of excess

Sometimes a gentle little family dog can turn into a dangerous biter, or a dog with no hang-ups whatsoever can end up afraid of its own shadow. Often this is the fault of owners who do not allow their dog to develop in accordance with its nature.

Lack of socialisation

Sometimes, a puppy may not develop its senses properly in the first weeks of life, due to a lack of stimuli or being separated too early from its mother. This could result in the puppy being unable to function properly in the company of other dogs.

The instinctive reaction can sometimes be to overprotect the puppy in this case, as part of a misplaced desire to safeguard it from greater trauma.

If they are to be good companions dogs need to get used to noise and contacts with other dogs. Just because the puppy is small does not mean it should be kept away from bigger dogs for fear of it being put in harm's way. It needs to learn to behave like a dog so it should encounter all different breeds and sizes. Otherwise it will turn into a frightened little dog that jumps into its owners' arms every time it comes across something bigger than it is.

The fewer dogs it encounters, the more fearful – and the more aggressive – it will become. A small dog will feel that it is constantly open to attack and, in response, it will develop an aggressive strategy itself.

Lack of understanding

Not being humans, dogs do not employ the same language code as we do, although humans have been known to growl when irritated!

With this in mind, we have to try to understand their language and not end up driving them into a corner until they finally snap. It can be especially difficult for children to understand that dogs need peace and quiet sometimes and that trying to dress the family dog up like a princess when it is relaxing in its basket is not the best idea anyone ever had. A bite is a logical way for the dog to react in a situation like this, but the consequences can be devastating, including abandonment or even euthanasia.

Lack of education

It is sometimes thought that small dogs are no threat whatsoever. They are not very imposing, after all, and they have small teeth compared with bigger dogs. People somehow feel they don't need quite such firm training. In fact all dogs, regardless of how small they are or what purpose they will fulfil, need to be trained to live in harmony with their owner and not cause any problems when they leave the home or when people visit.

Slowly but surely, the little bundle of joy that everyone used to adore turns into a tyrant that will not allow its owners to go into their own bedroom or sit on their sofa to watch TV and jumps at anyone who dares go anywhere near its bowl. This type of problem is caused by a failure to teach the dog its proper place from day one. It is treated like a child, as if it has the same needs as a human, and ends up ruling the roost. As a result of all these mistakes the dog becomes a danger to others.

“The fewer dogs it encounters, the more fearful – and the more aggressive – it will become.”



© Hémeline/DiffoMedia



Puppy behaviour and education

Domestication has changed the dog over the millennia, physically, physiologically and behaviourally. By the beginning of the 21st century, dogs have become primarily companion animals, although they are still used for hunting, guarding and various other types of work.

Natural pack dog behaviour

Domesticated dogs cannot form packs of sufficient size to allow them to establish a hierarchical structure as complex as that of the wolf, where the pack is a social unit in which hierarchy, play and solidarity are factors which maintain group cohesion, improve survival chances and facilitate reproduction.

Packs of wild dogs defend their territory while also being able to co-opt new members from other groups of strays or wild dogs.



Strays and wild dogs

There are large populations of stray dogs in Africa, Asia, the Americas and certain parts of Europe which seldom come into contact with humans or have become completely feral. They keep to the outskirts of cities and urban areas they can access easily where they are not likely to meet humans. They are also found in rural areas.

Some of these so-called free ranging dogs have owners who let them roam free most of the time; others have been abandoned or lost.

Feeding hierarchy

A pack of dogs is governed by a complex hierarchy. After catching their prey, wild canids ingest a large quantity of food in a short space of time. They will not necessarily

feed every day because they are not always able to catch anything. When they do catch something they have to eat it before it goes bad and before other animals arrive to contest the pickings.

The dominant dogs feed first, while the subordinate dogs have to wait their turn at a distance.

Highly individualised “elimination” behaviour

For wild canids, besides their physiological role, urination and defecation are also a means of communication, mainly through the pheromones in urine, faeces and vaginal secretions which provide information on the sex, identity, physiological condition and hierarchical position of the canid in question.

“The dominant dogs feed first, while the subordinate dogs have to wait their turn at a distance.”

Relations between dominant and subordinate dogs

The dominant dog in a pack controls the position of the various dogs when the pack is resting and when it is on the move. Dominant dogs sleep together in the middle of a circle formed by the pack. The space is organised in concentric circles accommodating the various hierarchical levels. The closer you are to the dominant dog, the higher your position in the hierarchy.

The dominant dog controls sexual activity in the pack. It is the only dog allowed to express its sexuality in front of the other members of the pack. Subordinate dogs cannot copulate in full view of the dominant dog. While urban dogs never live in a genuine pack situation, rural dogs can.

What kind of treats should you use for training?

Many owners over-feed their dogs during training. Food rewards should only be the size of a grain of corn, no matter how large the dog is. Most dogs don't care how large a treat is, only how it tastes (to test this out, offer your dog a piece of his regular food and a small, pea-sized tidbit of a great tasting treat and see which one s/he prefers). Small-sized treats also help prevent little dogs from filling up quickly and losing interest during training.

What are the signs that a dog is stressed?

Signs of stress and anxiety in dogs can be difficult to spot unless you know what to look for. Stressed dogs will often yawn, lick their lips, refuse to take treats they would normally gulp down and/or leave behind sweaty paw print tracks. Dogs, like many people, have a difficult time learning when overly anxious. Smart owners recognize early on that their dog is becoming stressed and take steps help the dog relax.

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Change of behaviour due to domestication

It is impossible to say exactly when *Canis familiaris* was first domesticated. It most likely occurred independently in different civilisations and regions of the world. According to some authors the process got underway at the end of the Palaeolithic period. The grey wolf (*Canis lupus*) is most often cited as the ancestor of the dog, although opinions have long differed on this point and some authors suggested that it was the golden jackal or even the coyote. This would involve the dog being the product of successive crossings between these animals. Recent DNA analyses appear to support the idea that dogs are descended from the wolf.

The first domesticated animal

There are various hypotheses about why dogs were domesticated. According to the most recent thinking, young wolf cubs were attracted to human encampments where they were cared for by the women. They were kept for emotional or religious reasons or for food. It would not be until much later that humans started to discover the advantages these animals could bring to the hunt.

There are several subspecies of wolf, which can be told apart by their size. It is thought that they are part of the dog's ancestry to

various degrees, given that domestication seems to have been undertaken in various places. This great diversity in the subspecies helps explain, at least in part, the polymorphism of the canine species and the large number of breeds.

As the centuries rolled by, dogs began to be used to hunt and sometimes to guard homes. The Middle Ages saw the appearance of many different breeds of hunting dog in response to considerable growth in demand.



© Duhaier/Royal Cannin

Domestication advances

Domestication and human intervention have changed the dog to such an extent that present-day specimens are nothing like their original ancestors. Humans have selectively bred for such fundamental traits as conformation and size, coat type and colour and even ear carriage (wild adult canids always have erect ears).

Physiologically speaking, dogs become sexually mature at a much earlier age – at 6-10 months in a dog weighing 10-25kg (22-55 lbs), compared with 2 years in wolves. Other differences are a doubling of the reproductive cycle in females, the reduction in the size of the anal and perianal glands and diversity in breed morphology.

Domesticated dogs are also more vocal than wild canids. Similarly, puppies trained by humans are more vocal than those raised in

packs. Numerous behavioural changes have also been attained, such as docility and socialisation with other species, including humans, at the expense of predatory behaviour.

Negative consequences of domestication

There are not only positive aspects to domestication. Some dogs may develop behavioural problems, such as aversion to sounds and people or aggression and biting, if they are improperly raised or trained.

Humans provide food and accommodation, so the dog no longer needs to hunt or search for shelter. They also provide health care, which extends life expectancy, and so leads to the emergence of age-related problems. And they control reproduction by neutering some animals and choosing others as breeding stock.

Humans make efforts to prevent conflicts between dogs, which may have an impact on hierarchical relations, which can develop naturally between dogs living together under the same roof. Owners must never get involved when dogs have a set-to. Separating two dogs simply aggravates and prolongs a conflict, as it prevents one dog from asserting its dominance over the other.

Very strong and ancient ties with humans

Owners' mad love for their dogs

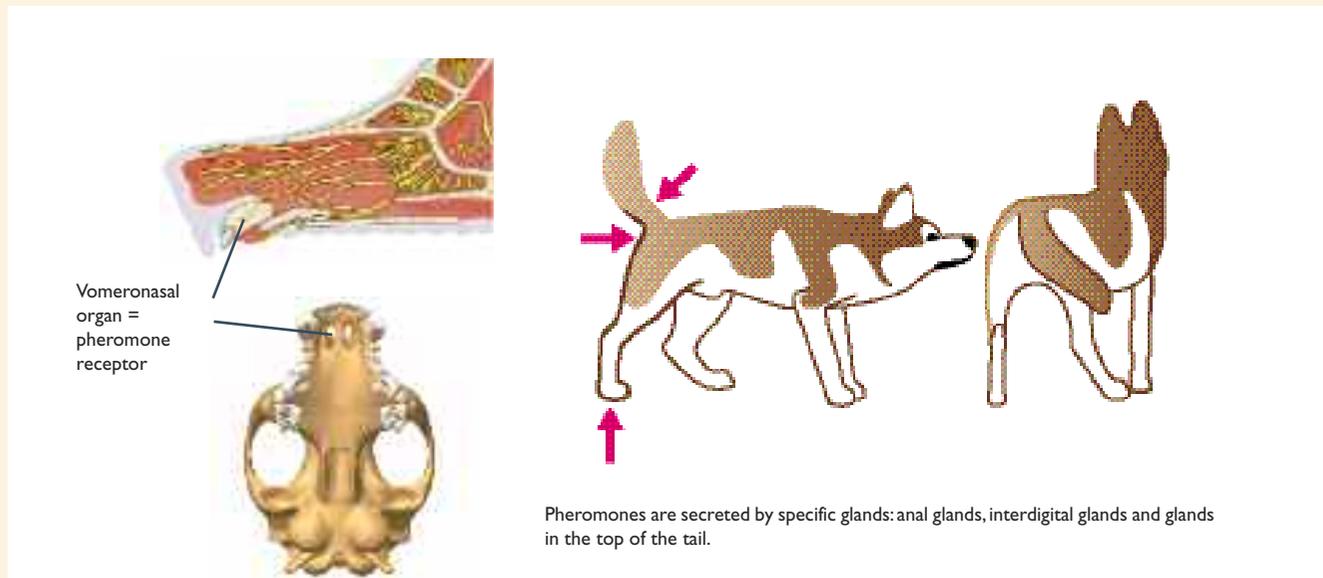
When owners are asked why they so adore their dogs, they very often say the same things: "it is my most loyal friend", "it understands me better than anyone", "it loves me unconditionally", "it is always so happy to see me", "it follows me everywhere", "it has never let me down", "it is always happy to play with me, to give me a cuddle, to go for a walk", "it always has time for me".

Pheromones

Pheromones are chemical substances secreted by an individual and picked up by others, triggering a behavioural and physiological response.

They are produced by various organs: anal glands, perianal glands, interdigital glands and glands in the top of the tail.

When a dog encounters another dog, it sniffs those areas of the body that have the greatest number of these glands.



Dogs and humans have evolved together

The special ties between dogs and humans are considered ridiculous by some and even revolting to others, but they are taken much more seriously nowadays, even by those who do not own a dog, because of the work of biologists, behavioural experts and evolutionary scientists who all agree about the extraordinary closeness of the two species and their shared history.

According to our current knowledge, modern humans – *Homo sapiens* – are probably a little under 100,000 years old as a species. We have also discovered that dogs are probably just as old. In those distant times, when our ancestors were still hunter-gatherers with no understanding of breeding or agriculture, some solitary wolves and probably some coyotes and jackals too left their pack, and were drawn towards humans by the regular supply of leftovers, which was a more stable source of food than hunting and tracking. As the centuries and millennia rolled by, having chosen a new way of life close to humans and away from their wild cousins, these canids gave birth to a new species – today's domesticated dog. This is why – even in the centre of towns and cities where companion dogs have never really taken hold, such as in Africa, Asia and the Middle East – large numbers of dogs are found that have lifestyles very similar to those of their ancestors despite a gap of tens of thousands of years, including close proximity to humans, albeit without the relationship of familiarity that characterises our companion dogs, and accessibility to food, although they often have to scavenge it from rubbish heaps.

It is striking to note that the dog population has grown at the same rate as the human population. There were one billion humans at the beginning of the 19th century, rising



© Dunayer/Royal Canin

to almost 7 billion at the beginning of the 21st, while there are also 600 million dogs. They accompany us wherever we live on the planet – even in the hottest and coldest regions. In the meantime, wolf numbers have shrunk dramatically as their territory has been destroyed and only a few hundred thousand remain.

Familiarity

Other studies have also shown that, while the proximity of our two species is undeniably the result of a shared evolution, the puppy's familiarity with humans is something that is established in the first few weeks of its life. A puppy that does not see or mix with humans before the age of 3 or 4 months will very likely always be afraid of people or at least never feel totally at ease in their company.

We now know that familiarity with humans depends on the frequency and especially the quality of contacts. They should be mostly of a positive nature: the dog must find them pleasurable and always feel comfortable around people. Like humans and indeed the overwhelming majority of mam-



© Corinne Dousseaud

“When owners are asked why they so adore their dogs, they very often say the same things: “it is my most loyal friend”, “it understands me better than anyone”, “it loves me unconditionally”, etc”

mals, dogs are constantly driven by emotions. It has even been shown that dogs, like apes and dolphins, have some sense of morality, which makes them sensitive to fairness. These recent discoveries make it clear that coercion and violence should never be used when training puppies or adult dogs. The much more preferable approach is to take advantage of the trust, motivation, attachment and pleasure we have shared for so long. This does not mean that dogs will not naturally recognise our authority, as they have done since they first

shed their wildest characteristics and started to live close to humans, even in our homes. To form a bond with a dog, we need do little else but share our time, every day, playing, cuddling, walking and relaxing. In short, having pleasure together, a fact many already realise.

Communication

Dogs may not be as intelligent as chimps or gorillas but they are much better able to understand our intentions, attitudes, gestures, looks and probably our emotions due to

their long history by our sides. Dogs have been fashioned to live with humans. They understand a large number of human words. We are now discovering that they are capable of complex reasoning and life-long learning. Contrary to the common expression, you can teach an old dog new tricks.



© Richardson/Royal Canin

Whelping and initial contacts

The gestation period in dogs is 57-72 days. The foetus responds to any tactile stimulation after 45 days. When stroking the mother's stomach you can feel the movements of the foetuses, which gradually decrease after several days. Puppies whose mother has been stroked in this way are more comfortable with being handled. Unborn puppies can also react to the emotional responses of their mother, which is why gestating females should be protected from situations that are potentially stressful or frightening.



© Duhaier/Royal Canin

Unassisted whelping

Generally humans need not get involved in whelping, which is a natural act. The bitch will choose where she wants to whelp, usually choosing somewhere quiet. The puppy emerges in its umbilical sac (water bag), and the mother bites through the umbilical cord and eats the sac. This can be helpful because the sac contains a hormone that triggers the onset of lactation. The mother then licks the puppy to stimulate its breathing. Puppies in a litter emerge at variable intervals of between 10 and 60 minutes. The whole process generally takes less than 12 hours, although it may take longer if the bitch has not given birth be-

fore. A litter can contain anything between one and 15 puppies, or even more.

The best approach is to leave the bitch alone after she has finished whelping. Occasionally, she may not display her natural maternal instincts, particularly if she is a first-time mother. In this case, the umbilical cord will have to be cut and the puppy extricated from the umbilical sac, rubbed down and placed by its mother's teats. The bitch should be fully alert during whelping, because if her senses are affected this may have an adverse impact on how she bonds with her puppies.

Puppy activity

Puppies spend most of their time sleeping – more than 90% of the day – and more than 95% of this is REM sleep, characterised by movements of the face, lips, ears and limbs.

When they are not sleeping they feed, generally every three to four hours. The whole litter feeds at the same time. When the puppy's muzzle comes into contact with the mother or another puppy it instinctively seeks the teat. This behaviour is known as the rooting reflex. On finding the teat, the puppy will knead with its front paws, right and left alternately to get the milk flowing. Contact with the teat triggers the sucking reflex.

Essential contact with the mother

The puppy gets around by crawling, since it cannot stand on its legs due to its limited motor skills. If it finds itself a long way from the mother the puppy will display great agitation, emitting a constant whine until the mother brings it back to the fold.

After feeding, the mother turns her puppies over for grooming. She licks the area around the anus to trigger the perineal reflex, causing the puppy to defaecate and urinate, and then eats the products. The puppies then huddle together again and sleep. Even in this neonatal period the puppies have a well-

Why is it critical that the puppies remain with their mother during the first 45-60 days of life?

This is important because they will learn valuable lessons during this first period of life, and the mother will be in charge of taking care of them. The puppies will not only learn to handle themselves coexisting with their mother (or any adult dog in charge of them), they will also learn to inhibit the bite, handle environmental stimulation and communicate with their peers.

At the age of 2-3 months old, the puppies must control their bite, even when playing. They must not bite or show any uncontrollable behaviour. The bitch controls and punishes the puppies when their behaviour is not appropriate.

This is a very hard task for the owners, given that many of them would never punish a small puppy.

If the initial conditions are correct, there is a significant decrease in the probability of having behavioural issues during development.

*Maria de la Paz Salinas;
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developed tactile sensitivity and sense of taste, responding to basic flavours. This is when the mother bonds with her puppies. As a result, anything that limits contact with her litter will be deeply distressing. The mother bonds specifically with her own puppies, and while she may sometimes adopt puppies from another female at the same stage, only her own puppies will truly calm her down.



© Grosémy

Puppy socialisation

Socialisation is a long period of learning in which the puppy develops all the behaviour it needs to live in a pack. It begins around week six and ends somewhere in the fourth month. Any mistakes made during the learning period can have an adverse impact on the future relationship between dog and owner.

Puppies come into the world with no knowledge of what species they belong to, which means that they have to identify with other dogs. They do this in a virtually irreversible learning process known as imprinting. An animal that is not properly imprinted is lost to its species.

The puppy is imprinted by playing with its mother and its siblings. Imprinting enables the adult dog to recognise its sexual partner, and avoid rejection of and by other dogs.



© Duhaier/Royal Canin

Why should I enrol my puppy in Puppy Preschool® class?

Puppy Preschool classes are the ideal start for your puppy to help him grow into a well adjusted dog that is welcome where ever you go.

These classes are specifically designed for puppies aged between 8 - 14 weeks of age and will teach your puppy good manners as well as how to interact with people and other dogs.

You will learn some fascinating facts about dogs such as how they see and smell the world as well as what to feed, how to toilet train and the best way to train him to sit and come on cue.

**Kersti Seksel,
Doctor of
Veterinary
Medicine
(Australia)**



Puppy education

With the purchase of a puppy comes a number of responsibilities, including an understanding of how to train it to preclude awkward problems in the future that may, in the worst case, result in the owner abandoning the puppy or even putting it down.

Puppies need to be trained to ensure they can live harmoniously with their owner. Housetraining and obedience are in any event essential.

The right approach to housetraining

First base is knowledge of the various stages in the puppy's acquisition of "elimination" behaviour. In the neonatal period, the mother triggers the urination and defaecation reflexes by licking the area around the puppy's anus, eating all faeces and urine produced. As the puppy starts to move away from the mother and the litter, the mother will continue to lick the puppy under the tail. These reflexes will eventually disappear and the mother's intervention will no longer be necessary. The puppy will begin urinating and defaecating further and further away from where it sleeps. At the age of six weeks it will use its sense of smell to return to where it has previously defaecated. When a puppy arrives in its new home it is generally not housetrained – the only thing that concerns it is not to soil its bed.

Puppies cannot housetrain themselves

The puppy should be taken outside for the first time around the age of two months, after it has had its first vaccinations. Up to around month four the puppy should be taken out every 5-6 hours, particularly when it wakes up and after meals.

Initially, a place – or a newspaper – should be selected that is impregnated with the puppy's own odour. A newspaper placed in the gutter can be removed after a while. The puppy should be congratulated with praise or stroking every time it does its business in the desired location. It is a bad idea to return home immediately, as the puppy will quickly make the connection between doing its business and having to return indoors.

Of course, in spite of the best intentions of the owner, accidents are inevitable at the beginning of the process. If the puppy does soil the home, the owner should not punish it; if caught in the act, the puppy should immediately be taken outside. Newspaper should not be put down in the home because the puppy will associate this with the earlier stage of its training and wait until it gets back home before it goes.

Obedience training is also vital. Reward or punishment?

The reward approach works effectively when a number of principles are borne in mind. First, the reward should be a significant one for the dog, i.e. the owner should lavish the puppy with praise and strokes. Second, it must be exceptional, i.e. any treat the puppy receives should not be given to it at any other time. And third, it should be systematic, i.e. if the reward only comes sporadically, the puppy's motivation will tail off and if the reward is given too late the puppy will not make the right connection.

Punishment – for example throwing a noisy object close to, but not at, the puppy or shaking the puppy by the scruff of the neck

as the mother might – is only effective if the puppy is actually in the act of carrying out an inappropriate behaviour & the punishment ends immediately the puppy adopts a posture of submission. Even seconds after the event, punishment will lead to anxiety, misunderstanding by the puppy and can aggravate the problem. Punishment can seriously damage the relationship between the puppy and owner.

Training by the reward method takes patience and persistence; it makes use of the puppy's natural desire to please its owner and helps reinforce the bond of trust between puppy and owner leading to long lasting results.

Once the owner understands these principles, training can commence.

Obedience training is easy

When training the puppy to follow commands, it's worthwhile bearing in mind that a telling off will be completely lost on a puppy because its comprehension skills are nowhere near good enough. If it's doing something you rather it wouldn't, a simple forceful "no" will suffice. The puppy should be accustomed to wearing a collar at a very early age. Once it is, it should be taught to walk on a leash, first indoors. These training sessions should be short and they should be repeated several times a day. If the puppy has a tendency to pull, immediately stop the activity until the pulling stops. The right behaviour should always be immediately rewarded.

Some dogs fail to come to heel when called. They come within a few feet and run away again when the owner approaches them.

Remaining calm is essential in this type of situation; never punish the puppy and get angry, even if it dallies. This is the most common mistake people make. The puppy will simply assume that it will be punished if it comes to its master. It should actually be congratulated and stroked, and the temptation to put it straight back on the leash should be resisted. The puppy will come to associate heeding the owner's calls with being put back on the leash and taken indoors, i.e. with being punished. The owner must adopt a calm, welcoming attitude for the puppy to want to come when called. Running after the puppy will be a fruitless operation, because the puppy will never allow itself to be caught. The best course of action is to turn and walk away, which will cause the dog to return of its own accord.

Puppies should ideally be around 4-5 months of age by the time they are taught to come when called. The owner will have to show a lot of patience. Training can start in the home. A simple "come" is all that's needed. If the dog obeys it should be praised. Once the puppy has got good at this in the home, the next stage is continuing training outdoors ideally in an enclosed space like a yard or garden at first, then in an open space. The puppy may find it difficult to reproduce its behaviour outdoors at first, due to all the distractions. In this case, the important thing is not to get annoyed. It might be a good idea to try indoors again, just to get the puppy back on track. Sessions should also be short, as the puppy will soon tire and lose interest.

The puppy must also be taught not to run amok in the home, biting table legs, destroying shoes or clawing at curtains. If it is caught in the act, a firm "no" is essential with redirection to an appropriate toy or activity.

Breaking the attachment

When it first arrives in the home, the puppy forms a mutual attachment to a particular person. By the time it reaches 4-5 months of age, it is important to break this exclusive attachment. If not, the puppy will panic as soon as it is separated from this person. In this state of distress, the puppy will frantically look for this person, causing damage to the furniture, soiling the carpet and crying. The puppy

is not throwing a tantrum, it is just worried. To avoid this, it has to learn to be on its own and not totally dependent on this one person. The first step is to ignore the puppy for a period of 30 minutes before leaving the home. If, upon returning, the dog gets all excited it should be ignored. Once it has calmed down, it can be given a stroke or two. If the puppy has caused damage, it should never be punished even if the urge to do so is strong as this will reinforce the negative behaviour. Ignoring it is the best policy. The puppy has to learn to accept separation from its owners and the only way to do this is by not responding when it wants to play or it wants some attention.



CALLALLOO Cans/Fotolia

The puppy has to learn that it cannot take the initiative in a relationship with its owner.

Learning its place in the home

The dog should always eat alone, in the kitchen. It must not be allowed to beg for scraps at the table, although it should be allowed to be in the room at mealtimes. It must not be allowed to jump on beds, chairs or sofas without permission. It should be assigned a place to sleep at the earliest opportunity, although this should never be anywhere people habitually pass through or that affords it a strategic view of the comings and goings of the whole family (its "pack"). The ideal location is somewhere calm where it can relax. If it nips at the hands or feet of people passing by, they should stand still and ignore the dog until the behaviour stops and the dog learns that such behaviour is not rewarding. If necessary, the position of the dog's bed should be changed

or use made of a playpen at identified problem times. It could cause serious injury if the dog continues to bite into adulthood. Puppies should not be stroked on demand, either. Again, the human must always take the initiative in the relationship.

If the puppy is raised with other animals – humans, cats, rabbits – including fake ones such as cuddly toys, there is a risk that it will identify with this foreign species. If the puppy grows up, between week 3 and around week 16, without being round any other dogs it will identify with the species it is closest to (in this case humans, cats or rabbits or even a cuddly toy). As a consequence, in adulthood the dog will prefer the company of that

species and even try to court and mate with it. At the same time, it will be aggressive to other dogs. Raising the puppy among dogs, with its mother, until it is 8 weeks old is an important way of avoiding this.

Dogs are not programmed for social interaction with other species, so they need to be given the chance to get used to other animals, for example cats, rabbits and humans. Puppies that are raised with cats will not chase after them later in life, for instance. They need to encounter other species and, where possible, different types of people – women, men and children – before they leave the breeder. It will not prevent

the puppy from identifying with its own species, but it will lead to the development of interspecies socialisation and attachment that takes the edge off the dog's natural predatory instincts.



© HermelineDifomeida

Communication between humans and dogs

No animal lives so closely with humans as the dog. They have to be able to live together in a harmonious way in an enclosed space. Dogs and humans work together too, often forming a team: guide dog and blind person, assistance dog and disabled person, working dog and handler. These partnerships would not be possible if the two species could not understand each other and did not share a common non-verbal language.



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Understanding language and gestures

Books on the subject have been around for many years and some have been bestsellers, but only since 1998 have academic studies been conducted into communication between humans and dogs. Since scientists started to delve into the subject, some fundamental ingredients of shared language have been identified in objective studies.

We have been able to show that companion dogs understand our gestures to indicate movement towards somewhere, such as when we raise an arm and point. We use this body language when we want the dog to return to its basket when visitors arrive, go outside, come back in again or fetch a ball from the corner of the room. The dog understands that its owner wants its attention and follows the gesture indicating the direction it should go in.

Conversely, dogs can also adopt behaviour designed to catch our attention and provide information on the location of something they want. They communicate their desire to go out, to come back in, to be cuddled. They are able to get us to comprehend that their ball is stuck somewhere or that they are hungry. We understand that the dog wants our attention and are able to read its behaviour to work out what it is trying to communicate.

On the one hand, dogs have learned to make a connection between a word and an object or an action. On the other, they are able to reinforce their attention-seeking and

direction-indicating behaviour with vocalisations. Studies have also shown that they can tailor their barking to specific contexts and that humans are able to pick up on this. If we are at home, we are liable to ignore slow, sporadic barking, but if the dog starts to bark more persistently we are more likely to get up and investigate.

While very limited, this shared communication space enables humans and dogs to manage and negotiate their living space. While humans always have the last word, this does to a degree replace the relationship of force between the species. To exaggerate somewhat: without that communication space dogs would be routinely cooped up and leashed when they go outdoors. Put differently, if the dog did not understand what we mean when we point with our arms and was unable to communicate a few simple needs, like wanting to go for a walk or come back in, the two species would be in permanent conflict.

Our shared life is only possible because three essential criteria are met: domestication has taken the edge off the dog's aggressive nature, it is able to form an attachment with humans and it is able to communicate with us, which reduces the probability that conflicts will arise.



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Scientific studies show how well dogs understand human gestures and words, what signals dogs use to communicate to humans and in what contexts the species use sounds to communicate with each other. These are the basic means of communication employed by both species to interact with each other.

Dogs can understand some human postures

Dogs use human gestures to locate objects

One striking characteristic of companion dogs is their ability to understand human gestures, such as when we point with our arm or our head. These are examples of referential communication, because their purpose is to get another person or animal to act by designating a location or an object. These are gestures that indicate direction. We use them when we tell the dog to return to its basket, go outdoors or, if we are on an agility course for instance, to run through a tunnel or jump over an obstacle.

This ability to comprehend human gestures is the most widely studied part of human-canine communication, resulting in the following experimental model. The dog is positioned opposite the person conducting the experiment who has an upturned container, such as a big bucket, to his or her left and right. The person attracts the dog's attention, placing a reward, food or a toy, under one of the containers. The person then allows the dog to approach that container and gives it the reward. This procedure is repeated until the dog is fully involved, which generally takes between four and ten repetitions. In the next phase, the reward is placed under one of the upturned containers without the dog being able to see. The person then has to direct the dog to the correct container by gesturing. The results are conclusive. Dogs choose the container the person points in the direction of nine times out of ten. It makes no difference whether the person looks at the dog or the target while doing so.



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The dog performs better when the person continues to point while the dog moves towards the container rather than pointing for just a moment. The success rate is higher when the finger is 10-20cm (4-8 inches) from the container than when it is around 70-80cm (30 inches) away, although the dog still performs better here than when no gesture is given at all. Dogs also understand when we point with a leg, but pointing with the stomach or pointing with a finger across the body produces random results, as does pointing with a mechanical arm or the arm of a dummy. Few dogs understand when a stick is used to indicate direction. The important thing appears to be that it is a human limb and that it is thrust outwards from the body.

Dogs are also capable of understanding which container to choose if the direction is indicated with the head, although the success rate is much lower. Nodding the head in the direction of the target, which includes movement, improves the success rate.

Leaning towards an object (without pointing at it with an arm) is not something many owners do to indicate the location of an object, but the success rate is higher than average, and improves further if the person looks at the dog at the same time.



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“One striking characteristic of companion dogs is their ability to understand human gestures, such as when we point with our arm or our head.”

The question is whether or not the dog uses its sense of smell to locate the reward in this experiment. It would not appear so, because the dog goes towards the container indicated regardless whether or not it is the container hiding the reward. In these situations in which dogs interact with humans, human gestures prevail over the dog's sense of smell.

Dogs have a tremendous ability for knowing when we are watching them and when we are not

Another skill dogs have is that they can work out where a person's visual attention is directed. All owners know that if their attention is elsewhere their dog is much more likely to try to steal food or do something it knows it is not allowed to.

The main clue dogs use to gauge whether we are watching them is the direction of our body and head. Researchers have studied

how dogs react when their owner is facing in different directions: facing the dog, facing another person, facing halfway between the two or hiding behind a screen. Each time, a recording of the owner played on a tape recorder commanded the dog to sit. Dogs were found to be more likely to obey when their owner was directly facing them.

But can it then be said that dogs "know" what humans see? Have dogs developed a theory of the human mind? In fact it's enough that dogs are sensitive to body language and posture, as well as the reward context. It is highly unlikely that owners feed their dogs without looking at them and dogs seldom get away with pilfering food if their owner is looking directly at them. Dogs don't necessarily have to form an understanding of the mental state of others to learn the most opportune moment to steal a piece of food.

Dogs want people to look at them and actively attract their attention

Dogs, which have become dependent on humans, have developed this behaviour to help them get what they want, be that food, a run in the garden or a toy they cannot find. This is known as functionally referential communication. Communication because the signal or behaviour physically addresses an agent and is designed to get this agent to act; referential because a specific external object is involved to which the message is applied; and functional because it is not possible to show that the dog is aware it is exhibiting designation behaviour to attract the attention of an individual it wishes to give a message to. The only thing that can be said with any certainty is that this behaviour appears to have a referential communication function.

Research conducted in this area shows that dogs are able to indicate to humans a target they want and that they are able to use information about location. To put it another way, they are able to get humans to do things and their ability to make use of a human's way of looking at things is a key factor in these interactions.

Vocal communication

Vocal communication by humans directed at dogs

Humans typically tend to reinforce their gestures with vocalisations. Talking to the animal has an effect on its behaviour. For example, when dogs learn to follow a course with lots of twists and turns by observing a person doing it, continual verbal encouragement is what facilitates the learning process most.

Tone and intonation are the most important aspects of the human voice for dogs, which are encouraged or dissuaded depending on the case in point.

Vocal communication by dogs

Barking is one of the distinctive characteristics of dogs, but it has not been of interest to researchers until fairly recently. The initial theories about barking were that it was a hypertrophied behaviour or a secondary result of domestication. Wolves can bark too, but they do so only in very precise circumstances, to alert other wolves or to protest, and there is very little variation in the acoustic structure of wolf barking. Dogs, on the other hand, bark in a range of different situations and produce a gamut of different vocalisations. These observations were long held to show that dog barking had no intraspecies or interspecies function.

But since 2002 researchers have shown that the acoustic parameters of dog barking clearly depends on context. For example, the characteristics of barking are clearly different when the doorbell rings (low frequency barking) and when the dog is alone or playing (more high-pitched barking). In the former case the individual barks are longer and they are repeated more rapidly than barks in other contexts.

Another essential observation is that stray and feral dogs bark a lot less. There is a theory that barking has more of a function in communication with humans. If that is true, humans should be able to decipher the code behind barking.

“All owners know that if their attention is elsewhere their dog is much more likely to try to steal food or do something it knows it is not allowed to.”



© LUMES



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So it is proposed that during domestication dogs became better at expressing their emotional state and situation to humans, which suggests that barking is a functional communication system in the relationship between humans and dogs. However a recent study showed that dogs were able to differentiate between another dog's bark depending on whether this dog was alone in a garden and when a stranger entered the garden. This suggests that barking could be a way that dogs communicate not only with humans but with each other too.

What is not in doubt is that companion dogs have specific, extraordinary skills for communicating with humans and that this is one reason why they have formed such a close bond with humans.

It would seem then that dogs cannot only "understand" us, they can "talk" as well. That being said, dog behaviour can be explained by more simple processes at a lower cognitive level, so it is important to bear in mind that until we can prove that an animal truly understands us and can "talk" to us, it's best not to take things at face value and attribute cognitive processes to dogs. The fact remains that when we restrict ourselves to observable behaviour rather than imagined cognitive processes, anthropomorphism, conveyed by an apparent functional interspecies convergence of non-verbal communication skills, this can sometimes be useful

in some day-to-day situations: a dog that stands at the backdoor looking alternately at the handle and at its owner while whining, then bolting out into the garden as soon as the door is opened, has definitely asked to go out or at least communicated its desire to go out.

But the study of social cognition in dogs is still at a very early stage and continued scientific research on their cognitive abilities is the only way to find out the degree to which their behaviour is governed by high-level mechanisms.

While much work remains to be done if we are to find proof that dogs have developed a concept of how people's minds work, there is no doubt that they have a specific ability to adapt and learn, and that communication training for both dogs and humans seems to be the best way of optimising the lives of humans with dogs and the lives of dogs with humans.

“Dogs bark in a range of different situations and produce a gamut of different vocalisations.”



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Learning the hierarchy

Dogs are pack animals and as such they have to learn to live within a hierarchy, which means they have to control their desires based on the rules of the pack. The hierarchical structure imposes rules which govern when they eat, when they express their sexuality and where they are allowed to sleep and play.

Rituals

In a pack the dominant male eats first, controls the comings and goings of all other dogs and is the only one allowed to express its sexuality in front of other members of the pack. Until weaning, the puppies feed at their mother's teat in a free for all without rules. During weaning the mother directs them towards sources of available food in the pack. When they move towards food

they are violently pushed away by the adults. They have to learn to wait their turn until the dominant dogs have eaten their fill. If a dog attempts to get too near to the food it will elicit the growls of the leader, which may bite if the youngster persists.

At around 5 or 6 months in males and from the time of the second oestrus in females, the dogs will be chased away from areas occupied by dominant males and females. The females will have less and less time for their puppies, which are forced to find a place to sleep on the edge of the pack's territory. This is also the stage in which the dogs gain control of their sexual behaviour. Only the dominant dogs are entitled to express their sexuality openly. Subordinated adolescent males have to do so out of view. Their sexual behaviour is inhibited in the presence of the dominant males.

missive posture. As a consequence of this punishment, the puppy learns not to bite too hard and to better control its motor skills in general.

Biting should not be accepted in a family situation. The puppy is not teething like a human baby. Teaching the puppy that biting is not acceptable will rule out any problems in later life when the dog is more powerful. Bite intensity varies depending on breed, line and individual. Some breeds, such as Labradors, can withstand very strong bites.

Breaking the attachment

Socialisation is also the period when the mother starts to teach the puppies to be more independent. By the fifth or sixth month the female displays increasing intolerance towards its puppies, especially the males. The female displays less affection, plays less and demands that the males find their own place to sleep. The females, on the other hand, remain with the mother until around the second oestrus. In the human pack, if the puppy retains a strong attachment to a particular person, when that person is not present it will develop behavioural problems which can encompass wholesale destruction of property, uncontrolled urination and defaecation, and continuous vocalisations.

“During socialisation the puppy is taught inhibited biting.”

Fear



Fear and submission after having been forced to stop biting.

Controlling biting

During socialisation the puppy is taught inhibited biting, both through play, from the age of three weeks, and by its mother. Puppies bite each other when they play and they will squeal if bitten too hard. The mother reacts by picking up the perpetrator by the scruff of the neck, shaking it vigorously and placing it back down. The puppy in question will squeal and adopt a sub-

Social capacities

Although dogs are descended from wolves and are still pack animals, they have become more individualised in the course of evolution. They have acquired their own codes and capacities, which are much more subtle than those of their wild cousins.



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The myth of strict dominance

The myth of the relatively strict social structure of wolf packs has done a great deal of harm to dogs. We all know the much-vaunted legend of the “dominant” wolf, the “alpha” male, yet there are relatively few academic studies on the social life of wolves in their natural environment to back it up. The alpha male is the uncontested leader of the pack with a number of “privileges” compared with the rest of the pack. It eats its fill at its leisure, before any other animal is allowed to eat; it controls its territory and the movements of all wolves within that territory; it chooses where it sleeps and does not tolerate the encroachment of any animal or any disturbance when it is sleeping or relaxing; it is the one that takes the initiative in contacts with members of the group and is likely to react ferociously if this rule is not observed; it chooses its female and is the only male allowed to copulate openly in the group. It is the dominant animal in the pack; all other wolves are subordinate to it. Relations among the other individuals in the pack are also based on strict observance of a hierarchy: each wolf is on a particular rung of the ladder – dominated by the wolves above it and dominating the wolves below it, except for the wolf at the very bottom of the ladder.

The most recent studies into animal behaviour using remote monitoring technology shows that, while it is constant and homogeneous, the social organisation of wolf packs is often much less rigid than originally thought.

Dogs are not wolves

We often forget that dogs are not wolves; that dogs have evolved together with humans for millennia in a climate of cooperation and mutual benefit, consequently developing natural and social abilities very different to those mastered by their wild cousins. Like humans, dogs have been freed from the imperatives of survival that characterise the natural world. Humans have lived in relative prosperity for at least 10,000 years, thanks to the development of agriculture and “breeding”. This has led to the promotion of cooperative exchanges rather than combat. We have flocked to cities in increasing numbers and turned our back on war more and more. We rightly regard ourselves as “civilised”, but we forget that dogs have accompanied us on this journey too. Exactly like modern humans, modern domesticated dogs function through mechanisms of cooperative exchange much richer than a simple relationship of dominance and subordination. Dogs have a very wide

“Dogs are not wolves any longer; they have evolved together with humans for millennia in a climate of cooperation and mutual benefit.”



© DuhyerRoyal Canin

“Some wild canids, such as foxes, are solitary animals that only come into contact with other members of their species when they need to mate.”



range of signals they can use to communicate to humans and to other dogs. Just like us, they prefer signals of conciliation which promote cooperation and exchange with both species. In conflict situations, they are still able to express dominance and subordination, of course, but this occurs very rarely when dogs are properly socialised.

Being “civilised”

For dogs, expressing a social relationship with other dogs and familiarity with humans or other species is not only an act of “civility”, but also an essential need which is written into their DNA. By being social, dogs show that they are capable of and, indeed, need frequent exchanges with others. Some wild canids, such as foxes, are solitary

animals that only come into contact with other members of their species when they need to mate. Dogs seem to be very like wolves in terms of this irresistible need for social relations, although the two species express this in very different ways. Social contacts are a type of essential lubricant, a basic behavioural need. When positive and structured, social contacts with other dogs and with humans very probably have the same role as those between mother and litter immediately after birth – they provide a soothing, stimulating context. These include playing and cuddling, both with other dogs and humans. Simply spending time with other dogs or humans, even when dozing, is very important and very significant to the dog. It is probably the most common form of social exchange for humans. And, like us, dogs are strikingly flexible in their relationships. They are basically just as happy to spend time with other dogs or with humans, with perfect strangers or with those familiar to them. Like us, they are social animals not limited by any particular familiarity or attachment. This social ability to cooperate is extremely rare in the animal world, one shared by humans and domesticated species that has developed over a long period of time.





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Aggressive behaviour

In ethology – the science of animal behaviour – aggression is defined as “a physical act or threatening action towards another individual that limits its very freedom and genetic potential”. Several types of aggressive behaviour can be distinguished: predatory aggression, hierarchical aggression, frustration aggression, territorial and maternal aggression, and fear aggression. Leaving aside predatory and fear aggression for now, we need to examine the entire behavioural sequence, which is split into three phases.

The three phases

The first is the threat or intimidation phase, characterised by growling, raised hackles, erect tail and ears and bared teeth. The second is the attack phase, when the dog charges, attempting to grab its adversary around the neck, chest or front limbs and pin it down until it adopts a submissive posture. The third is the appeasement phase, when the victor bites the loser on the top of the head, places a paw on its withers or straddles it.

The form of attack varies depending on the hierarchical relationship between the two dogs. If the attacker is dominant the bite will be a quick one and will be followed by another intimidation phase. But if the attacker is a competitor, it will hold the bite until the other dog submits. The full sequence is termed reactive aggression. If the intimidation and appeasement phase is missed out, the correct term is instrumentalised aggression or secondary hyper-aggression.

Predatory aggression

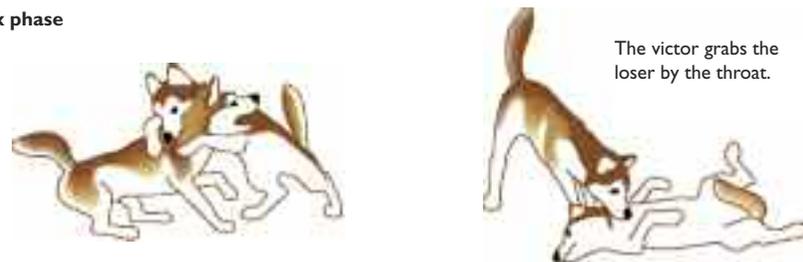
Predatory aggression is generally triggered by hunger. The dog pounces on its prey with its limbs together, tail and ears erect and hackles raised. It comes down on the prey with its front limbs, clamping it in its jaws and shaking it vigorously to break its spine. Predatory aggression has also been observed in satiated dogs, including dogs killing hens in a farmyard. This is physiological behaviour that cannot be effectively inhibited.

There are occasional reports of predatory aggression against people by packs of feral dogs, which identify humans as prey because they have never been socialised in a human environment. Companion dogs may also sporadically exhibit this behaviour towards infants not yet able to walk if they have not encountered infants of this type before.

1. Threat phase



2. Attack phase



3. Appeasement phase

The victor expresses its domination through various rituals.



Bite on the top of the head.



Straddling.



Paws on the withers.



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“*The appeasement phase is the same when the adversary is a human. Sometimes the dog may lick a limb it has bitten when the human presents it, which leads the human to wrongly suppose that the dog is somehow expressing contrition.*”



In fact, the dog is expressing its domination, as it would do with another dog.

Mirror test

Aggressiveness, fear – the puppy's behaviour in front of the mirror reflects its future character.



Hierarchical aggression

Hierarchical aggression has been observed against both dogs and humans. It is triggered when the dog feels that it is being challenged by a subordinate. A dominant animal protects the cohesion of the social group by inhibiting aggression by other members of the pack. The dominant animal eats first, at its leisure, preferably while the other animals are watching. It controls the occupation of the territory and how other members of the pack move around this territory. As a consequence, it often occupies a strategic position, enabling it to survey its entire territory. It controls reproduction, managing sexual activity in the pack. A dominant dog can copulate in full view of the other members of the pack. In the human equivalent of the pack – like a family – the presence of an owner of the same sex may be an exacerbating circumstance. Subordinate dogs are not allowed to copulate in front of dominant dogs or, by extension, a dominant owner, so they will be inhibited in the presence of an owner of the same sex, which means that dominant owners should not be around when their dog is mated. Dominant dogs straddle their subordinates of the same sex – in fact they can even exhibit this behaviour with cushions and pillars – in front of everybody. Straddling has nothing to do with homosexuality, it is an act of dominance. If the dog's dominance is challenged this may trigger hierarchical aggression against dogs or humans characterised by the typical behavioural sequence (intimidation, attack, appeasement).

The appeasement phase is the same when the adversary is a human. Sometimes the dog may lick a limb it has bitten when the human presents it, which leads the human to wrongly suppose that the dog is somehow expressing contrition.

Frustration aggression is triggered by a feeling of discontentment caused by hunger, pain or prolonged physical contact initiated by a subordinate (such as an owner stroking or brushing a dog). Territorial aggression is triggered by any intrusion into the pack's territory or personal space. Maternal aggression is triggered only in the presence of puppies, although the immediate cause may be as simple as a toy or slipper.

Fear aggression

Fear aggression occurs where the dog is trapped and unable to escape. It can be expressed towards humans or other dogs. There is no intimidation phase, the attack comes immediately, without warning, causing violent injury as the dog does not control its bite in any way.

The lack of the intimidation or appeasement phase may also be due to effective conditioning. We have already seen how dogs become aggressive when their dominance is challenged. In the case of fear aggression, initially, all three phases of the aggression sequence are completed, but if conflict situations continue to occur without the balance of the relationship changing in any way, the dog will gradually fine-tune this sequence. So if the dog bites someone who then runs away, this will reinforce the development of effective conditioning. The appeasement phase diminishes and ultimately disappears, while the intimidation phase merges with the attack phase, eventually disappearing too. The result will be a serious bite without warning. By this time, the dog has become a dangerous animal.

Approaches to aggression

While they are integrated into the everyday world of humans, dogs still have their own modes of expression. These have sometimes been used, and even exploited by humans for highly debatable ends. Consequently, we do not always identify the truly aggressive dogs and the poor reputation some breeds have is not always based on objective or proven facts.

How the dog experiences the world

It requires a great deal of effort to understand the dog's "Umwelt" – a German term for the world as experienced by a particular animal – and how they see us. Wherever they are found, feral dogs most often live peacefully with other dogs and with humans provided resources are relatively abundant. The small number of scientific studies dealing with wild dogs in the forests or stray dogs in cities confirms all these observations. In the vast majority of cases, dogs that live together or with humans do so in a spirit of cooperation and harmony. But even dog lovers cannot say that they have never come across dogs that are aggressive towards humans or other dogs. In the vast majority of cases, we are responsible for this aggression.

History of Molossers

When humans first started to settle and practise agriculture and animal breeding, they also discovered that dogs were not only great companions and hunters, they were also impressive guards and efficient waste disposers. By crossing the strongest with the most ferocious and the best guard dogs, within a few thousand years in different parts of the world we created stronger, more ferocious dogs with even more acute guarding instincts. These were the first Molossers. We have not been able to produce a precise timeframe or identify exact geographical locations, but we do have a few descriptions

of dogs employed in antiquity based on their ferocity and courage in battle against enemy armies. Alexander the Great and Scipio the Roman have both left epic works describing packs of war dogs that were let loose on the enemy. Dogfights in Roman amphitheatres are also mentioned. The modern Bulldog is descended from dogs which less than two hundred years ago were still used for bull-baiting in the UK, where Bulldogs were also crossed with terriers to produce a faster fighting dog, the Bull Terrier. Miniature fighting dogs bred in the central market of Paris at the beginning of the 20th century but soon banned are the ancestors of the modern French Bulldog, which themselves are pleasant little companion animals very popular with city folk.

Underground dog fighting continues to this day in many countries, often using American Pit Bull Terriers or similar types. Organisers and owners face custodial sentences and large fines if convicted.

Military dogs

The military has taken advantage of the courage and athleticism of selected breeds, originally sheepdogs, for over a century. Almost all the world's armed forces now train dogs to save humans by putting their own lives on the line.

Why does my dog bark when left alone at home?

This type of behaviour is called separation anxiety and it is a common problem. Dogs are social animals and they perceive isolation as a serious threat. Teach your dog that to be alone is in fact a pleasant activity. After a long walk you can give your pet a rubber toy filled with treats and don't pay any attention to him or her. When your pet is engaged with the toy, go to another room and shut the door behind you. Then open the door shortly afterwards so that your dog doesn't notice your absence. This game should be played as often as possible and it is recommended to change the rooms and extend the period of your dog's isolation. Then you can try to leave your home in similar manner. If your pet can stay alone without problems for half an hour, it is usually easy for him or her to be in isolation for longer periods.

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Why do dogs sometimes eat dirt?

Pica is defined as eating nonfood items (including faeces). It can be related to behaviour (i.e. boredom, curiosity) but is sometimes associated with a specific disease process (examples include digestive problems, liver disease, and anaemia). An especially concerning consequence of pica is the possibility of intestinal obstruction or perforation, either of which can be a life-threatening condition.

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1) Causes of pica

Pica is the craving for and eating of unnatural foods such as dirt, clay etc. There is no real clear cause, but pica may be due to medical or behavioral problems and should be further evaluated by your veterinarian. It is often incorrectly assumed that pica is due to a nutritional deficiency. This is rarely the case if the pet is eating a good quality complete and balanced pet food.

2) Why don't we change pet foods frequently?

Veterinarians do not recommend changing foods frequently because pet foods are formulated to be complete and balanced- providing everything the dog needs, in the proper "balanced" amounts. However, there can be a significant variation in nutrient levels such as fat, protein and fibre content between foods. Sudden changes in any of these nutrient levels may cause gastrointestinal upset which could cause flatulence, nausea, diarrhoea or vomiting.

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The impact of genetic selection by humans

These examples from history and prehistory, right up to the present day, all confirm that genetic selection and training by humans can be employed to produce an attack or guard dog that is potentially aggressive in certain circumstances. On the other hand, when they are left to their own devices and their reproduction is not interfered with they can live alongside humans throughout the world without resorting to aggression

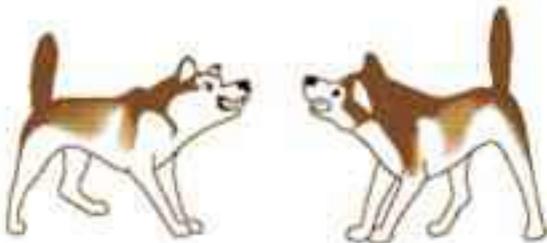
towards either us or other dogs. Genetic selection by humans can have a considerable positive impact on temperament when the goals are reasonable. Who would believe that those adorable little French Bulldogs are descended from formidable fighting dogs that drew big crowds in Paris just a century or so ago? Most of the molosser-type dogs found today are loyal and devoted protectors which on the inside, are nothing like their ancient ancestors.

The impact of development, environment and lifestyle

Leaving aside genetic selection, which we have seen can be used to change an aggressive temperament in a positive or a negative way, the conditions in which the puppy is raised in the first few weeks and the conditions and environment in which it spends the rest of its life have the greatest bearing on its social abilities with regards to other dogs and humans.



Never try to stop a dog fight; one of the two has to submit.



Almost three weeks into its life the puppy is ready to encounter humans, other dogs and experience its physical environment. The encounters and experiences it has in the next few months will be decisive for its future emotional balance. If it is allowed to explore a rich and varied physical environment, full of smells, sounds, sights and other beings, it will experience thousands upon thousands of sensations which it will be able to use as points of reference in its later life. As the number of formative positive experiences and social contacts with various dogs and humans is gradually increased, the puppy will learn to respect others, to behave in a “civilised” way, just like a child at school. It will also be more sociable. Science has now confirmed something we have known in our hearts for a long time: our longstanding canine companions can be just as civilised as we can, provided they are raised in the right conditions. The



aggression shown by selected individuals is almost never a matter of nature, but rather a consequence of nurture.

My dog keeps chewing the furniture. How can I stop him?

The first idea is that you can't or shouldn't stop a dog chewing. This behaviour is a natural and healthy activity for puppies and dogs. Dogs will always chew, because they use it as a pastime. There are breeds more predisposed towards chewing than others, especially hunting dogs (like Retrievers, Spaniels and Hounds). Chewing is also a form of occupation therapy to relieve stress and release energy. Boredom, loneliness, frustration and anxiety are leading causes of destructive behaviour like chewing. Dogs can adopt compulsive behaviours as a response to stress. It's necessary to consider these causes in order to properly address the issue.

Some owners allow puppies to get away with chewing but will not tolerate it from an adult dog. To avoid an adult destructive dog, the puppy needs to clearly understand as soon as possible that only toys are for chewing and

then get him to stick to this rule. Particularly when the puppy is teething, it is very important to have chew toys available all times.

A great way to stop your dog from chewing furniture is to re-direct the chewing behaviour. As you find your dog chewing furniture, you should take a toy and re-direct his attention to the toy. When he turns his attention away from the furniture onto the toy, you have to praise him greatly. The same praise need to be given when you find your dog chewing the correct items. This will give positive reinforcement around chewing the correct objects. Please remember that punishment will not deter chewing but can actually increase the behaviour.

Remember that dogs have always been pack-oriented animals and their sociable nature makes them require plenty of time interacting with you. Your dog needs your compan-

ionship, mental and physical stimulation. They need sufficient exercise, because an excess of energy can cause more stress and associated destructive behaviour. If you have no time for it, you can use dog-walking or dog-sitting services. In some places you can also find doggie day-care. But your dog has a mind too! To keep your dog happy, he also needs mental stimulation. There are active toys that stimulate your dog and allow him to play alone, keeping him occupied for hours on end.

To sum up these hints to control your dog's chewing habits, you will need to consistently follow the training methods adding a touch of patience and you will be well on your way to solving the problem.

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Submission

The submission posture stems from the ritualisation of urination stimulated by the mother. When the puppy finishes feeding, the mother rolls it over and licks it.



© Grosvenor



© Duhaier/Royal Canin

The puppy's posture then corresponds to the submission posture adopted by a subordinate dog in a fight when it wants to halt the aggression of another dog. There are, of course, other forms of submission, such as the squealing of a puppy when grasped by the scruff of the neck, which is also a line of attack in hierarchical fights, but the adoption of the submission posture is a ritual that strengthens the cohesion of a pack and enables disputes to be settled with minimal violence

Some dogs do not learn the submission posture, which makes them dangerous. The failure to adopt the submission posture when appropriate means that the other dog

is never mollified and so continues to fight. Other submission signals have been observed, including the lack of direct eye contact, a lowered tail, lying on one side with a raised hind limb and flight. Owners have to be able to recognise the preferred submission posture of their dog, because continued aggression after the dog has adopted the submission posture can lead to behavioural problems.

Why do dogs dig?

Dogs dig for several reasons. Some dogs will dig to try to get to interesting things, such as children playing in a neighbouring yard. They can also dig to go after little burrowing animals like gophers: a trait especially true in breeds developed to hunt burrowing animals. Digging to es-

cape a yard, crate, or house can happen when this social animal feels isolated. Hot dogs can cool off by lying in freshly dug soil and high energy dogs use the behaviour to get rid of some of that energy.



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Marking territory

All dogs mark their territory, regardless of age or sex. This is a means of communication which varies greatly depending on the dog's social status. The development of communication systems is an absolute necessity in social species like domesticated carnivores. Territory is typically marked by urine or faeces deposits, which are both visual and olfactory in nature.

Olfactory communication relies on chemical substances known as pheromones, which are hormones that transmit information between individuals of the same species and trigger a behavioural or physiological response in the recipient. They are released by anal, perianal, facial, interdigital and supra-caudal glands. Pheromones are also contained in saliva, faeces, and particularly urine. They are released, via the faeces and urine in particular, in social contexts such as sexual and territorial behaviour. The pheromones linked to territorial marking come from the feet and urine. They are released during the intimidation phase of territorial aggression. The dog scratches the ground with its front paw and urinates by raising its hind leg. When a subordinate dog smells a urine deposit from a dominant

dog it tends to release submission signals and urinate on the ground. Pheromones released in the urine appear to convey hierarchical information. In conflicts between humans and dogs, the dog may urinate in the strategic locations of social importance in the home such as on a table leg, in bed, in the hallway and in the main doorway. This type of urination is hierarchical in nature. Some dogs will even defaecate in a bed or on the arm of a sofa –somewhere highly visible. In this case, the faeces will be soft.

“Dogs may urinate in the strategic locations of social importance in the home such as on a table leg, in bed, in the hallway and in the main doorway.”



© Duhaier/Royal Canin

Sexual behaviour

Males reach puberty at around 7-10 months on average, depending on the breed. Small breeds develop earlier than medium breeds, which in turn develop earlier than large breeds. The earliest cases have been observed at 6 months, the latest at three years. First oestrus together with sexual maturity or puberty occurs in females at 6-12 months. Females have two oestrous cycles every year. The onset of oestrus does not appear to be directly connected with the seasons, although it is more likely to occur in autumn or spring.

Oestrus – the period when the female is sexually receptive, or “on heat” – lasts for about three weeks. The first half of the oestrous cycle is known as pro-oestrus, when the female attracts males but rejects their attempts to mate. It is characterised by swelling of the vulva and bloody discharge. Oestrus occurs in the second half of the oestrous cycle. By now, the female is nervous and willing to mate, especially between the tenth and twelfth day of oestrus. Ovulation occurs around day 11-12. It is spontaneous and provoked by the release of luteinising hormone by the pituitary gland.

Some females can still be fertilised up to and beyond two weeks after oestrus. The dog's spermatozoa are highly resilient and can fertilise a female who is mated at the end of pro-oestrus. Females always ovulate several times, which means that the puppies in a given litter can have different fathers. Oestrus is followed by metoestrus, which lasts for around two months. Pseudo-pregnancies are possible, characterised by behavioural changes and milk production. The final phase is anoestrus, the period of rest lasting 3 to 4 months. The whole oestrous cycle generally takes 6 months to complete, producing two cycles per year, although it can take 10-12 months without being a cause for concern.

The male knows that the female is in oestrus (heat) by the smell of the female's urine, which contains oestrogen metabolites. The female will also actively seek out males during oestrus. When they meet they will smell each other vigorously. These meetings are often characterised by invitations to play. If the female is in the pro-oestrus phase, she will not remain still for long, moving about, turning around, lying down, getting back up and sitting alternately, which makes it impossible for the male to mount her. This all changes during the oestrus phase, when the female finally allows the male to mount her. The male prefers to do this in a familiar environment impregnated with his own odour, so females are typically taken to males for mating. A subordinate dog is unable to mate in front of a dominant member of its “pack”; therefore, dominant owners should not be present during mating attempts.

Hormonal contraceptives can be administered orally or intravenously to inhibit oestrus, but only during anoestrus, one or two months before the expected onset of oestrus. Contraceptives do have side effects and may cause uterine infections, so if the female is not going to be used for breeding, neutering is preferable. Once the ovaries are removed the female will not have another oestrous cycle. If neutering is carried out before puberty there is a reduced risk of diseases of the genitals or mammary glands.



© Duhaier/Royal Canin

Feeding behaviour

Wild dogs spend a lot of time and expend a lot of energy finding, pursuing and capturing their prey. Predatory behaviour is triggered by hunger. The prey has the following characteristics: it is not hostile and it is associated with feeding. Wild dogs eat small prey such as mice, lizards and insects, although they can also take medium-sized animals such as rabbits or even bigger prey like deer. Wild dogs hunt alone, in small groups or in packs.

The diet of domesticated dogs needs to contain all of their maintenance needs. Depending on the dog's life stage, physiological condition and activity levels it may also need nutrients to grow, work optimally, gestate or nurse.

To rule out any hierarchical problems leading to biting, dogs should be trained to obey certain rules with respect to feeding. Dogs should always eat after – or at least one hour before – the humans in the household and must never be given scraps from the table. The bowl should always be put down in the same place, which should never be the room where the humans eat. Dogs should be left alone when eating and never watched.

Sometimes the dog may not digest its food properly and the faeces may give off nutritional odours which may encourage eating. Some claim that the indigestible ingredients used to improve palatability in processed foods are at the root of the problem. These highly aromatic ingredients pass through the digestive system and end up in the faeces, attracting the dog. If the dog does soil the home, there is no use rubbing its nose in the mess, bearing in mind this is not something the dog finds repugnant. It is also important not to clean up the mess in front of the dog. The dog will interpret the master crouching down to clean the mess as an invitation to play.



Coprophagia

Some puppies have an unfortunate tendency to eat their faeces. This behaviour should end after 3-4 months, but if it does not the cause will have to be identified. Dogs are naturally attracted to excrement, either their own or that of others, but there are several reasons why dogs might eat their own faeces.

It is often due to poor cleanliness. If the dog is punished for defaecating in the home or some other inappropriate place – especially after the fact – it may defaecate more and more often when it is left alone and get rid of the evidence by eating it before it is discovered. Another cause may be the reinforcement of the dog's behaviour by its owner, who races to stop it and clean up the mess when it is caught in the act. The puppy feels it is in competition with the owner, which causes it to eat even faster to be certain that the faeces are not taken from it.

Parasites which can be transmitted by the occurrence of coprophagia



Roundworms (eggs are invisible to the naked eye):

1. Ascaris: 5-20cm
2. Whipworm: 4-8cm
3. Hookworm: 1-2cm

Protozoa:

4. Giardia (a single cell invisible to the naked eye)



© Duhaier/Royal Canin

Behavioural problems

Behavioural problems are frequently observed in dogs, some of which can be avoided with the proper socialisation as soon as the puppy arrives in its new home.

Some phobias, such as noise anxiety and fear of people or motorised traffic, may develop as early as infancy or adolescence. These dogs are not suited to life in built-up areas, as it will be very difficult, if not impossible, to take them out on the street. If they are not properly leashed they may run away and end up the victim of a road accident. Other dogs pull on the leash to return indoors, refuse to budge or move in leaps and bounds. Still others wait until they get home before doing their business, because they need a calm environment they can control. They are often afraid of people and may attack them because of this fear.

Puppies need to be accustomed to various noises and experiences from a very early age

The dog's brain is not fully developed at birth, continuing to grow for several weeks, so the puppy needs to be raised in a stimulating environment in which it encounters lots of different people and noises. If the puppy is raised in the countryside there may be little in the way of ambient noise or visitors, which will be detrimental to the puppy's development. Some kennels have endeavoured to mitigate this problem by ensuring their dogs experience lots of different noises and encounter lots of different people, but generally, dogs raised in a non-urban environment will find it hard to function properly in town and cities.

While breeders bear some responsibility, owners can exacerbate any potential problems if they fail to socialise the puppy properly. Puppies need to experience lots of different things from a very early age,

including walks in the street, rides in cars, encounters with other animals and people and exposure to plenty of noise sources. Vaccines are available to protect puppies from diseases they are susceptible to and the vet will advise how soon the puppy can be taken out.

Some dogs are simply unmanageable. They are unable to control themselves, jumping, running after anything that moves, including joggers, bikes, birds and leaves, and playing all the time. These tireless animals often end up running amok in the home, chewing enthusiastically, especially if their owners try to rationalise by claiming they are teething. The truth is that these types of dog have been raised by a mother that was too young and not capable of educating them or perhaps part of a large litter that the mother couldn't cope with. Alternatively they may have been separated from their mother or sold too early (ideally they should remain with her for the first eight weeks) or the mother may have died. These dogs have not learned to control their motor functions or their jaws. They lack any form of self-control

Separation anxiety

Separation anxiety is a disorder that veterinarians often have to treat. Dogs are brought to a consultation because they are very destructive, they urinate and defaecate in the home, and they cry, bark or howl constantly when left alone. This type of behaviour is caused by attachment or even hyperattachment to a specific person. Attachment is a learning mechanism in which the puppy identifies with its mother.

It is a vital part of the imprinting process and the proper social, cognitive and motor development of the puppy. During the neonatal period the bitch forms a bond with her puppies and anything that limits contacts between them causes her great distress. During the transition period the puppies in turn form a bond with their mother, who is the only one able to mollify them. The mother becomes their reassuring reference point around which their exploratory behaviour develops. At this point the attachment is mutual and any attempt to come between the two will agitate both parties.

At a certain time, this attachment is broken by the mother. This is an important milestone in the socialisation of the puppies. The first ones to experience this are the males, at about 4-5 months. The mother gradually becomes less and less receptive to their advances and they are forced to sleep elsewhere. The females do not experience this process until their first or second oestrus.

Biting

The most common behavioural problem that veterinarians have to deal with is biting. Like all social mammals, dogs base their life in the pack on a set of hierarchical rules, governing things like access to food, control of territory and control of reproduction. During puberty, dogs endeavour to position themselves in the "human pack". They will express their dominance and defend their hierarchical privileges, resorting to aggression, confrontation and even urination or defaecation in an effort to reassert them if



Depression in dogs

Some behavioural problems could be described as depression, which is defined as a mental disturbance characterised by sleeping problems, psychomotor inhibition and withdrawal. The animal loses its ability to adapt to variations in its environment. The depressive state can be acute or chronic. Acute depression is characterised by a lack of interest and enthusiasm, a state of apathy (an unwillingness to explore). The dog is indifferent to its environment and uninterested in regular activities. It eats less, sometimes not at all (anorexia) and sleeps a lot (hypersomnia).

There are many different causes, including violent aggression (traffic accident), sudden loss of the socio-emotional framework (abandonment or death of an owner or even another animal to whom it was attached). Sometimes it can affect puppies that are rejected by their mother and unable to form an attachment to a person or another animal.

In the case of chronic depression, the dog exhibits sudden emotional responses to highly intensive stimuli. Its behavioural functions are altered. It loses interest in all regular activities, like playing or social relationships. Sleeping problems have been observed, as have cleanliness issues. Chronic depression may develop from untreated acute depression or from endogenous problems such as endocrine disorders (thyroid or adrenal gland dysfunction) or brain tumours.

they are taken away. Dominant dogs have a number of privileges. They eat first, at their leisure, while the rest of the pack looks on. They control their territory and the movement of members of their pack within it. They often occupy a strategic position (bedroom, landing, hallway), so that they can keep an eye on everything that happens. They control reproduction and manage sexual activity in the pack. Any challenge to the dominant dog's privileges is likely to be the source of behavioural problems, expressed in aggressive behaviour characterised by the

familiar phases of intimidation (growling) and attack (biting), both in the pack and in the family.

Behavioural problems can be fairly easily avoided. One simple precaution is selecting the right breeding establishment. Potential owners should pay an advance visit and ask to see the mother and her litter so that they can get an idea of the conditions in which they are being raised and fed. Puppies should not be bought until they are eight - ten weeks old and enquiries should be made

to make sure the puppy was not separated from its mother before it was two months old. And when the puppy does arrive in its new home there are a number of rules that need to be followed to ensure that everything goes smoothly.

In the event of a behavioural problem, in a puppy or an adult dog, the appropriate remedy will often be found by consulting a veterinary behaviourist. The list of behavioural pathologies is too long to be included here.

Instinct and intelligence

The concept of instinct has changed a great deal. The development of behaviour necessitates the complex interaction of genetic predispositions and experience. It can be wrong to say that an animal is acting instinctively, because that implies that the behaviour has not been influenced by experience.

It is very difficult to conclude that the genes primarily determine a form of behaviour or that it cannot be modified by experience. Once it is accepted that animals can be guided by other things than instinct, the only possible conclusion is that they are intelligent. So are they? Is a dog that pushes down a handle to open the door really intelligent? And what about a dog that goes looking for its leash so that it can go out or for its ball so it can play? There's no question that dogs do some astonishing things, but they all depend on proper training. Let's compare two puppies raised in different ways, one that is exposed to a lot of sensory stimuli and raised by a mother that

gives it a lot of attention, and one that is not exposed to any sensory stimuli and is not raised by its mother or by a disinterested mother. The first dog will be more "intelligent". In fact, it will be better able to adapt to new situations because its neural interconnections were stimulated more during the most sensitive period of its development, which is between week 3 and week 16 in puppies. The dog that fetches its ball when it wants to play or its leash when it wants to go out regards itself as the dominant dog in its "pack". It initiates contact when it wants something. This is not a matter of intelligence but of hierarchy.



Assistance and service dogs

Photo de gauche : © Zagla



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Lifesaving dogs

Dogs have always assisted humans, ever since they were domesticated many millennia ago. They are versatile enough to succeed in fields as diverse as hunting, security and livestock protection. But over time, dogs have made a name for themselves in search and rescue situations too, as heroes that save the lives of people trapped in avalanches and collapsed buildings, lost in the wilderness or even in rivers and lakes.

Hero dogs

The devotion dogs can show to people prompts them in certain situations to put their own life in danger to save humans. Some of them – of various breeds – have become the stuff of legends, displaying through their actions a tremendous aptitude for first-aid.



Balto statue in Central Park, New York

Togo and Balto, the sled dogs

Back in February 1925 Alaska was in the grip of a diphtheria epidemic that was threatening the town of Nome on the west coast. The winter weather meant that serum could not be flown in from Seattle, so the decision was taken to use the railway for the first part of the journey, transferring the

precious cargo to sleds for the final 600 miles or so. The call went out to Leonhard Seppala, who was regarded as America's fastest musher at the time.

As the epidemic spread, a round-the-clock relay of mushers was set up to deliver the medicine as soon as possible. In appalling weather - a swirling blizzard - Seppala was forced to take staggering risks. Urged on by the tenacity of their master, his lead dogs Togo and Balto displayed an exemplary attitude and extraordinary endurance.

Thanks to them, the serum arrived at its destination ahead of the disease. Seppala and his dogs covered over 300 miles on their own, making a major contribution to the mission, which delivered the serum in 127 hours and 30 minutes.

This feat is commemorated in one of the world's biggest polar sled dog races, the annual Iditarod.



© Zaglia

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Barry, the St Bernard

St Bernards are traditionally used as mountain rescue dogs. The monks of the Great Saint Bernard hospice in Switzerland first kept these dogs in the 11th century, and since the 17th century they have been trained to search for people missing in the mountains.

Barry was one such St Bernard who lived in the 19th century. In the local dialect the name means “bear”, and the handsomest male in the hospice’s kennels is still traditionally called Barry. The original Barry is attributed with saving upwards of 40 people, which earned him a place in posterity. A monument was raised in his honour at the animal cemetery in Paris, which notes that Barry was actually killed by the last person he ever found, who mistook him for a bear. In reality, Barry died of old age in 1814 and his body is preserved at the Natural History Museum in Bern. The St Bernard is also commonly associated with a keg of brandy around its neck, but this is a myth too. It is dangerous to give alcohol to people suffering from hypothermia.

Cyrrhus, the disaster search dog

An earthquake measuring 7.2 on the Richter scale hit Armenia on 11 December 1988. A call went out for international assistance due to the scale of the disaster – two towns were completely razed to the ground.

French dog teams arrived on the scene within 24 hours, including NCO Deguerville and his dog Cyrrhus, a three-year-old Pyrenean Shepherd. The dog teams worked two days without a break in temperatures dropping to -4°C during the day and almost -20°C at night, before settling into a slightly less demanding routine of 6-8 hours on and 3 hours off. The local residents endeavoured to help by indicating where victims might be trapped. On day four Cyrrhus and NCO Deguerville were advised to go to the site of a primary school. The lead came up blank, but while there they decided to investigate a shoe factory in the vicinity. After a search lasting several hours, Cyrrhus marked a spot, and a young woman was pulled from the debris. She had spent several days trapped under the rubble without food or water and had sustained a serious injury to her leg. After time in intensive care she made a full recovery.

Cyrrhus is just one of the countless canine heroes that have saved people trapped under rubble following natural disasters and terrorist attacks, such as 9/11 and the 2005 London bombings, which occur with unfortunate regularity. Many others perform similar heroics in complete anonymity.

Thousands of dogs work across the planet to save human lives every year. Most of them remain anonymous, although a small number are given official awards and medals, such as the Dickin Medal for outstanding bravery in war and the PDSA Gold Medal, two British awards.

These are exceptional animals, but the same can be said for all those dogs that are dedicated to finding trapped and missing persons, detecting illegal drugs, explosives, or helping people with impaired sight or mobility. These are dogs which give their all to help us day after day.

“**Barry was a St Bernard who lived in the 19th century. In the local dialect the name means “bear”, and the handsomest male in the hospice’s kennels is still traditionally called Barry. The original Barry is attributed with saving upwards of 40 people, which earned him a place in posterity.**”

Cyrrhus and his handler during a helicopter winching exercise.



© Brigade de sapeurs pompiers de Paris



Avalanche rescue dogs

There is no more breathtaking a vista than the winter mountains swathed in snow but often bathed in sunshine. They attract numerous hikers and skiers who sometimes forget that this can be a dangerous environment. While the weather may seem inviting, avalanches are always possible which is why considerable resources are made available to winter sports resorts. They include first-aid teams and ski-patrols, dog teams, local guides and efficient weather forecasting systems to evaluate threats.

SAR dogs in action

Preventive measures are vital, but accidents are unavoidable and sometimes emergency-response teams need to be called into action. This is where search and rescue dogs come in.

Avalanche search and rescue is one of the few SAR disciplines where dogs need to be deployed immediately to make the most of their exceptional sense of smell, speed and tenacity. Dogs are part of a team that also

includes people responsible for plumbing depths and others for digging. All of these team members work parallel to each other, but initially dogs have the most important task.

One reason for this is the time factor, which is always critical in search and rescue missions in mountainous regions. The sooner the area can be explored, the greater the chance of finding survivors. Dogs can explore the terrain faster than humans and

their results are at least as good if not better. It will take twenty patrollers twenty hours to meticulously survey 2½ acres, whereas a dog can cover the same area in just two hours.

Dispersal of body odour under powdery snow.



Dispersal of body odour under compacted snow.



How do you train rescue dogs?

In our country, it takes approximately one year to train dogs for search and rescue. The complete process can be divided into three steps, although there are no precise boundaries and these can sometimes be combined.

Step 1: puppies 2 to 6 months old. From the age of 1.5 to 2 months, they undergo tests to select for dominant behavioral reactions compatible with their future tasks. Preference goes to puppies who enjoy playing with small objects and who are not frightened by sudden loud noises or strangers. It is indispensable that they like to bark. After this selection, the puppies are accustomed to their current environment, as well as the one in which they will be working. They must communicate a great deal with humans, from whom they must receive only positive signals. In this stage, play is used to train the puppies in basic obedience, both at home and outside. The commands taught are: "Here", "Go", "Bark", "No", "Heel".

Step 2: puppies 6 to 8 months old. The young dogs undergo more stringent obedience training and complete preparation. At the same time and still through play, they learn to communicate with strangers for long periods of time without their handler. They learn to play with other humans and enjoy their company.

Step 3: puppies 8 to 12 months old. The dogs go through a special training cycle oriented towards search and location of victims of various catastrophes. Then, they take a professional aptitude test and begin working in their speciality area.



Pavel Valerievitch Andreiev
Rescuer and specialist in the handling
of mountain rescue dogs
Russian Ministry of Emergency Situations

Selecting dog and handler

Depending on the country or the region, avalanche rescue dog teams are part of public emergency-response organisations, the armed forces or voluntary organisations such as ski patrollers.

Handlers are often highly skilled off-piste skiers with extensive experience of life in high mountains.

The Belgian Shepherd Dog (Malinois), the Labrador and the German Shepherd are the three preferred breeds in all types of search and rescue. There are several good reasons for this. Both are big and strong enough to work indefatigably in the snow. They are selected on the basis of physical attributes, health and mental traits. Interestingly, these dogs adapt very well to their new environment. After a few days they grow an abundant undercoat, the hair

between their toes is worn down less, forming a sort of natural snowshoe, which increases the bearing surface, and the skin on their pads hardens, providing greater protection from the snow and the grit on the roads. The only point requiring special attention is the eyes, which have to be protected from the sun's ultraviolet rays. Eye lotion is applied during training and lengthy missions to help protect the dogs' eyes.

The Belgian Shepherd Dog (Malinois), the Labrador and the German Shepherd are the three preferred breeds in all types of search and rescue.



© Duhaier/Royal Canin



© Hermeline/Diffomédia



© Hermeline/Diffomédia



Dog team training

Dogs undergo many weeks of training in the mountains, based on a tried and tested programme, which may be fine-tuned to suit individual dogs.

The dogs gradually learn what is expected of them, while handlers learn to read their dog so they know when it is marking a spot. At the end of training, which generally takes a year or so, the dog teams are ready to go to work.

The teams hone their skills in regular training camps during the winter, which also gives handlers the opportunity to meet up and compare their experiences.

Handler and dog form a team to which each member brings specific skills.



© Zaglia

Tracking and trailing dogs

Trailing is a technique used to search for individuals by their scent, which may be present on a piece of clothing or an object. In tracking, the dog follows a trail by using non-human odours, such as those emitted by disturbed soil or plants. It may also be used to find objects or simply to indicate the general direction in which the search should continue.



© Schüller

Putting together the right team

In theory, all dogs have a good enough sense of smell to follow a person's trail, but given the complexity of the discipline, special training is demanded and not all dogs are able to cope with this so a good selection process is essential.

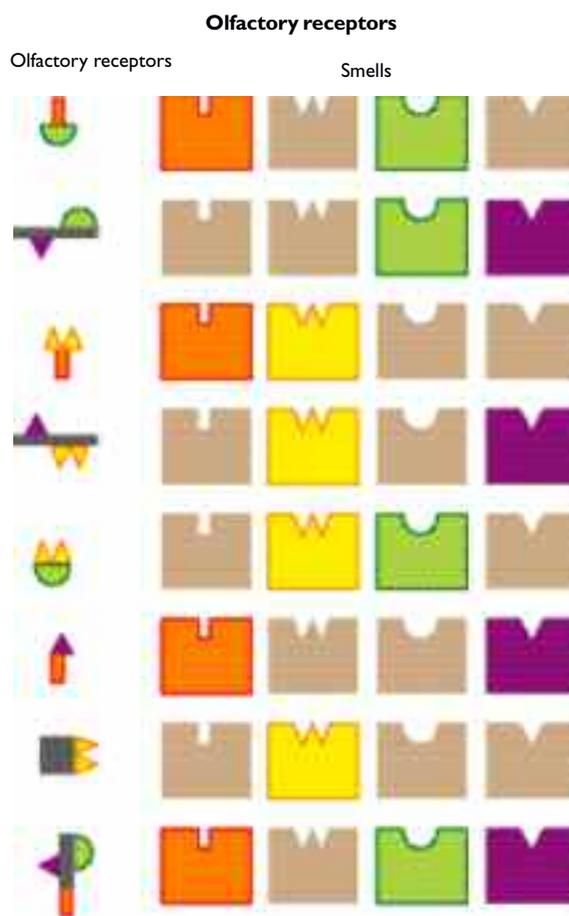
Suitable dogs will be dynamic, hardy and strong, with great stamina, a very well developed sense of smell and an ability to concentrate for a long time, which is essential if they are not to be distracted by other scents. They also need to be brave and unfazed by gunfire and other ambient noise.

The handler must be phlegmatic, level-headed and physically fit. Long distances will sometimes have to be covered at a fairly high speed. Good observation and interpretation skills are also required, so the handler is able to register and act on even minor reactions from the dog.

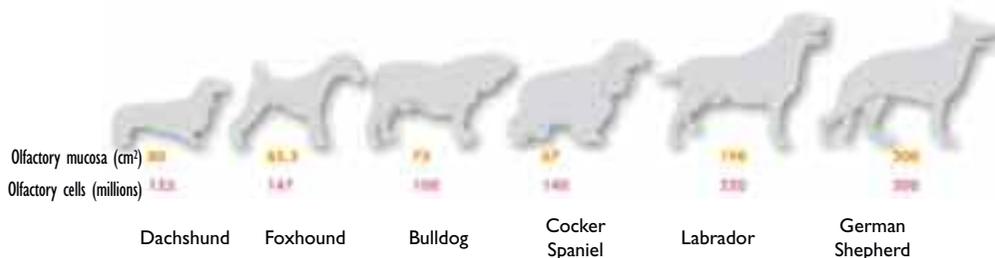
Each receptor is specific for an odotope

The receptor does not recognise an individual scent molecule, but rather a chemical grouping (odotope) of this molecule.

This model provides an understanding of why a scent molecule can be recognised by different receptors and why the same receptor can recognise scent molecules of different classes.



Variation in olfactory ability dependent on breed



© Grandjean



The trail

The person who is being searched for gives off a scent at all times. The dogs will have to deal with a number of factors: specific scents (individuals and groups), chemical odours (leather, fat, clothing), breaks in the terrain (trampled vegetation, bacteria brought to the surface when the soil is broken), the surroundings (woodland, grassland, farmland) and atmospheric conditions.

The following factors can change the way the dog perceives scents. When encountered simultaneously they can seriously complicate the search operation.

External factors

Temperature. This can have a positive impact (cold air stops the diffusion of scent molecules) or a negative impact (warm air accelerates this diffusion, causes the dog's nasal mucosa to dry out and reduces its resistance to fatigue).

Wind. This can physically alter the trail, cause the dog's nasal mucosa to dry out and diffuse scent molecules at a much faster rate.

Precipitation. This can have a positive or negative impact on the trail, depending on the intensity. The trail will be preserved in the event of low humidity, frost or light snow. Heavy precipitation will "clean" the trail and impact on the dog's olfactory acuity by depositing fine droplets or snowflakes on the nasal mucosa, which will make tracking impossible.

Terrain. This has a strong impact on the quality of the trail. There are three main types of terrain:

- Hard, dry terrain (sand, stone, rock, road), which scents do not cling to.
- Loose / wet terrain (grasslands, undergrowth), which is very good at retaining scent for up to 24 hours or more
- Ploughed terrain, which is good in overcast and damp weather but bad in dry and warm weather.

Electromagnetic field. The trail is disturbed by stormy weather or the closeness of high-voltage power lines.

Animal-related factors

Breed. German Shepherds, Bloodhounds and Belgian Shepherd Dogs (Malinois) are the breeds with strong scenting potential which are most commonly used.

Sex. Males are very distracted by the presence of another dog, especially a female in oestrus (season).

Physiological condition. Dogs will only work optimally when they are in good health.

Tiredness. Following a trail demands intense nervous physical activity. Regular and gradual training slows down the onset of tiredness and improves scenting quality.

Nutrition. Any deficiency due to low intake or low quality nutrition will have an impact on the dog's general health and may have an adverse effect on its sense of smell.

Trail-related factors

Length. The dog will only be able to detect a scent if the reference scent – a piece of clothing or an object – is of adequate quality and freshness. Likewise the dog needs to get a good run at the trail, i.e. it should not present immediate difficulties. A single trail of scent is often not enough for the dog to pick up. As it follows a trail, minimal quantities of body scent molecules will amalgamate, enabling the dog to identify the right scent.

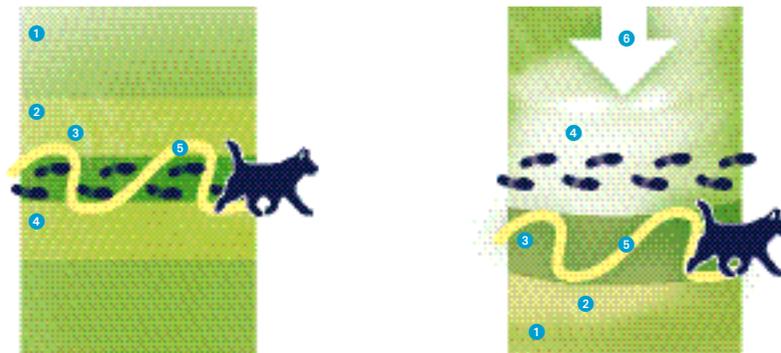
Time. Scent molecules are diffused and evaporate in the ambient environment. In doing so, they decrease in intensity until they are no longer detectable, sometimes within a few hours, sometimes within a few days.

Trail. The form of the trail has an impact on how the dog works. If the trail is straight and simple it will be a lot easier to follow than one that changes direction frequently.

Human factor

The handler must be as neutral as possible, so as not to encourage the dog to invent things simply to try to please its handler.

Dissemination of scent particles on a trail caused by the wind



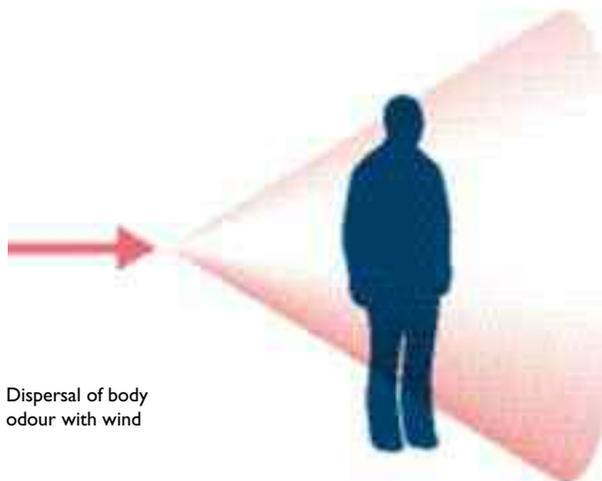
- 1. Very light bands of scent particles
- 2. Light bands of scent particles
- 3. Heavy bands of scent particles

- 4. Footprints
- 5. Route taken by the dog
- 6. Wind direction

Dispersal of body odour



Dispersal of body odour without wind



Dispersal of body odour with wind

Tracking dogs

Tracking is the flipside of trailing. In tracking, dogs search for missing persons without having any reference scent to go on.

“The lives of several hundred children and adults are saved every year by tracking dogs.”



© Adair



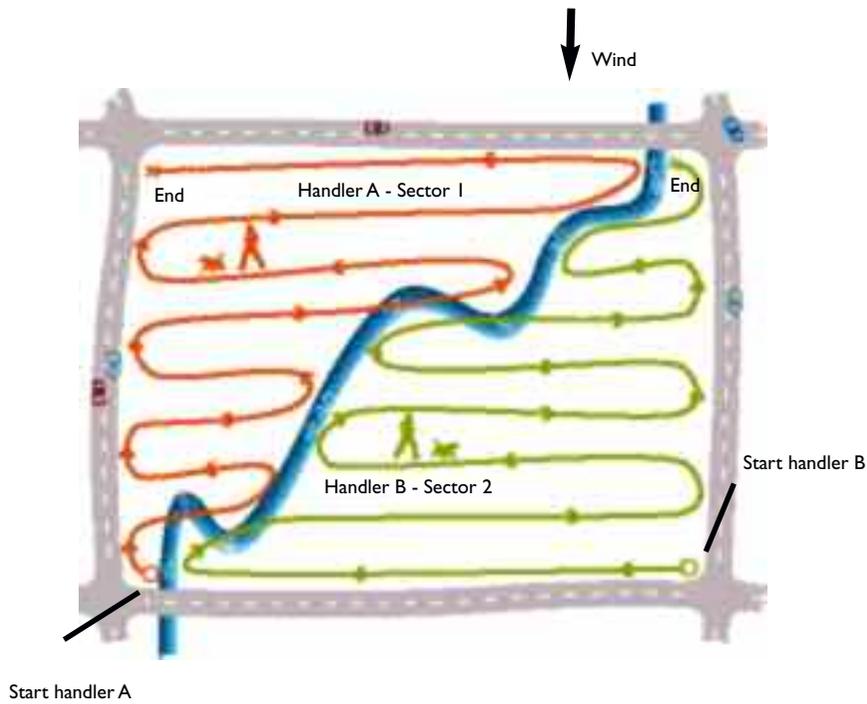
© Adair

Tracking

In this type of search, which is often used to find young children or elderly people suffering from senility disorders, dog and handler are assigned a geographic area to explore. While the skills involved are very similar to those demanded in disaster searches, this is very physically demanding work for dogs which may be asked to cover several tens of miles at a time. When it finds a person, the dog is trained to bark or return to its handler and take the handler to the victim.



Handler encouraging her dog to begin searching.



In some countries, including New Zealand, the dog may wear a GPS tracking device or a radio transmitter, which switches on automatically when disconnected from its holder, either by the person the dog finds, if conscious, or by the dog itself, which is trained to leave the device near the victim.

The lives of several hundred children and adults are saved every year by tracking dogs.



Water rescue dogs

As with other types of search and rescue, dogs make good use of their physical traits and drive to please in water rescue situations.

Breed of choice: the Newfoundland

Newfoundlands have a number of traits that are well suited to water rescue:

- Strength: they can pull several people or tug a boat weighing several tonnes
- Stamina: they can swim for several hours, covering long distances
- Resistance to cold: they can withstand low temperatures thanks to their luxurious coat
- Calmness: they remain unruffled in all circumstances, which is very reassuring for the people they are trying to save
- Tenacity: they always complete their mission
- Readiness: they are ready to get to work immediately without extra equipment, unlike a diver who needs around five minutes to prepare

Selecting the right dog

A good water rescue dog will have the appropriate physical and mental traits to begin with, although they do need extensive training too. Lack of the swimming instinct and an inability to swim strongly are important disqualifying traits, although hip dysplasia is the number one problem.

The best water dogs will be blessed with dynamic musculature and strong bones. The parents of candidates are screened for hip dysplasia.

Training

Whether training a puppy or an adult dog, the watchword is “slowly does it”. An adult dog will have to get used to its new life. Due care needs to be taken to ensure its muscles and joints are not put under too much stress, which is why its swimming, climbing and trotting skills are worked on gradually. Its character will also have to be handled carefully too. Puppies need to be trained gradually, in short sessions, based on how well they can concentrate. Training sessions should be held in different places at different times of the day to prevent habits forming.

Risks during training

Dogs can experience physical or psychological problems during training. If puppies are asked to do too much jumping, climbing and swimming at an early age they can damage joints or ligaments or aggravate an existing dysplasia.

Forcing a young dog to do things that it finds frightening can cause it to lose the desire to learn. It would be a great pity if a Newfoundland developed a fear of water after being forced to jump in as a puppy. It can take several months to restore the dog's confidence if something like this has happened.

The handler uses play to encourage the dog to do things it is otherwise wary of. This helps build up the dog's confidence and overcome any natural timidity, reserve, apprehension or fear. Dogs can be trained to overcome their inhibitions, whether innate or nurtured, and to compensate for any inherent genetic imbalance.



© Hermeline/Diffomedia

The versatility of the Newfoundland

On its own

Newfoundlands can be used in any water rescue situation. They can deal with fully conscious or exhausted victims, haul boats and equipment, get tow ropes out to where they are needed in the event of floods or other scenarios and guide boats to shallow water or rocks in fast-flowing water.

With its handler

When the dog works in a team it assists the handler. In the water, it will do the pulling while the handler deals with a struggling victim. It can also pull a boat out to open water away from a danger and help people when their boat capsizes or is in danger of sinking. On an area search, the dog will pull an inflatable dinghy, following the trail of air bubbles produced by divers.

Activities

Water rescue dogs can be deployed in all aquatic environments.

- Seas: emergency response; lifeguard duties in hard to reach spots. Restriction: beaches with heavy waves.
- Rivers: immediate emergency response by vehicle to back up local rescuers regardless of any obstacles. Restriction: locations upstream from lock gates.
- Lakes and stretches of smooth water: emergency response; lifeguard stations in tourist areas. Restriction: locations upstream from dams.
- Floods: emergency response to back up transport teams to recover equipment, getting lifeboats and food to victims, getting support ropes out.

- Natural disasters: helping victims and similar tasks to flood situations.
- Nautical surveillance: regattas, triathlons, water sports requiring short-term surveillance and rapid response in the event of an incident.



© Caron



© Caron

Just like other search and rescue environments, dogs are also used to assist lifeguards because of their swimming skills and attraction to water.

The Newfoundland: an outstanding water dog

The Newfoundland has helped fishermen and other water-based workers for centuries. Nowadays it is the most popular water rescue breed, due to its many outstanding qualities:

- Power and endurance, enabling it to pull heavy loads (small boats, people) for several hours.
- Resistance to cold and alertness, which ensure it is immediately ready to work in any conditions, unlike a diver, who needs five minutes to get ready.
- Great calm and tenacity, which commands confidence in all situations (people in a panic, surf).

Other breeds used in water rescue, although not to such a great degree, include Landseers, Labradors, Golden Retrievers, Leonbergers, Polish Tatra Sheepdogs and Bernese Mountain Dogs.

Gently does it with training

Like all other giant breeds, Newfoundlands complete their growth phase fairly late, which means that intense physical training must be avoided in the early months, due to the risk of serious orthopaedic injuries.

Initially, the emphasis is put on work on dry land and obedience. The dog is gradually introduced to water, primarily as part of a game. Handler and dog learn to swim together and to cover difficult terrain, such as steep cliffs and slippery surfaces. Training is completed with a series of rescue exercises, such as towing people and small crafts and passing on objects (ropes and buoys). Handlers are also given first-aid training, ensuring they are able to provide immediate care once the victim is out of the water.

The tenacity of the Newfoundland can sometimes make things difficult for the handler during training, but pressure should never be put on the dog and training should be presented as a game wherever possible. This is the way to produce a motivated and confident dog, qualities which are essential in emergency situations.

Water rescue dogs in action

The dog is almost never sent into the water on its own. It would be irresponsible to leave a dog to deal with a person in distress without assistance, as it could easily be pulled under in the panic. Handler and dog therefore work as a team, complementing each other. The handler holds and reassures the victim, while the dog does the pulling work. This enables the handler to concentrate fully on the victim without exerting too much physical effort, bearing in mind that the victim may require intensive care once dry land is reached.

Water rescue dogs can be used on beaches and shores (sea, lakes, rivers), but they can also be used in the event of flood, to pass on ropes, get heavy equipment into place by boat and pull small crafts. This lightens the workload of the rest of the rescue team. An added advantage is that water rescue dogs can work just about anywhere (steep slopes, rocks just above the water surface), unlike motorised craft, which are much bulkier.

The only places they cannot be used is in the vicinity of weirs, dams and locks and on rough seas.

Water rescue dogs around the world

In reality, dogs are rarely used in water rescue in most countries. Canine lifeguards are only active in Austria and Italy. The Italian School of Rescue Dogs (www.canisalataggio.it) trains dog teams recognised by the state (around 150 dog teams are currently accredited to patrol bathing areas). Some dogs are even trained to jump out of helicopters into the open sea.

Noémie Caron
Veterinarian (France)
Author of a thesis on Newfoundlands as search and rescue dogs (2009)

Training Newfoundlands

Every training session should start with a short period of play to help the dog get rid of excess energy and prepare it for the work to come.

Training takes place on land and in water. The first stage is obedience, when the puppy is taught to heel, stay and come from a few months of age. The commands gradually become more complicated – including voice commands and remote commands – and sessions are also held on slippery terrain, much like those the dog will have to cope with on a mission. The puppy is also familiarised with its environment, including potential problems such as crowds, traffic noise and lifts.

Work-related training is split into two stages:

- The dog learns to retrieve objects and tow first its handler, then people it does not know and finally sailboards and small boats.
- The dog and handler learn to trust and work with each other in a team. Once the dog reaches fifteen months of age it starts rescue training, which gradually becomes more complicated. The dog learns to climb to get into the water, it learns to haul increasingly heavy loads and it gets used to being submerged under large waves.

The frequency of sessions depends on the dog's motivation and physical prowess. Basic obedience is worked on every day.

The two members of the dog team have to advance at the same pace. A close bond between them is essential, but it will only be possible if the handler learns to read the dog like an open book and is able to anticipate its responses.

The handler uses a different tone of voice to indicate the beginning and end of a work phase. Commands are communicated dryly and abruptly. Encouragements should be communicated in a lively, cheerful way.

The most important thing to remember when it comes to training is that when things go well it's down to the dog, but when things go badly it's down to the handler.



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Disaster search dogs

Disaster search dogs have become vital lifesavers across the world since their introduction during the middle of the 20th century. They deserve our admiration for the calculated risks they take in saving hundreds of lives every year in all sorts of disaster situation.

A vital lifeline

“The dog has to trust its handler completely because it needs to be willing to follow wherever the handler goes, regardless of how difficult the terrain.”

Dogs are used in a vast array of search and rescue situations, including landslides, collapsed and burnt-out buildings, caved-in mines and rail and air accidents. Unfortunately these situations are only too common.

Devices that can pick up very weak noises such as heartbeats are also used on these missions, but they need to be employed in total silence, which is a scarce luxury in clearing operations.



© Brigade de Sapeurs Pompiers de Paris

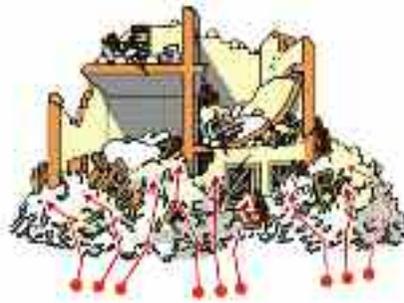
Dogs were first used in disaster search operations in Great Britain during the Second World War Blitz. The Americans, Germans and Swiss followed the British lead, opening dog-training centres in the mid-fifties. Swiss dogs were first used in an international operation during the 1976 Friuli earthquake in Italy, where 12 dogs managed to find 42 survivors and 510 bodies. A year later in Vrancea, Romania, 10 dogs found 15 survivors and 97 bodies.

A French contingent of disaster search dogs found 10 survivors and 500 bodies in El Asnam, Algeria in 1980. Dogs have recently been used in places as far apart as Mexico and Iran in response to major earthquakes. Through the years, these animals have saved several hundred victims.

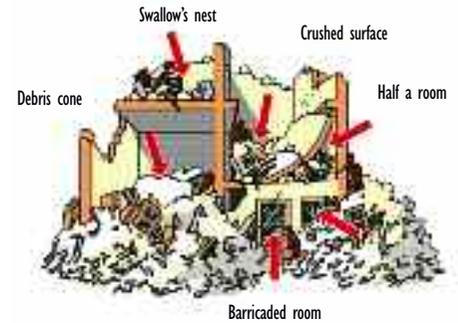
The five-step search and rescue method in urban environments
(from Ruud Haak)



The first stage is the study of the disaster zone.



The second stage is one of rapid search.



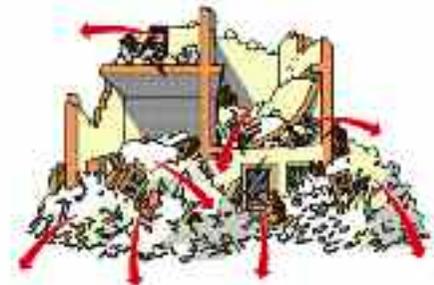
The third stage is exploration around and inside damaged buildings.



© Brigade de Sapeurs Pompiers de Paris



In the fourth stage, the dog clearly indicates to the master that it has found a victim.



The fifth stage is rescue.



© Rescue Teams Poland

Properly trained dogs, on the other hand, can work at any location alongside rescue workers and noisy clearing equipment, such as cranes, drills and bulldozers. They can also find dead bodies, which they mark in a different way to survivors, allowing rescue teams to prioritise saving lives. Professionals agree that dogs are vital in any type of disaster search situation.



- | | |
|-------------------------|------------------------------|
| 1. Slide | 7. Crumbling room |
| 2. Floors | 8. Blocked room |
| 3. Half room | 9. Swallow's nest |
| 4. Destroyed room | 10. Type A peripheral debris |
| 5. Room filled with mud | 11. Type B peripheral debris |
| 6. Concertina damage | 12. Debris cone |

Teamwork

As in all situations where canines and humans work together, there must be a strong bond between handler and dog. The handler has to have a very good understanding of the dog and an impressive ability to read its behaviour as it searches the rubble so he or she can anticipate its reactions at all times. The dog, on the other hand, has to trust its handler completely because it needs to be willing to follow wherever the handler goes, regardless of how difficult the terrain.

Such a degree of teamwork demands a lot of training. After familiarisation and basic training, the team focuses on actual search work, using various techniques.

Generally speaking, the handler relies on the dog's attachment to him or her and its enthusiasm for a particular object, such as a

Can any dog work in search and rescue?

Trainers have their preferred breeds, but various guard and protection breeds – including sheepdogs, terriers and even mongrels – can be trained to work in search and rescue. Just like humans, dogs have particular character traits (as individuals) and general character traits (as a society/pack). When we identify these variables in dogs we can say that all dogs have the potential to be trained to work in search and rescue, but only some of them have the

individual character traits needed in this type of operation and the ability to employ them at the highest level.

The search and rescue dog is exceptionally attentive, has a great capacity to concentrate, a very well developed hunting/playing instinct (finding a toy) and has a very well developed sense of smell combined with an intense desire to sniff. Good health, docility, boldness, confidence and obedience are other essential character traits in a dog that is ex-

pected to explore hilly and mountainous areas, in bad weather, surrounded by the noise and activity of heavy machinery and people. The dog must also be emotionally balanced when travelling by air, water or abseiling.



Aristides Maganin Junior
1st Veterinary Lieutenant MP
Military Police, State of Sao Paulo –
Central Veterinary Kennels Department
(Brazil)

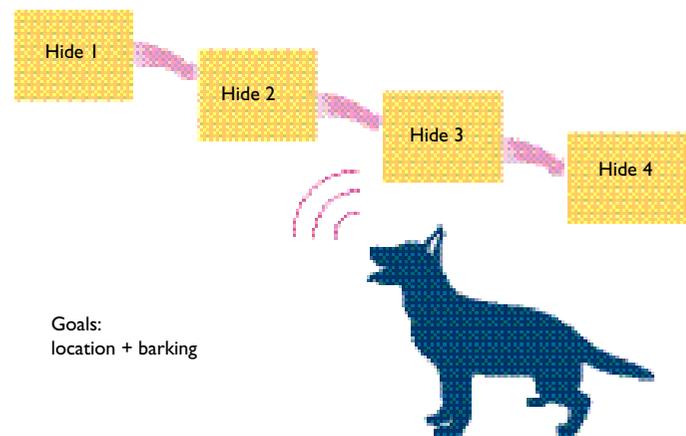


NYPD dog working at Ground Zero.



© UMES

The dog is trained to search for several victims successively to allow more time for them to be rescued



toy or a ball. The handler hides with this object and the dog has the task of finding him or her and marking the spot by barking and scratching the ground. The dog's enthusiasm for the object helps drive it to develop this marking behaviour, which is an essential part of disaster search work. First one, then several strangers gradually replace the handler as the dog becomes better at the game.

When the dog is able to find several victims that hide out of its view it is certified in accordance with the rules and regulations of its home country. Handler and dog are then registered as a civilian or military disaster rescue dog team in that country.

“An outstanding sense of smell is essential in disaster search dogs, which also have to be calm, well balanced and full of energy.”



Selecting the right dogs

An outstanding sense of smell is essential in disaster search dogs, which also have to be calm, well balanced and full of energy. They have to be sociable with humans and other dogs, as they will often work in the vicinity of other dog teams. They need to enjoy playing too, if training is to be a success.

Sheepdogs are used most often, especially German and Belgian Shepherd Dogs. Pyrenean Sheepdogs, Dobermanns, Beaucerons and Labradors have also shown themselves to be well up to the task.

This is a tough, stressful job for dogs, which have to learn to work in what is often a highly hostile and dangerous environment, so daily training is important.

A good disaster search dog will be used to fire.

Disaster search dogs follow a difficult training programme.



© Brigade de Sauteurs Pompiers de Paris



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Assistance dogs

All owners can praise their dog's attachment to them and its drive to please them, but some dogs are specifically selected to assist humans based on their well-balanced psychological characteristics and physical abilities. These canine assistants help people go about their daily lives in spite of a disability. They also act as a bridge, helping people to break their social isolation, as well as enabling them to be more independent and to control their own destiny. Most assistance dogs are trained by private charities established by passionate individuals.

Guide dogs and hearing dogs

As far back as 1856, Elizabeth Barrett Browning wrote that "The blind man walks wherever the dog pulls" in her poem *Aurora Leigh*. The first training school for guide dogs was opened in Germany during the Great War for soldiers who returned blind from the battlefield. One opened in the United States in 1929 and Britain opened its own five years later. A very large number of countries now have their own training centres. The International Guide Dog Federation is located in Reading, England.

Selection

Most of the earlier guide dogs were German Shepherds, but Golden Retrievers and Labradors are the most commonly used breeds nowadays. A good guide dog must be obedient, able to learn and capable of concentrating for long stretches. Crossbreeding is sometimes practised in an attempt to combine the traits of different breeds. One such cross is the Labradoodle, which was bred in response to the need for a good guide dog that could also be used by people allergic to dog hair. The aim of human selection is to produce dogs with the right be-

havioural and physical qualities, minimising character faults and hereditary joint disorders, such as hip dysplasia.

Weaned puppies are placed with host families (puppy walkers), before being enrolled in a training school. In some cases, the females will regularly return to the centre to give birth, which allows breeders to retain advantageous genetic traits, especially an aptitude for the work. The selection process will achieve good results over several generations.



© Zagla



© Hermeline/Difimedia

Training takes around four to six months, although this is split over several terms. The first thing the dog needs to learn is obedience. This is accomplished on the basis of simple exercises in which the dog learns to adopt and hold various stances, retrieve an object, get used to wearing a harness and walk to heel.

The dog then has to learn to avoid all types of obstacle and to give their human companion the information they need to avoid

them too. This is the trickiest part of the entire training, so a specialised instructor is used. Once the dog has started to get the hang of it, it is handed over to a blind person who has to get used to it and learn to trust it in day-to-day situations. In the course of time a close bond is formed between the two, helped by the instructor, who trains not only the dog but the blind person as well, moulding them into an inseparable team. Guide dogs allow blind people to have a full social life and hold

down a job, so that they can live independently wherever possible.

This basic training method is used throughout the globe, although approach and duration can vary slightly depending on the country. The goal is to establish a strong relationship of mutual trust and respect between human and dog.

Guide dogs are protected by law in virtually all countries, which means that they can accompany their human companions almost everywhere, even where other dogs are not allowed. Even in Muslim countries, where dogs continue to be regarded as unclean animals, it has been stated that guide dogs should not be subject to the ban on dogs in public places. Sheikh Ibrahim Mogra of the Muslim Council of Britain has called for his co-religionists to embrace guide dogs, given the duty under Sharia for all Muslims to help visually impaired people.

Hearing dogs

Hearing disabilities too can be a cause of social isolation, so it is perhaps no surprise that more and more dogs are being trained to assist people with impaired hearing.



© UNMES

A hearing dog wakes up its owner after a fire alarm goes off (Samsung Canine Center, Korea).

Hearing dogs are trained in various countries including Britain, the United States and Australia. The purpose of training is to teach the dog to be the ears of its owner, who is obviously unable to hear important signals such as doorbells, car horns, fire alarms and sirens. The hearing dog will, for instance, jump on its owner's bed when the morning alarm goes off and tug at a trouser

leg or gently nibble at a hand when the doorbell sounds. Over and above this essential work, hearing dogs help the hearing-impaired to break out of their social isolation.

Many hearing dogs are Golden Retrievers, although Welsh Corgis, Bearded Collies, Poodles and a range of other breeds including cross-breeds are also used.

Unfortunately, hearing dog training schools are not as widespread as they perhaps should be and some people are left with no option but to train their own animal.

Future hearing dogs are placed with families – preferably families with children – between eight weeks and one year of age for basic obedience and housetraining. This

host family also introduces the dog to different types of situation, from busy city roads and supermarkets to country lanes. After this socialisation has been completed the dog is ready to train as a hearing dog. Its learning abilities are put to the test as it is

expected to learn over 70 spoken commands and 20 gestures. People with impaired hearing commonly speak differently to hearing people in terms of intonation and enunciation, so the dog needs to get used to this too.

Dogs can also be trained for people with combined hearing and sight difficulties, although in this case training will take two years rather than one.



© Labrad/Royal Canin

Service dogs

Various UK charities have been set up to champion the cause of disability assistance dogs, including Guide Dogs for the Blind, Hearing Dogs for Deaf People, Support Dogs, Dogs for the Disabled and Canine Partners, which are all part of Assistance Dogs (UK), and DogAID which helps disabled people train their own pet dog as an assistance dog. Similar organisations exist in the United States – Canine Companions for Independence – and France – Handi’chien. Indeed, disability assistance dogs are becoming more and more common in today’s world. Labradors and Golden Retriever are the favoured breeds because of their calmness, docility and ability to learn commands. Training is split into several stages. First, the puppy is placed with a host family, which is responsible for training it in the basics before undergoing specific training at a specialised school. By the end of this training it must be able to understand around fifty different commands.

Special training

The host family plays a decisive role in preparing the puppy for its future. Socialisation begins at three months of age. The host family teaches the puppy the basics of obedience and ensures it experiences a wide range of different situations. In this time with the host family the puppy learns to live among people, it is house-trained and introduced to other dogs and animals to ensure it is able to cope with almost any scenario it will have to deal with in its future life. The puppy will visit the training centre for regular monitoring. This is also an opportunity for the experts at the centre to give personalised advice to the host family or to identify any dogs that need to be dropped from the programme due to behavioural problems.

The puppy spends around 18 months with the host family before returning to the centre to complete its specific training as a dis-

ability assistance dog. This takes about six months, during which time the dog boards at the centre and undergoes daily training sessions.

At the end of the full 24 months one in three dogs will be dropped from the programme due to a physical deformity, such as poor hips, or a behavioural problem, such as an inability to remain calm in stressful situations. They are either returned to the host family or retrained, for example as an autism service dog.

An asset for all disabled people

In the final few weeks of training the dog is introduced to its future owner. The number one goal is to match humans and dogs with similar temperaments. There needs to be a mutual understanding between the two. The disabled person also needs to learn the right commands to get the best out of the dog.

Assistance dogs perform a lot of tasks on their owner’s behalf, but they also play a therapeutic role too in the treatment of diseases, especially among children. Disabled children are often more easily able to form relationships with dogs than with people, which can raise their self-confidence and act as a stepping stone to bigger and better things.

“The number one goal is to match humans and dogs with similar temperaments. There needs to be a mutual understanding between the two.”

Psychiatric service dogs

The special ability animals have to connect with people with psychiatric problems has been long known. As far back as the Crimean War in the mid 19th century, Florence Nightingale kept a tortoise called Jimmy to occupy the wounded soldiers on her ward. In 1950, Boris Levinson, an American child psychiatrist, first showed that companion animals were a valuable help in the treatment of some psychiatric disorders.

A go-between for the well-being of people

Dogs are used as a go-between when treating people with psychiatric, physical or social health issues. A relationship with an animal helps fulfil these people's psychological and emotional needs, increasing their self-esteem. While animal-assisted therapy is about therapeutic contact with animals, in animal-assisted activities the aim is to use the animal to motivate, engage or educate. Pets As Therapy and Equine Assisted Psychotherapy are two British charities active in this field. Similar organisations exist in France, Canada and the United States.

Therapy dogs are also used in care environments to improve morale and reduce stress among patients. Animals are sometimes integrated into physiotherapy, where they may be used as a form of motivation. The patient may be driven by the idea that if they work hard enough they will one day be able to brush their dog, for instance. In care homes, therapy dogs have a social function in bringing residents together. They can have a soothing effect on Alzheimer patients and provide residents of homes for the elderly with something to look forward to if they are otherwise cut off from their family. Along with horse and cats, dogs are the most commonly used therapy animals for autistic children.



© Hermeline D'Ilormedia

Dogs are also used to teach respect to children in disadvantaged neighbourhoods, helping them to find their place in society. Similarly, future guide and hearing dogs are sometimes taken into prisons as part of the social re-education of prisoners.

All told, dogs are able to achieve great things in helping people find their place in society and the wider world. Their exceptional learning abilities, motivation and strong bond with humans have given them a position in human society that goes far beyond that of a simple companion.

Association of Animals for Therapy

Animal-assisted therapy comprises all goal-oriented measures using animals to achieve positive effects on a person's physical and mental health.

The relationship between human and animal has a positive impact on the quality of life; especially effective for younger and older people, it is scientifically proven to be a positive stimulus for healing processes.

The association "Animals for Therapy" (TAT-Tiere als Therapie) has been using animals successfully as co-therapists for more than 20 years, working with educational, geriatric and therapeutic projects

TAT offers training for humans and animals. Through the Veterinary University of Vienna, TAT runs the course "Therapy through Animals" for professionals. This is the only university course in this field available in Europe.



Helga Widder
Veterinary Surgeon,
(Austria)

“A relationship with an animal helps fulfil people's psychological and emotional needs.”



© Labrad/Royal Canin

Sniffer dogs

Police, customs and the armed forces worldwide have long used the dog's exceptional sense of smell for security and crime-fighting purposes. Again, as with search and rescue dogs, it is important to understand that play must underly all training. The toy is the reward the handler uses to motivate the dog to complete tasks.

Drug sniffer dogs

The ideal drug sniffer or detection dog is playful and dynamic, medium-sized and supple enough to get everywhere, climbing over obstacles where necessary. It also needs to be tenacious and indefatigable, as it often needs to conduct many searches in a day. The favoured breeds are Belgian Shepherd Dogs (Malinois), German Shepherds and Labradors, although smaller dogs, such as Cocker Spaniels and Yorkshire Terriers are also beginning to make inroads in the field, as they can be carried in the arms of an undercover plain-clothed customs official in a queue.

Most often, drug sniffer dogs work in closed rooms, at ports of entry for instance. They work quickly and thoroughly, speeding up searches that can otherwise take a long time to complete. They can also work outside searching cars, boats and aircraft. They are so effective at finding cocaine, heroin, ecstasy and other drugs that it is very difficult, perhaps even impossible to fool them.



© Labrad/Royal Canin

Drug sniffer dogs find millions of pounds worth of illegal drugs every year, although only small sums are invested in scientific studies that would help us better understand in detail how the dog's nose works, which might even provide clues on how it can be improved.

It is important to understand that drug sniffer dogs are not "under the influence" themselves. They would not be able to do their job properly; searches would be random and superficial, and the dog would be in a constant state of aggression, even towards its handler.

International Working Dog Breeding Association (IWDBA)

The International Working Dog Breeding Association (IWDBA) was founded in 1999 to promote research in canine related health issues through educational programs, public service programs, and grants. The production of high-quality working dogs in large numbers must draw upon the best current knowledge available from the fields of animal science, canine behaviour, and veterinary medicine. Challenges facing the production of dogs in the numbers required by police and military organizations and by agencies that breed and train service dogs and guide dogs are orders of magnitude more complex than the challenges faced by private dog breeders. Where a large private breeder might whelp six litters per year, large breeding organizations producing working dogs must whelp 100 or more litters per year. Through the bi-annual conferences organized by the IWDBA, managers

and technicians working with large breeding programs have an opportunity to meet each other. Through scientific papers presented at each conference, members can share knowledge and results from specific studies designed to learn new knowledge about the science of producing working dogs in large numbers. Papers presented at recent conferences have focused on ways to improve the overall behaviour of working dogs, techniques for raising puppies that will maximize their opportunity to become emotionally sound working adult dogs, ways to genetically control a variety of health issues and techniques for treating dogs affected by specific disorders amenable to treatment. The 2009 conference, attended by about 280 delegates from 26 countries, included a number of papers that looked at the many nuances of canine olfaction. The Association maintains an interna-

tional presence year-round through their web-site: <http://www.iwdba.org>. Persons interested in becoming a member may visit the web-site where they can purchase a membership, which includes access to both a printed paper copy of the Association's peer-reviewed journal and on-line access through Elsevier.

Eldin A. Leighton
Chairman IWDBA



A brief look at drug sniffer dog training

A dog will have to pass four stages of training before it can be put to work in drug detection. The duration of these stages depends on the individual dog.

Stage one

A target object is placed in a PVC tube with holes in it. Heroin and cocaine are too dangerous to the dog for them to be used directly, so a rag impregnated with the desired odour is used instead.

The dog is given this tube to play with for several days until it becomes attached to it. In the process, it associates the object with

the odour of the substance the rag inside the tube is impregnated with.

Stage two

The object is now hidden from the dog, at first in an easily accessible place while it is watching. The dog is then encouraged to find the object. Gradually, the object is hidden in places that are increasingly difficult to access, sometimes under sand, which encourages the dog to scratch the ground to retrieve it. At a certain point the hiding place will be made completely inaccessible.

Stage three

Now the object is hidden in an inaccessible place out of view of the dog. The dog is

brought into the room and the trainer encourages it to find the object, although it is not allowed to start until the command is given. The dog then has to use its sense of smell to locate the object. It also has to scratch the ground with its paw before it is given the object.

Stage four

In the final stage, the tube is no longer used, ensuring the dog learns to search for the odour of the drug, which it will continue to associate with the object, rather than the object itself.





Explosive sniffer dogs

Explosive detection is a highly specialised area. While the principles are the same as for drug detection, the very nature of explosives demands that searches are conducted very calmly to minimise the risk of detonation. The dog's marking behaviour is also different. Rather than scratching the ground and barking, when it finds an explosive device the dog is taught to lie down without moving a muscle or making any sound whatsoever.

A difficult job

Because of this, explosive sniffer dog training is much tougher and more complex, requiring the handler to properly channel the dog's motivation and excitement. Mine detection takes that to another level still, given that mines are not only buried in the ground, they are also enclosed in a tight plastic casing, which means they emit little in the way of detectable odour.

Many of the world's armed forces employ specialised dogs as part of mine clearing operations, as do a number of NGOs working to clear mines from former war zones, in Africa for example. The dogs may work remotely, sometimes miles away, sniffing air samples taken from a specific location captured in sealed jars marked with GPS coordinates.

Police services around the world use dogs to find explosives at airports, although their job is becoming more difficult all the time, as new forms of improvised explosive devices (IEDs) are developed.

Explosive sniffer dogs of China's national police service check Beijing's Tiananmen Square ahead of an official ceremony.

A brief look at explosive sniffer dog training

As with drug sniffers, explosive dog sniffer training is split into four stages, although there are some differences. Searches are conducted indoors and outdoors on an array of explosive substances including dynamite, semtex, TNT, formex, nitrate, fuel, RDX, smokeless propellants and tetryl.

The explosive is placed together with another object, usually a tube of some sort. Initially it is placed somewhere accessible in view of the dog, then somewhere inaccessible, but again in view of the dog and, in the third stage, it is hidden from the dog's view.



Examples of explosives that dogs learn to recognise and memorise during training

Type of substance	Example of this substance	
Explosive devices		Pyrotechnical devices
		Electrical detonators
Explosive substances		Fuses
		Industrial explosives
		Dynamite
		Securex
		Semtex
		Nitrate
		Military explosives
	Homemade explosives	

From top to bottom : © RAJD

“Searches are conducted indoors and outdoors on an array of explosive substances including dynamite, semtex, TNT, formex, nitrate, fuel, RDX, smokeless propellants and tetryl”



© UFFS



© Armée Danoise



Demonstration of an explosives search in a vehicle by a Beijing police dog.

The search is conducted on the basis of hot points, corresponding to the possible locations where an explosive may be hidden, although the dog is actually looking for the tube.

Depending on the location of the charge, the dog is taught to mark its find by sitting or lying down. If the dog sits, the charge is above ground level; if it lies down, it is on or under the ground.

The dog must never bark or scratch the ground as this can cause a device to detonate, especially IEDs put together by terrorists.

The dog is taught not to get excited. The aim is to get the dog to locate the charges as part of a routine check or in response to a specific bomb threat. The handler works alone with the dog and if they detect anything, the location is evacuated and the bomb disposal team takes over.

Other sniffer dogs

Alongside these “traditional” sniffer disciplines, dogs have also been trained to use their exceptional nose for many other purposes around the world.

Airport search for banned foodstuffs.



Minerals

Dogs were first used to detect minerals – sulphur crystals in fact - in Finland in 1962, and similar activities have been undertaken in Sweden, Canada and the former USSR.

Elsewhere, dogs have been used to find nickel and copper deposits, although they are more difficult to detect than sulphur crystals.

Training is again based on the tried-and-tested method.

In Scandinavia and the east it is claimed that dogs can be trained to detect deposits up to 50 feet below the surface. This begs the question of how long will it be before we see dogs used in gold or diamond prospecting?

Criminal identification

For years, police in the Czech Republic have used dog units specialised in identifying criminals and hooligans. Dogs are trained to link human scent found on clothing or personal objects found at crime scenes to a specific suspect. This is considered to be strong enough evidence to convict the suspect. Many other countries in Europe have followed this initiative. While findings are inadmissible as evidence in a court of law, they do provide leads for investigators.

Foodstuffs

To enforce a ban on the import of meat and vegetable products into the United States and Australia, dogs are trained to detect these foodstuffs at international airports in these countries.

These dogs – usually Beagles (in the States they are called the Beagle Brigade) – are used to sniff bags as they are taken off international flights. Training is much less complicated than with other substances as the dogs are naturally attracted to food.

The Canadian Border Services Agency has 72 dog teams in place at entry points throughout the country – including sea-



ports, airports, post offices and courier depots. These dogs are trained to detect contraband agricultural products, as well as drugs, firearms and banknotes. The Canadians developed an original marking method. Rather than scratching or barking, their dogs are trained to sit next to the source of an odour they are searching for. This has been found to work much better when dealing with travellers who are carrying contraband on their person or in their hand luggage.

“Dogs have been used to find nickel and copper deposits, although they are more difficult to detect than sulphur crystals.”

Chiens de recherche de produits alimentaires en Corée.



Banknotes

Since the turn of the century, police dogs have been employed to detect banknotes. The dogs are trained to pick up the smell of the ink used on the notes, which can save investigators a great deal of time.

Parasite larvae

The Samsung Canine Center in South Korea has been successful in training dogs to detect the presence of termites in timber buildings (so helping protect the wooden Korean temples). Private firms in Scandinavia have also trained dogs in this area.

Dogs have also been used with great success in the United States and Japan to detect termites in trees, wood and telegraph poles. Candidates – often Beagles – undergo 200



hours of training, in which they learn to detect a chemical found at the foot of trees infested by termites. The Abu Dhabi police have trained their dogs to identify populations of termites and other larvae in palm

trees and telegraph poles, so that any damage can be repaired before it is too advanced, achieving major savings compared with the cost if the poles had to be replaced.

Parasite larvae sniffer dog of the Abu Dhabi police checks a palm tree.



“Dogs – usually Beagles – are used to sniff bags as they are taken off international flights, searching for foodstuffs.”



© Samsung

Samsung Canine Center

Samsung, one of the world's leading companies, has a strong corporate responsibility to the communities it operates in - both in Korea and worldwide. The company believes in putting something back into those communities by placing animal welfare high on its agenda of corporate concerns. Nowhere is this more evident than in Samsung's activities in the animal welfare arena.

Samsung believes that the relationship between people and pets - especially dogs - makes for a better and less self-centered world. Samsung's initiatives such as the Pet Ownership Program - where lovingly reared dogs can be adopted by Samsung employees - shows the emphasis Samsung places on making dogs part of the family. Other Samsung key programs and community welfare projects in Korea are:

- Guide Dog School
- Therapy Dog Center
- Canine Center for Companionship
- Search and Rescue Dog Center
- Hearing Dog Center
- Detector Dog Center
- Riding for the Disabled

No other company in the world the size of Samsung dedicates its efforts to animal welfare in quite the same way as this multinational, and it is providing a role model of what can be done for society by a company with a determined corporate welfare philosophy.

Samsung's newest program is the Detector Dog program. At the center, dogs are trained primarily to detect narcotics and explosives. Working closely with the Korean military and police special forces, Samsung is currently training

dogs from its specially designed canine facilities south of Seoul. Once the training is completed, Samsung will both loan and donate its trained dogs to the authorities and provide ongoing handling advice to the respective organizations.

At present, Samsung has 8 qualified dogs on its programme, supported by three handlers. There is one dog trained to detect narcotics, five to locate explosives, one foodstuffs detector dog and one conservation dog. Of the 8 dogs, 3 are dual trained in termite detection too. Since its inception in 2003, the center has donated 24 dogs to national organisations such as the Korean police, military and customs.



© Samsung



© Samsung

*John Choi
Samsung Canine Center
(Korea)*

Manny, a pirate DVD sniffer dog in the United States.



© UMES

DVDs

Lucky and Flo are two American Labradors that became famous in 2006 for being the first dogs ever to be trained to detect counterfeit DVDs. They were originally trained to detect the chemical components used in laser discs by film studios.

The authorities decided to use the image of these two dogs to raise awareness of the importance of copyright laws and the consequences of DVD pirating on communities, beginning in primary schools.

Human and animal remains

The dog's nose is increasingly used to find human remains, both recent and ancient. Whether the goal is to find a body in a criminal investigation or mummified remains in a burial chamber, training is difficult as bodies give off different odours depending on the state of decomposition. Commercial firms have developed substitute odours, but the process certainly has some way to go before it is reliable.

In a similar vein, dogs have also been trained to detect the odours emitted by mammoth remains preserved under the Siberian permafrost.

Snakes

Owners in the affected parts of the United States and Australia can sign their dog up for a course in which it is trained to detect the odour of venomous snakes. The dog thus acts as an early warning system, allowing the owner to stay out of harm's way.

Ovulation

An ability to detect ovulation is an important advantage in cattle breeding, as it improves the success rate of insemination and allows farmers to pinpoint when calving



© Grosvenor

will occur. Some farmers use dogs every day during oestrus to identify the optimal time to inseminate their cows, based on the change in odour emitted by the vaginal mucosa during ovulation.

It feels as if not a year goes by without the dog's extraordinary olfactory qualities being used in new ways. Now that we have developed a way to train dogs to detect different

odours as part of a game that the dog enjoys, drawing on its desire to please, the future is surely only limited by our imagination.



© Richardson/Royal Canin

“Now that we have developed a way to train dogs to detect different odours as part of a game that the dog enjoys, drawing on its desire to please, the future is surely only limited by our imagination.”



Diabetes attack alert dog.

Disease detection

New methods developed in the United Kingdom for the early detection of human diseases using the dog's sense of smell are now sweeping the world. Specially trained dogs are able to detect and mark melanomas (skin tumours) by sniffing patients and prostate or ovarian cancers by sniffing urine.

Other dogs have been trained to warn diabetes sufferers when they need to inject themselves with insulin, or to alert epilepsy sufferers of an approaching seizure.

This fledgling field will without doubt expand in the future. Indeed, rats are already being used in Gambia to diagnose tuberculosis of the lungs.

Cancer Detection Dogs

Our first study, entitled "Canine Olfactory Detection of Human Bladder Cancer a Proof of Principle", was published in the British Medical Journal, September 2004. This was the first scientifically robust study to support anecdotal reports that dogs may be able to identify the odour of cancer.

Over the centuries, physicians have been aware that many diseases have a characteristic odour. Dogs are renowned for their sense of smell, some estimates putting a dog's sense of smell up to 100,000 times more sensitive than ours. Cancer cells are known to produce chemical compounds that differ from those made by normal cells. It is therefore not unreasonable to think that some may have distinctive odours. It is anticipated, in the long-term, that these findings will lead to the production of an electronic nose machine that GPs can use in surgeries. We believe from the current information that this may well be a possibility. We are currently establishing to what degree of accuracy the dogs can indicate the presence of different cancers, what odour signature the dogs are using to detect the presence of cancer and to what extent, if any, the dogs can distinguish between various types of cancers.

Diabetes Hypo Alert Dogs and Medical Assistance Dogs

Hypoglycaemia (low blood sugar levels) itself, or the avoidance of it, is an acute daily problem for people with diabetes but when accompanied by loss or a partial loss of warnings, it can be life threatening and have a dramatic effect on the person with diabetes and their families. Diabetes hypoglycaemia alert dogs are trained to become sensitive to glucose changes in people who have rising or falling blood glucose levels. These levels are believed to give a different scent than blood sugars in the normal range. Following training the dogs are able to alert their owners and get help even before the symptoms of both hypo and hyperglycaemia (high blood sugar levels) are felt. For those living with a life threatening health condition, having an assistance dog can make a huge difference: a better quality of life, freedom, confidence and independence. They reduce the responsibility of care and worry for relatives and carers and often enable people to return to work. In addition awareness of hyperglycaemia can reduce the very damaging long term health effects for people with diabetes. We also train Medical Assistance Dogs to detect and alert to potentially fatal health conditions such as an Addisonian crisis. In an emergency, anyone with Addison's disease can experience symp-

toms of extreme weakness, a serious drop in blood pressure and confusion. The dogs are trained to alert prior to an episode.

Claire Guest MSc
Buckinghamshire NHS Hospital
(United Kingdom)
Chief Executive of Cancer and
Bio-detection Dogs
www.cancerdogs.com





Pollution-busting dogs

Animals have long been used to provide information on the presence of toxins before they can affect humans. Canaries, for example, were placed down mines as an early warning system in the event of the accumulation of carbon monoxide.

Sharing the same environment

We have more recently learned that studying diseases or simply biological modifications in dogs, which live alongside humans and share our lifestyle, can help us detect, at an early stage, contamination that can also affect us. Dogs have a much shorter average lifespan than humans and are much more sensitive to some toxins, so they have the potential to reveal certain forms of pollution in our environment that we are unable to detect.

Pollution markers are looked for in blood, urine, hair, saliva, milk, expired air and sometimes tissues. Procedures that do not affect the dog's quality of life are favoured.

In Alaska, for example, studies have been conducted to measure mercury concentrations in the hairs of sled dogs fed on a diet of salmon from the Yukon, which flows through a gold washing region where the risk of mercury pollution is higher than normal.

On the other side of the United States, dogs that played a huge part in the search for survivors and, sadly, bodies in the aftermath of the 9/11 attacks on the Twin Towers were monitored as part of a long-term study by the College of Veterinary Medicine at Cornell University. The purpose of the study was to find out whether the presence of large quantities of asbestos at Ground Zero provoked an increased occurrence of mesothelioma, so as to evaluate the necessity of preventive treatment in human emergency response personnel.

“Dogs have a much shorter average lifespan than humans and are much more sensitive to some toxins, so they have the potential to reveal certain forms of pollution in our environment that we are unable to detect.”



In the security forces



The role of dogs on the battlefield has evolved as weapons and armies have developed. Originally employed as a “grunt” in the front-line, dressed in a suit of armour, dogs gradually took on other duties as guards, trackers, patrollers, messengers and medical assistants, once again displaying their extreme devotion, generosity and capacity to serve and protect people and societies.

Dogs in the armed forces

Armed forces throughout the world have long understood the varied roles dogs can play on difficult missions. But today’s military dogs are not like the war dogs of ancient times; they have become indispensable assistants to peace-keeping forces.

Combat dogs

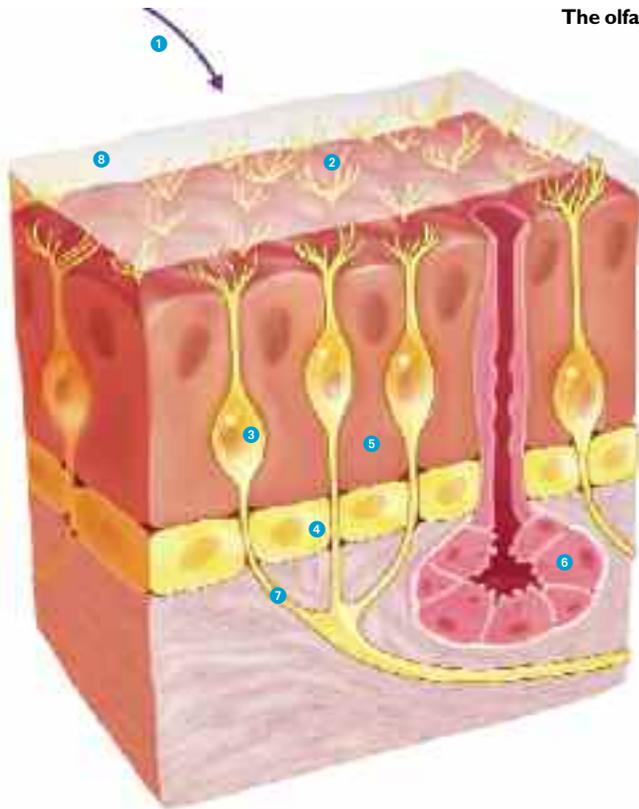
Dogs have been used in human wars since the 13th century BC, most often powerful molossers, formidable beasts that could bring a man down and inflict serious injury with their terrible bites. These dogs looked much like the present-day Tibetan Mastiff, albeit much more imposing, measuring up to 30 inches at the withers, compared with today’s 27 inches. More ferocious than the Greyhounds bred by the Pharaohs, these dogs were in great demand in Egypt and later in Greece, eventually gaining ground in the Roman Empire after the conquest of the Greek territories. Around the same time, Gauls, Celts and Germans developed a

breed derived from the Great Dane. The two canines would have faced each other in the battles of the 1st century BC.

It was not difficult to train these dogs, given that their role was simply to kill any enemy soldiers or horses they came across. Gradually they were equipped with armour-plating with spiky points and strips of sharp scythes, spiked collars and hides covered in a flammable substance. These machines of war were used to scatter horses and frightened or injured foot soldiers. Advancements in firearms in the 19th century saw the disappearance of these terrifying animals from the battlefield.



The olfactory mucosa in detail



1. Scent molecules
2. Cilia
3. Olfactory cell
4. Basal cell, divides to form olfactory cells
5. Support cell
6. Mucus-secreting gland
7. Nerve fibres, transmission of olfactory stimuli to the brain
8. Mucus

Sentry dogs

Their astonishing sense of smell and predisposition to defending and guarding has enabled dogs to become sentries at forts and fortresses.

Plutarch described the exploits of the dog Soter: Corinth was defended by a garrison, assisted by 50 Molossers that slept on the beach. One evening, enemy armies disembarked. The Corinthian troops had feasted the night before and were not in a state of readiness, so it was left to the dogs to fight the battle. Facing a much bigger force, the canine defenders were all killed until only one was left. This dog, Soter, managed to escape and raise the alarm with his barking, enabling the Corinthians to arm themselves and fend off the attack. To reward his courage, Soter was given a magnificent collar with the inscription “To Soter, defender and saviour of Corinth”.

This type of dog was especially common in the Middle Ages, defending such places as Mont Saint Michel in Normandy and the fortified town of Saint-Malo in Brittany, where, in a tradition started in 1155, 24 English Mastiffs were left on the shore every evening to guard the boats from pirates. The practice was discontinued in 1770, when a young officer was devoured on the beach. Dogs continue to work as sentries to this day.

Tracker dogs

Many dogs have been trained to follow a trail left by a person. During Columbus’ invasion of Native American territories dogs were trained to find and kill the enemy. In La Vega, the modern-day Dominican Republic, thousands of Native Americans were routed by just 150 foot soldiers, 30 cavalymen and 20 war dogs. Later, the Spanish used dogs in South America to track down escaped plantation slaves. The dogs were trained using black dummies filled with blood and guts. Excited by the odour, the dogs would quickly make the connection between these dummies and the unfortunate slaves, who didn’t really stand a chance.

German Army Dogs

The German Forces (Bundeswehr) have been using military working dogs since 1958. The Bundeswehr started with a dog squadron of 10 trainers, 7 dog handlers and 52 guard dogs in Koblenz/Bubenheim. For nearly 40 years, the sole task of the handlers and their dogs has been guarding military bases, airports, military depots etc. By the end of 1980 the number of dogs had grown to around 2000, handled by civilian employees. German reunification led to a reduction of troops and today there are less than 500 guard dogs.

The participation of Germany in international military missions has necessitated it to train soldiers as dog handlers and dogs with other abilities than guard dogs. The first steps of the Bundeswehr School of Dog Handling were taken in 1993 when the first explosive sniffer dogs were trained. The school is the centre for recruitment, training, selection and breeding of dogs and has a veterinary medical facility. Since 2005 it has been located in Ulmen/Eifel.

Since 1997, dog handlers and their dogs have been deployed continuously on missions to the Balkans, Congo and Afghanistan and the functions of the dogs include drug sniffing, mine detection and explosive ordnance detection in addition to patrol, scout, tracker and military police dog. There are in the region of 300 military handlers, including military police, air borne infantry, engineers and explosive ordnance disposal personnel.

Leander Buchner
Veterinary Colonel
German Armed Forces



This military role was really developed after the Second World War, by the French in Algeria, the Americans in Vietnam and more recently by the coalition of the willing in Iraq and Afghanistan.

Liaison dogs

Good communications are critical in war. Advanced detachments need to get information back to HQ or the front line so that plans can be updated. Before the invention of telecommunications, dogs were widely used as messengers.

In Antiquity, dogs were forced to swallow messages and were killed on arrival so that these messages could be retrieved. This practice was short-lived however, not because it was considered cruel, but because it was expensive.

In the 18th century, Frederick II (the Great) of Prussia reintroduced the practice to pass messages between armies in his kingdom. The dogs he used made a great impression in the Seven Years' War, giving birth to a whole line of messenger and liaison dogs.

“Relay dogs” were introduced in the Great War (1914-1918). The selection criteria were fairly severe: they had to be between about 40-70cm (16-28 inches) at the withers, have a neutral coat, be in perfect health, have excellent sight, smell and hearing, and be calm, intelligent and obedient. They had to be between 2-5 years old to ensure they were at the height of their abilities and robust enough to withstand bad weather, privations and fatigue.

Chilean police team dropped into position.



© UPI/ES



© UPI/ES

Korean Air Force dog training session.

They had a vital role to play, connecting points several miles apart in often difficult climatic conditions. It was reported that these dogs could cover 3 miles in 12 minutes during a bombardment. They carried uncoded messages that could easily be deciphered by enemy troops, but this gamble paid off because they were rarely caught.

Carrier and draught dogs

Dogs are able to carry up to 10kg (22 lbs) of extra weight, so it's no surprise they were widely used to carry munitions, provisions and even arms to the front lines in various wars. In the Great War, German dogs were captured carrying light machine guns. That conflict saw the creation of two types of dog. Some were trained to carry a reel of telephone wire over a dangerous route through trenches, firing lines and barbed wire to re-establish lines of communication cut by fighting, while others were trained to carry homing pigeons to outposts.

Draught dogs were used as early as 1911 when the Belgians employed them to pull machine guns. They were preferred over horses due to their better endurance and excellent mobility in following men in the undergrowth. At the same time the dogs were harnessed to carts loaded with supplies and stretchers bearing the injured. They were even used by the Germans on the Eastern Front to pull sledges. Due to the controversy that developed about a dog's capacity to pull moving object, only the Belgian, German (for a short time) and the Russian armies actually used this type of dog.

“Dogs are able to carry up to 10kg (22 lbs) of extra weight.”



Beijing police dog teams during the 2008 Olympic Games

Scout dogs

Their well developed guarding and protecting instincts meant that scout dogs soon made a name for themselves. Used to flush out enemies hidden in bushes and thickets, they enabled patrols to thwart ambush attempts and flag up the presence of enemy troops. These dogs were also deployed to guard prisoner escorts. Few dogs were to get their names into the history books, but they did allow countless patrols to find the enemy or their trails.

Medic dogs

The Egyptians were the first to train dogs to recover the wounded: once the battle was over these dogs would be released onto the battlefield to find anyone still alive, who they would mark by licking.

Medic dogs returned to the theatre of war in the 20th century. Trained to recover the wounded, they would flag them up by bringing back an object belonging to them: a soldier's helmet often served as a signal for the medics who would send the dog out again in search of new wounded comrades. Their involvement was fundamental: the wounded could only be recovered under cover of darkness, and the dogs were good at directing search parties. The first Société

du Chien Sanitaire (Society of Medic Dogs) was established in 1885 by the Belgian Van de Putte, followed by a German society founded by the animal artist Bungartz. France didn't equip its own dogs until 1908, following an earlier move by the German army.

There are a whole host of stories about the exploits of these dogs, such as this testimony of a soldier from Mans, who was wounded on 2 November 1915. "Hit in the

arm by a shell, with a bullet in my jaw and a bayonet wound in my scalp, I was half buried under the corpses of many of my comrades when I felt something stroke my forehead; it was a fine German Shepherd medic dog that licked my face. I managed to raise myself a little in spite of my physical pain. I knew that the dogs were trained to return to camp with the helmets of wounded soldiers, but I had lost mine. The brave dog hesitated. 'Go,' I said to it, 'Go little doggie, find my comrades.' It understood, turned and made off for camp energetically, barking, pulling on their coats, which grabbed the attention of two brave stretcher-bearers. They followed it; it took them right to me. I was saved."

Dangerous missions

Dogs have sometimes been used in difficult situations and exceptional conditions.

During the war in Indochina, the terrain and the vegetation posed a great many problems in operations undertaken by French troops. The dangers facing parachutists dropped in enemy territory were revealed in the first few months of the campaign. Dogs were able to accelerate the meticulous searches the soldiers had to conduct. On September 5-6th 1949, parachutist dogs were trialled at Meucon.



© Ziegler



Belgian army dog team in front of the Atomium in Brussels

The principal difficulties during parachute training were encountered when the dogs left the plane, and when they hit the ground. Lighter than their masters, dogs reached the ground a long time after the humans and far away, which delayed recovery and the start of the operation significantly. A reduction in parachute size solved this problem, enabling the dogs to touch down at the same time as and close to their masters.

The armed forces of many countries now have canine parachute units. Alaska's National Guard even uses them on search and rescue missions.

Other dogs have sadly sacrificed their lives during missions. The Soviet general Panfilon, faced with the advance of the German army, trained dogs to search for their food under armoured vehicles. Not feeding them for one or two days ahead of an attack, a mine was then attached to their backs and the dogs were pushed towards their doom. This cruel practice spread pandemonium through the German ranks.

Still indispensable

While dogs have the same aptitudes they have always had, as the art of war has changed so too has the role of canines. They have parachuted into forward positions, transported carrier pigeons, detected mines and chemical attacks. Nowadays they are flown in to intervention areas by helicopter, abseiling down with their handler. Who knows how their role will evolve in the future.

All of these dogs need to be as calm as possible in the midst of gunfire and explosions, while also remaining ready for swift action at a moment's notice, which demands daily training and the establishment of a strong bond of trust between dog and handler.

Belgian defence dogs

The Belgian Army has been using patrol dogs to guard military areas for many years. A patrol team is made up of either two servicemen or a handler with a dog.

Malinois Belgian Shepherd Dogs account for 85% of all dogs used, and German Shepherds another 13%. The majority (80%) are males. They are purchased aged 18-24 months and follow a selection programme, which includes tests to assess basic obedience, biting in confrontation situations and their ability to deal with gunfire.

If they pass the selection, the dogs are fully trained and paired with a handler. There are five dog teams at each guard

post, enabling round-the-clock surveillance. For a few years now we've encouraged handlers to take their dog home with them, so they stay together at all times, deepening the bond between them.

Besides day-to-day exercises, in-depth training is held with the kennel chiefs twice a month.

As well as around 500 patrol dogs, over the past few years we have also trained explosives, munitions and arms dogs, which work in areas such as Lebanon and Afghanistan, where they perform security duties by examining all vehicles that enter the compounds.

In the near future dogs will also be used on active arms and munitions searches and to back up the troops on crowd and riot control missions.

**Colonel Miguel Stevens,
Chief Veterinarian of the Belgian
Ministry of Defence**





Abu Dhabi Police Dog Section

The Abu Dhabi Police Dog Section was established in 2005 as part of the restructuring of the police dog units of Abu Dhabi (1982), Al Ain (1983), Almirfa (2002) and Algoevat (2004). In 2006, two new groups were added to the section, which now has a training centre and a breeding kennel in Al Ain.

Abu Dhabi police dogs are used to search for a number of people and objects:

- Criminals
- Explosives - Illegal drugs - Arms
- Buried persons

They are also used for patrols and to fight crime.

The Dog Section also has dogs specialised in the detecting of date palm parasitic diseases, which plays a big part in protecting this important commercial activity.

Abu Dhabi police dog teams regularly participate in search and rescue operations abroad following earthquakes.

Colonel Jamal Habash
*Director of the Dog Section,
Abu Dhabi Police
(United Arab Emirates)*

When is the best age to train the dog?

Generally speaking, we can divide the training program into three periods.

The first period: 3-6 months old. The handler stays with the puppy to understand its temperament. At the same time, a well-designed physical training program not only improves the dog's physical capacities and performance, but also improves its self-confidence, courage, and obedience.

The second period: 6-8 months old. The basic training program can be started, including commands such as come, sit, down, stand, bark, no etc.

The third period: from 8 months old. The training program can be tailored to the dog's use, especially for working and sports dogs.

Junyan Dong
*Chief veterinary surgeon
Public Security
Ministry of China
Nanjing City Police Dog
Research Centre
Animal Hospital*



Rumanian National Police: Sibiu Dog Centre

In 1950 the Rumanian Minister for the Interior gave the National Police a Dog Centre in the town of Sibiu, with its optimal climatic conditions for breeding and its great variety of terrain (mountain, forest, plains) to allow the dogs to be developed for different specialities.



The Centre originally consisted of a reproduction and a maternity unit allowing breeding of the dogs needed. Nowadays dogs are bred, raised and trained with their future master. Another feature is the permanent availability of specialised veterinary services 24 hours a day, provided by the Minister for the Interior.

Most of the disciplines (attack, drugs, explosives, missing persons, bodies etc) followed by the police dogs are assigned to different groups of dogs. The prospective handlers are also trained in general understanding of the dog, before specific training lasting several months and enabling them to work daily with their new companion.

At the same time the Centre has developed in the area of odour technique, a science which comprises the dog recognising a suspect in a line-up from a reference odour from the scene of a crime. Although this does not constitute legal proof in Rumania, it is a valuable indicator for detectives.

Fully modernised, Sibiu Dog Centre is recognised in Europe for development of the concept of genetic selection & breeding dogs with specific aptitudes for police work.



© iStock/Getty Images

Police and customs dogs

Police dogs are mostly used as a deterrent to intimidate potential troublemakers in high-risk situations such as demonstrations or highly charged sporting events. Sometimes they will be called into action. German Shepherds are the most commonly used breed of dog in the UK, although Dobermanns, Rottweilers and Weimaraners are used too. German Shepherds are muscular, agile and fearless dogs that can move at a fast pace. Police dogs are always trained to the highest possible standard and tightly controlled by their handler when on duty.

Dogs are also used to detect explosives and drugs, as already discussed, and to comb buildings and areas prior to major events. Some forces also have specialised dog teams for urban or rural search and rescue operations, in countries where these tasks do not fall within the remit of other agencies.

As we have seen, sniffer dogs are permanently posted at ports of entry and other high-security zones, including prisons, to find contraband.

Fire investigation dogs

The number of fire investigation or hydrocarbon detection dogs continues to grow in the UK, as it does in the rest of the world. These dogs are trained to help the police and fire services in their investigations into blazes, making use of their ability to detect products used by arsonists. They can also be used as part of a prevention programme in places susceptible to forest fires, such as Australia and the United States.

These dogs are trained to detect various fuels as well as fire starters used to ignite hearths and barbecues, including acetone, methylated spirits, surgical alcohol, brake fluid, solvents, turpentine and naphthalene. They are taught to mark a find by scratching. The flammable substances are then taken away or sampled for testing in the laboratory.

These crime scenes present a lot of difficulties for dogs, as they will have already been trampled by a large number of people. An additional obstacle is that fires destroy some odours but actually release many others, which are problematical and sometimes toxic. Smoke is another complicating factor.

Again, training is play-based, taking advantage of the dog's attachment to a particular object by associating a specific odour or range of odours to that object. Fundamentally then, the dog's remarkable work is driven by its desire for a reward.



Security dogs

Of course, armed forces and police services do not have a monopoly on the use of dogs. Private security firms also use dogs to guard property (warehouses, parking facilities, shopping centres, vehicles) and keep order at big events (sporting events, concerts, shows).



Here, dogs are used for general crowd control or to guard a particular person. The main qualities demanded are vigilance and obedience. The dog must be detached and must not display any overt aggression unless it is prompted to act by its handler, for example in the event of trouble or attempted escape. It should be ready to defend its handler in the face of unprovoked aggression, but it is not an attack dog.



© Duhayer/Royal Canin

Other canine vocations

Dogs have exhibited and continue to exhibit a range of traits and qualities in human assistance disciplines. They have come a long way, even in the past hundred years, bearing in mind that they were still being used to pull small carts containing everything from wood and milk to women and children at the beginning of the 20th century. They moved into show business and street entertainment, while some even joined the circus. In today's world, they can be trained to detect almost anything – from disease to explosives. And all that time they have been used to hunt game too.



© Duhayer/Royal Canin

Hunting

Hunting remains a way of life for some – a passion, a sport, a source of prestige, even an art no less – that more than a million dogs participate in. These dogs need to be in excellent physical condition and possess the right character traits – strength of character, tenacity, concentration – to be able to keep going for long stretches, not to mention that exceptional canine sense of smell.

Different practices

The Hunting Act 2004 in England and Wales and the Protection of Wild Mammals (Scotland) Act 2002 officially outlawed the hunting of mammals using dogs, although land managers are still allowed to hunt vermin. The ban does not extend to Northern Ireland.

In countries where it is still allowed, hunting is a highly regulated activity in which the concept of “unnecessary cruelty” plays an important role. Hunting is against the law out of season to ensure that animals can reproduce in peace so that numbers do not drop to dangerously low levels, although, again, this does not apply to fast-breeding pests.

- In New Zealand and Australia, where there is a great tradition of hunting, deer, boar, feral goats, rabbits and chamois are all hunted to control numbers in a country that has no natural predators.

- Hunting is a major industry in the United States, which is home to a wide variety of game. This has traditionally attracted hunters who want to bag themselves a trophy.

Natural aptitudes and training

All hunting dogs share the main natural aptitudes, which have been honed by centuries of human selection by specialised breeders. Intelligence is the most important trait any hunting dog can have. Though essential, a good nose is not enough: the dog has to know how to use it too.

Hunting dogs fall into a number of different categories, each with their own particular dispositions:

- Terriers: used to bolt and kill foxes
- Dachshunds: versatile dogs that were originally bred to hunt badgers
- Scenthounds
- Bloodhounds

- Pointers: dogs that indicate the position of game for the hunter and retrieve it once the hunter has shot it

- Retrievers: dogs that retrieve the game from the ground or water once the hunter has shot it

- Flushing dogs: there are a range of different breeds with different aptitudes

- Sighthounds, most of them of the Greyhound type, still much used in such countries as Spain (Galgo) and the United Arab Emirates (Sloughi)

Training depends on what the dog is expected to do and how receptive it is. It will certainly need a strong, fearless character. If a specialist trainer is employed it may be possible to bring it up to speed in two to three months, but generally six months of daily training will be needed to produce a good hunting dog.

The dog needs to learn obedience first and foremost. Basic commands such as “down” are fundamental in all forms of hunting. Only when these have been properly as-

simulated can the dog begin to learn to use its nose. By the end of training, the dog must be able to identify scents in the air so well that it never makes a mistake. Pointers have to learn to search a given area and mark the presence of game while remaining completely still, so as not to scare it away. And once the hunter has shot the game, pointers and retrievers have to be able to bring it back in their mouth without damaging it, which in many respects goes against their nature. The dog has to be taught all of this in as playful a way as possible, as force will often be counterproductive.

By their very nature, hunting dogs are not suited to living in flats or to life as a companion dog. If an owner tries to suppress hunting instincts this may come back to bite them, albeit not always literally. If the dog is not used specifically for hunting, it will at least need plenty of opportunities daily to expend its energy, so keeping such a dog in the city is often highly inadvisable.





Herding dogs

Although now more often used in sporting contests rather than their original work, dogs continue to be employed to round up and drive herds and flocks. These dogs need to be brave, keen, very observant and able to act independently. Sheepdog competitions are the most common, although cattle herding contests are sometimes held in the United States and dogs are used to herd any type of animal, including geese and pigs.

Natural aptitudes

Border Collies have a very good natural aptitude for herding, so it's no surprise they are used in many different countries, including the UK, USA, France and Australia. These lively, agile dogs, which are very intelligent, work at a distance from the flock, adopting a characteristic position close to the ground and seeming to hypnotise the ewes to move them into a corner. As outstanding herders, Border Collies are mainly used to drive flocks into a pen.

Other breeds have their own special skills:

- Beaucerons and Picardy Shepherds are calm and agile dogs that prefer open country.
- Briards work farther away from the flock.
- Australian Shepherds are dogs of rare intelligence.
- Pyrenean Shepherds are able to protect herds from any predators.

Farmers can choose from among the different breeds, depending on their needs. In competitions, dogs are primarily judged on their obedience, but the ability to take the initiative is the most highly prized trait in a sheepdog.

Educating sheepdogs

The first stage in a sheepdog's education is a general one in which the puppy learns to follow simple commands (sit, down, come, stay). It will also have to be taught to stop and stay at a distance. But it's in its work with sheep that the dog will be able to show its herding instinct and to truly express itself. For this to be able to happen, the shepherd must introduce the puppy at a very early age, and on a long leash, to the animals it will be trained to work with.

The presence of another dog skilled in the work is always beneficial, as the puppy will be able to imitate it, will become bolder itself and will learn how the animals respond to its movements.

The next stage is getting the dog to work with the flock off the leash. These sessions should last between 15 and 20 minutes so as not to wear it out or put it off, because it will be expected to complete brief, but intense and repetitive exercises. By working very gradually with small flocks of twenty or so ewes, the dog will learn right from left, which will allow the shepherd to guide it from a distance.

The dog will gradually move farther away from the shepherd, working on the far side of the flock. It will also start learning more difficult tasks, including getting the sheep (or other animals) to move in a given direction and moving away from the flock on command when it is too close.

Only when these skills have been learned can the dog move on to the final stage of its education, learning to work in a small area (rounding up, exploring, guiding, holding the flock in a group), on roads and paths (guiding from the front, reversing, guarding



one side when passing a vehicle), in pasture (moving the flock forward without rounding it up, guarding a bank) and in the mountains (exploring, guarding a dangerous passage).

Sheepdogs have often surprising abilities, so the shepherd will very quickly allow the dog to take the initiative. Generally speaking, a good sheepdog knows exactly what it needs to do in a given situation. The shepherd will scarcely have to speak; these two team members can read each other without the need for words, which shows just how intelligent a dog can be.



© Duhaier/Royal Canin

Truffle dogs

The truffle is an underground fungus that is highly prized as a gourmet food. There are several varieties of truffle. Black truffles (*Tuber melanosporum*), the most fragrant and most highly sought-after variety, are found in the Périgord region of France. Truffles grow in chalky soil around the roots of trees. They grow wild although cultivation is also practiced, primarily in France and Italy.



© Duhaier/Royal Canin

Various animals have traditionally been used to sniff out truffles: goats, sheep, flies, pigs and more recently dogs, which are more amenable and easier to transport. Pigs do not require any training, as they have a natural taste for truffles, but they can damage them with their snout. Dogs are not naturally interested in this food source, although training is relatively simple depending on the breed. The Lagotto Romagnolo, for example, is an Italian breed that has been used to find truffles for almost 130 years.



© Duhaier/Royal Canin

Several training methods

The traditional training method involves an entire litter of dogs, which are impregnated with the scent of truffles from birth by smearing the mother's teats with truffle juice and adding it to their food. The dogs come to associate the scent of truffles with feeding and tend to search for it, especially when they are young. It is, however, important not to use too much juice as it is not very palatable and it can inhibit feeding.

There are a number of possible approaches to training. In one, the truffle is associated with a treat that has a similar odour, such as Swiss cheese or ham. The truffle is gradually hidden and the treat given as a reward when it is found.

A playful approach is suited to puppies and young dogs. The truffle is hidden in a sock or a plastic tube that the puppy is given to play with. Once the puppy has formed an attachment to the object it can be used in a game of hide and seek. The puppy does its best to find its favourite object, which it does by identifying the scent of the truffle.

Training can also take advantage of the puppy's instinct to imitate its mother, if she is an experienced truffle dog, although this approach appears to demand more training than reward-based methods.

Extraordinary tales

You just have to switch on the TV or go online to find the most incredible stories, illustrating just how devoted dogs can be to their human companions. They are seemingly prepared to do anything within their power to help them.

In 1994, a six-month old German Shepherd called Nellie from Vienna, Ontario walked two miles to the nearest neighbour to fetch help for her 78-year owner, who was badly injured in a tractor accident. Nellie's efforts saved the man's life.

In Scottsdale, Arizona, an 18-month old German Shepherd called the emergency services in 2008 after its owner had a seizure. After similar seizures in the past, the owner had trained the dog to call 911 by pushing the buttons on the phone with its teeth and whimpering when the operator answered.

The winner of the 2009 PDSA Gold Medal, which honours the exceptional bravery and devotion to duty of dogs in the UK, was a Jack Russell Terrier called George, which was killed while protecting a group of children from a pair of attacking Pit Bull Terriers.

These are just three of the numerous stories of dogs that have saved their human companions from danger, showing once again just how naturally devoted dogs are to their owners.



© Duhaier/Royal Canin

“Dogs can cover hundreds of kilometres to find their owner or look for help.”

Circus dogs

Very few modern circuses have canine acts, but things used to be very different. Dogs were also commonly used in music halls.

Dogs started to be exploited for entertainment purposes on the streets of big cities. They would be dressed in human clothes and trained to stand on their hind legs. They were then adopted by troupes of travelling performers. Most of these dogs were mongrels

A Miss Dore presented the first Poodle tightrope walkers at the Paris Olympia in 1896, although clever canines had been trained to do tricks since 1850.

We know from Alain Dupont, who wrote a book on the subject, that trainers had their favoured breed, including Pekingeses, Bichon Frises, Borzois, Collies, Fox Terriers, Saint Bernards, Greyhounds, Pinschers, Papillons, Spitzes and Afghans. They were trained to take on various roles – jockey, footballer, trapeze artist, tightrope walker.

They were also taught to apparently solve maths problems and make astounding predictions.

Clearly, animal welfare was not an important factor in the training of such dogs. Brutality, deprivation and even starvation were among the barbaric methods used to get dogs to perform these tricks. It was in response to this problem that the Jack London Club was founded in London in 1929. The aim of the club was to stop all exploitation of animals, in particular dogs, in this way.

Progress was achieved at a rapid pace, as more and more trainers started to understand that they could get their dogs to do much more if they established a bond of trust with them, based on reward rather than terror. They soon realised that their

dogs were happy to do what they needed to get the applause they craved and became sad and unhappy when they did not perform.

They had come to learn something that has become a central tenet in all types of dog training: that dogs only learn when they are having fun and feel they form a team with their handler.

“Training is relatively simple depending on the breed. The Lagotto Romagnolo, for example, is an Italian breed that has been used to find truffles for almost 130 years.”



© Grosvenor

Teach your dog to count

The French dog expert Alain Dupont has developed a relatively simple method for teaching dogs to count.

The dog first has to learn to bark on command, triggered by a specific gesture that onlookers will not notice. When you want to give your dog a treat, command it to bark while raising your hand. When the dog barks, give it the treat and command it to be quiet, lowering your hand with the palm towards the dog. Before you know it, you will only have to raise your hand to get the dog to bark and lower it again to get it to stop.

Next time you want to impress your friends, you can get your dog to solve a simple maths problem – adding or subtracting, say – asking your question and discreetly raising your hand, to adjust a piece of clothing, for instance. The dog will start barking. All you have to do is count the requisite number of barks before lowering your hand again to silence the dog and give it its reward. There is one caveat, of course: you do need to know how to count yourself!



Dog sports and leisure activities

Photo in the left: © La Grande Odyssée



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© Desert



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Dog sports and leisure activities

Taking part in sporting activities together helps strengthen the bond between owner and dog. Success depends on understanding and responding to the dog's abilities and enthusiasm. The owner/handler must constantly reassess the suitability of activities and adapt them where needed. Both handler and dog need to enjoy themselves to achieve good results, while for the more competitive owner and dog there are plenty of titles to be won, which can be recorded with the pedigree of purebred dogs.



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Working trials for purebreds: a brief introduction

Working trials highlight the particular abilities of a given breed. As such, they are only open to dogs of that breed holding an official pedigree. Initially, they may be restricted to confirmation of natural abilities in one or more type of working activity traditionally practised by a particular breed through the Certificate of Natural Qualities.



“Grazed: the dog must hold the flock in a specific area of grassland and allow them to graze.”

Sheepdog trials

The first official sheepdog trials, organised in 1873 by Lloyd Rice in Bala, Wales, were a great success, inspiring a large number of trials in Wales and elsewhere from 1876 onwards.

For centuries they were held in the Scottish Borders as part of agricultural shows and fairs and the first international trials were held there in 1906 after the breed clubs had drawn up regulations.

These trials, which demonstrate the dog's obedience and abilities working with sheep, are now held in many different countries. They are an excellent way for owners to share ideas and techniques and promote selective breeding.

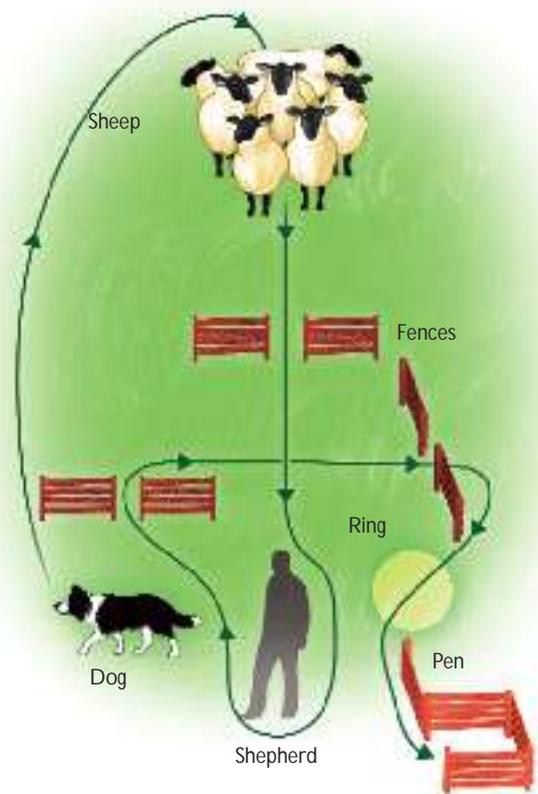
Trials are open to all sheepdogs registered in the breed registry or stud book and holding a certificate as a working dog, although competitions are split into two types, one for Border Collies and one for all other breeds. Border Collies, which have exceptional abilities, are separated from other breeds for reasons of fairness.

Trials are split into various classes. Whatever the standard, the dog must show its ability to follow the vocal commands of the handler and complete an obstacle course without picking up any faults. It is judged against various criteria: completion of the tasks, calmness, initiative and handling of the sheep. The clarity of the handler's orders is also judged. Participating dogs must be at least one year old.

There are three levels. The dog works with a flock of between 50 to 80 sheep depending on the category. The course is set up to mirror real-life conditions as much as possible. There are five parts to each trial:

- pen or sheepfold, in which the jury judges how well the dog manages the exit of sheep from the pen. The dog should be calm but firm in rounding up the sheep and returning them to the pen, so that the handler is able to close the gate.

Dog working with a flock





Border Collie: following the command “right”



Border Collie: following the command “right” when the dog is on the other side of the herd.



Border Collie: learning to “push” the sheep

The dog must also be able to protect its handler when feed is given to the herd and to clear a hurdle to return to the owner at the end of the exercise.

- Difficult passages, in which the dog has to deal with a narrow passage or a specific complication, such as a bridge or a corridor made by barriers or hedging. Again, the jury judges how well dog and handler work together to shepherd the flock over or through the obstacle.

- Conduct and manoeuvre, which comprises five elements:

- Graze: The dog must hold the flock in a specific area of grassland and allow them to graze.

- Holding the flock and shedding a sheep: The handler must be able to separate a ewe while the dog keeps the rest of the flock at a distance.

- Remote work: The dog must keep the flock together, while the handler moves away without giving the dog any more commands.

- Car passage: The dog must keep the flock from panicking when a vehicle passes very close-by.

- Movement: The dog must be able to control the movements of the flock calmly.

- Stops, in which the dog has to get the flock to stand still at a precise location. This is done at least twice during an exercise.
- Intelligence, in which the dog's initiative, gentleness, activity and obedience are judged, together with the handler's commands.

There are several different working trials:

- Herding certificate trials to judge obedience, character, bravery, initiative and essential herding abilities.
- Aptitude certificate trials at the herding championship.

- Herding championship.

Thanks to the hard work of the breed clubs, these trials are now held in conditions that closely mirror real life. This gives an advantage to dogs able to show initiative, rather than those which simply follow the handler's commands at all times. Trials also show exactly what sheepdogs can do, hopefully encouraging breeders to select stock based on working abilities rather than beauty. In some trials, dogs work not with sheep but with cattle or geese.



CALLALLOO CanisFotoItalia

Working trials for hunting dogs

In some countries, there are a large number of official working trials for purebred hunting dogs. Some of these are discussed in more detail a little later.

N.B. under the Hunting Act 2004, it is illegal to hunt wild mammals, including foxes, hares and deer, with a dog in England and Wales (with certain specific exceptions).

The purpose of trials for scenthounds is to identify the best individuals for reproduction by awarding the Certificate of Natural Qualities. Trials are open to all breeds in the FCI's group 6 (scenthounds and related breeds). The dogs only hunt one particular species – hare, rabbit (only for small-game dogs), deer and wild boar – enabling them to develop an aptitude for it. Titles are awarded at the end of a trial depending on how well the dog follows a trail and gives voice.

Depending on the trial, four to six dogs work on the same terrain at the same time. The goal is to find prey within a given period of time.

There are trials for terriers, and to a lesser degree dachshunds, using artificial fox dens and badger setts, hare tracking and following blood trails.

Pointers and retrievers also have their own trials.



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Schutzhund and Ring

Schutzhund (which is the German word for “protection dog”) and Ring are a series of training trials used to evaluate the dog’s natural aptitudes in clearing obstacles, obedience, combativeness and tracking. They can be used as a basis of selection for the essential qualities of athleticism, dynamism, obedience, steady character and bravery in sheepdogs and watchdogs.



Training a dog in a biting exercise.

Origins

Schutzhund was developed in Germany at the beginning of the 20th century for the purposes of selecting the best German Shepherds. Today it is open to many other breeds of dog.

A Mr Moucheron was the first person to exhibit the discipline known as Ring, perhaps appropriately in a circus ring, in Belgium in 1885. He used some muzzled Groenendaels to perform attack and defence exercises. The decoy’s characteristic gear first appeared in 1906, as customs and police started to get

more and more interested in the use of dogs. At the end of the Second World War two distinct disciplines emerged:

- In the Netherlands, Belgium, France and Switzerland, Ring developed into its present form.
- In Germany, Schutzhund developed, which retains a tracking component.

Other countries later became interested in Ring. The North American Ring Association was established in the United States in 1986 and it has also made inroads in Mexico and Canada. The Société Centrale Canine in France continues to control the sport’s code.

Schutzhund has also spread to new territories, including the United States, where the United Schutzhund Clubs of America works as a steward of the German Shepherd working dog in the New World.

List of breeds authorised to participate in biting exercises (FCI)

Airedale Terrier	Australian Cattle Dog	Dobermann (black and tan)
German Shepherd	Bouvier des Ardennes	Dogo Canario
Berger Blanc Suisse	Bouvier des Flandres	Perro de Presa Mallorquin
Beauceron	Boxer (brindle)	Fila de Saint Miguel
Briard (fauve)	Boxer (fauve)	Hovawart
Briard (black, slate, grey)	Cane Corso	Australian Kelpie
Berger Picard	Belgian Shepherd Dog (Malinois)	Puli (white)
Pyrenean Shepherd (smooth-haired)	Belgian Shepherd Dog (Groendael)	Puli (black-grey/ light fauve)
Pyrenean Shepherd (long-haired)	Belgian Shepherd Dog (Laekenois)	Rottweiler
Dutch Shepherd Dog (short-haired)	Belgian Shepherd Dog (Tervueren)	Schnauzer (giant, black)
Dutch Shepherd Dog (wire-haired)	Smooth Collie	Schnauzer (giant, salt and pepper)
Dutch Shepherd Dog (long-haired)	Rough Collie	Black Russian Terrier
Border Collie	Dobermann (brown and tan)	

Hundreds of thousands of dogs now take part in these two disciplines. Dogs first have to earn their licence before being allowed to participate in category 1 competitions. They can then progress to categories 2 and 3. Category 3 dogs must amass a certain number of points in pre-qualification trials to win a place at one of the three qualification trials for the French championship, which is open to just the 26 best dogs, compared with the 250 dogs which compete at national level. The system is more or less the same in Schutzhund and the closely related discipline IPO.

Differences between Ring and Schutzhund/IPO

In Ring, the decoy the dog will attack when commanded to do so by the handler is completely covered by a protective suit, whereas in Schutzhund (or IPO) this person wears lightweight trousers and a heavily padded sleeve. That means that in Schutzhund, the dog must only bite the arm covered in the sleeve.

In Ring, the decoy has a bamboo cane, although a flexible rod may also be used. The duration of the grip and the way the decoy responds are different in the two disciplines.

Schutzhund and IPO also include a tracking component, which is not included in Ring.

Competitions

Ring, Schutzhund and IPO competitions are held in a closed area measuring around 2500 square metres (3200 sq m in Schutzhund), although the playing field can be much smaller depending on the occasion. All three are strictly regulated and dogs are scored in accordance with a very precise system by a specialised judge, who is responsible for deciding the final positions and awarding any titles.

Preferred breeds

While many breeds are eligible to take part, the Belgian Shepherd Dog (Malinois) is far and away the most common breed in Ring. Dogs must be very well balanced, lively,

not frightened of anything (for example they must not loosen their grip in response to a gunshot or a swing of the bamboo cane), docile and willing.

Schutzhund was originally designed for German Shepherds, although it is gradually opening up to other breeds that are authorised to bite in sporting competitions.

Training

Dogs need to be well balanced. Even before training, they need to become used to gunshots and other sounds. Prospective owners need to become skilled at identifying timorous or overexcited puppies and puppies that are not interested in biting games, so that they can be avoided.

Dogs commence training around three months of age. It is important to note that training continues all through the dog's active life, which is up to eight or nine years on average. Dogs start earning their licence around twelve months of age.

In Schutzhund (or IPO) the decoy wears lightweight trousers and a heavily padded sleeve. The dog must only bite the arm covered in the sleeve.



© Hermeline/Diffomedia

In Ring, the decoy the dog will attack when commanded to do so by the handler is completely covered by a protective suit.



© Hermeline/Diffomedia



© DuLayverfoyal Carain



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“The Belgian Shepherd Dog (Malinois) is far and away the most common breed in Ring.”

Participating in category 3 competitions requires four one-hour training sessions a week on average. More than 500 hours of training will be needed to make a talented dog – which will typically be from a long line of such dogs, sometimes going back over a century – competitive at this level. Category 3 involves a programme lasting between about 45 minutes and an hour of intense effort in various situations that test the senses, athleticism, obedience, initiative and combativeness of these exceptional dogs.

Puppies must be introduced to tracking and jaw holds between three and six months of age. They need to be taught the basics of practical obedience, including come, sit, lie, stand and stay. Puppies should be acquainted with lots of different situations (crowds, traffic) and other dogs to ensure

they are properly socialised. Exercises should be kept short to ensure the dog remains fully motivated.

Dogs are introduced to the exercises in the programme between six and nine months, when they learn to bite a tube, a leg pad and finally the padded trousers worn by the decoy. They learn to react fast and change holds on either leg, as well as the holding technique. They learn to deal with the threat of the cane and not to fear gunshots.

Specific exercise training starts around nine months and continues until the dog is anywhere between two and two-and-a-half years old. The final months before competition are used to harden the animal to the speedy, selective work of high-quality decoys.

Dogs are not trained in jumping until the end of the growth phase to avoid orthopaedic problems.

Basic training begins once the dog has stopped growing, at around 12-14 months, with the objective of getting the dog up to an optimal performance level. Ring and Schutzhund dogs are elite athletes, so a single training session a week will not do. Jaw holds and obedience are not the only aspects that require training – dogs also need to follow a physical training programme to ensure they are in perfect condition. In competition, dogs have to be in tip-top shape, because they need to clear obstacles and deal with attacks at a fast pace.

The physical training programme is based on two long-distance courses a week, gradually increasing from 4 km to 12 km, alternating with short courses. Speed work with tennis balls thrown from a launcher is incorporated as a warm-up or instead of the short courses. Natural obstacle courses are then also incorporated, including swimming sessions if suitable water is available nearby.

As contrary as it may seem bearing in mind their physique, Boxers, Dobermanns, Rottweilers and Giant Schnauzers need this training more than other breeds. On the whole, sheepdogs are hardy animals, but they are not all able to withstand such bracing work, especially in strong heat. Briards and Bouviers des Flandres can experience difficulties due to their dense coat. In general, dogs standing no higher than 65 cm and weighing no more than 35 kg will find Ring or Schutzhund tough-going.

Bending and stretching exercises

These obedience-based exercises are a good way of assessing the dog's learning capacities. Different types of tests can be strung together in any order. The number and difficulty will depend on the competition standard.

In competition, dogs are asked to retrieve an object – glove, sock, spectacle case – belonging to the handler and to present it sitting down in front of the handler. The handler will also throw an object for the dog to retrieve. The object can also “fall out” of the handler’s pocket in full view of the dog. The dog is then expected to pick it up and return it to the handler. In another test, the dog has to retrieve a hidden object using its nose. These tasks should be completed rapidly without the handler having to repeat the command or make gestures.

The dog will also have to learn to ignore treats. The way they are presented (placed on the ground or thrown at the dog from behind a screen while it is lying down) and the number of treats used depends on the dog’s training level. The dog must neither touch nor lick them. At higher levels, treats are placed around the playing field and the dog must ignore them.

Walking to heel shows how well the dog follows its handler. The dog’s shoulder must never be in front of the handler’s leg. It

must stop when the handler stops without being commanded to do so and move on when the handler moves on. This section includes a lot of changes of direction. The dog must never pull on the lead. No commands are allowed.

The dog must also be able to adopt various positions twenty metres away from the handler on the handler’s command. Each position (sitting, lying, standing) must be adopted twice. Commands must never be repeated. Errors are penalised.

The dog must also be able to stay where it is when the handler goes away. The dog is commanded to stay in the same position until the handler reappears and gives it a new command.

Another test assesses the dog’s ability to move away from the handler in a straight line (the distance will depend on the level) before returning to heel on command.

“Boxers, Dobermanns, Rottweilers and Giant Schnauzers need this training more than other breeds.”



© Grosvenor

In competition, dogs have to be in tip-top shape, because they need to clear obstacles and deal with attacks at a fast pace.



© Duhayer/Royal Canin



© Hermeline/Difomedla



© Brigade des Sapeurs-Pompiers de Paris BRSP

Jumping exercises

There are three different types of jump: high jumps, long jumps and fencing. Every obstacle must be cleared twice, once on the way out and once on the way back.

Obstacles can be up to 120 centimetres high and up to almost 7 metres long (at least 4.5 metres according to the rules) while fencing can be up to 230 centimetres high.

Combat and attack work

Once basic training has been completed, the dog will be started on a programme of different exercises to develop its combativeness and attack technique. The typical sheepdog qualities of initiative, control, mobility and decision-making – the same qualities sought in search and rescue dogs – are required here.

Search and bark

The dog must identify the decoy's position in one of the six hides on the playing field as quickly as possible, barking to alert the handler. When the handler arrives at the spot, the decoy runs off firing two blanks with a .9 calibre revolver. The dog follows the decoy for a few dozen metres, during which time the decoy will try to escape twice again to test the dog's vigilance and speed of intervention. In Schutzhund, the search takes a lot longer and the dog has to explore an area covering several hundred metres with its nose.

Defence of the handler

The handler approaches the decoy with the dog at heel, shakes hands and starts a conversation. The decoy then walks away before attacking the handler. When this happens, the dog must defend the handler energetically, keeping the decoy at bay until it is commanded to heel.

The test is repeated with the dog muzzled and the decoy in regular clothes, as some dogs will only attack if the decoy is wearing the padded suit, which makes them useless in real-life situations.

Attacks

There are many types of attack. The decoy may be approaching or running away, carrying a gun or a bamboo cane, which makes a threatening noise but is not used to hurt the dog. At the end of the exercise the dog returns to heel or retains its hold on the decoy. It must stop the decoy from escaping twice.

The attack technique is a complex one which comprises decision-making, impact and hold.

The dog is taught to make decisions during gradual, methodological training in which it learns to bite the decoy's standing leg and the other leg if the decoy manages to pull free. The dog then learns to take hold of the decoy's arm if the stick is swung in front of the legs, then the inside of the arm close to the body if the decoy tries to slip away. This is the same training as used in martial arts. The dog goes for the vulnerable part of the decoy. This enables the dog to dodge a forceful attack.

The jaw hold is worked on during basic training, using extensive padding to ensure a strong, firm hold on the protective clothing.

Only well-balanced, gentle dogs with nerves of steel are able to learn these techniques. Aggressive dogs will not be able to withstand the pressure and will seldom be able to pass the tests in which a cane is used.

Stopped attacks

These spectacular tests demonstrate the handler's full control of the dog, which will throw itself on its side within a metre of the decoy without making contact when the handler blows a whistle. During training, the handler stands next to the decoy with the dog at a distance of twenty metres from the two. The handler then commands the dog to attack, calling it off when it is as near to the decoy as possible. It is hard for the dog to understand that it should not go through with its attack, so this particular exercise should be reserved until the end of its training.

Guard of object

This is certainly the most complicated exercise in guard and police dog tests. The dog will guard an object, such as a basket, that the decoy will try to steal while walking by two or three times.

Tracking in *Schutzhund* and IPO

In this test, the dog has to search for personal objects and ultimately the person in question by following a human trail. The trail is shown on a map given to the judges and the course setters, who try to introduce some difficulties, such as acute turns, asphalted sections and water sections over longer than expected distances, unavoidable obstacles greater than 1.5 metres high, sections running over main roads or through villages and even courses that turn back on themselves so that the start is also the finish.

Everyday objects such as wallets, gloves, pens, scarves and handkerchiefs are dropped on the course as if they have been lost.

The handler is free to guide and even help the dog during the test. The dog may be let off the lead when it comes to an obstacle or when it loses the trail so that it can try to find it again. Handlers are allowed to pick up the objects, approach anyone that happens to be on the course with questions and let the dog rest when they feel they need to.

“The dog must also be able to adopt various positions twenty metres away from the handler on the handler's command. Each position (sitting, lying, standing) must be adopted twice.”



© Hémeline/Difromédia

Utility tracking

In utility tracking the dog again has to follow a trail, although this time the only thing that matters is the dog's ability to follow the trail. The course setter will take up a position similar to one a missing person could be found in.

There are competitions in which the dog has to find an object by following a trail on its own and competitions in which it is on a lead with its handler. Here, the dog has to find objects placed on the course by the course setter and find this person at the end of the course. National championships are held in most countries, and there is an annual world championship too.

These are sporting disciplines, of course. In most countries specially trained police or emergency service dogs will be used to search for real missing persons.



© DIMES

Tracking trial programmes

Examples

Class 1 tracking trial

Trail duration: 2 hours.

Trail length: around 2 km.

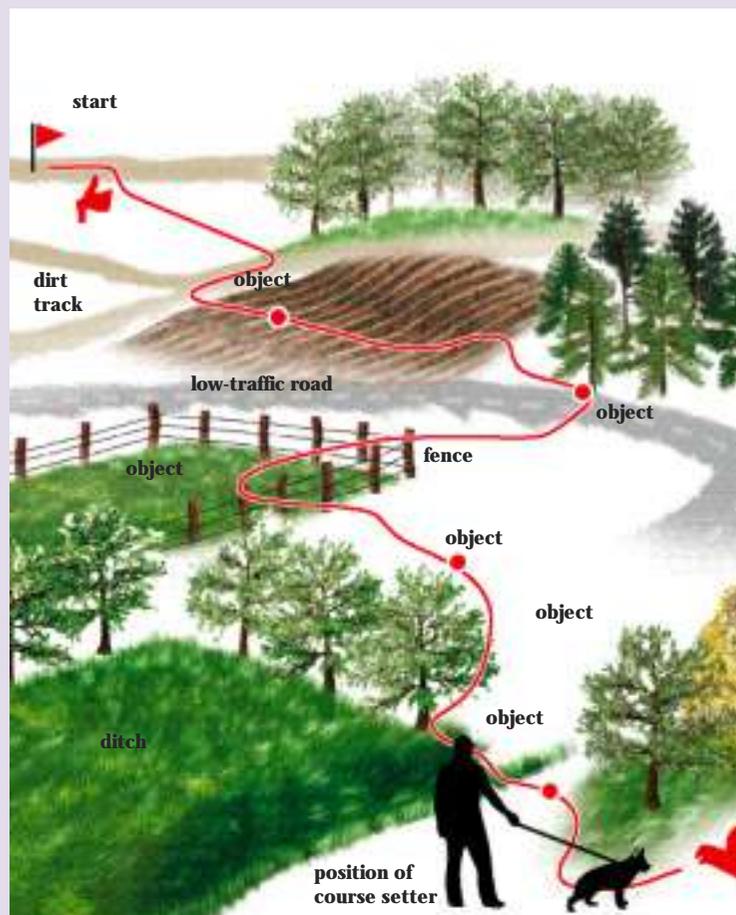
Time allotted for finding the course setter: around 60 minutes.

Pace of course setter: walking.

Objects on the trail: first personal object ten paces from the start; five objects at intervals of 500 paces.

Difficulties: dirt track and grassy area, electric livestock fence, barbed wire, following and crossing a low-traffic road, ditches.

Position of the course setter: lying or concealed in ditch, under shelter, behind a fence or wall.



Class 2 tracking trial

Trail duration: 3 hours.

Trail length: around 2 km.

Time allotted for finding the course setter: around 90 minutes.

Pace of course setter: walking.

Objects on the trail: a reference object is given to the dog and handler prior to the start; first personal object 150 paces from the start, followed by a further five objects, at intervals of 500 paces, one of which may be hung above the ground.

Difficulties: the scent of a stranger will be deposited in the start area around 90 minutes before the course setter arrives, dirt track and grassy area, electric livestock fences, barbed wire, following and crossing a low-traffic road (50 paces), ditches, dense hedges, woods with copses, 1.50-metre passable obstacle, passing by an isolated house.

Position of the course setter: lying or concealed in ditch, under shelter, behind a fence or wall, in a parked vehicle or by a road.



Handler/dog utility tracking certificate

Trail duration: 6 hours.

Trail length: around 3 km.

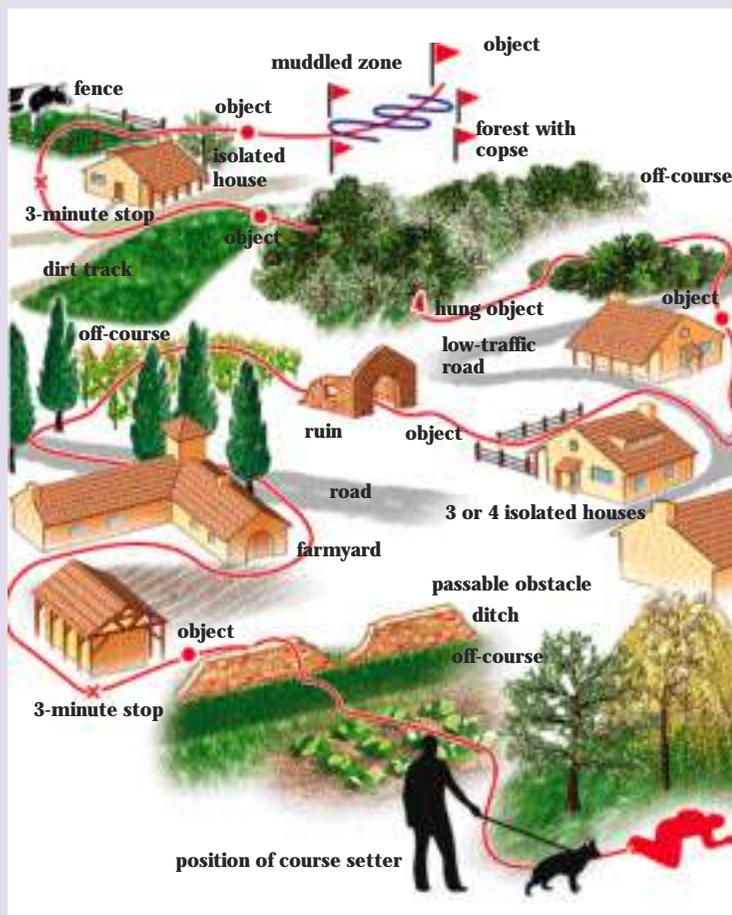
Time allotted for finding the course setter: around 120 minutes.

Pace of course setter: walking with occasional running or one or two 3-minute stops.

Objects on the trail: first personal object 150 paces from the start, five further objects at intervals of 625 paces, one of which may be hung 1.50 metres above the ground.

Difficulties: the scent of a stranger will be deposited in the start area around 15 minutes before the course setter arrives, dirt track and grassy area, electric livestock fences, barbed wire, following and crossing one or more roads, ditches, 1.50-metre obstacle that can be bypassed, passing by an isolated house, walking along a road for around 100 paces, crossing ruins, a farmyard, passing a small group of 3-4 isolated houses.

Position of the course setter: lying or concealed in ditch, under shelter, in a parked vehicle or by a road, in a room, up a tree, in a farmyard, in a group of people, behind a hedge or wall.





CALLALLOO Canis/Photo



© Bigot

Retrieval test in a countryside trial.



CALLALLOO Canis/Photo

“This sport challenges the dog’s capacity for taking initiative.”

Countryside trials

Originally a purely French sport, this especially complete canine discipline has started to gain in popularity in the United States and elsewhere. The programme includes obedience, defence, jumping, retrieval of objects from water and tracking, which makes it very suitable for dogs with natural aptitudes in various fields.

The capacity to adapt to any situation

Countryside trials are held in a natural environment over at least three hectares, or six hectares for tracking, challenging the dog's capacity for taking initiative. This means that there are few clubs around large cities. Every competition is different, so dogs need to be very well balanced and able to adapt to new situations. The results of these trials

are recorded with the pedigree certificate. Only dogs authorised to bite are allowed to participate.

Some of the tests are those practised in Ring (with different jump heights and distances), but in countryside trials the terrain changes constantly.

There are five types of obstacles for jumping (natural wall, hedging, lattice fence, wire mesh and river). Noises are used to try to distract the dog during the obedience exercises (aircraft, falling objects). The decoy is often partially camouflaged, demanding more active search efforts by the dog.

Obedience trials

This relatively new discipline is very popular in the Nordic countries. The setup of classes 1 and 2 varies somewhat depending on the country, but the highest class (3) is internationally recognised. Competitions are open to all breeds and crosses are sometimes also accepted. Annual national championships are held, where the best teams qualify for the world championships. Teams are graded pass, good, very good and excellent.



© Grossemey

The classes

Class 1 is open to novices (licensed and certified working dogs), class 2 is open to dogs which have been graded excellent in class 1 competition, while class 3 is open to dogs graded excellent by two different judges in two different class 2 competitions.

The goal in the obedience trial is to complete a series of simple tests of ascending difficulty as the dog gains more experience. Anyone can practise them, because they are a great way to help owners improve communication with their dog. During the tests, the dog should constantly show willingness to work and the ability to follow the handler's commands to the letter. Handler and dog should form a well-oiled team.

Aggressive and timid dogs are not suited to obedience trials, as the dog must be comfortable about being touched by a stranger. The tests include:

- Heel (with or without lead): the dog has to follow the handler without pulling on the lead, moving away or walking in front of the handler.

- Sit, lie and stand: the dog has to follow the command immediately without the handler having to repeat it.

- Go lie: the dog must walk in a straight line away from the handler and lie down in a square on the handler's command.

- Retrieve: the dog must retrieve an object after the handler gives the command. Depending on the level, the object may or may not belong to the handler. The dog may also have to retrieve an object touched by the handler and placed among other objects out of its view.

- Stay: the dog must stay where it is without moving or changing position for between one and four minutes depending on the level, while the handler hides from view. This test can be made more difficult by getting several dogs to do it at once, as the dogs will be distracted by each other.

- Come: the dog must go to the handler on command. The difficulty can be increased by asking the dog to stop before it reaches the handler.

- Jump: the dog must clear an obstacle in proportion to its height in one direction and then the other.

This sport is open to all certified working dogs. It is a good way to train a dog while also enjoying the competitive aspect.

Obedience: heeling without a lead.



© Brigade des Sapeurs-Pompiers de Paris BIRP

Heelwork to music

Heelwork to music is a sport recognised in many countries, along with a variant called musical freestyle. Based on obedience, this relatively recent sporting discipline was developed in the United Kingdom and North America around 1990, gradually spreading to continental Europe.



© Grossemy



© Grossemy



© Grossemy

At the end of the 1980s, one of the leading dog trainers in Britain, Mary Ray, began demonstrating a highly precise form of heelwork. By 1990 she was doing it to music.

At the same time on the other side of the Atlantic, canine freestyle began to gain popularity in both the United States and Canada. Musical freestyle is a sport that combines obedience and dance, with less focus on heelwork. Human and dog move freely, enabling the human leader to attain a choreography with the dog in which all movements and figures are permitted, provided they are not dangerous.

The first official competition was held at Crufts in 1996, leading to the official recognition of heelwork to music by the Kennel Club.

Training is based on obedience and reward. The dog quickly learns to correct its errors when it does not get a reward after an exercise.

When everything goes to plan, the dog mirrors the moves of the human perfectly. This requires human and dog to work very closely, just as in other canine sports. Heelwork to music is a creative, artistic sport that often appeals to women. When human and dog are in perfect harmony they are able to perform remarkable feats in a dynamic, enthralling musical atmosphere.

Sled dog racing

There is evidence of dogs being harnessed to sleds in eastern Siberia as far back as 4000 years ago. The sport was officially recognised in the 20th century. During the Alaskan gold rush, enthusiasts pitted themselves against each other to find out who had the strongest, fastest dog teams. It was not long before a sport was born.



©lightcatcher/fotoFotolia

Polar expeditions

North Pole (1909)

On 6 April 1909 Robert Peary became the first person to reach the geographic North Pole. This man of legendary authority led an expedition that comprised 132 dogs, 15 sleds and 24 men; only 40 dogs and 8 sleds would make it after a hard slog covering an average of 25 miles a day.

South Pole (1911-1912)

The Norwegian Roald Amundsen and the Englishman Robert Scott both set course for the South Pole in 1911. Amundsen's dog-led expedition arrived first on 16 December 1911. Scott, who refused to take dogs for sentimental reasons, arrived almost five weeks later on 18 January 1912. None of the men on Scott's expedition would return.

Alaska's first races

Mushers and gold diggers established the Nome Kennel Club in that small town on the west coast of Alaska in 1907 to regulate the sport and organise official races.

One year later Albert Fink, a Nome lawyer, drew up the rules of the first ever competition, the All Alaska Sweepstake, a 408-mile course from Nome to Candle and back again. They were as follows:

- Every musher must be a member of the Nome Kennel Club.
- Every dog must be registered with the Club.
- A musher can have as many dogs as desired, but every dog that starts a race must arrive at the finish, either in the harness or on the sled.
- The dogs must be identified and marked at the start to prevent substitution during the race.
- If one team approaches another team from behind, the team in front must stop and let it pass, waiting a certain amount of time before moving off again.

The musher is the person who drives the dogsled. It is said to come from the French word "marche", which means "walk", a command given by the French-speaking Canadians to get their dogs moving and then anglicised to "mush".

The first edition of the race took five days to complete.



© Dussert

The Norwegian Leonhard Seppala would become the greatest name in the early years of the race through his exploits on this course of “ice fields, high peaks, frozen rivers, tundra, forests [and] glaciers”. He won the All Alaska Sweepstake with his team of Siberian Huskies in 1915, 1916 and 1917.

“He is a superman,” wrote one of his rivals. “He passed me every day of the race, although I wasn’t dawdling. I never ever saw him mush his dogs but I’ve never seen dogs pull like that. Something happened between him and his dogs that I cannot put my finger on; something supernatural, a sort of hypnotism.”

The teams improved quickly between 1908 and 1915. The first Huskies imported from Siberia set a new record in front of Iron

Man John Johnson in 1910 of 74 hours 14 minutes 37 seconds. A year later, Allan Scotty Allan won the race with a team of Alaskan crosses (Malamutes and Setters) in around 80 hours in the midst of a terrifying blizzard. He would go on to become another great name in the All Alaska Sweepstake, winning three of his eight races, along with three second places and two thirds.

Despite this fantastic record, it was Leonhard Seppala who dominated the sport. His best lead dog Togo is known to mushers around the globe. Seppala racked up a lot of successes in New England, where he met a young student called Roland Lombard. The sport came on leaps and bounds under “Doc” Lombard, a musher and a veterinarian, who won more Anchorage World Championship titles than

anyone else and became the first president of the International Sled Dog Racing Association (ISDRA).

Another name that deserves a mention is Georges Attla, a Native American from Huslia in Alaska who won every title going. His book *Everything I know About Training and Racing Sled Dogs* is still considered to be the musher’s bible around the world. The life story of this remarkable man, who suffered from tuberculosis of the bones, robbing him of the use of one leg, was adapted for cinema in the 1979 film *Spirit of the Wind*.

Races today in the United States

Sled racing became popular in the rest of North America in the 20th century. The New England Sled Dog Club was founded in 1924. The 1932 Winter Olympics in Lake Placid, New York included dogsled racing as a demonstration sport, attracting a lot of attention from the general public.

The Second World War disrupted competition, but clubs started to spring up in the post-war period, including the Sierra Nevada Dog Drivers, whose head Robert Levorson was president of ISDRA between 1971 and 1974. His appointment coincided with a momentous decision of the Alaska state government in 1971 to make sled dog racing a national sport.

A wealth of races is held every winter in North America. The biggest are the Fur Rendez-vous World Championship, Anchorage, Alaska; the World Championship Sled Dog Derby in Laconia, New Hampshire; the World Championship Dog Derby, La Pas, Manitoba; the North American Championship, Fairbanks, Alaska; the Alaska State Championship, Kenai-Soldotna, Alaska; the Race of Champions, Tok, Alaska; the Surdough Rendez-vous, Whitehorse, Yukon; the U.S. Pacific Coast Championship, Priest Lake, Idaho; the All American Championship, Ely, Minnesota; the Midwest International, Kalkaska, Michigan; and the Quebec International Course de Chiens, Quebec City.

People often ask me if living alone for weeks in the solitude of the far north doesn’t overwhelm me. I always say I’m never alone when I’m with the dogs. And it’s true; they say so much to me with their eyes, their bravery, their sensitivity. I remember one night in the far north of Canada, somewhere between the Great Slave Lake and a small first nations village. It was very cold, minus fifty at least, and I was very sick. I suddenly fell from the sled and started vomiting while I was on my stomach. My head was spinning. I was afraid I would pass out, which would have been the end of me. The dogs stopped and came back to me. Voulk moaned, licking my face and nudging me, gently leaning on me, as if to say, “Come on, we have to go. Don’t lose heart. I’m here. We are here”. How could I feel alone that night?

Dogs are part of our lives just as much as they are part of the history of the far north, where they have helped humans discover and explore. They are the indispensable companions of a large number of people, who need their eyes, their ears or their nose to deputise for their own. They accompany hunters for whom they retrieve game, they save people trapped under avalanches and collapsed buildings. They give so much it would take a whole book to do them justice, but the greatest thing they give is love. Mutual love, which is most strongly expressed in the help they give us. Long live dogs and everyone who loves them!



Nicolas Vanier
Film maker and explorer
www.nicolasvanier.com



These annual races attract tens of thousands of spectators. They are split into three legs of between 15 and 45 miles depending on the category, held on Friday, Saturday and Sunday. Some, or all, of the course runs through urban areas. Long-distance races have also been initiated, including the Beargrease Sled Dog Marathon, which covers 500 miles in Minnesota; the Yukon Quest, which covers 800 miles along the Yukon River from Canada to Fairbanks, Alaska; the International Rocky Mountains Stage Stop Sled Dog Race, which covers around 370 miles, starting in Jacksonhole, Wyoming, and of course, the Iditarod, the longest (1049 miles officially, but even longer in practice), toughest, most prestigious sled race in the world.

These races have added new names to the sled dog hall of fame. People like Joe Redington Senior and Earl Norris (the Siberian Husky breeder and the world's most famous musher), Eddy Streeper (1985 world champion), Harris Dunlap, Rick Swenson (the King of the Iditarod), Libby Riddles (the first woman to complete the Iditarod in 1985), Susan Butcher (Iditarod winner in 1986, 1987 and 1988). In 1979, Butcher joined Redington to drive her team around 6,000m (20,000 feet) to the top of

Mount McKinley, a feat equalled by Jacques Philip in 1991. Alaskan Lance Mackey, meanwhile, became the first musher to win both the Yukon Quest and the Iditarod in the same year in 2007, repeating the trick a year later.

“Dryland”: from training method to world championship

The cart is the musher's fundamental training tool, used when there is no snow on the ground, generally in September. Dryland competitions are also held in many countries where snow is more of a rarity (initially Australia and South Africa although the list is growing all the time). The International Federation for Sled Dog Sports' first ever world dryland championship was hosted by Aranda, Spain in 2004.





© La Grande Odyssee/Travers

The sport in the Nordic countries

Sled dog racing is also very popular in Sweden, Norway and Finland. The most popular dog sport is pulka, in which between one and three dogs pull a loaded sled with a person on skis alongside.

Hunting breeds such as hounds, pointers and setters are preferred, as they are faster over short distances (4-7 miles) and better adapted to working alone.

The Norwegians swept the board at the first European Championship in 1988 on the short distances. They have since bred a cross with even more speed and stamina, the Greyster.

There are some very long-distance races, too, including the Femundlopet in Norway, the Amundsen in Sweden and Norway, the Finnmarkslopet in northern Norway and the Arctic Bahrens, the world's longest sled dog race from Murmansk in Russia to Røros in Norway, a distance of around 2000 miles.

Continental Europe

Dr Thomas Althaus and Paul Nicoud founded the Swiss Nordic Dog Club in 1959. The club held its first race in 1965, allowing the handful of continental European enthusiasts to discover the sport as practised in North America. A winter race programme was soon established in Switzerland (Lenk, Saint-Cergue, Saignelégier, Sils, Saint-Moritz) and Germany (Todtmoos, Bernau). The first race in France was held on the Col de la Schlucht in Vosges in February 1979.

The sport's popularity has grown down the decades, as has the number of races. The ruling body on the continent is the European Sled Dog Racing Association. ESDRA organises annual championships in Europe.

The Trail Club of Europe was formed in 1973, based on the rules established in the International Sled Dog Racing Association in the United States. It organises the Swiss championship and a European championship in Germany.

The Alpirod-Royal Canin was the biggest European race between 1988 and 1995. It was the first time Alaskan Huskies had raced through Italy, France, Germany, Switzerland and Austria. The 600-mile race was spread



© JillyFoto



“The Alpirod-Royal Canin was the biggest European race between 1988 and 1995. It was the first time Alaskan Huskies had raced through Italy, France, Germany, Switzerland and Austria. The 600-mile race was spread over 12 days in January and February.”

over 12 days in January and February. Winners included Joe Runyan, Kathy Swenson and Roxy Wright.

The first annual world speed championships, combining pulka and sled dog racing, with teams of six, eight and ten dogs, were held by the International Federation for Sled Dog Sport in Saint Moritz in 1990.

Pulka and sled dog racing are now firmly established canine sports on the international stage. Pressure has been steadily building for inclusion in the Winter Olympics. Sled dog racing was unable to break through after its appearance as a demonstration sport at the 1932 Winter Games, but more recent demonstrations suggest that it may yet win a place among the Olympian disciplines.

Elsewhere in Europe, the Pirena – a race made up of stages of between about 10 and 20 miles – is held in the Spanish Pyrenees. The Alpentrail runs along some of the old Alpirod course in the Tyrol in both Austria and Italy. Stages are between 20 and 30 miles long.

The most impressive – and difficult – of them all is the Grande Odyssée – Savoie Mont-Blanc, which was first run in the French Alps in 2005. The race, which is held in January, covers well over 600 miles (1,000 km) in ten stages, passing through some of the most breathtaking winter scenery France has to offer, including the Portes du Soleil, Megève and Haute Maurienne Vanoise. There are more than 25,000 m (82,000 ft) of elevation changes during this race.





© Royal Canin

Alaskan Huskies: the world's best-performing dog

Distinctive characteristics: Alaskan Huskies are not like any other dog. They have been bred for over a century for their sporting qualities.

Origins: Alaskans are a cross between Siberian Huskies, native dogs and a few other working breeds. They have become the world's best-performing sled dog.

Physique: Their compact size (16-24kg /35-50lbs) ensures they can cover huge distances through the snow. They are robust and hardy, rarely suffering from illness.

Did you know? Alaskan Huskies currently make up around 90% of the world's sled dog population. Each dog is specialised in a particular distance class. Alaska and Canada are home to the largest Alaskan Husky breeding kennels.

Why is carting good for dogs?

It's not just for Nordic breeds; carting is open to all dogs with the right morphology and in good health. It doesn't even require snow.

It's an activity which enables dogs to expend their energy, while learning to manage their efforts. It also demands discipline and a great deal of care. Measures need to be taken to protect handlers, dogs and any passengers, but they should never prevent the dogs – especially the lead dog – from showing initiative by choosing the best routes, anticipating difficulties and controlling the pace.

For me, it's one of the few activities where dogs work with the handler, rather than for the handler. The result is a strong bond that matures over time.

I'll never be more than a Sunday musher with my cart and my two Australian Shepherds, not working in snow, but Aladin and Cooper couldn't care less. They don't mind that sheepdogs never run the Grande Odyssee or the Iditarod. They are courageous, steadfast and reliable, and they are clearly happy.

Carting is first and foremost about enjoying walks in the forest, the first feeling of gliding, commanding a small family cart, the management of effort, and especially the sense of freedom.

Freedom with strings, because the dogs have to follow commands, even when the cart is small. All told, it's an extremely pleasurable team activity, which also has the advantage of channelling the exuberant energy of these two very active dogs.

Colonel Pierre Esnault
French Army
(France)





A close-knit team

Mushers and their dog form a very close-knit team. Sled dog racing is the only sport in the world in which the same level of effort is expected from human and dog. Mushers have to help their dogs to pull the sled on uphill sections. Downhill, they have to manoeuvre the sled to negotiate bends at high speed (often more than 25 mph / 40km/h). Even on the flat, mushers are expected to pay their way by pedalling through the snow to help their dogs.

Their master's voice

Sled dogs only respond to the musher's commands, so he or she has to build a solid relationship with them, especially the pack leaders. The goal is to get to the finish line as fast as possible and so everything depends on the desire of the dogs. While all dogs love to run, the trick is to get them to try to surpass themselves.

Total teamwork

Obedience is not the only factor in sled dog racing. The success garnered by women in the sport shows that other qualities such as gentleness are just as important. Sled dog racing is about total teamwork, based on encouragement rather than coercion. When asked, the majority of mushers will tell you that they feel happiest when they form a strong team with their dogs.

Sled dog racing elsewhere in the world

Nowadays races are held around the world. In South America, there are races in Tierra del Fuego and in the Andes (Ushuaia race, Andirod). Argentina hosted the first intercontinental championships in 2009.

Australia and South Africa hold their own races on dirt tracks, while Lesotho has held a race on snow. The Chukotka and the Kamchadal are two Russian races in eastern Siberia.

“Pulka and sled dog racing are now firmly established canine sports on the international stage”.

Andy

Rick Swenson's son Andy is named after Rick's all-time favourite lead dog, which helped him win his first three Iditarod titles between 1977 and 1981.

There was no money at all in the sport in the 1970s, but Rick Swenson was driven to compete because of his love of dogs. Back then, regular dogs could still make their mark in sled dog racing, which only makes Rick's achievements even more outstanding. Of course, he was able to build on the dog's natural motivation and desire to run, but having said that, it is much easier to achieve a top-class performance with dogs from established racing lines and Andy certainly was not one of them. He was simply an extraordinary sled dog who won the utmost respect of one of the world's greatest mushers.



Andy and Rick Swenson.



Granite and Susan Butcher.

Granite

Susan Butcher always acknowledged that her lead dog Granite was instrumental in her four Iditarod victories between 1986 and 1990. She admitted that Granite had plenty of faults. As a puppy, Granite was afraid of his own shadow, never mind other dogs and

let alone the sled itself, refusing to pull his

own weight. Susan even tried to give the dog away but there were no takers. Eventually, she took Granite with her on a training session on an ice field on the final part of the Iditarod course between Koyuk and Elim – and could scarcely believe what happened next. Granite suddenly blossomed into a great leader, able to drive the team through a blizzard, and never looked back, becoming one of the sport's biggest stars.

Togo and Balto

Two dogs – Balto and Togo – share the honour of both having a statue in their name. Balto's is in Central Park in New York, while Togo's stands in Anchorage, Alaska. Both were heroes of Leonhard Seppala's team on the famous serum run in the winter of 1925, when a diphtheria epidemic threatened the town of Nome on the west coast.

Ten-year-old Togo led Seppala's sled for 340 miles through a storm, an amazing feat in itself, and compounded by the fact that Toga was suffering a fracture that would leave him limping for the rest of his life.

After his death in December 1929, Togo's body was exhibited at Yale University's Peabody Museum, and then subsequently moved to the Iditarod Museum in Wasilla.

Balto gained global fame after the story was made into an animated movie by Walt Disney. In fact, Balto only covered 50 miles – no mean feat, but not quite in the same league as Togo's.



© Vété des Neiges

Ski pulka and skijoring

As already mentioned, ski pulka is a sport developed in Nordic Europe at the beginning of the 20th century in which one or more dogs pull a loaded sled, while the human follows on skis.

Pulka is a demanding sport that requires great skiing skills and a high degree of athleticism from dogs and humans alike. Along with skijoring, in which the person is directly connected to the dogs by a rope or harness, it is surely the most complete sled dog sport there is, demanding perfect teamwork.

These sports have their own national and international championships, held alongside the sled dog championships, but unfortunately they do not get the media attention they deserve, as a much broader public would certainly be interested.



© UMES

Skijoring is a variant of pulka in which one or more dogs are directly attached to the skier.

Canicross and bikejoring

In these disciplines, the human runs or rides a bike hitched to the dog on a natural marked-out course. The goal is to get to the end of the course in the fastest possible time. Human and dog have to work together, although the dog determines

the speed and must always be in front or level with the human. Pulling the dog or running or cycling in front of the dog is not permitted.



© UMES



© UMES

Some special equipment is required for this sport. The dog should wear a comfortable harness, connected with the human by a lead with integrated shock absorber attached to a special belt.

These disciplines are open to all dogs, with or without pedigrees, aged 12 months or over on the day of the race. Dogs must have received some obedience training and be sociable.

Dogs are typically examined by a veterinarian the day before a race to check their identity, health and vaccination status.



© Duhayer/Royal Canin

Agility

Agility has always been the basis of play and leisure pursuits, but it has grown as a sport in its own right over the past thirty years or so. Owners learn to train their dogs, while also strengthening the bond between them. Any dog can participate from a very early age and there are many different types of owner assistance allowed (dogs can learn to follow commands from a distance or the owner can follow the dog at very close quarters). Whatever the style chosen, the owner will have to learn to take up the right position to be able to clearly indicate to the dog where it needs to go next on the course. The dog participates without a lead or collar.

Agility is a sport that was first demonstrated in Britain by John Varley in 1978 as a canine take on showjumping for horses. This new activity quickly became popular and soon spread across Europe, with recognition from 14 countries, and the United States. In the 1990s the sport went to Japan, South America and North Africa.

The FCI imposes a minimum age of 18 months on participants.

There are two types of FCI course:

- * Standard courses containing all types of obstacle, including seesaw and dogwalk.
- * Jumper courses, primarily comprising jumps, but also tunnels and weave poles.

There are four FCI categories, depending on the dog's size:

- * Category A: dogs up to 37 cm at the withers (clearance height 35 cm).

- * Category B: dogs between 37 and 47 cm at the withers (clearance height 45 cm).

- * Category C: dogs over 47 cm at the withers (clearance height 60 cm).

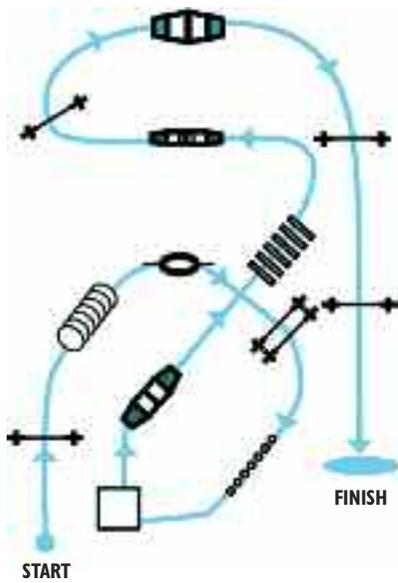
- * Category D: Molosser and slow breeds (Leonberger, Great Dane, Rottweiler) (clearance height 45 cm).

Generally, all dogs are welcome to participate, although some competitions are only open to pedigrees. The course, which is between 100 and 200 metres long, is laid out in a closed arena comprising between fifteen and twenty obstacles, including at least seven jumps. The handler should not touch any obstacles, relying solely on voice and gestures to guide the dog through the course in the right order.

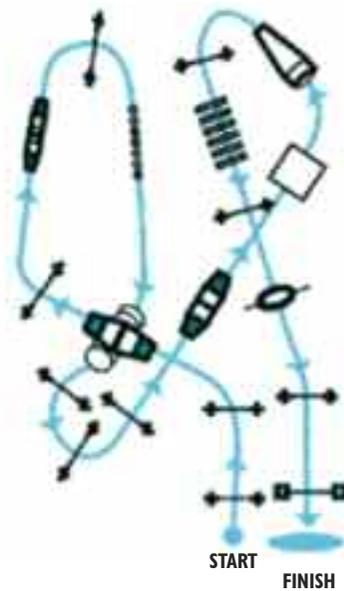


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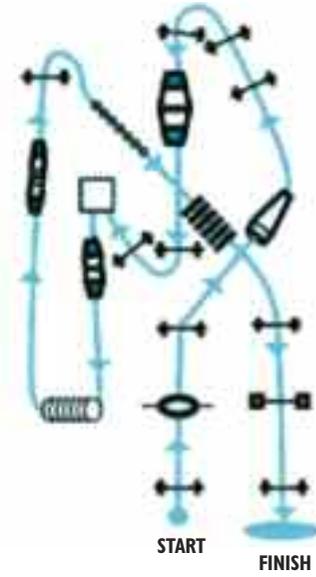
Agility course



Example of an open class agility course.



1st Master France Agility Royal Canin.
Round 1: length 170 m, speed 2.50 m/s, time 68 sec.



2nd Master France Agility Royal Canin.
Round 1: length 200 m, speed 2.70 m/s, time 70 sec.

“Dogs need to undergo thorough training, but this must be based only on play and trust.”

-  Fence
-  Wall or viaduct
-  Tyre
-  Long jump or water jump
-  Table
-  Pause box

-  A-frame
-  Dogwalk
-  Seesaw
-  Slalom
-  Rigid tunnel
-  Collapsed tunnel

There are three competition levels. A pedigree dog that completes a course without any faults on two occasions can move on to the next level. Three “excellent” scores at the highest level is rewarded with an agility certificate.

Faults are given to dogs which take obstacles in the wrong sequence (three faults result in disqualification), in the wrong direction (disqualification) or fail to clear or complete an obstacle. In the event of more than one clean run in a competition, the fastest dog wins. Agility is therefore above all a sport of skill.

Dogs need to undergo thorough training, but this must be based only on play and trust. This makes agility a very attractive sport because it gets not only the dog involved but its owner too, and often children. If the dog feels confident enough it may even be able to complete the course on its own, guided only by the voice of the owner standing in the middle of the course.

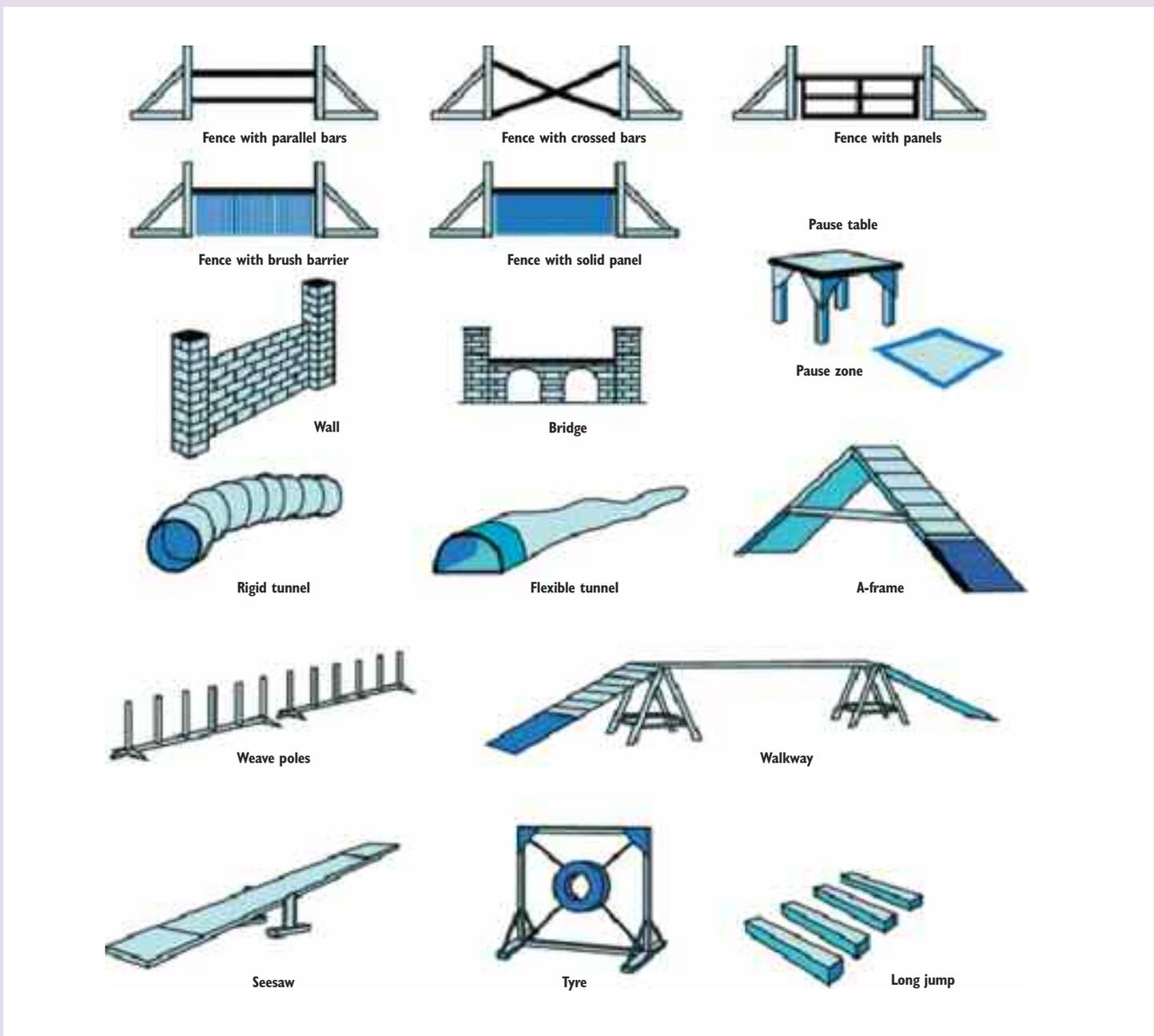
Agility is not only great fun to take part in, it is also very exciting to watch.



©cynoclub/Fotolia

Agility obstacles

- **Tunnel:** a rigid or collapsed tunnel of varying length the dog has to run through while the owner waits by the side.
- **A-frame:** two sloping ramps – the dog has to go up one side and come down the other without jumping.
- **Walkway:** planks placed several feet above the ground; the dog has to run across while the owner waits by the side.
- **Weave poles:** a series of equidistant upright poles the dog has to wind through on its own.
- **Long jump:** several planks of wood placed at regular intervals defining an overall distance, tailored to the participant; the dog is required to clear it in one jump.
- **High jump:** wall or bridge.
- **Tyre:** through which the dog has to jump.
- **Seesaw:** a plank which tips over when the dog passes the midpoint.
- **Pause table:** a table the dog has to jump on and pause for five seconds in its preferred position.
- **Pause box:** a square marked on the ground which the dog must enter and pause in as on the pause table.





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Sheepdog trials

Sheepdog trials were originally started to encourage shepherds to train their dogs. They demand a very high level of obedience from dogs and a strong partnership with the handler. They are great fun to watch, which explains their popularity in the UK and Ireland, as well as the Antipodes, South Africa and the United States. We looked at the basics of sheepdog trials at the start of this chapter.

While there may be minor differences between countries, the basic premise remains the same the world over: one or two dogs herding a group of sheep under the supervision of a single shepherd. Dogs are responsible for three to six sheep, which they must steer through a gate into a pen before shedding two sheep, within a specified time limit. This is very difficult, because of the small size of the flock.

Dogs may also work in tandem with two flocks of ten sheep each. Each dog is responsible for one of the flocks. The dogs

have to herd 'their' sheep along the course and into separate pens without allowing them to form a larger group, which they are naturally inclined to do.

In some trials, dogs are required to herd a larger flock (120-150 sheep) into a pen, get them to pass through a narrow opening, cross a road with traffic and pass through arable land around 400 metres in length. Courses are specially designed to mirror natural working conditions. As with other trials, there are three classes of increasing difficulty. Professional shepherds, sheep

breeders and enthusiastic amateurs may supervise the dogs, which must be at least one year old.

The mission of the International Sheep Dog Society, which was founded in 1906, is to encourage the breeding and training of sheepdogs. Each national society is responsible for the official trial regulations and for certifying working dogs and champions.

Yard dog trials

Australian yard dog trials are a highly technical take on sheepdog trials in which one or more dogs have to show great skill to separate and drive sheep through a series of yards and runs into a pen. Australian Shepherd Dogs, Border Collies and Kelpies are the best of the breeds in this very popular sport.



Field trials

Field trials are very popular events for gundogs, especially in the UK where they were first held in 1865 before being adopted on the continent around 20 years later. They are open to all gundogs registered in a stud book recognised by the FCI and certified as working dogs.



Depending on the exercise, there are three types of field trials, which test different qualities:

- Spring trials, the toughest, are held in flat open country, with wild grey and red-legged partridges as quarry.
- Summer trials are held on hunting grounds with arable land and hiding places for quarry, with game birds as quarry. Dogs are scored according to their behaviour after the shot is fired. Some breed clubs organise field trials at altitude with grouse, capercaillie or rock partridge.

- Autumn trials, mostly using pheasant, in which dogs are scored according to their behaviour before and after the shot is fired. Dogs must retrieve the downed bird.

The purpose of field trials is to improve the standard of gundogs by showing the best of each breed and awarding them the title of trialer.

Dogs have fifteen minutes to show off their gundog qualities. They must explore the territory assigned to them with their head high, looping each side of the handler. Each of these passes must be at a distance equiv-

alent to what the judges call “shooting range”. The search range on either side of the handler varies with the inherent search range of the breed.

Continental breeds (pointers, spaniels, griffons) are not judged in the same trials as English breeds (setters, pointers). Continental breeds always work on their own, whereas English breeds work alone or in tandem. Some English breed dogs of very high standard may participate in the FCI's *Grande Quête* field trials. These are exceptionally tough trials for dogs with a very good temperament. They could be described as speed races with loops up to almost 100 metres. Dogs always participate in twos and must have a powerful nose and be in exceptional physical condition.

The *Quête à la Française* is not quite so tough. It is similar to a spring trial, with four categories: English single, English brace, Continental single and Continental brace.





In all categories, the dogs are scored on their speed, training level, sense of smell, passion for the hunt, search range, head carriage and style by judges following a very precise scoring system. There are five faults which lead to immediate disqualification: unsatisfactory overall quality; straying from the handler and disobeying the command to return; pursuing game regardless of whether it has been marked; exaggerated fear when the gun goes off; and flushing game by chance without realising.

In all these trials, dogs are awarded working certificates for good work. The FCI's highest certificate is the CACIT, an international working championship certificate.

So an activity as ancient and natural as hunting has given birth to an increasingly popular sport with local, national and even world championships organised by the FCI.

Truffle hunting

Truffle-hunting competitions have been held in France since 1969. In these competitions, dogs have to find the location of six truffles over a 25-square-metre area as fast as possible, marking the location by pawing the ground. Two hundred points are up for grabs in the competition, with penalties for not finding all six truffles and marking the same location twice. Dogs which eat the truffles are disqualified.



Truffle-hunting competitions are split into two classes. Class A is open to debutants – those which have not participated in more than three successive competitions. Here, the handler is permitted to accompany the leashed dog in the search area. Class B is open to more experienced dogs. Here, the handler is not permitted to enter the search area except to dig up the truffle, which is handed to the judge before the dog moves on to the next location. Training is the same for both classes, although dogs in class B competitions are not supposed to scratch the ground as much or leave the search area.

Greyhound racing

Greyhound racing is almost certainly one of the oldest canine sports. The first greyhounds are described in the fourth century BC. Arrian wrote about hunting competitions using live game in the first century AD in his cynegeticus, *On Coursing*. The Celts continued this tradition.

Races after game and at specially designed dog tracks began to be held at the end of the 19th century. A horserace track in Hendon, London hosted the first recorded dog race in 1876 over 360 metres. The sport also took off in the United States, after the first dog track was opened in Tucson, Arizona in 1909.

Races drew huge crowds in the 1930s and some dogs became legends, not least Mick the Miller, a dog that clocked up 19 consecutive victories at one point, winning the English Greyhound Derby in 1929 and 1930.

The setup is a simple one. Six to eight dogs are released from their starting box and chase after an artificial hare over an oval sand or grass track. Distances vary between 250 and 800 metres, depending on the stadium and the dog. The sport owes its popularity to short races and the possibility of betting large sums of money.

Dog races for betting purposes are held in the UK, Ireland, some of the United States, Australia and New Zealand, as well as some other countries on a smaller scale. In some countries on the continent betting on dog racing is illegal, which is one reason why the sport is not so well developed there. There are also cultural differences, of course.



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A Research Centre for Racing Dogs

Greyhound racing is one of Florida's main cultural activities. These unique canine athletes, able to cover a 480-metre (1,575 feet) course in twenty-five seconds at speeds exceeding 70 kilometres (44 miles) per hour, require a very specialized approach to their preparation (training and nutrition) and medical care (true sports medicine). This approach involves concepts new to the everyday veterinarian. In the spirit of progress, the University of Florida in Gainesville recently established the Research Centre for Canine Sports Medicine, focused entirely on the Greyhound. This centre has its own training course for the practical observation of problems specific to the breed.

*Professor Mark Bloomberg,
University of Florida, Gainesville
(USA).*

Dog racing is a very professional sport, just like horse racing, with dedicated breeders, trainers and race clubs. Specialised sports medicine has been developed, including anti-doping controls, training and nutrition. The dogs receive special treatment, including stays at training centres and specialised clinics.

In Britain 20,000 Greyhound births are registered every year and annual attendances at races top 3 million spectators (Sittingbourne Greyhound track can accommodate 4,750 spectators in its main arena at Central Park Stadium). In the USA, champions can win anything up to \$125,000 depending on the race. The best dogs are able to reach speeds of around 45 mph ahead of the first bend, covering 525 yards in just 25 seconds.

Other breeds which are raced for money include Whippets, Italian Greyhounds, Borzois, Afghan Hounds, Salukis and Sloughis.

In the major dog racing countries, there are numerous charities which try to rehome Greyhounds, whether a success on the track or not, although it can be an uphill struggle.

The natural variant of dog racing – coursing – was a sport once popular with the nobility in Britain. In coursing, Greyhounds are set on a live hare, while a judge on horseback compares their skill and speed. Nowadays a decoy is used instead of a live hare. The Hunting Act of 2004 in England and Wales and a similar law in Scotland made it illegal to course hares.

Both of these sports draw on the hunting instinct. Dogs have to be intelligent, because they need to anticipate what is likely to happen and take up the right position in relation to other participants. In coursing, agility and the ability to take acute corners are most important, while racing is primarily based on pure speed.



Search and rescue trials

While search and rescue dogs are first and foremost used in life-saving operations, the International Rescue Dog Organisation has also organised a world championship in various disciplines, including area and rubble searches, tracking and water rescue.



All competing dogs must complete two common test series:

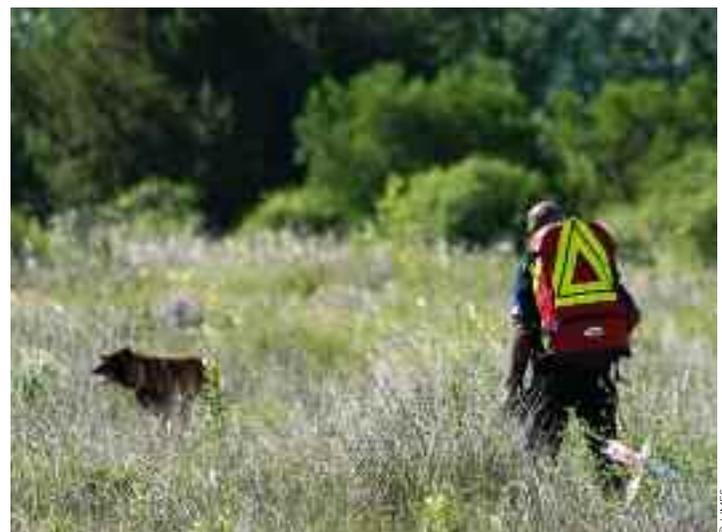
- Obedience: including heeling on and off lead, adopting positions on command, standing still, retrieving, sociability with strangers and sending out.
- Dexterity: dealing with a series of unstable obstacles simulating real-life situations, such as tunnels, jumps and horizontal ladders.

Each team is judged on its performance in its preferred operational discipline:

- Searching for people under rubble: five people need to be found within forty minutes.
- Searching for missing persons without scent: five people lost in woods or injured must be found within forty minutes.
- Searching for missing persons with scent: the dog must follow a trail and find five objects dropped by the victim and then find the victim.

- Water rescue.

This competitive side to a highly professionalised discipline (search and rescue dogs are most often trained and used by police, military, emergency services and mountain rescue teams) brings together teams from about fifteen countries every year, enabling them to share their training methods. Obviously, success in competition does not guarantee success in real-life situations.



Disc dog sport

Disc dog competitions are another fun-based but physically demanding sport for dogs.



The origins of this sport go back to 1871 when the Frisbie Pie Company started selling pies in round, flat pie tins in the USA. Young people soon found out that they could throw the tins in various trajectories as they became more skilled. In 1948 Walter Morrison had the idea of developing a flying disc in Bakelite, which he called the Pluto Platter (this later became the Frisbee). The first world championships were held in Pasadena, California in 1967 and the pastime soon spread around the world.

Given the dog's natural aptitude for catching just about anything in its jaws, it was only a matter of time before canines started to play with these flying discs. The first demonstrations were held in the 1960s, followed by official competitions, mainly in the English-speaking world. In the United States the sport's popularity exploded after a student gave a demonstration with his dog on live TV during a baseball game.

The rules are fairly simple. The handler throws a standardised disc, which cannot veer more than five metres left or right as it travels out to the dog standing a given distance away. The dog has to catch the disc and return it to the handler as quickly as possible. Encouraged by the handler, a dog will often demonstrate incredible feats of acrobatics. Freestyle competitions based on technique and showmanship are also common.

Disc dog competitions comprise various disciplines:

- **Toss and fetch** (short distance) is played on a grass field measuring twenty metres wide and fifty metres long. The handler tosses the disc from behind a throwing line and the dog must catch it and return it to the handler behind the line as quickly as possible. Performance is scored according to the length of the throw, how the dog catches the disc (on the ground or in the air) and how many times the dog returns the disc in a given period of time (generally 60 seconds). The distances are reduced for small dogs and young handlers.
- **Circle** is based on the same concept, although this time the playing field is marked as a series of concentric circles, with the handler in the middle.
- In **freestyle** the handler and dog are expected to execute a number of special moves in a given time frame (generally between 90 and 180 seconds) using one or more discs. The judge is most concerned with technical criteria (obligatory moves), taking into account the level of difficulty, coherence, creativity and the number and quality of toss and fetches. Musical accompaniment, accessories or special costumes are common in freestyle competitions.

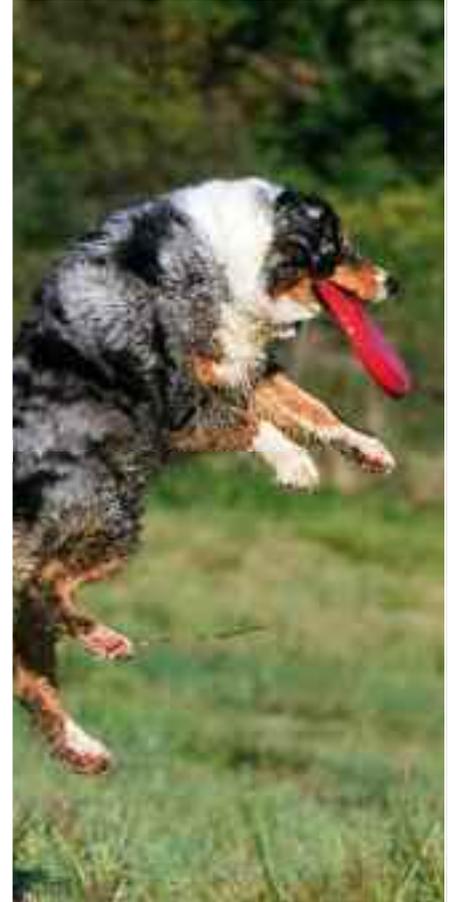
- In **long distance** competitions, which are very popular in Florida, participants are ranked according to the farthest distance the disc travels through the air in three attempts within 90 seconds. The world record currently stands at 97.90 metres. The women's record is 56.16 metres. The judge awards a certain number of points depending on where the dog catches the disc. An extra half point is awarded if the dog catches the disc in mid air. A bonus zone is also marked out.

The great thing about disc dog competitions is that they are open to dogs and humans of any age, as well as people with a disability who compete with everyone else, which is not always the case in other sports. The best performing dogs tend to be Border Collies, Tervuren and Malinois Belgian Sheepdogs and Australian Shepherd Dogs. To avoid orthopaedic problems, participation should be delayed until the dog has completed its growth stage.

Disc dog competitions are a great way to have fun, expend energy and pit yourself against others without becoming too competitive. Provided the dog is not more interested in eating the disc than fetching it, of course!



“*Encouraged by the handler, a dog will often demonstrate incredible feats of acrobatics”.***”**





The hard part is teaching the dog to press the pad to release the ball.

A sport for fun: flyball

Flyball is a great way for owners to have fun with their dog while ensuring it gets lots of exercise. It works in a similar way to disc dog sports.

The game is played on two parallel courses by two teams of four dogs or more. Each team must comprise at least two different breeds of dog. The course is made up of four hurdles, which have to be cleared as fast as possible. The height of the hurdles is tailored to the size of the smallest dog in the team. At the far end of the course the dog has to operate a spring-loaded pad, which releases a tennis ball around 60 centimetres into the air. The dog has to catch the ball and bring it back to the start. The second dog then does the same. The best dogs can

complete the course in less than 20 seconds. The team that completes the relay in the fastest time wins.

This sport is open to all dogs and humans, including less sprightly people, as the dog is the one that actually runs the course. It is a simple sport that requires little training, because the dog is motivated by its desire to play with the ball.

Flyball can be practiced as a simple leisure pursuit or as fully regulated competitive

sport. Dogs younger than 18 months, females on heat, dogs with injuries or in rehab and aggressive dogs are not well suited to tournament flyball.

Participants in FCI competitions must hold a flyball pass issued by the judge, proving that the dog has completed the course at least once in three attempts.

Flyball is a fun and motivating sport for dogs and humans which helps dogs expend their energy in an enjoyable way.

Carting

Dogs have been used to pull carts and loads for millennia. This practice has been banned in most of the world during the past century, although it has survived in traditional events and occasions.

In 1990 a modern carting project was launched in France as a fulfilling sport for large, heavy dogs.

Carting is an exercise in manoeuvrability which demands attentiveness, precision and teamwork between handler and dog. Any dog aged at least 12 months and standing at least 50 centimetres at the withers can take part. Dogs usually work alone although they may also work as pairs.

The carting certificate awarded from 12 months of age proves that both handler and dog have the training to participate in competitions, which they can do from 15 months. These comprise three components:



Carting dogs were formerly used by tradespeople to transport goods to market.

- Evenness: 20-30 minutes on a natural surface. Each handler has to estimate how long the dog will need to complete the course based on difficulty, which requires a solid understanding of the dog's capacities for adaptation and initiative.

- Obstacles: 15 in all (slalom, tunnel, slope, seesaw, narrow passage, footbath), which requires precision work and manoeuvrability.

- Harmony: a non-scoring component that puts the sport in its historical context (handler costumes and cargoes represent a traditional line of work).

Special equipment is required. The cart must have four wheels and it must weigh around 15 kg. The shafts must be able to move vertically and horizontally so that the dog can stand or sit. The harness must be comfortable and the chest strap must be at least four centimetres wide. Bearing in mind that abuse and maltreatment led to the original banning of carting for profit, the total weight of cart and load must never exceed the weight of the dog.

This fun new sporting activity is making quite a splash, as a great way to tone up larger dogs that were originally bred to perform hard work.



Dog pulling is a popular sport in the United States.

Dog pulling

The International Weight Pull Association was founded in 1984. It approves competitions open to all dogs including purebreds and mongrels. Dog pulling is especially popular in some parts of the United States.

As the name suggests, dogs have to pull loads of increasing heaviness over a short distance (16 ft) in 45 seconds. Noteworthy competitors include a Malamute which pulled a load of 1497 kg (3300 lbs) over a concrete surface and an Irish Wolfhound which pulled 1293 kg (2850 lbs) over snow. Events are held on all types of surface.

Dog pulling demands some special equipment. The harness is specially designed to distribute the strain over a large area of the dog's chest. Its diagonal shape and tension rails, which continue along the body of the dog to the tail, reduce the risk of injury. The padded V collar maintains the tension downwards, ensuring the dog's breathing is not encumbered by pressure on the throat.

The best participants are sled dogs and molosser-types, such as the American Staffordshire Terrier, which are particularly good at pulling heavy loads due to their powerful muscles.

Dog pulling is mostly practised in the United States and Canada.

Preparing sporting and working dogs



© Hermine/Royal Canin

Dogs have worked with humans for millennia. To begin with, they helped with everyday tasks, but gradually they started to take on the role of friends and playmates, so that over the past two hundred years or so they have become fully-fledged leisure companions. Step by step, we humans have become involved in the day-to-day life of our dogs. We have sought to improve their selective breeding, to raise and train them better and to give them the best possible diet so that they can live a richer, fuller life with us.

Once simply hunters, guard or draught animals working to their instincts, dogs now take part in field trials, sled pulling, sheepdog trials and other regulated sports. Leisure has become sport and our companions have become athletes.

Performance in dog sports is determined by four factors: genetic selection, the psychological relationship between dog and human, training (based on knowledge of the physiological characteristics of effort) and nutrition. Each of them must be given due consideration.

Working dogs are athletes, too, of course. As such, they demand proper physical training and preparation.

The physiology of physical effort

Intense work and competition cause physical and psychological stress. General knowledge of the physiological changes produced by physical effort can help owners and handlers to understand their dogs and thus better train and prepare them for competition or work, preventing any pathological conditions which might arise.

Cardiovascular and respiratory changes

During effort, changes in the cardiovascular and respiratory systems occur to ensure the provision of oxygen and nutrients to the muscles and the removal of waste – especially carbon dioxide and heat – produced by muscle metabolism. These changes are absolutely necessary not only in the course of completing a work task or sporting endeavour, but also afterwards. The body responds to effort in two ways:

- There is a direct response adapted to the body's immediate needs, occurring concomitantly with effort.
- There is a longer-term response which anticipates the body's needs linked to adaptations produced by training.

During physical exercise

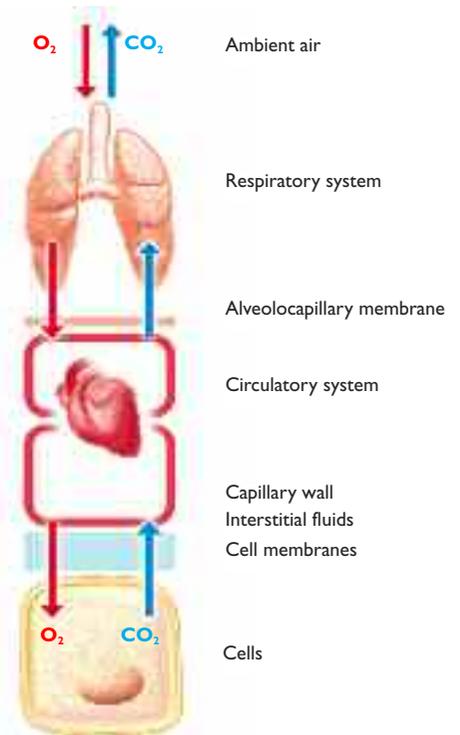
Changes to the circulatory system during effort play an essential role in increasing blood flow and consequently the provision of oxygen to the tissues with increased metabolism, especially muscles. The body does this by increasing the cardiac output and directing more blood to active areas. The blood's capacity to carry oxygen is also increased by the contraction of the spleen, which releases a large number of red blood cells into the blood, increasing the haematocrit (the ratio of red blood cells to the total volume of the blood) and the quantity of haemoglobin (a chemical pigment in the red blood cells responsible for transporting oxygen).

Cardiac output can increase considerably – up to ten times the resting level – which significantly increases the heart rate.

Depending on the intensity of the effort, it can rise to 300 beats per minute in a racing dog and 200 in a sled dog. The blood vessels in the muscles that are working dilate to a very high degree so that blood flow can increase. Minute respiratory volume – the total amount of new air moved into the respiratory passages each minute – also increases in various stages during effort:

- Ventilation increases sharply during the first three or four seconds.
- This is followed a few seconds later by a second, slower, increase.
- The curve then levels off, which continues until the end of the effort.
- During recovery, the breathing rate falls slowly from over 300 to about 30 breaths per minute in just a few minutes.

The gas exchange system





© Labatt/Royal Canin

In Greyhounds, six months intense daily training leads to a 50% increase in the thickness of the heart wall and a 30% increase in the volume of the left ventricle.

Effect of training

After four to five weeks daily training, the dog's cardiovascular and respiratory systems will have undergone significant changes. Changes to the heart and circulatory system due to repeated physical exercise tend to minimise the energy the heart needs to work, as well as improving the heart's pumping capacities. Properly trained dogs have a lower resting heart rate than sedentary dogs and their respiratory arrhythmia is more pronounced. Their plasma volume is higher and they have better venous blood return, which increases overall cardiac output.

Intensive training sometimes leads to enlargement of the heart muscle (often seen in sled dogs). Training will also cause an increase in the number and density of muscle capillaries. Contrary to what many people think, regular physical exercise produces very little if any change in the respiratory system in healthy dogs. It is the body's overall ability to consume oxygen (VO_2 max or maximum oxygen consumption) that is significantly increased by endurance training.

These changes can occur optimally only in generally healthy individuals. Any alteration or failure of these functions will curb the dog's ability to adapt to physical effort, and so limit its sporting or working performance.

Consequences of biological stress during effort

In sporting dogs, stress induced by environmental conditions or physical effort causes behavioural changes (barking, lack of drive), changes to the autonomic nervous system (salivation, tachycardia, mydriasis), digestive problems (vomiting, diarrhoea, gastric ulcers) and anaemia (there's even such a thing as sports anaemia). Many of these outward signs reported by dog handlers during intense work or sporting competition are due to a physiopathological process, but they can be prevented with the right training.

Overtraining is often the leading cause of such changes, but it is important to acknowledge that, at the psychological level, dogs can very easily differentiate between



© Duhaier/Royal Canin



© Bouchu/Cogis

Origins of stress in sports dogs



training situations and competition or proper work. Generally speaking, stressful situations often cause anxiety in animals, which is expressed in species-characteristic behaviour. In dogs, anxiety and fear is expressed in well-known responses, such as repeated bowel and bladder evacuation, barking and howling and other stereotypical repetitive behaviour, such as biting objects and digging.

For these reasons, reactions of a behavioural, autonomic, digestive or other nature can be regarded as stress-induced. Clearly, in the

context of physical tests, which often place high demands on the metabolism, digestive disorders (stress diarrhoea, for instance) are among the most harmful in physical terms, especially in combination with loss of water and electrolytes or insufficient water and food intake.

An appropriate training programme, a calm psychological environment and the right type of food are key to the prevention of problems due to physical stress or over-training.

Energetics of effort

The chemical energy used in muscle contraction comes only from the high-energy phosphate bonds in a fundamental molecule known as adenosine triphosphate (ATP). The ATP concentration in the muscle cells must be immediately replenished as it falls during muscular effort so that the dog can sustain its exertions. Three

“Cardiac output can increase considerably – up to ten times the resting level – which significantly increases the heart rate.”

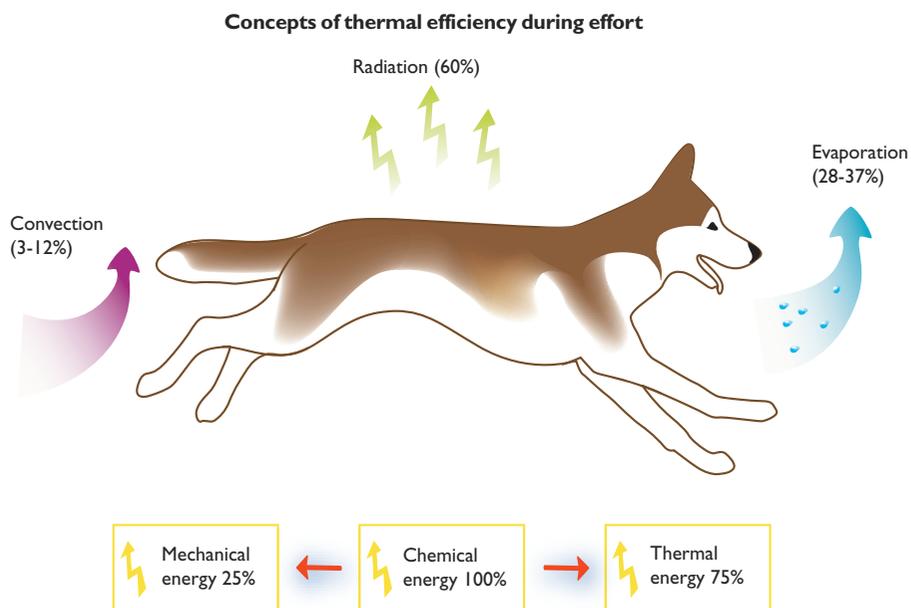
processes achieve this. The role and relative importance of each process depends on the type of effort required.

Anaerobic mode without lactic acid production: During very brief, very intense effort (lasting a few seconds), ATP is replenished from muscle phosphocreatine reserves, without the need for oxygen (anaerobic) and without the production of lactic acid.

Anaerobic mode with lactic acid production: During intense efforts lasting at least two minutes (racing, agility), the energy is replenished from glycogen stored in the muscle and blood glucose. Again, no oxygen is consumed, although this time lactic acid, a waste product of metabolism, is produced. In very general terms, it is often the accumulation of lactic acid that causes muscle fatigue and cramps.

Aerobic mode: This metabolic process covers the energy requirements of the dog when sustained effort is required (effort of relatively low intensity but lasting between several minutes and several hours). Initially, blood glucose is oxidised by the oxygen provided to the muscle in the red blood cells, but, unlike in humans, fats very quickly become the preferred energy source in dogs.

Without going into too much detail, it should be noted that proper training and nutrition is reliant on knowledge of these specific metabolic processes.



Relative intensity of different metabolic energy pathways during effort in dogs			
Type of sport	Anaerobic no lactic acid	Anaerobic with lactic acid	Aerobic
Jumping	+++	+	0
Brief attack	++	++	+
Racing	+	+++++	++
Agility	0	++++	++
Ring	0	+++	+++
Field trial	0	++	+++
Newfoundland	0	+	++++
Tracking/countryside	0	0	++++
Herding	0	0	+++
Hunting	0	0	++++
Sled pulling	0	0*	+++++

* Except sprints: + to ++



©Photos: PassierFoto/la

Genetic selection of sporting dogs

Unlike other large domestic animal species, dogs have not yet been touched by the revolution in breeding methods and techniques. This is mainly because the socioeconomic status of the dog is fundamentally different to that of commercial livestock in industrialised countries. This has determined the main genetic orientation of dogs, characterised by intentional morphological diversity and primarily based on aesthetic considerations. However, selective breeding has also produced certain physical aptitudes and behaviours, leading to genetic divergence between beauty and utility. The result is the variety of working breeds and, subsequently, sporting breeds.

The importance of success

Breeding stock is still primarily selected on the basis of working performance. For geneticists, the goal is to compare the genetic potential that different candidates can pass on to offspring (added genetic values) by studying their observable characteristics (phenotype). This can only be done on the basis of sporting trials with very specific rules. Having said that, without wishing to underestimate the skills and experience of expert breeders, dogs cannot yet be ranked within a breed based on their genetic value. This means that selecting the best sporting dogs for breeding is still not an exact science and is most often based on observation and experience.

Consequently, there is still a great deal of work to be done to develop effective tools for the genetic selection of sporting, working and service dogs. In a direct selection process (to improve a particular trait), the first problem is the frequent difficulty of measuring sporting performance correctly (or objectively), accurately and reliably (reproducibility).

A Greyhound time trial is an ideal opportunity, with the use of two selection parameters:

- The best time achieved in the various races at a meet.
- The average time in these races.

In Ring, the choice of parameters is even greater:

- The dog can be graded based on the judge's scale or some other scale.
- Ranking.
- Extra points based on the level of the competition and performance (this system is used for horses).

Indirect selective breeding criteria (which impact performance) can also be used. These could be performance tests in standardised conditions or the length of a Greyhound's leg, given that it is positively correlated with speed, and even the behaviour of the angulations between the bone segments during the trial.

The current approach is oriented to a genetic selection index based on several performances by the dog, which undergo sophisticated mathematical analysis. The first results have been obtained for racing Whippets and Malinois Belgian Sheepdogs taking part in the Ring discipline. They will enable the future adaptation of modern genetic methods to sporting dogs.



© UMES

“Dogs cannot yet be ranked within a breed based on their genetic value.”



Training sporting dogs

Bearing in mind that we speak in terms of canine sports and that some dogs behave like regular athletes, training dogs for sport is the natural next step. Human athletes need to follow specific physical training programmes tailored to their sport and standard and, clearly, dogs need to do the same if they are to perform well and be healthy and happy.

“*Anaerobic power allows the muscles to work intensively without oxygen, as in sprinting, racing, the attack segment in Ring.*”

Basic principles of training

Training entails the physical, technical, tactical, intellectual and psychological preparation of an athlete by means of physical exercises. In terms of dogs, training is about putting the dog through a set of physical exercises in a playful way to keep the dog motivated.

Workload

The concept of workload is fundamental. It should be long enough and of sufficient intensity for it to be qualified as training, increasing as the performance improves, without becoming so demanding or tedious that the dog loses its motivation.

Characteristics of the workload

The workload should be applied gradually, especially at the beginning (some steps may be accelerated if the animal is already used to training), and continuously (sessions need to be regular if they are to be effective).

The workload should vary with time. It will not be possible for a dog to maintain the same level of fitness throughout the year, so preparation, competition and training periods are distinguished.

The content of the workload should also vary. Several different physical demands are made on the dog within a single sport (power, speed, endurance, coordination for example). The dog needs to adapt physically to all of these demands in a different way and the recovery period will also be different for each. A dog is perfectly capable of undertaking one type of effort while recovering from another type of effort. This actually maximises the dog's potential as well as saving time and improving performance. So a dog recovering from a run has no problems doing a different type of exercise, such as muscle stretching, for instance.

The workload sequence does need to follow a precise order in a single session. Exercises demanding explosive strength, speed and coordination are generally scheduled early in the session, followed by exercises based on incomplete recovery and finally endurance exercises.



Training methods

Training muscle strength

Work and muscle strength can be increased during very intense, very short bursts of effort followed by short recovery periods without increasing oxygen consumption or triggering anaerobic catabolism (lactic fermentation). This is the principle on which all pure strength exercises are based. The best example is dog pulling. This can be adapted to each individual dog by letting it pull a tyre, which is something all dogs love to do.

Training anaerobic power

Anaerobic power allows the muscles to work intensively without oxygen, as in sprinting (racing, the attack segment in Ring). In practice, it is developed by alternating very short, intense sprints (between ten seconds and a minute) and recovery periods (two to four minutes). This type of training is very physically and psychologically demanding and should only be scheduled just ahead of a competition. One useful exercise is to get the dog to run the length of a football pitch and back by placing a person at each end to encourage it.

Training aerobic power

Aerobic power is used for long a period of effort requiring the improved use and transport of oxygen. It is the type of effort demanded of scenthounds and sled dogs, or



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indeed any dog that needs to sustain an effort for more than 20-30 seconds. Long-distance running at moderate pace or a series of short runs (3-5 minutes) at a slightly faster pace followed by periods of light exercise (walking or trotting) are recommended to increase aerobic power.

The dog's experience and alertness are the best indicators of how effective the training programme is.

Training and competition

Warm-up

All athletes warm up before a competition to activate their enzyme and oxygenation systems (which will provide the energy they need) and reduce the reaction time for muscle contraction.

For dogs, the warm-up can comprise muscle stretching and flexing, followed by a game to stimulate the dog's muscles and get it motivated. If the warm-up is done properly, it will improve the dog's neuromuscular coordination, prevent muscle tears and contraction, and ensure it begins the competition in optimal physiological and psychological condition.

Warm-down

The dog always needs to be warmed down after a competition or a period of work. This helps ensure success in future competitions, among other things. A series of very light exercises will keep the blood circulation in the muscles at a high enough rate to get rid of waste accumulated during effort (lactic acid, toxins). A light massage also helps eliminate toxins and calm the animal down. As a consequence, it will suffer from much less muscle fatigue and aches, and will be physically and mentally fitter for future events.

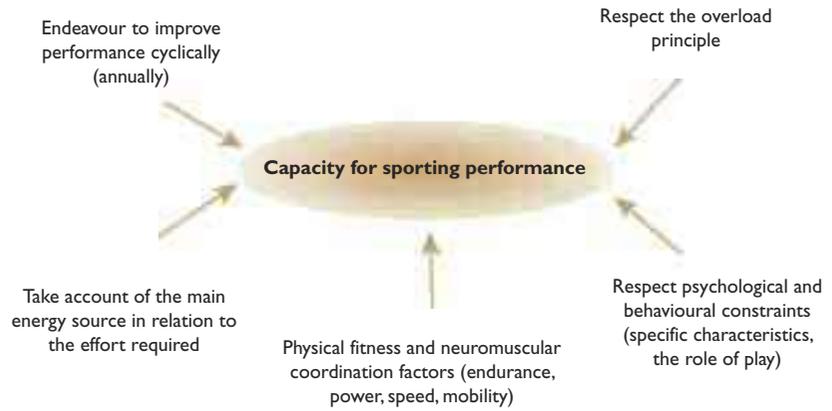


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Main principles of sporting dog training



Break in training

A sudden and complete break in the training programme at the end of the season is highly inadvisable. The animal will quickly lose the benefits it has accumulated and will be mentally destabilised. It is better to gradually decrease the workload while increasingly transforming physical activity into play.

Recovery and overtraining

After a period of intense effort, such as a competition, the dog will naturally be physiologically tired for a time. If the dog is properly fed and trained, its body will recover and even overcompensate (the dog will be in better shape for a short time after complete recovery than it was before the competition). This is the ideal time to demand more major efforts from the dog.

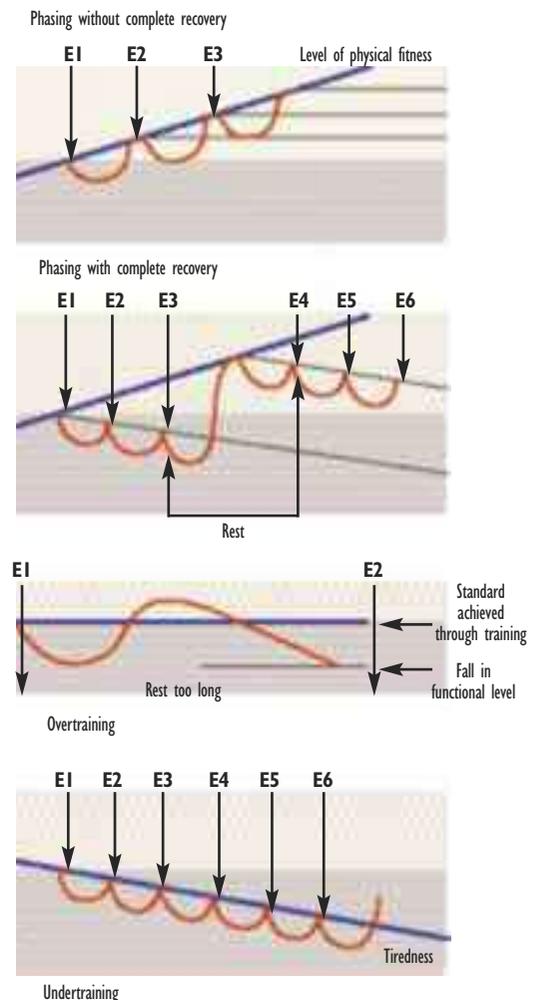
However, if this effort is demanded during the recovery period, the body will not be able to recover normally. The dog will de-

velop overtraining syndrome, characterised by loss of appetite, weight loss, oversensitivity and extreme fatigue.

To ensure balance throughout the competition season, the dog's recovery period must always be respected, which entails a good understanding of its biological clock.

By training the dog properly, the owner will ensure it remains in good health, puts in good performances and stays motivated throughout the year. It is about respecting the dog's work and endeavouring to ensure it can continue to do the best it can for as long as possible based on its physical and mental abilities. Good trainers need to draw on the experience and advice of experts, while also learning to read and respect their dog.

Principles of training cycle planning



Influence of the handler-dog relationship on the dog's work

Relationships in small groups will be one of three types: authoritarian, democratic or laissez-faire. In a work situation, the dog completes a task at the request of the handler. In this relationship, the handler is dominant and the dog is dominated (alpha-omega social structure). Here, the laissez-faire relationship type should be avoided, as it is not conducive to the completion of the task, so the relationship needs to be either authoritarian or democratic. One of the aims of an expedition to Licancabur in Chile in April 1996 was to study the behaviour of SAR dogs at high altitude. During the expedition, we compared the influence of different relationship types on the behaviour of dogs under extreme conditions.

In the authoritarian relationship, the dog has very little freedom. The search for victims is controlled completely by the handler, who selects the search technique. The dog is in constant visual contact with the handler and does not indicate the location of the victim until encouraged to do so by the handler. The two individuals in a team have complementary functions. The dog can be regarded as the handler's nose. The handler takes the decisions.

In a democratic relationship, the dog and the handler go through the search area individually. The dog indicates the victim's location as a result of the collation of information provided by the dog and the handler. The search is accomplished through synergy between the partners.

The two relationship types proved to be equally effective in terms of the work itself. The victims were found in both cases. On the other hand, in extreme conditions when the dogs felt considerable physiological suffering, the democratic relationship appeared to be superior.

Dogs in democratic teams worked for longer stretches in difficult conditions. With encouragement from their handlers, they seemed to accept and tolerate a higher level of suffering.

Dogs in the authoritarian teams refused to follow their handler as soon as they began to suffer in a way that could have put them in danger. This rebellion even extended to aggressive behaviour towards the handler.

The type of relationship between the handler and the dog is a decisive factor in the accomplishment of a task under extreme conditions. The more the relationship within the team is based on mutual exchanges, the greater the dog's acceptance of suffering seems to be. Developing democratic relationships in dog teams and encouraging collective decision-making would therefore appear to be beneficial.

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Victim search sequence based on relationship type

Democratic teams

1. Visual survey of the search area.

The dog immediately heads toward a finite area where the victims are located.

2. Exploration of the search area and surroundings.

The dog moves through the area.

It collects scent information in the vicinity of the victims. The search area is extended to include the surrounding area. Movements are more rapid. The handler may warn the dog if it goes too far outside the search area. During this exploratory phase, the dog and handler work more or less independently and are relatively far apart.

3. Discovery of the victim.

The dog returns to areas already explored and identified as probable locations of a buried victim.

The dog sniffs more insistently.

The dog waits for its handler to approach.

The dog establishes visual contact with its handler.

As soon as it is encouraged to do so by the handler, the dog marks the location of the victims. This all occurs as if the deductions of dog and handler were being collated.

Authoritarian teams

1. The dog is taken to the search area.

The dog follows the handler into the search area.

2. Exploration of the search area and surroundings.

The dog walks at the handler's side.

The dog looks at the handler from time to time.

During this time, the dog and the handler work together. The dog is always under the handler's authority.

3. Discovery of the victim.

During the exploratory phase, the dog stops at the probable location of a buried victim.

The dog sniffs. The dog makes visual contact with the handler.

As soon as it is encouraged to do so by the handler, the dog marks the location of the victim. This all occurs as if the dog were awaiting the handler's permission to mark the victim's location.

Feeding sporting dogs

Proper training is an essential part of preparing a sporting dog for competition or even for non-competitive sports. But all the time and effort spent on training sessions that the owner can often find tedious will be wasted if the dog does not follow a very specific diet. Proper nutrition is a vital part of a sporting dog's preparation, which can prevent many problems.



Nutritional requirements

In general terms, there are three factors which have significant impact on the nutritional requirements of sporting dogs.

- Energy expenditure, which can vary greatly, although the quality of the energy source needs fundamental attention.
- Stress of training and competition, insofar as they necessitate nutritional changes.
- Dehydration, which can largely be prevented by good nutrition.

With this in mind, food adapted for sporting dogs must fulfil a number of criteria:

- Provide optimal-quality energy in sufficient quantities.
- Minimise the volume and weight of the chyme (partially digested food in the stomach).
- Help maintain proper hydration.
- Where possible, act as a buffer for metabolic acidosis caused by running.
- Help optimise the results of an appropriate training programme.

- Make up for any physiological deficits caused by stress.

It is quite simply absurd to feed a racing dog the same way as a hunting dog, or a SAR dog the same way as a sled dog, if the goal is optimal performance and prevention of medical problems and traumas.

Nutritional specifics

The quantity of energy the dog needs to take in is first and foremost influenced by the intensity and duration of effort. Generally speaking, the goal should always be to maintain the dog at its healthy weight through regular weighing – preferably every week – and a tailored diet in stable quantities.

Scientific data can be used in some cases to tailor the approach. A Greyhound's energy requirement, for instance, rises just 5% of its maintenance requirement when it races, whereas a 20-kg sled dog's energy requirement can increase sevenfold (to 12,000 kilocalories a day) in extreme conditions, such as the Iditarod in Alaska, where they cover up to 125 miles a day in temperatures plummeting to -50°C . In simple terms, an hour of work increases a dog's energy re-

quirement by about 10%, which would necessitate a 40-50% increase in its daily intake. Changes in temperature also need to be taken into consideration, because dogs need extra energy to cope with temperatures below or above their "thermal neutral zone", which is about 20°C .

The quality of energy is vital here, which is why criteria have been established for optimal energy intake for sporting dogs. In addition to the nature of the nutrients, there are two main qualitative concerns:

- The energy must be readily and quickly available precisely where it is needed (muscle cells).
- The energy ingredients must be balanced in such a way that their consumption entails minimum waste, maximum efficiency and no risk of metabolic blockage.

The more sustained the effort demanded, the higher the fat content of the food should be, ranging from 16-20% for dogs needing to generate effort in short bursts, to 35% for dogs needing to demonstrate endurance (20-25% is the optimal fat content for work falling between these two extremes).

Adapting dietary fat ... Good news and bad news

In 1970, a team of competitive sled dogs was brought to me at the small-animal hospital at the University of Pennsylvania. The dogs were becoming tired too quickly, just a few miles into the race, and the best of the university's medical specialists could find nothing wrong with them.

Although I was specialised in dairy cows at the time, I conducted a thorough visit of these dogs' kennels. I saw dogs eating their own excrement, noted that the food had too high a starch content and took blood and urine samples. The problem was eradicated simply by putting the dogs on a diet of whole chickens (to see what would happen). Within a few weeks the dogs on this fatty chicken diet were running faster and farther than the others.

This is where the idea of adapting the fat in dog diets came from. It was subsequently developed scientifically for sled dogs, by myself and later Professor Arleigh Reynolds in the United States and Dominique Grandjean in France.

These sled dogs also served as a model for my long term research on horses at Virginia Tech. Just like dogs, albeit on a lower scale, horses that consume fats use less glycogen when they run and so are hardier, calmer and paradoxically lighter (less undigested food remains in the digestive tract). For this reason, adapting the animal to fat consumption eradicates a traditional sports muscle problem known as exertional rhabdomyolysis (destruction of muscle fibre linked to the accumulation of lactic acid).

However, other muscle problems do emerge (the bad news), because these dietary fats weaken the body's antioxidant protection systems. In the 1980s, I observed that levels of vitamin E and C (antioxidants) in the blood fell sharply in sled dogs during periods of physical effort. Research work by the teams mentioned above now focuses on this problem, with the aim of determining the most effective levels of nutritional antioxidant supplements.

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Feeding and performance in hot environments

Many sporting dogs compete and train in hot environments which can cause considerable dehydration and stress. A few concepts in feeding and hydration management may be able to help combat these potential problems. When we examine substrate used during exercise, three substrates are used for energy; protein, carbohydrate and fat. These substrates have the ability to create heat due to digestion and metabolism, as well as create a certain amount of water. Typically, protein has the greatest ability to create a higher basal temperature, while fat is the least thermogenic thereby creating less metabolic heat. Although this has not been directly observed in working dogs other than anecdotally in previous studies in beagles, work in cats has shown that basal metabolic temperature is considerably higher on very high protein diets.

Additionally during the metabolism of protein, carbohydrate or fat there is water formed as a byproduct of metabolism. Water production is greatest when the dog burns fat. Therefore higher fat diets may allow dogs to exercise at a slightly lower temperature and creates more metabolic water, slightly altering hydration status. Hydration status is very important when dogs are working in hot environments but as long as dogs are panting they can tolerate very high temperatures for short periods of time. Limited evidence in dogs, but considerable evidence in humans, suggests that in very hot climates the use of glycerol in drinking water can promote a higher total body water retention for short periods of time. This is an interesting concept which some competitive sporting dog trainers use in the field to promote better hydration.

However, the use of glycerol should be done judiciously (only 1% of the drinking water i.e. 1 ml/100 ml of water) as excessive glycerol has been associated with GI cramping and headaches in humans which can negatively affect performance, proving to be a very controversial issue of benefit versus detriment.

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“The volume of daily intake should be adapted to the dog’s body weight.”

To ensure energy is readily available and can be quickly used by the body during effort, it would appear essential to select highly digestible, specialised, complete dry foods which can be eaten in small volumes and produce less faeces. This can be evaluated simply by comparing the faecal volume with the quantity ingested. The optimal ratio for a sports dog is 45 grams of faecal matter per 100 grams of dry matter ingested.

Short-chain fatty acids (copra oil, for instance) are very beneficial for dogs which need to work especially hard. They are found among the nutrients of a specialised food, and negate the need for biliary salts for digestion, are transported to the muscle cells faster and l-carnitine is not needed to transport them into the mitochondria, the cells’ power plants.

Effort puts extra stress on the body, which thus has the following specific nutritional requirements:

- Increased protein, which should make up between 32% and 40% of dry weight of the food, depending on the intensity of the effort.
- Increased B-vitamins (especially B1, B6 and B12), antioxidants (vitamin E, selenium, polyphenols, flavonoids) and omega 3 fatty acids (from fish, to improve the flow of red blood cells, oxygen exchanges and a reduction in exercise-related inflammation).
- Additional supplements to compensate for nutrients not found in the selected complete food, including l-carnitine (essential for the use of fatty acids by the cells and for recovery), ascorbic acid (vitamin C, which is not usually an essential nutrient for dogs), probiotics (lactic acid bacteria, which improve digestion of food) and glycosaminoglycans (green-lipped mussel extract, for example, which helps prevent joint problems).

Effectiveness of various ergogenic nutritional supplements on the market for dogs

Substance	Activity				Daily quantity (/kg)	Safe?
	Brief effort	Intermediate effort	Sustained effort	Recovery		
L-carnitine	+	++	++++	++	50 mg	Yes
Aspartic acid	0	+?	+?	?	?	?
Arginine	0	+?	+?	?	?	?
Sodium bicarbonate	+	0	0	?	400 mg	Yes
Dimethylglycine	++	+	0	?	1.5 mg	Yes
Inosine	0	0	0	++	10 mg	Yes
L-tryptophan	+?	+?	+?	0	5 mg	?
Ascorbic acid (vitamin C)	++	++	++++	+	100 mg	Yes
Methylsulfonylmethane	0	0	0	0	-	?
Coated superoxide dismutase	++	++	+++	++	30 mg	Yes
Probiotics	+?	+?	+?	?	?	Yes
Octacomasol	+	+	+	+	?	Yes
Bioflavonoids	+	+	+	+	?	Yes

Practical feeding

Food given to sporting dogs and working dogs must be:

- Nutritionally balanced.
- Concentrated and highly digestible.
- Appropriately served and consumed.

Owners should always assess their dog's diet based on the following demands:

- Meeting the maintenance requirement.
- Increasing the concentration of energy and essential nutrients, coupled with reduction in the quantity of faeces.
- Enriching the food to meet the increased energy requirements due to increased physical effort (fat) and stress (protein, vitamins).

With this in mind, only complete dry prepared foods meet these demands (home preparation is becoming increasingly rare and wet canned food is unsuitable), together with supplements adapted to the breed in question.

Once the right food has been chosen, an annual feeding plan can be drawn up, adapted to the training schedule.

- Annual rest period: very high-quality maintenance food.
- Training period: gradual (over the course of one week) transition to a working diet or gradual addition of a dietary supplement for working dogs to a maintenance food.
- Competition period: added stress may necessitate additional dietary changes. The volume of daily intake should be adapted to the dog's body weight.



© Laba/Royal Canin

- Break in training: gradual return to maintenance food.

Dogs should never work on an empty stomach. Contrary to the misguided and indeed damaging idea held by some, this will simply lower performance and compromise well-being. The dog should be given one quarter of its daily feeding amount with a lot of water in the morning, at least two hours before it goes into competition or starts work, and the rest at a regular time in the evening.

Sporting dogs need constant access to fresh water, especially immediately after performance, to ensure they do not become dehydrated.

Giving the dog a snack at key times is also beneficial. This can be presented as a reward. One such time is around 30 minutes after intense effort to effectively replenish the muscle glycogen reserves with an appropriate energy complement, provided it is properly formulated for the dog. These are available commercially or can be prepared at home with cooked rice, copra oil, a little honey and an l-carnitine supplement.



Aspects of canine sports medicine

The constant development of canine sports, continually rising working dog populations and particularly the ever increasing number and standard of competitions has led to the emergence of dedicated canine sports medicine to address the problems posed by a very specific sporting pathology.

A specific pathology

The integrity of the musculoskeletal system is clearly essential in sporting and working dogs. A limp is a sign of pain and adversely affects performance. It may be caused by problems with the footpads or the spaces between the toes, which are the only places where dogs sweat. Such problems, which are very familiar to hunters and mushers, can be prevented by hardening the footpads with a spray and applying grease (a mix of lanoline and pine tar) or better still a balm of hyperoxygenated fatty acids (with strong anti-inflammatory properties) in between the toes. In some cases, as for sled dogs, protective boots are highly recommended.

Dozens of bone, joint, tendon and ligament problems are specific to different sports. Like humans, dogs suffer from common problems such as sprains, dislocations and fractures. Similarly, active muscles can suffer from simple contractures, strains, pulls and tears or inflammatory conditions such as tendonitis and myositis. Sophisticated diagnostic methods such as ultrasounds and thermograms (pictures produced by a thermal camera which visualises hot and cold areas) ensure that the best treatments and therapies can be identified. Physiotherapy is also used during rehab.

Prevention is a major goal in this field of canine traumatology. This demands a number of safeguards:

- It is important to have a regular, properly conceived physical training programme to bring the dog to peak sporting potential during the competition season.

Dedicated international veterinary association for sled dogs

The International Sled Dog Veterinary Medical Association (ISDVMA) is a professional veterinary organisation with more than 400 members on five continents, from countries as far apart as New Zealand and Greenland, Japan and South Africa. ISDVMA was founded in 1991 to actively promote and encourage actions contributing to the well-being and good health of sled dogs and to conduct scientific research to improve our understanding of these extraordinary dogs. ISDVMA holds an annual conference and meetings throughout the globe to share the latest scientific advances with veterinarians.

It also publishes a journal and other publications to keep the dialogue going. The ISDVMA database of all scientific and technical publications relating to sled dogs is updated annually. ISDVMA also runs courses to teach mushers about their dogs and provides international federations and organisations with specialist veterinarians to oversee some 4,500 sled dog races across the world every year. ISDVMA awards study and research scholarships to many veterinary students.

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Clinical assessment of dehydration in dogs

Percentage dehydration	Clinical examination	Response
< 5	No clinical change	Give water
6	Minor persistence of skin fold (a)	Oral rehydration
8	Major persistence of skin fold	Drip
	Capillary refill time 2-3 seconds (b)	
	Minor endophthalmitis	
	Dryness of the mucous membranes in the mouth	
10-12	Severe persistence of skin fold	Drip
	Capillary refill time more than 3 seconds	
	Pronounced endophthalmitis – cold extremities	
	Myospasms – occasional tachycardia	
12-15	State of shock	Emergency treatment
	Imminent death	

(a) measure skin elasticity along the back or in the lumbar region, avoiding the neck, where the skin is naturally loose.
 (b) normal capillary refill time is 1-1.5 seconds.

- The dog needs to learn how to move its body flexibly to perform a given task. The dog must be used to working or competing in various environments so that it can position its feet optimally.
- The dog needs to warm up before training sessions and competitions and warm down afterwards.
- Water must be always available to prevent even minimal muscle dehydration, which will be harmful.
- The food must be perfectly adapted to the type of effort, and the feeding amount must maintain the dog at its healthy weight.

2009 Licancabur scientific expedition

The aim of the expedition to the summit of the 19,000 ft (5,980m) Licancabur volcano in northern Chile in April 1996 was to study the biological and nutritional effects on SAR dogs working at high altitudes, where oxygen is less plentiful and atmospheric pressure is higher. Dogs are often used to save human lives in the event of earthquakes, landslides at high altitudes (Andes, Asia) or avalanches. In these situations neither dogs nor humans have time to acclimatise before they get to work.

Dog teams from the Paris Fire Department and Chilean Riflemen took part in a field exercise to better prepare them for work in these difficult conditions without suffering from the effects of altitude sickness. Without acclimatisation, they were given the task of searching for victims buried in the Inca ruins alongside the vents of the Licancabur volcano. The expedition findings clearly showed the importance of optimal nutritional preparation for the dogs, based on the consumption of a high energy, high protein, complete dry food.

This was supplemented with antioxidant vitamins (E and C) and omega 3 essential fatty acids (fish oil). A similar comparative study was also conducted among the humans, and subsequent expeditions of this type will be undertaken in association with the UMES at ENVA and the Royal Canin Research Centre.

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Emergence of canine medicine

Canine sports are growing in stature all the time. Some are even knocking on the door in terms of inclusion in the Olympic Games (pulka and sled pulling would appear the most logical choices, given that dog and handler need to work together in these sports). Others are a great way to teach children and train dogs as part of a game (as in agility) or to celebrate the ancestral qualities of certain breeds, such as sheepdogs.

As the popularity and professionalism of these sports rise, so too does the number of sporting dogs. The National Veterinary College of Alfort (ENVA), France, organised the first all-day conference on canine sports medicine back in 1985, a direct consequence of which was the formation at ENVA of UMES, whose canine sports medicine unit is one of only three in the world. (The other two are at Auburn University and the University of Florida, both in the United States). The unit, which welcomes outpatients three times a week, has physio and occupational therapy facilities and a research laboratory working on the physiopathology of lipids and free radicals to study the biological and cellular effects of physical effort in dogs. UMES veterinarians attend many dog sports competitions, including international ones, in an official capacity.

Since its emergence just a few short years ago, canine sports medicine has slowly but surely become a recognised specialisation, as demand grows among users, covering everything from training and preparation to pathologies and doping.



Dog on a treadmill.



It must be possible to distinguish the individual dogs in a competition. Electronic tagging is currently the most reliable method of identification.

Doping

Bearing in mind the high stakes in some dog sports, doping is a concern which needs to be addressed. Dog racing and sled races are highly regulated sports and drug tests have been a regular part of them in Europe, North America and elsewhere for many years.

The threat of doping

Doping is the use of any substance or means that artificially improves a dog's competitive performance. It is an assault on the principle of fair play and the dog's physical integrity.

While extremely rare, doping has been uncovered in dog sports. There are two main goals:

- Doping to improve performance, when the prize money and rewards are high.
- Doping to inhibit performance, when betting is involved, as in dog racing

When rival dogs are drugged to inhibit their performance it is more than a simple case of fraud.

Sports ruling bodies have a list of banned substances. The International Federation for Sled Dog Sport's list reads as follows:

- Analgesic substances
- Steroidal or non-steroidal anti-inflammatory drugs
- Antiprostaglandins
- Central nervous system stimulants
- Antitussives
- Sedatives and anaesthetics
- Diuretics
- Anabolic steroids
- Muscle relaxants
- Anticholinergic substances

- Antihistamines
- Blood injections

Samples are taken from the dog's saliva, blood or urine, none of which involve any danger or harm to the dog, in accordance with very strict rules (samples, coded for anonymity, are placed under lock and key and sent to the laboratory for analysis under strict security).

Besides all these regulations and tests, it is important for every owner to realise that doping is potentially harmful to the dog. Anabolic steroids, stimulants, tranquillisers, anti-inflammatory drugs, diuretics and beta-blockers all have harmful side effects when used for the wrong reason.

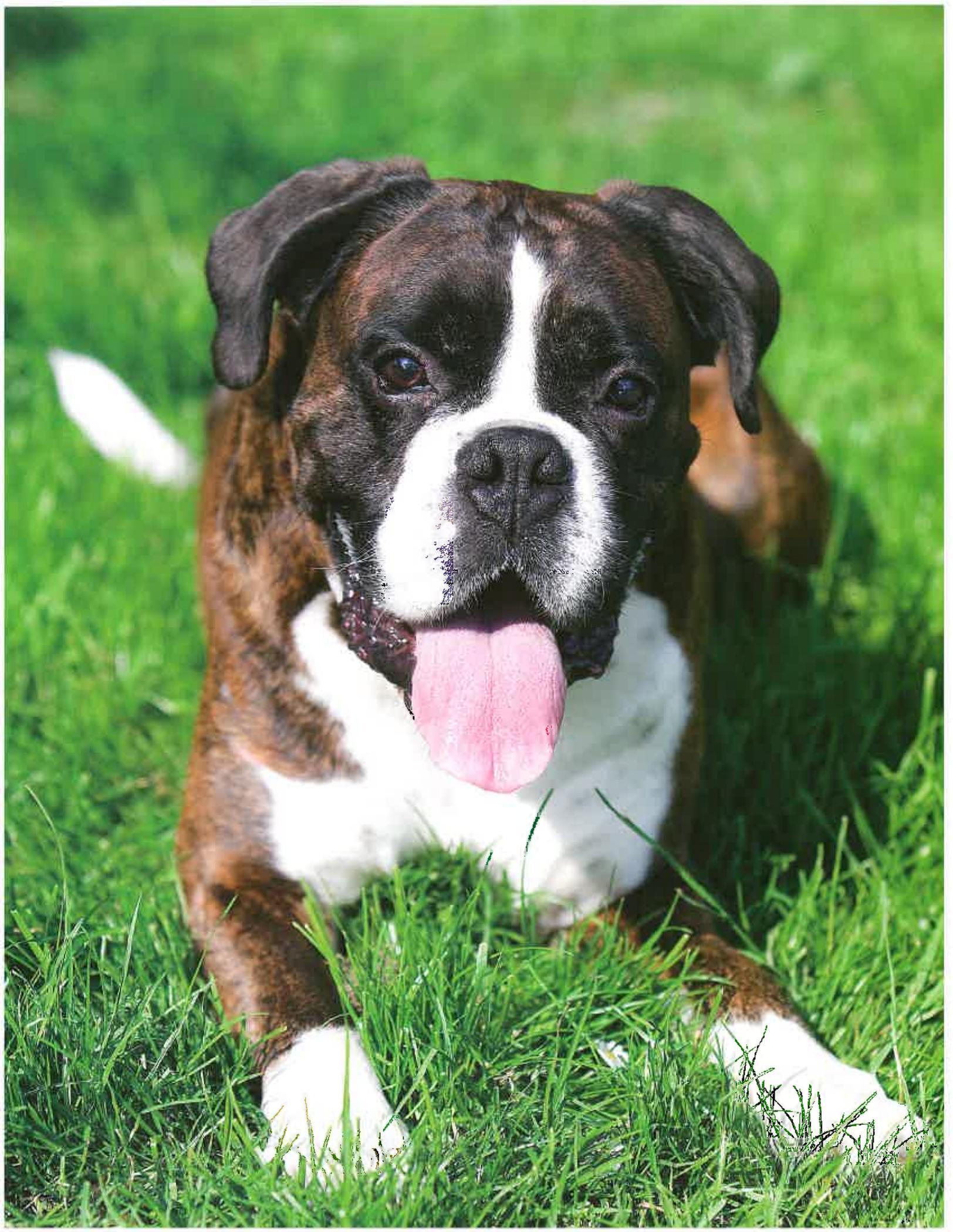
So, while it does only concern a tiny minority of thoughtless individuals, there needs to be a major campaign against doping to educate owners and keep sports dogs out of harm's way.



Required documents.



Respecting the chain of evidence: coded samples kept under lock and key.



The wider dog world

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Veterinarians and specialists

From the very beginning, human and veterinary medicine have developed side by side and it is often said that there is no boundary between the two. Originally, practitioners served both species.

History of veterinary medicine from Egyptian papyrus to Hippocrates

In antiquity, medicine was based on empirical knowledge and on botany, which were both imbued with mystical power. There was no real difference in how animals and humans were treated. There is, however, evidence that the Egyptians practised specific veterinary science – a papyrus text from 1750 BC describes animal ophthalmology. The walls of tombs

were sometimes painted with frescos depicting scenes of calving and the care of cattle hooves. It even seems that animal doctors made up a special caste. Of course, sacred animals were most likely to benefit from the latest advances in knowledge at the time.

“*The systematic study of animal pathology did not arrive until Aristotle*”

The Greeks were the first to make significant advances in medicine. Hippocrates developed pragmatic medicine around 4000 BC based on systematic questioning and examining of patients. He is also credited with the first medical prescriptions. Next came Plato, Herophilus and Galen, each of whom devoted himself to describing human and sometimes animal diseases. Hippocrates was interested in cerebral disorders in cattle and sheep, but the systematic study of animal pathology did not arrive until Aristotle, who described the best-known diseases of the time, rabies, swine erysipelas and equine colic. He was even interested in elephants. His teachings were used at the famous medical school of Alexandria.

Throughout antiquity, the desire to gain a better understanding of animal medicine was primarily dictated by the importance of the military cavalry, which was vital to military conquest. In addition, frequent epidemics often wiped out entire herds of farm animals. Texts have been found that mention cattle plague in Greece and the Byzantine Empire.

In the Middle Ages science experienced a steady decline and veterinary medicine was no exception. In Europe, instruments and techniques remained practically unchanged. Bloodletting, enemas, cauterisation, trocars, and salt and vinegar were the order of the day.



Some rules were introduced with regard to animal treatment in East Asia (China, Japan), but only the Arabs continued to expand their knowledge by studying Hippocrates and Galen, developing various types of surgical scalpel as well as the setting and splinting of bones in horses.

Horses, the object of all care

Particular attention was given to warhorses and blacksmiths played a key role. The Crusades, wars and tournaments were all very demanding and mounts were often taken to surgeons or other medical apprentices after battle. Monks practised the art of medicine, although they were forbidden from studying anatomy by the highest church authorities and the ancient medical texts were blacklisted. More than any other era, the Middle Ages were ravaged by epidemics, but superstition and religion prevented intellectuals from studying them. For the Church they symbolised divine punishment. Satanic practices involving animals began to appear.

It was certainly not a good time to be a cat or a bird, or to care for them.

The first medical schools began opening their doors in the 12th century, as the power of reason started to make inroads. Animal pathology, anatomy and physiology were often studied along with the human equivalents. Veterinary medicine was split into pastoral and equestrian medicine. The Italian Giardono Rufo was the first to write about blacksmiths, horse medicine and surgery in 1250 AD.

The Renaissance brought more advances. The study of anatomy was an obsession that occupied the greatest scientific minds, not least that of Leonardo da Vinci. Horses were again the first to benefit from the most advanced studies. Dissection instruments were developed that would be used until the 19th century.

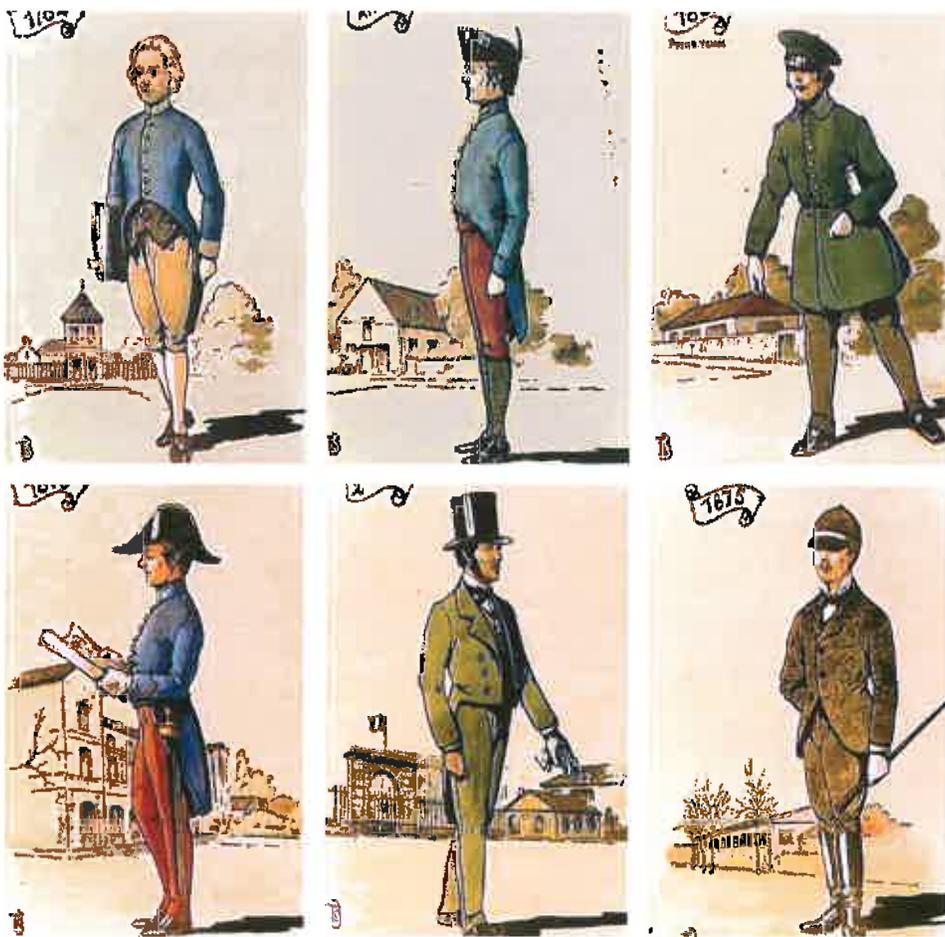
In 1650, Marcello Malpighi invented the modern microscope. The study of cells and tissues contributed to the advancement of

medical science. Around this time, a Maltese knight by the name of Ludwig Melzo wrote the first book to list all known horse diseases. It includes illustrations of the syringes, mouthpieces and forceps used at the time. The book served as a reference for several decades.

During the Age of Enlightenment, scientific thought became more influential and the idea of establishing a school for veterinary medicine began to form during the 18th century. One was ultimately established in France.

The first veterinary school

By 1761, one of Europe's best horsemen, Claude Bourgelat, had been the director of the Royal Academy in Lyon for twenty years. This was a seat of learning where horse riding, weaponry, music and mathematics were all taught, but driven by his interest in anatomy and equine diseases Bourgelat had ideas about founding a veterinary course that would help preserve and



The outfits of a veterinarian in the 18th and 19th century



Statue of Claude Bourgelat, founder of the veterinary college in Maisons-Alfort (France)

improve the condition of horses and protect cattle from ravaging epidemics. He managed to convince the Controller-General of Finances to grant him a subsidy to establish the first school of veterinary medicine in Lyon in February 1762.

Unlike university education at the time, veterinary education prioritised reflection and observation, manual dexterity and visual memory. From the outset, the students conducted checkups and hospitalised animals. Students were soon attracted from abroad and the school became the point of reference in veterinary medicine. In 1764 it became the Royal Veterinary School.

In 1765, Bourgelat opened another institution at Alfort, which still occupies the same site today, making it the oldest continuous veterinary school location. It was originally built within the walls of Paris but taxes on fodder taken into the city soon became prohibitive, leading to relocation to Maisons-Alfort. Similar schools started to spring up across Europe, including Turin (1769), Vienna (1777), Hanover (1778), Dresden (1780) and London (1792). Followers and students of Bourgelat took on the mantle of continued development.

Veterinary education advanced as scientific discoveries were made and research was added to its remit. Doctors and veterinari-

ans have worked together to control and eradicate a great many diseases. They include Henry Bouley and Louis Pasteur (anthrax vaccination), Camille Guérin and Albert Calmette (BCG vaccine against tuberculosis) and Auguste Ramon (tetanus and diphtheria toxoids).

Today's veterinary medicine benefits from state-of-the-art medical technologies and surgical techniques. Diagnostic ultrasounds and endoscopies are performed on a daily basis and scanners are used on animals too. Current studies are producing improvements in animal care as well as contributing to advances in human medicine.

Veterinarians

All veterinarians are trained to treat diseases of small animals, even those who work in rural areas, but growing urbanisation has led some to specialise in dogs and cats either as generalists or specialists.



Generalists

Many general practitioners work in small animal medicine. Their clients include individual owners and breeders. As in human medicine, their role is to ensure the animals under their care are healthy. They have three main focus areas:

- Preventative medicine: routine vaccinations, worming treatments, anti-parasite treatments and nutritional advice. This includes some surgical interventions, such as teeth scaling and neutering. They also monitor gestation and give advice to ensure that whelping occurs in optimal conditions.
- Cure: all medical and surgical interventions associated with disease or injury. This entails large investments in expensive equipment.
- Advice: veterinarians increasingly provide advice and recommendations in terms of behavioural management, training, diet, choice of breed and other matters. Owners are looking for someone who can help them understand their dog, based on the overriding concern for its well-being.

General veterinary medicine is accordingly a vast field, which is why veterinarians rarely work alone. A practice is a small business with employees (receptionists, nurses, practice manager, veterinary assistants) and sometimes several partners.

Kennel veterinarians

In some countries, as kennels grow bigger they need dedicated veterinarians to look after their dogs and ensure living and breeding conditions are optimal. This extends to the arrangement of buildings, hygiene (ventilation, surface area per dog) and the distribution of food to different groups of animals (breeding stock, lactating and gestating females, and puppies).

To gain the best results, the veterinarian should work on site, drawing up precise reports and providing breeders with recommendations on how best to care for their dogs.

“As in human medicine, the role of veterinarians is to ensure the animals under their care are healthy wherever they live.”



© Hermine/Difonecta



© Hermine/Difonecta

“Bone surgery is becoming increasingly sophisticated and many fractures and abnormalities that were formerly untreatable are now routinely treated.”



© Duttay/Royal Canin

Specialists

Just as in human medicine, research and technical advances have led to the emergence of various fields and some veterinarians prefer to specialise in one particular field.

Cardiology

This discipline is focused on detecting heart abnormalities by means of clinical examination and the use of sophisticated equipment, such as X-ray machines, sonographs and electrocardiographs.

Neurology

Neurological vets specialise in disorders of the nervous system, the brain, spinal cord and nerves. They use diagnostic tools including x-ray machines and electromyographs.

Dermatology

This essentially involves treating skin diseases, some of which can be diagnosed immediately while others need further tests including lab analysis of samples or biopsies.

Ophthalmology

Dogs require ophthalmic care in the case of disease or injury of the eye. This field includes examination for congenital disorders and surgery for cataracts.

Orthopaedics

It is not uncommon for a dog to break a bone in an accident. The extent of surgery and the care required depend on the severity of the fracture. This field includes surgery on dysplasia, degenerative disorders, sporting injuries and congenital conditions. Surgery is becoming increasingly sophisticated and many fractures and abnormalities that were formerly untreatable are now routinely treated.

Most specialisations demand very expensive equipment, which is why general practitioners often refer dogs to specialists when they require specific care.

Receptionists

Receptionists have a major influence on the image of the practice, as they deal directly with clients, so they need to be able to weigh up a given situation and act accordingly. Receptionists serve as a “filter” between the veterinarian and the client, fielding phone calls, whether it is a simple request for information or an emergency. They also handle client files and may send out vaccination reminders.

Veterinary nurses

The Veterinarian’s job is greatly facilitated by the assistance of a veterinary nurse. In many countries this is a separate profession that demands a similarly high level of training as nurses in human medicine.

Invaluable assistance in the practice...

Veterinary nurses monitor the stock of drugs and other materials within the practice, placing orders for replacement stock as needed. They help during examinations and procedures in the consulting room and with dispensing medicines. They are responsible for monitoring the hospital kennels, and providing day-to-day care for patients under the veterinarian’s supervision.

...and in the operating room

Nurses assist during surgery, and with pre- and post-operative care. They sterilise and set out instruments and prepare the animals. During operations they are responsible for ensuring anaesthesia goes smoothly. They may also assist the veterinary surgeon by handing the right instrument at the right moment and swabbing any bleeding. They monitor animals as they come round after surgery and clean the surgical wound, applying a bandage if necessary. Nurses are dedicated professionals who are responsible for much of the care dogs receive when they visit the veterinarian.



© D'Almeida/royal Canin

Qualifying as a veterinarian

Whatever the country, qualifying as a veterinarian is never easy. Training is long and laborious, and places are often scarce, which produces ferocious competition.

Veterinarians need to be all-round scientists. Alongside the main subject area – anatomy, physiology, biochemistry, biophysics, zoology, pathology, pharmacology and nutrition – trainee veterinarians study an array of specialist fields, including animal husbandry, inspection of animal foodstuffs, hygiene, bacteriology and virology, meat inspection as well as core veterinary skills

such as medicine and surgery on a range of species, infectious and parasitic diseases, and more.

The veterinary profession has changed enormously over the past two decades, in part because the relationship between dogs and humans has changed, but also because veterinarians have skills that can be used in other fields.



Other canine professionals

There are many different professionals that provide various services to dog owners and meet the demand for the increasing use of the dog in the service of society.

A very varied range of professions

There are many different dog-related professions, from breeder to boarding kennel owner, from groomer to trainer, meeting the demand for the increasing use of the dog in the service of society.

Breeders

Dog breeding is professionalised to a greater or lesser extent depending on the country. Some breeders are simply owners that mate their dog a couple of times a year, while others own huge establishments accommodating up to several hundred females for reproduction.

Regardless of the scale it is practised on, dog breeding needs to be as professional as possible in order to ensure that high-quality puppies are produced.

Laws vary depending on the country, but in most of them this is a highly regulated business in which quality and reliability are prioritised, entailing proper training for breeders.

Groomers

For some breeds, regular grooming is essential; for others it is a luxury that brings pleasure to both owners and dogs.

Here again, proper training is indispensable, as grooming is not as easy as it may seem at first glance. In parts of Asia, nowadays you can even see dogs with dyed coloured coats, a practice that may perhaps become more widespread in time.

Behaviourists

Dog behaviourists are not exclusively veterinarians. Behaviourists need to have a very good knowledge of dogs as well as being skilled when it comes to dealing with owners, who can often be responsible for any be-



havioural problems their dog may have. Qualifications are available, including a university degree, although this is not yet a well-regulated field.

Trainers

Trainers have an important role to play in urban societies, where people often have only a patchy understanding of what dogs want and need. Trainers help owners train their dog properly, which is the best guarantee of a future without behavioural problems. Owners are strongly recommended to get the help of a trainer – through a club or on an individual basis – as soon as they purchase a puppy, especially if they have never had one before.

Boarding kennels

Boarding kennels provide accommodation for dogs when owners need to go away without them, whether for just a few days or annual holiday. Boarding kennels are sometimes connected to breeding kennels, although good health practices ensure the two are always separate. Some boarding kennels will offer additional services, such as collection/delivery of the dog, or grooming. Anyone considering using a boarding kennels should visit before booking their dog in to assess the quality of the accommodation and the staff.

Handlers

The development of so many different types of service dogs in recent decades has increased the need for handlers, too. Dog handlers may be members of the military, the police, the customs services, fire departments, security services or specialised search and rescue services.

Handlers have to undergo extensive training, because they have to train their dog before they can get to work. Certificates and licences apply to the dog team – the specific handler and dog – rather than the handler alone.

Dog walkers

Dog walkers have come onto the scene in a big way in recent years and it can be amusing to see them grappling with a whole pack of dogs in parks and gardens during the day. It's no surprise that dog walkers are popular in large towns and cities, where busy people often have little time to give their dog the exercise and companionship it needs. It's important for dogs to socialise with other dogs and this is a great way to accomplish that.



Dog walkers are common in cities.

“Trainers help owners train their dog properly, which is the best guarantee of a future without behavioural problems.”



© Grosvenor



Canine medicine

Photo on the left: © Duhayer/Royal Canin



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Preventive medicine

“Prevention is better than cure”: this ancient saying is just as applicable to dogs as it is to man, especially since dogs are more exposed to contamination with infectious diseases and parasites than man. A good knowledge of the diseases caused by parasites, bacteria and viruses, many of which can be effectively prevented, enables owners to understand why their veterinarian prescribes treatments for their dog even when it is not unwell. Vigilance, a healthy lifestyle and preventative health care can prevent many of these health problems in dogs, some of which are potentially fatal.

Parasitic infestations

External parasites (ectoparasites), including arthropods (fleas, ticks, lice, harvest mites and mange mites) or fungi such as yeasts and ringworm, can have a profound effect on the dog's skin and coat. Internal parasites (endoparasites), bacteria and viruses, which are sometimes transmitted by fleas, ticks or mosquitoes, may have serious consequences for the dog's health and cause infectious diseases, some of which are contagious. Certain diseases can be prevented through vaccination. External parasite infestations mainly affect the skin and coat. They can cause eczema, pruritus (itching) or significant hair loss. Internal parasites are primarily encountered in the gastrointestinal tract (oesophagus, stomach and intestines), but can also infest the lungs and bloodstream.



Flea egg

© ENVA



Flea larva

© ENVA

Ectoparasites

Fleas

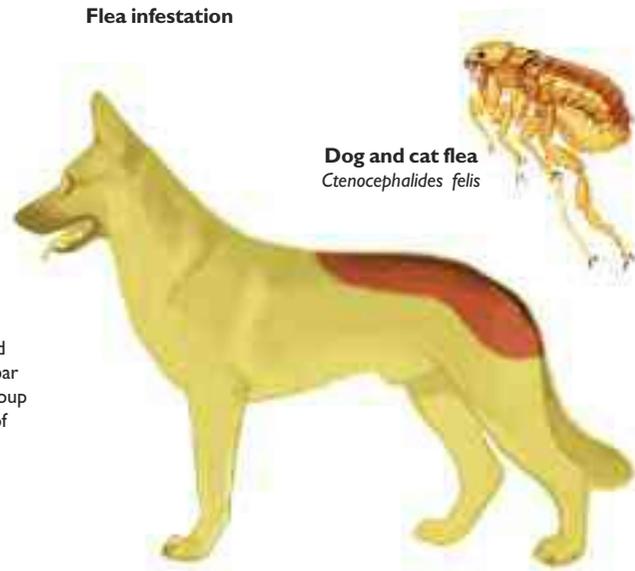
These are wingless insects with a laterally flattened body. Dog and cat fleas belong primarily to the species *Ctenocephalides felis*, but other species may be seen, such as *Ctenocephalides canis*. Only the adult fleas infest mammals, while the other larval stages and cocoons (nymphs) stay in the environment. These are essentially found in areas that are frequented by dogs or cats. It is estimated that at any given moment, adult fleas present in the coat represent less than 5% of the total flea population. Fleas are highly prolific: a female lays 25 eggs per day and almost a thousand in her lifetime. The eggs do not stick to the dog's coat, but fall to the

ground and collect in rugs, carpets, wooden floors, etc. After hatching, the larvae undergo metamorphosis and become nymphs; then, when conditions are favourable, they emerge as adults and become parasites on an animal. The adult flea pierces the dog's skin with its mouth parts and then sucks the blood using its proboscis (feeding tube) after inoculating it with its saliva, which has anticoagulant and allergenic properties. The presence of fleas can be determined by the excrement that they leave behind: tiny black pellets on the animal's skin, particularly in the dorsal lumbar region. These pellets consist of blood which has been swallowed and partly digested by the fleas.

Fleas cause many diseases. They are a direct pathogen, although usually not a serious one, as they merely make the dog itch. However, dogs can develop flea allergy dermatitis (FAD), which causes significant pruritus resulting in hair loss and even sores from scratching; the lesions are primarily localised to the back, loins and base of the tail. The manifestations of this disease are less common during winter, since fleas are less active in the external environment. They are also indirect pathogens, i.e. they transmit other pathogenic agents: bacteria (including the bacterium responsible for bubonic plague in humans) and a tapeworm that infests the gastrointestinal tract (which is transmitted when adult fleas are ingested by the animal).

Flea infestation

Flea infestation:
Lesions are found in the dorsolumbar region, on the croup and at the base of the tail.



Dog and cat flea
Ctenocephalides felis

The why and how of the war against dog fleas

The only way to combat a parasite effectively is to understand its life-cycle in order to break it at the most sensitive point.

Larvae hide from the light, meaning that they can be found under rugs or cushions, behind the skirting boards, between floorboards, etc. After one or two weeks of life, the larva changes into a cocoon, which is very resistant to flea treatments and can survive this way for up to five months. The presence of animals or humans and the vibrations that they create as they move about triggers the hatching of the adult from the cocoon. When animals or people move into a house that has been uninhabited for several months, a large number of cocoons may hatch all at once, leading to an infestation of fleas within a matter of hours: so-called “parquet fleas” are in fact a massive emergence of adult *Ctenocephalides felis*. The adult then jumps onto a cat or dog (usually) and bites the animal to feed on its blood. The females are the most voracious and can eat fifteen times their own weight in blood (seventy females can consume one millilitre of blood per day!). If nature calls while a female flea is feeding, the flea deposits “flea dirt”; these small black pellets can be seen in the animal’s coat and leave a deep red stain when placed on wet paper.

In addition to siphoning off blood, fleas frequently cause allergies and can also transmit a tapeworm to dogs and cats, a phenomenon often found in adult carnivores.

Most of the flea treatments that are applied to the animal do limit the number of fleas, but they are not sufficient to eliminate all of them because there are often large numbers still lurking in the environment. Two treatments are usually recommended. The purpose of the first treatment, an insecticide, is to kill all the adult fleas on the dogs and

cats living in the area to be treated. This is achieved with antiparasitic agents in a spray, “spot-on” or tablet format. Flea-collar and powder formulations have limited efficacy. A “spot-on” is a medication that is deposited on the animal’s skin in the form of a few drops of a very concentrated solution. This solution then diffuses over the entire body of the animal and makes it possible to kill the fleas as they feed. This treatment should be repeated every one to two months depending on the product used. The second treatment is with an insect growth regulator or IGR, which blocks the flea’s lifecycle in the environment. Insect growth regulators have the advantage of being completely harmless to domestic animals and humans.

These insect growth regulators are administered either by applying them directly to the animal (where they act because they are ingested by female fleas who transmit them to their offspring) or by application in the environment (direct contact with the flea larvae). Before applying this treatment to the environment, it is important to dust and clean all of the areas to which the animal has access (don’t forget the vacuum cleaner and the cupboard where it is kept, which can become “flea nests”), then treat the surfaces that are liable to harbour fleas using an insect growth regulator (usually combined with an insecticide). It may also be necessary to treat the garden in summer months, although only in shady areas where the dogs and cats lie down (the products used should be resistant to UV light). There are many effective insecticides and insect growth regulators on the market, each with their own advantages and limitations.

The results obtained are usually good, but are reliant on how the treatments are applied and how often they are used.

Ticks

These are large acarina (2 to 10 mm) belonging to the Ixodidae family. They have three life stages: larva, nymph and adult. Ticks present significant sexual dimorphism: the abdomen of females is highly distensible, unlike that of the males. Their body is red-brown in colour and flat, except after a meal of blood when they become globular. At each stage of their lives these parasites attach themselves to a vertebrate host; they are strictly haematophagic (feed on blood), except for the males of certain species, which do not feed at all. Numerous species of tick can infest dogs, but the most commonly observed are *Dermacentor reticulatus* and *Rhipicephalus sanguineus* (the most common in Europe but not in the United States). The latter are specific to dogs and try and attach themselves to this host at every stage of their life (larva, nymph and adult). Ticks attach to a dog's skin, preferring the most delicate areas. They use their mouth parts to pierce the skin and inject their saliva, which solidifies into a very strong attachment point. The tick can then enjoy its meal of blood, after injecting more saliva with anticoagulant and vasodilating properties. Fertilised females drink large amounts (as much as several millilitres). Larvae, nymphs and other adults take only a single meal. Once the tick has finished its

meal, another type of saliva is used to dissolve the attachment point so that the tick can drop off. A free-living stage may follow the parasitic phase, depending on outside conditions. This free-living stage of the tick's life cycle is much longer than the parasitic stage.

Ticks mate on their hosts as the female feeds, which accelerates its food intake. Once it has finished its meal of blood the female falls to the ground, then after a few days it lays several thousand eggs and dies. Depending on the environmental conditions, the eggs incubate for a variable period from a few weeks to a few months and then hatch. The larvae leave the egg and climb up the nearby vegetation, where they wait for the passage of their future host. They attach to the host and take their first meal, which may take several days, before dropping to the ground again. After a period on the ground, the larva moults and becomes a nymph. The process repeats itself: the nymph attaches to the host and feeds, drops to the ground and moults again to become an adult male or female. The complete cycle is quite long, considering that the tick must attach to three hosts: if conditions are not absolutely ideal, the entire life-cycle may take up four years in some species of tick. Furthermore, not all eggs reach adulthood because they may be destroyed or in-



Tick

Ixodes ricinus :
Female waiting for a host to pass

gested at any stage of development by various animals, particularly during the free-living stage.

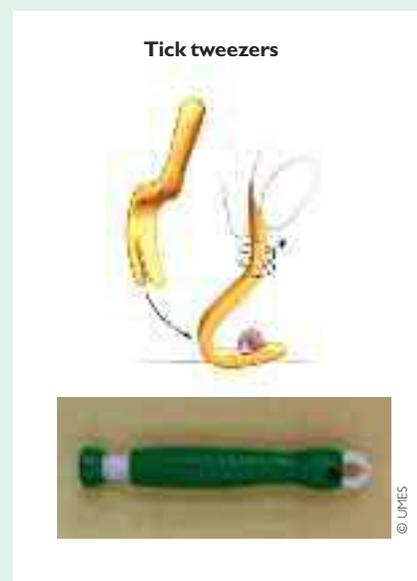
Ticks play a significant direct pathogenic role, firstly through the irritation provoked by the penetration of the tick and its saliva. After the tick has fallen off, the skin is weakened, so that the lesion caused by the fixation may become the point of entry for bacteria, leading to secondary infections. The blood meal deprives the dog of a small amount of blood, which can lead to anaemia in the event of a massive infestation. Finally, the presence of ticks on the dog, as with other animals or man, may have a toxic action, both local and systemic. For example, in Australia there is a disease known as tick paralysis, which is caused by

How to remove ticks

If the dog is not heavily infested, the ticks may be removed one at a time with a special, veterinary-designed hook that can be used to extract the tick without squeezing it or breaking off the mouth parts, or by using a felt-tipped applicator impregnated with cypermethrin. It is essential to remove all of the mouth parts to prevent an abscess forming at the point of attachment. Always inspect your dog carefully after returning from a walk in tick-infested areas (long grass). The ticks should be removed as soon as possible after they latch on, as this is the best means of preventing tick-borne illnesses.

If the dog is heavily infested, it should be washed in pyrethroids, or amitraz, which will kill all of the ticks.

To avoid infestations in kennels or other group situations, the floor and walls should be covered with cement, and an appropriate powdered insecticide should be used. A vaccine is also available against piroplasmiasis; this is effective for six months and is designed to prevent this parasitic disease in dogs which frequent areas with a significant tick population (e.g. forests).



© LUMES

Ixodes holocyclus. Without treatment this leads to death due to paralysis of the respiratory muscles.

The presence of ticks also affects the dog's immunity. At the next infestation the dog may become hypersensitive with a severe reaction (pruritus) at the fixation point, which make it hard for the tick to attach, and progressively results in a reduction in the number of ticks attached. The dog develops an acquired immunity. Ticks can also transmit various pathogenic agents that are responsible for disease, either from a female to its offspring or from one stage of development to the next. Ticks are responsible for the transmission of:

- *Babesia canis*, the agent responsible for babesiosis (also known as piroplasmosis), which is transmitted by *Dermacentor reticulatus* and *Rhipicephalus sanguineus*.
- *Hepatozoon canis*, responsible for hepatozoonosis, transmitted by *Rhipicephalus sanguineus* following the ingestion of the latter.
- *Ehrlichia canis*, the agent responsible for ehrlichiosis, transmitted by *Rhipicephalus sanguineus* in tropical and temperate regions.
- zoonoses (diseases which are transmissible to man) such as eruptive Mediterranean fever, present in southern Europe, Africa and India due to transmission of *Rickettsia conorii* by *Rhipicephalus sanguineus*.

Ticks play a role in the transmission of numerous other bacterial diseases as well as viral diseases and helminthiasis. These include Lyme's disease, which is caused by a bacteria (*Borrelia burgdorferi*) transmitted by *Ixodes ricinus*.

Demodectic mange

Demodectic mange is a parasitic dermatosis caused by infection of the hair follicles with a microscopic vermiform mite: *Demodex canis*.

It causes patchy or diffuse alopecia and significant erythema (redness) and there is a risk of secondary bacterial infection. It es-

What is the best way to protect my dog against ticks and fleas?

Treatment of fleas must be directed at the adults on the pet and the eggs and larvae in the environment. There are numerous products that can be applied to our pets in the form of spot-on products, sprays, shampoos, dips and collars and these kill the adult fleas. Together with treatment of the pet, environmental control is required and here we need to use environmental sprays on the carpets and rooms in the house where the animals spend most of their time. Ticks are best controlled by using collars, spot on products, dips and sprays and they can also be removed manually.

Is it true that dogs can get tick bite fever even if I use a tick and flea product on them?

Yes this is true. Application of products onto the pet dramatically decreases the risk of infection but sometimes a tick may take a blood meal and transmit the disease before being killed and falling off the dog.

Dr. Alain J. Carter
BVSc (Hons)
MMed Vet (Med)
South Africa

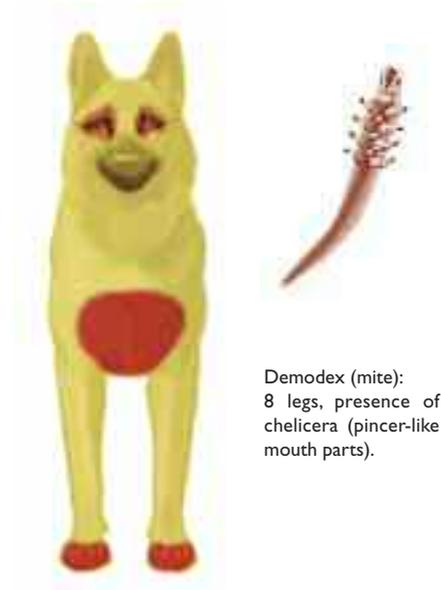


pecially affects young dogs through contamination during the first few months of life (puppy-mother contact) while nursing. Many dogs are carriers of the infection (approximately 85% of the population) but only a few develop demodectic mange. The disease often appears between three and twelve months of age. Moist skin and poor breeding conditions are favourable conditions for *Demodex canis*.

Dry demodectic mange may take several forms:

- Localised form: limited number of nummular (circular or coin-shaped) lesions often localized around the face (small patches around the eyes) and on the limbs.
- Generalised form: this carries a more guarded prognosis. Irregular hair loss in roughly oval patches, erythema, hyperpigmentation then hyperkeratosis (thickening of the skin) and seborrhoea (increased production of sebum) which causes a rancid odour.

Treatment is long and requires the use of amitraz or milbemycin, which are prescribed by the vet.



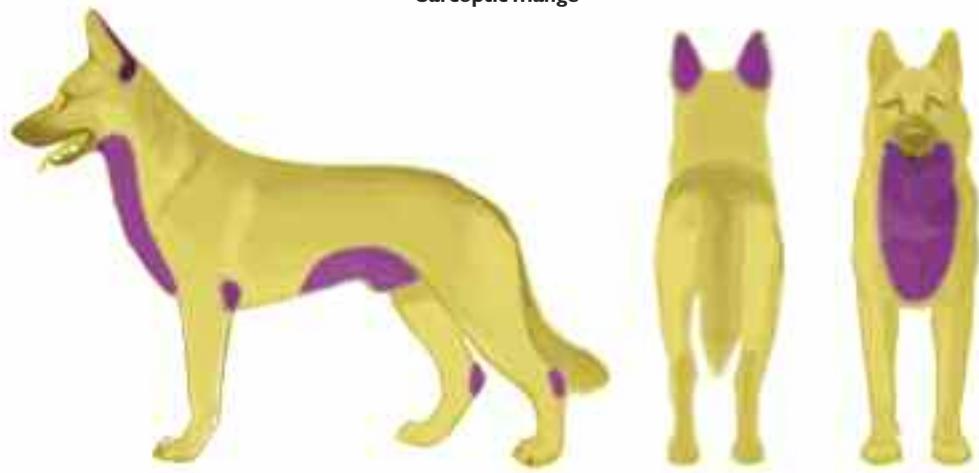
Demodex (mite):
8 legs, presence of
chelicera (pincer-like
mouth parts).

Demodectic mange: lesions are seen around the eyes (spectacles), at the commissure of the lips, on the lower part of the neck and on the extremities of the forelimbs.

Sarcoptes (mite)



Sarcoptic mange



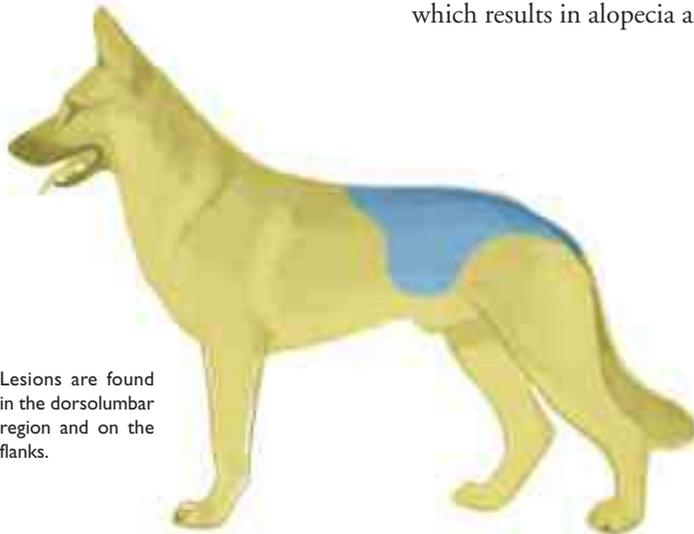
Lesions are found on the posterior aspect of the ear pinna (outer ear), the ventral aspect of the neck, on the points of the elbows and hocks and on the abdomen.

Cheyletiella (another acarina like the ticks)



Mites are related to spiders and scorpions

Cheyletiellosis



Lesions are found in the dorsolumbar region and on the flanks.

Demodectic mange may also become secondarily infected, resulting in pustular demodectic mange in which in addition to the lesions described above there are pustules, crusts and oozing skin. The dog loses weight. Death may occur within a few weeks if no treatment is provided.

Sarcoptic mange

Sarcoptic mange or scabies is a parasitic dermatosis that is highly contagious to humans and is characterized by intense pruritus.

Symptoms: The skin is erythematous (red) with small papules (spots) on the limbs and lower parts of the body, axillae, groin and ears. Lesions initially appear around the edges of the ears and on the point of the elbow. It causes intense pruritus (scratching), which results in alopecia and crusts.

Treatment: all affected dogs and those that have been in contact with them should be isolated and treated with an anti-parasitic treatment. In man the disease causes small, red papules similar to insect bites on the arms and legs and very intense itching especially at night (due to warmth in the bed). Recovery is only possible once the dog has been treated.

Pseudo-mange

Cheyletiellosis or “walking dandruff” is a highly pruritic dermatitis caused by the presence of microscopic mites that live in the animal’s fur. They cause significant desquamation (peeling of skin in scales) in the dorsolumbar region and on the ears. Pruritus is variable. Hair loss is seen where the dog has scratched itself. This disease is highly contagious in a kennel and is transmissible to man (pruritic papules on the arms and trunk).



Cheyletiella sp.

© Zibel S.

Pediculosis

Pediculosis is an infestation of lice. Two species of lice infest the dog; one chewing louse, *Trichodectes canis*, and one sucking louse, *Linognathus setosus*. Lice are host-specific, permanent parasites. They cause severe skin irritation resulting in pruritic dermati-

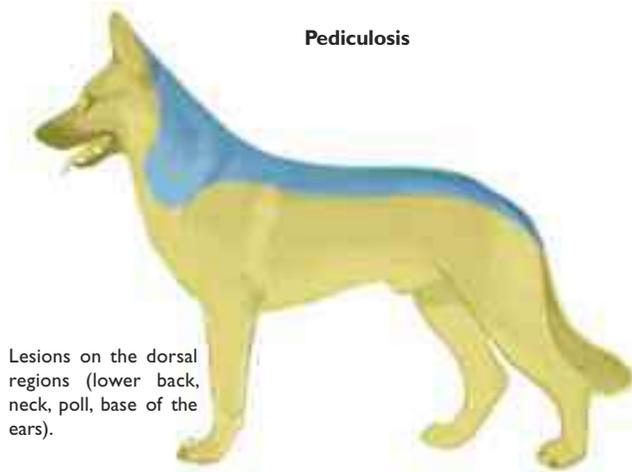
tis with desquamation. The nits (lice eggs) stick to the base of the hair shaft and are easily visible.

The head (ears) and neck are the most affected areas. Long-haired breeds are most susceptible (Cocker Spaniels, Spaniels).



© Parasitologie ENVA

Canine pediculosis (the eggs or nits can be seen at the base of the fur).



Pediculosis

Lesions on the dorsal regions (lower back, neck, poll, base of the ears).

Chewing louse of the dog (insect, 6 legs)



© Zibel S.

Pediculosis

Trombiculosis

This parasitosis is caused by the larvae of microscopic mites called harvest mites and is restricted to fine skinned areas of the body: ears and the extremities of the legs. Powdery, orange-coloured clusters are seen on the dog's skin along with marked skin irritation: trombiculosis is a highly pruritic dermatitis.

Ringworm (Tinea)

Ringworm is a cutaneous mycosis (fungal growth) that affects the skin and nails. The lesions present localised, regular or diffuse areas of hair loss. Erythema and more or less intense desquamation is observed. Ringworm does not cause pruritus and has no effect on the general health of the dog, but it is highly contagious from dogs to other dogs, cats and humans. It is transmitted through direct contact with infected animals or via contact with fungal spores on contaminated bedding and grooming materials.



© Parasitologie ENVA

Ringworm in the dog and human contamination.

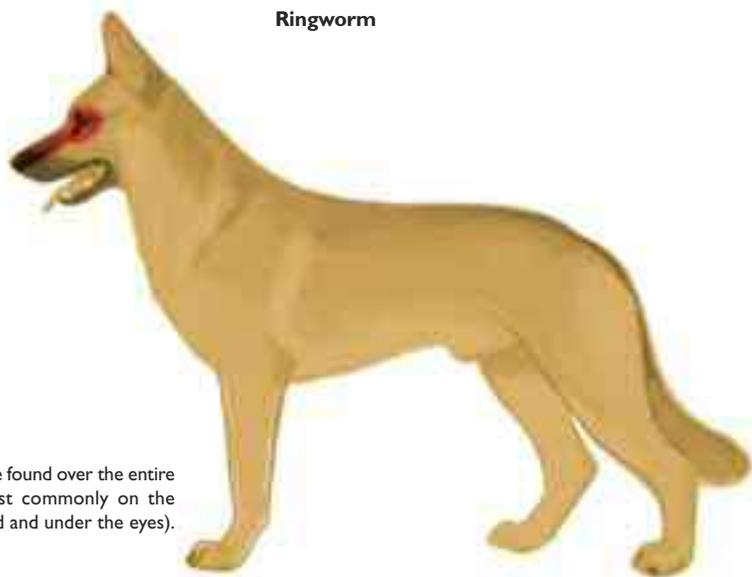


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Dog infested with ringworm.

“The lesions present localised, regular or diffuse areas of hair loss”

Ringworm



The lesions are found over the entire body, but most commonly on the head (forehead and under the eyes).

There are two different clinical presentations:

- *Dry ringworm:*

Often localised, the alopecic lesions are regular and well demarcated (like a coin). The skin is erythematous, especially at the edges of the lesions and is covered with greyish scales with a powdery appearance. The lesions are more common on the upper and anterior regions of the body.

- *Suppurative ringworm:*

Localised or diffuse forms, sometimes forming a raised, erythematous and oozing plaque of one to two centimetres in diameter, which is called a kerion.

Treatment for ringworm is long and requires good hygiene and specific local and systemic treatments for at least one month before any improvement can be expected.

Internal (gastrointestinal) parasites

Oesophagus and stomach

Spirocerca lupi is the main parasite that infects the oesophagus and stomach in dogs; it is a nematode that is usually found in the oesophageal wall and less commonly in the stomach or even in the wall of the aorta.

These parasites cause a serious disease that is endemic in tropical countries, northern Africa and southern Europe. Dogs become infested by ingesting the intermediate hosts, usually coprophagic Coleoptera (dung beetles) but also small vertebrates that become contaminated when they eat dung beetles.

Diseased animals show oesophageal (regurgitation, sometimes inability to swallow) and gastric symptoms (repeated vomiting, increased thirst). Respiratory difficulties may be observed when the parasite infests the wall of the aorta. Treatment is very difficult, involving injectable anthelmintics such as ivermectin. Given the wide variety of hosts that are capable of hosting the larvae of the parasite and that are responsible for the infestation in the dog, totally effective prevention is almost impossible.

Small intestine

Several species of worms infest the small intestine of the dog, principally the strongyles, ascarids and cestodes.

Strongyloidiasis, or hookworm infestation, is mainly caused by *Uncinaria stenocephala*, *Ancylostoma caninum*, which is particularly common in very hot regions, and *Ancylostoma braziliense* in tropical countries. These parasites primarily affect animals living in groups. *Ancylostoma* causes severe anaemia – often referred to as pack dog anaemia – whilst *Uncinaria* causes diarrhoea. Larvae of the *Ancylostoma* genus penetrate the skin or are ingested by puppies along with the bitch's milk. The infestation has several stages corresponding to larval migrations within the body. It begins with a cutaneous phase: small lesions appear on the dog's abdomen or between the toes, which disappear spontaneously within about ten days. The adults develop in the small intestine, which causes gastrointestinal symptoms such as alternating diarrhoea and constipation, followed by the onset of persistent diarrhoea with a foetid odour. Finally, the dog's general health deteriorates due to anaemia in the event of infestation with *Ancylostoma*. This parasite is highly haematophagic: each adult ingests around 0.2 ml of blood per day; with infestations of up to several hundred parasites this results

Ascaris (roundworm)

Egg (thick shell)



in the loss of tens of millilitres of blood each day. In severe forms, the disease may prove fatal, whilst in milder forms spontaneous recovery is possible.

They also affect the immune system. In such cases the initial skin reaction on re-infestation is more marked, which hinders larval migration. Dogs can therefore develop a degree of resistance to these hookworms.

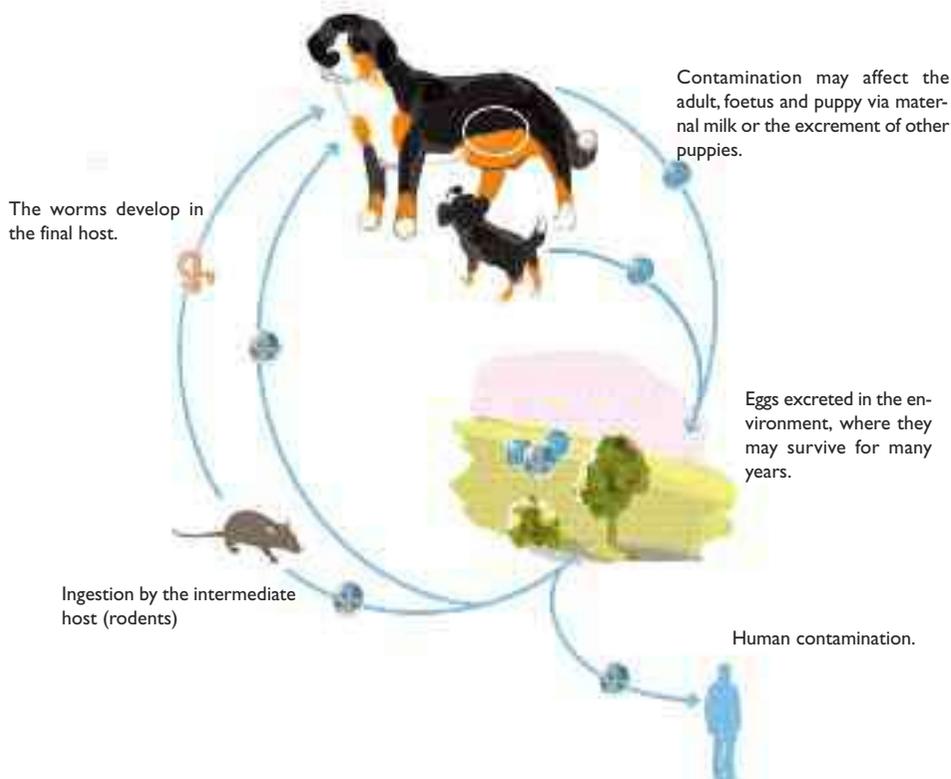
The primary means of prevention in group housing situations is to disinfect the entire area. Pregnant bitches can be given preventive treatment with fenbendazole, which destroys the larvae. Puppies can also be treated once a week from the age of 10 to 45 days, then again at 8 weeks and 12 weeks in areas where these parasites are endemic.

Small intestinal parasites include the nematodes (roundworms) from the Ascaris family (e.g. *Toxascaris leonina*) and the Toxocara family (*Toxocara canis*); the latter

can be transmitted to humans and can cause serious disease notably ocular disorders. These parasites primarily infest young dogs less than a year old. The puppies ingest embryonic eggs in their drinking water or food, or the eggs are transmitted from the mother to the puppies either in utero or via the milk. Dogs in poor general health are more susceptible, particularly those suffering from certain nutritional deficiencies. Massive infestation causes generalised symptoms such as slow growth, weight loss and a high mortality rate in three- to seven-week-old puppies that were massively infested before birth. *Toxocara canis* may cause the dog to cough due to the migration of the larvae through the heart and lungs before returning to the intestine via the trachea. Puppies display primarily gastrointestinal symptoms: diarrhoea interspersed with periods of constipation, vomiting (to get rid of some of the parasites) and a distinctly pot-bellied appearance. Complications may also arise in the form of intestinal obstruction (by a clump of worms) or even intestinal perforation.

Routes of transmission of toxocariasis

Transmission of ascaris by rodents or through the environment



Toxocara canis

© Parasitologie ENVA

ration leading to haemorrhage or peritonitis. The parasites also ingest blood and some of the intestinal contents, both of which contain elements essential for the puppy's growth. Diagnosis is usually straightforward: the puppy's overall health is poor, its abdomen distended and it sheds parasites in its stools or by vomiting. Analysis of a stool sample can sometimes provide the diagnosis. Many parasiticides are available, the most effective being the benzimidazoles and macrocyclic lactones. Preventive measures include the systematic treatment of young dogs and their mother. Dogs should be treated every month up to six months or one year of age, then four times a year. This treatment should be adapted as a function of the conditions in the breeding kennel. It is extremely difficult to destroy eggs in the environment, as they are highly resistant.

Cestodes can also invade the small intestine. These tapeworms, such as *Dipylidium caninum*, are transmitted via the ingestion of fleas. They affect dogs of all ages, leading to significant anal pruritus which causes the dog to rub its bottom along the ground.

What are the benefits of preventative worming treatment?

Everyone knows the benefits of vaccination and that vaccines are a preventative treatment for pets.

For parasites it is interesting to see that in fact many parasitic illnesses can be prevented by giving the dog a simple monthly preventative treatment.

Not all parasites live in the same regions. For example, in certain areas mosquitoes are vectors of heart worm. So if a dog lives in or visits these regions for a holiday, it must be given a preventative treatment to avoid a life-threatening disease.

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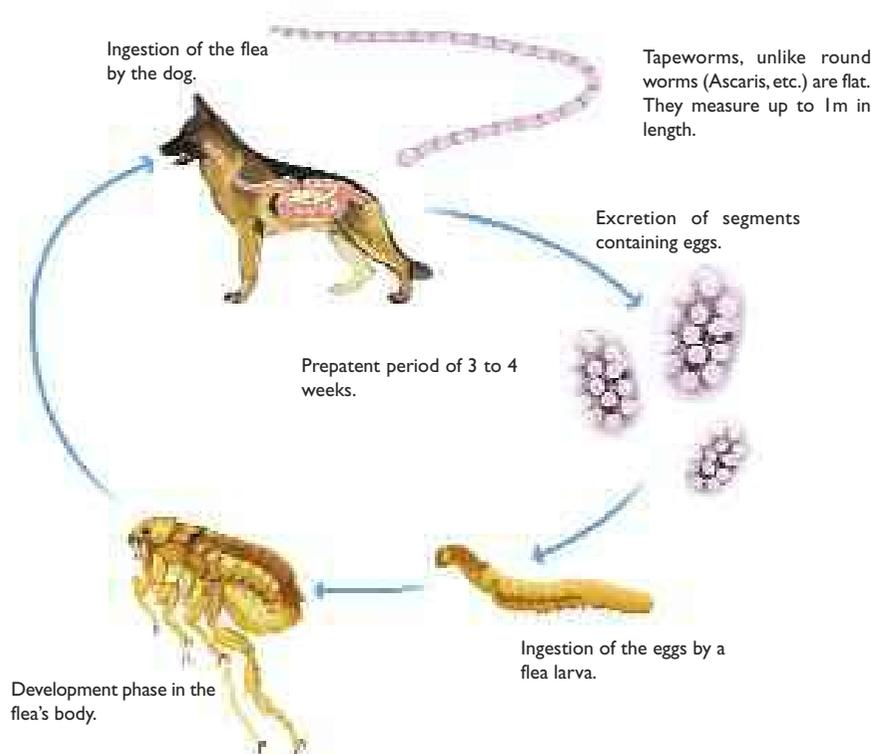


Associated gastrointestinal symptoms include the elimination of segments of the parasite (which look like grains of rice) in the stools; there may also be diarrhoea. Reinfestation is common and facilitated by gregarious living conditions due to the difficulty of eliminating all of the fleas. The parasites ingest minimal quantities of blood.

Their main effect is to cause irritation and swelling of the anal glands.

Prevention is primarily based on eliminating the intermediate hosts, both fleas and, to a lesser extent, lice. Use of specific anti-cestode treatments in infested animals, such as praziquantel, is then recommended. Multi-purpose anthelmintics such as nitroscanate can also be effective. There are many other less commonly seen cestodes which can have serious consequences in other mammals as a result of the development of larvae of the parasite in these species. Two from the *Echinococcus* species, *Echinococcus granulosus* and *Echinococcus multilocularis*, can be transmitted to man and cause serious disease.

Lifecycle of *Dipylidium caninum*
Transmission of tapeworms by fleas



“They affect dogs of all ages, leading to significant anal pruritus.”

Large intestine

This section of the gastrointestinal tract, namely the caecum and colon, is mainly infested with nematodes of the genus *Trichuris vulpis*. Dogs become infested by ingesting eggs present in the environment. Young dogs between 8 and 18 months of age seem to be the most susceptible. A massive infestation leads to symptoms such as diarrhoea (which can be bloody), anaemia and obvious weight loss. These whipworms siphon off blood, leading to blood loss, and cause lesions in which bacteria can develop. Diagnosis requires faecal analysis, which reveals the presence of the parasite eggs in the dog's faeces. Treatment is by administration of benzimidazoles or macrocyclic lactones. However, re-infestation is extremely common so the owner should ensure that the facilities are clean and the food is hygienic.

Babesiosis

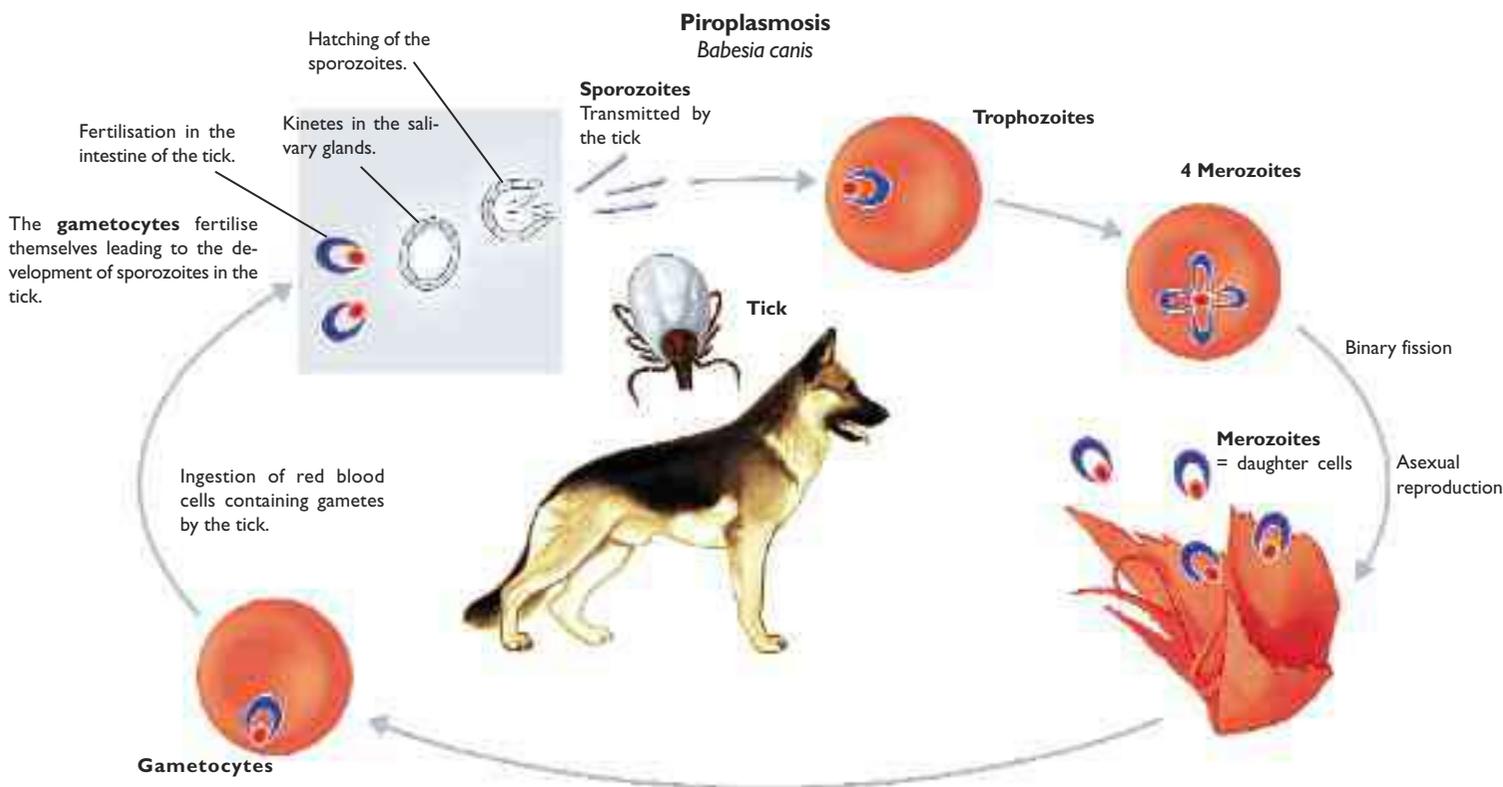
Babesiosis is caused by a protozoan (single-celled) parasite known as a piroplasmid, namely *Babesia canis*. During its life cycle, this parasite must pass through a vector host before transmitting the disease from

one dog to another. In Europe the vectors are ticks from the *Dermacentor reticulatus* and *Rhipicephalus sanguineus* species.

Parasite development in dogs passes through several stages corresponding to the different stages of the parasite's lifecycle. Initially, the parasite is a very simple, circular organism known as a trophozoite. It enters the red blood cells and feeds on their haemoglobin, which it digests. The trophozoite undergoes asexual reproduction (simple cell division).

The nucleus of the cell divides first, followed by the membrane and cytoplasm (the liquid contained within the membrane). The division results in two droplet-shaped daughter cells, or merozoites, which are still inside the red blood cell. There may be more than two cells inside one red blood cell. Usually the red blood cell is destroyed after division and the parasites are released into the bloodstream. Each merozoite quickly attaches to another red blood cell, enters it, and forms a trophozoite. Some merozoites stop producing trophozoites and produce gametocytes. This is the first stage of sexual reproduction in the parasite.

“In Europe the vectors are ticks from the *Dermacentor reticulatus* and *Rhipicephalus sanguineus* species.”



If the tick, an intermediate host, takes a meal from an infested dog, the red blood cells it ingests are destroyed in its intestine, as are the trophozoites. Only the gametocytes remain, which then become gametes in the intestinal wall. Two gametes fuse, forming an egg, or zygote. The zygote produces a motile form that leaves the tick's intestine to enter its egg cells, where it multiplies and develops into motile spores. If a female tick in the next generation, i.e. one hatched from an egg containing motile spores, bites a dog, the motile spores move into its salivary glands. Each motile spore becomes very large, and is then called a sporoblast. Inside the sporoblast, thousands of sporozoites form and infest the dog. Each sporozoite enters a red blood cell and becomes a trophozoite to complete the cycle.

“Highly-selected breeds such as Cocker Spaniels, Spaniels, Yorkshire Terriers and Dobermanns are more susceptible than others. Puppies are more vulnerable than adults.”

Babesiosis is especially common in hot and temperate climates, in the areas where ticks are abundant. It is more widespread during seasons in which ticks are active, and with certain lifestyles, such as hunting dogs. Highly-selected breeds such as Cocker Spaniels, Spaniels, Yorkshire Terriers and

Dobermanns are more susceptible than others. Puppies are more vulnerable than adults.

The incubation period usually last two days to three weeks and sometimes only 24 hours. After this phase, the parasites reach the peripheral blood stream and the symptoms appear almost simultaneously. In the acute form of this disease, the dog has a very high fever and is exhausted. The fever lasts an average of 6 to 10 days. At the same time, anaemia (pallor of the mucosa) is present due to the destruction of red blood cells as the parasites multiply within them. After several days of illness, haemoglobinuria occurs: the dog passes pink to dark brown coloured urine. Atypical clinical symptoms including neurological, respiratory, gastrointestinal, cutaneous or visual signs may also appear. The course of the disease is short: one week at the most. The dog's condition deteriorates if left untreated and it falls into a coma leading to death. A chronic form of the disease, mainly found in adults, may follow an acute form. In the chronic form of babesiosis, the fever is not



© Grosvenor

as high, or is absent, and the dog's overall condition remains good. However, anaemia is always present. This is a slow form of babesiosis, but complications may still occur. The disease may last several weeks and end with the dog's death.

The diagnosis is based on the presence of fever and anaemia. The dog's lifestyle should also be taken into account. Microscopic examination of the blood can confirm the diagnosis. A blood sample is taken from a peripheral area—usually the ear—and examined for the presence of *Babesia* in the red blood cells. The parasites are more difficult to find in the chronic forms of the disease, since there are fewer in the blood.

Specific treatments, known as piroplasmicides, are available for Babesiosis. The most commonly used is imidocarb. Sometimes two injections at an interval of 48 hours are necessary, since there is a risk of relapse. In addition to this specific treatment, symptomatic treatment should be provided, in particular correction of the anaemia (using anti-anaemic agents, or blood transfusions in the most serious cases).

Prevention is still the best cure. The disease can be prevented by destroying all ticks as early as possible, and by using acaricidal (anti-tick) treatments.

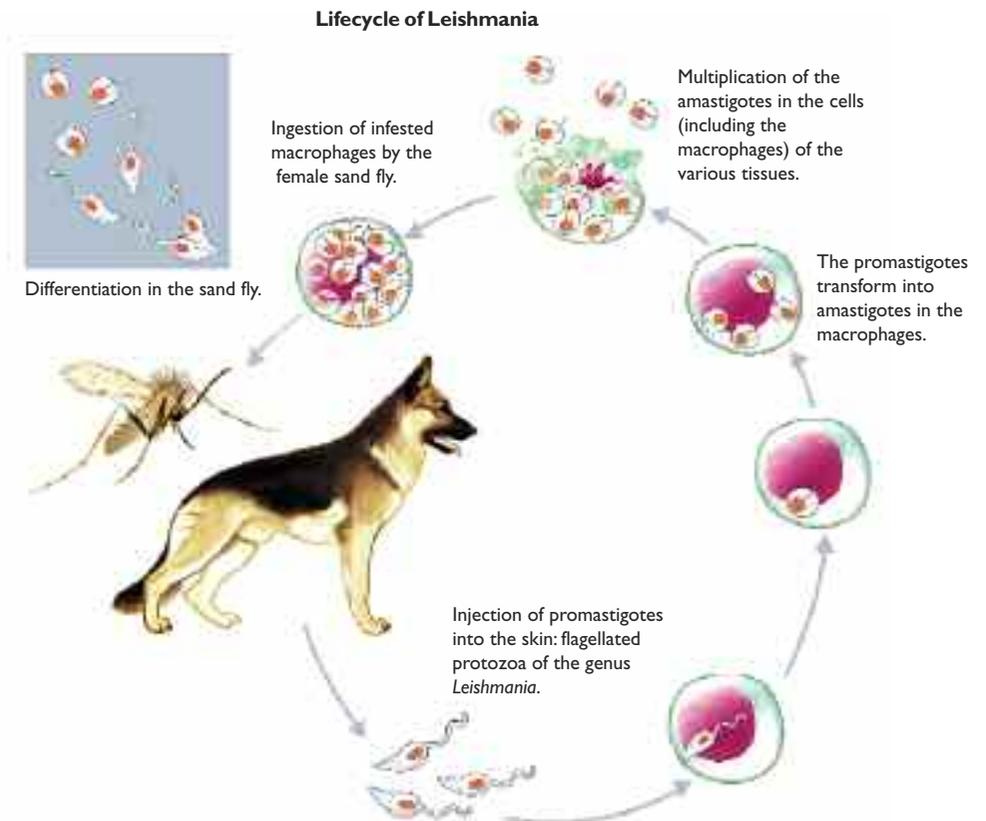
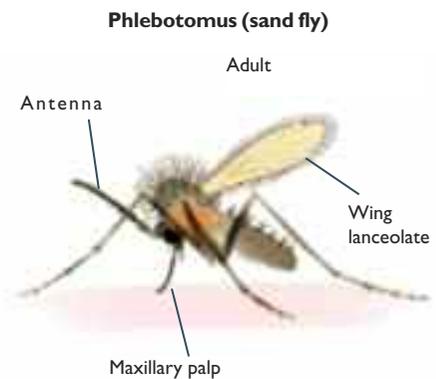
In some countries a vaccine is available against babesiosis, but it is effective for a maximum of only six months and is only about 70% effective. The vaccination protocol is as follows: two injections, one month apart, followed by a booster every 6 months to a year as a function of the risk. The dog must be in good health.

Leishmaniasis

Systemic leishmaniasis in the dog is a disease caused by a Protozoan parasite known as *Leishmania* (more precisely *Leishmania infantum*). This parasite is localised in the dog's macrophages (white blood cells responsible for removing debris & bacteria from cells) and requires, over the course of its lifecycle, passage through a vector host which transmits the parasite from one dog to another; this vector is a phlebotomus fly

(sand fly, an insect similar to the mosquito). The disease is prevalent around the Mediterranean basin and is also seen in Asia and America. In France and other Mediterranean countries, cases are localised in the South of the country, but there is a current trend towards progression to the North.

Symptoms: following an incubation period of 3 to 18 months or more, the disease produces a collection of highly varied symptoms which when present together are indicative of the disease. There is also a general deterioration in the health status (depression, weight loss, occasionally fever, enlarged lymph nodes, etc.), skin problems with desquamation, non-pruritic hair loss, hyperkeratosis notably of the nose with ulceration, ocular disturbances with corneal lesions (keratitis and ulcers) and sometimes visceral (diarrhoea, uraemia) or joint problems (lameness). The progression of the disease is generally slow, over several months or even years, with progressive deterioration resulting in death in the majority of cases if no treatment is implemented.



Dirofilariasis (heartworm)



In *Dirofilariasis* ("heartworm"), the infesting larvae are transmitted via mosquito bites.

Diagnosis: this relies on the finding of *Leishmania* in the macrophages (microscopic examination or using molecular biology) and via serological tests to assess the dog's immune response against the parasite.

Treatment: this is difficult and usually life-long. It is primarily based on the combination of meglumine antimoniate and allopurinol.

Prevention: effective use of insecticides (pyrethroids) preventing bites from sand flies throughout the period of activity of these insects, which is usually from April to November. It is important when travelling to Southern Europe with your dog to start preventative treatment 8 days prior to departure. Sand flies are particularly active at night; it is therefore preferable to keep dogs inside from dusk onwards in affected regions.

Heart worm

This disease is caused by a filaria, *Dirofilaria immitis*. This worm infests the right ventricle and atrium of the dog's heart and its pulmonary artery; it is transmitted by mosquitoes and is encountered in tropical countries and those with a hot climate such as Southern Europe and the USA.

Symptoms: this parasitic disease results in coughing and exercise intolerance; with heavy parasite burdens the symptoms progressively worsen with weight loss and finally death due to right heart failure.

Diagnosis: several techniques are used: cardiac ultrasonography to visualise the adult parasites and the lesions that they cause; microscopic examination of a drop of blood to observe the larvae (or microfilaria); serological testing for an antigen secreted by the female *Dirofilaria immitis* which means an approximate quantification of the parasite burden can be assessed.

Treatment: this is difficult and unreliable as the destruction of the parasites results in pulmonary emboli which may prove fatal. Prevention is therefore preferable for dogs living in endemic regions or travelling to these zones, such as Southern Europe.

Prevention: monthly administration of a macrocyclic lactone-based anthelmintic during the mosquitoes' activity period (April to October).



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Contagious infectious diseases

These are caused by bacteria or viruses. Vaccines are available against the majority of these diseases. They are often fatal without treatment or in unvaccinated animals.

Leptospirosis

This is a contagious disease caused by bacteria from the *Leptospira* genus; it can affect all domestic animals and is transmissible to man. In the dog, several groups, known as serotypes, are highly pathogenic, including *Leptospira icterohaemorrhagiae* and *Leptospira canicola*. These diseases are found worldwide with variable serotypes from one region to the next, and a predilection for wet areas and kennels.

The clinical symptoms of leptospirosis vary depending on the serovar present. At first, the dog may have haemorrhagic gastroenteritis, which can be caused by either of the serovars mentioned above. This is a severe form of gastroenteritis: after an incubation period of five days, the dog is exhausted and prostrate with anorexia and polydipsia (increased thirst). It will have a high fever for two or three days, followed by an abnormally low body temperature. Palpation of the abdomen is extremely painful.

The following clinical phase lasts about five to six days. During this period, gastrointestinal symptoms appear (bloody vomit and diarrhoea), as well as haemorrhagic patches on the mucous membranes and skin, inflammation of the oral mucosa (which smells extremely unpleasant) and acute kidney failure (reduced urine production, sometimes tinged with blood). Nervous, visual, cardiac and pulmonary symptoms may also be observed. This phase is followed by coma then death.

Gastroenteritis may be present in a peracute (very severe) form leading to death within 48 hours, after a period of hypothermia accompanied by vomiting and diarrhoea then coma.

A less acute form is also possible, which lasts about two weeks, in which the dog may recover after the gastroenteritis phase.

A second form of leptospirosis known as icteric leptospirosis (infectious jaundice) also exists. It is caused exclusively by *Leptospira icterohaemorrhagiae*. The incubation period lasts between 5 and 8 days, giving way to fever for two days, followed by hypothermia, exhaustion and abdominal pain. The dog becomes anorexic. During the following clinical phase the mucosae take on the reddish-orange colour characteristic of jaundice. The jaundice is accompanied by diarrhoea and vomiting. This form leads to death in 5 to 15 days.

A third form of the disease, leptospiral nephritis, is caused by *Leptospira canicola*. There are two forms: a rapid form in which gastroenteritis predominates, and a slow form, which is usually not discovered until

Leptospira



Leptospira: helical shaped bacteria.

Leptospirosis



Contamination:

- transcutaneously (swimming in water that has been soiled with rodent urine).
- via the mucous membranes of the eyes or mouth
- through skin lesions.



© D. Hayer/Royal Canin

“River or pond water and objects soiled by urine may lead to indirect contamination.”

its final stage with uraemia (a significant increase in the urea concentration in the blood). The dog dies after falling into a uraemic coma.

Leptospirosis is diagnosed on clinical examination of the animal. The symptoms are fairly characteristic. Laboratory analysis can be used to detect leptospire in the blood before the 8th day of the disease, and thereafter in the urine. Circulating antibodies are not present until after the 10th day of the disease and cannot therefore be detected in the blood until then.

Dogs may contaminate themselves or each other by biting, licking or coming into contact with contaminated dead animals. River or pond water and objects soiled by urine may lead to indirect contamination. The leptospire enters the body via the mucous membranes or through wounds in the skin. Sources include the excreta and secretions of diseased animals, blood in the early stages of infection and urine for several months after the 8th day. Dogs suffering from less acute and chronic forms of the disease can be treated with certain antibiotics. Preventive measures include preventing water contamination, disinfection of the premises and rodent control; the latter act as vectors,

particularly rats, hedgehogs and voles. Vaccines are available and provide relatively good immunity with a maximum duration of six months; they should be used in high-risk areas.

Dogs can transmit these leptospire to man, thus presenting a public health risk. It is therefore classified as a zoonosis. In man the disease causes jaundice similar to that seen in the dog.

Infectious tracheobronchitis (Kennel Cough)

This disease is a contagious respiratory disease, characterized by a cough which can last for several weeks. The syndrome is caused by a combination of bacteria and viruses, and is primarily encountered in group situations (kennels) in which dogs of various origins are brought together. It is also seen in isolated animals, for example after a dog show. The main culprit is the *Bordetella bronchiseptica* bacterium. It often appears at the same time as a viral infection. The dog's general health is not affected. After an incubation period of about three days, the dog begins to cough and a purulent nasal discharge appears. Different viruses may cause the various symptoms. Canine *parainfluenza* virus may provoke mild inflammation of the nasopharyngeal region and a cough that lasts for a few days. This virus is highly contagious and can be transmitted to other dogs in the vicinity. Finally, various *Mycoplasma* may exacerbate the effects of other microorganisms, although alone they do not cause symptoms.

The most common clinical symptom of kennel cough, tracheobronchitis, is uncomplicated. It causes a severe cough that is dry, harsh, non-productive and persistent. The symptoms may disappear within a week or last for several weeks in more serious forms of the illness. Associated symptoms include inflammation of the conjunctivae, sinuses, tonsils and pharynx. The dog's general health is not usually affected.

In rare cases, in dogs with immunodepression, a more serious form of the illness develops, leading to pneumonia and deterioration in general health (exhaustion, anorexia and fever). This form develops progressively over a short period.

Diagnosis is easier in a group situation than in a single animal. Kennel cough is usually suspected if a cough matching the above description is observed. Laboratory analysis of a sample of the nasal secretions can confirm which viruses or bacteria are responsible, thus indicating which treatment will be most effective. In isolated cases, other possible causes of the same symptoms should be investigated before concluding that the disease is kennel cough.

The value of laboratory analysis prior to implementing treatment is limited. The only effective medical treatment is an antibiotic in aerosol form. If treatment is administered within 48 hours of the onset of the first symptoms, the injection of a serum specific to the principal pathogens may be effective. To make the dog more comfortable, antitussive (cough-relieving) agents are also given.

The risk of kennel cough can be reduced by taking proper sanitary measures. The kennel layout is important: an outdoor area and an area with a constant temperature should be available to the dogs. The kennel

Zones of expression of the symptoms of some transmissible diseases as a function of the causative agent



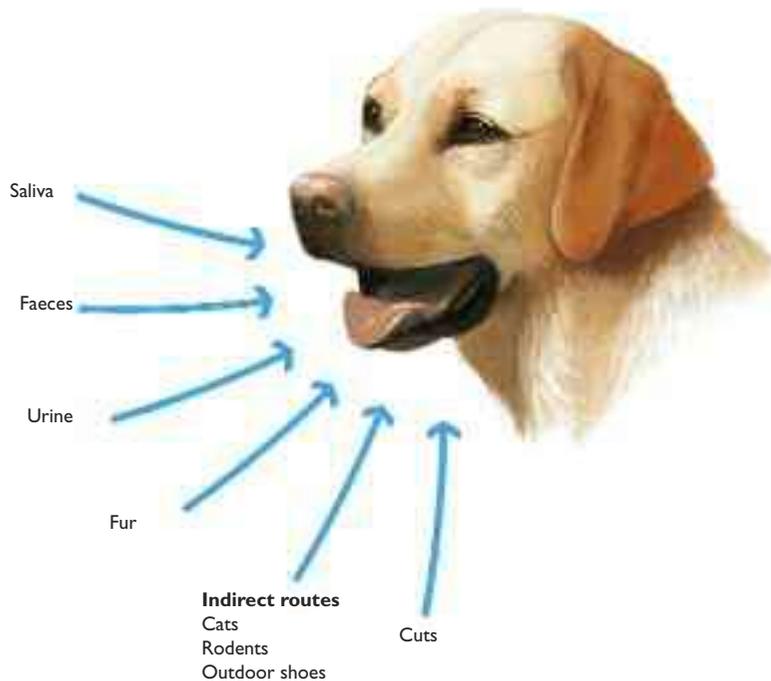
1. Kennel cough: trachea and bronchi.
2. Distemper: brain, respiratory tract, gastrointestinal tract, eyes.
3. Nasal aspergillosis: frontal sinuses, nasal cavities (disease caused by a fungus).
4. Lungworm: tracheobronchial bifurcation (disease caused by a parasite).

should be easy to clean and disinfect. A quarantine period allows the kennel owner to determine a dog's state of health before introducing it into a group, and vaccinations can be administered. A number of vaccines are available, although their effectiveness varies.



“The only effective medical treatment is an antibiotic in aerosol form.”

Main routes of contamination in the dog



junctivitis and corneal clouding (“blue eye”) are seen. The dog usually recovers in 6 to 10 days. More rarely, the disease leads to a coma and then death.

The subacute form has essentially the same symptoms, but they are less severe than in the acute form. The dog recovers within 3 or 4 weeks.

The prognosis is usually good, except in the peracute form. However, in some cases, corneal clouding may persist.

Infection results from contact with an infected dog, or by indirect contact (contact with contaminated objects or food). Nursing bitches can also transmit the virus to their puppies, which then develop the peracute form of the disease. The virus primarily enters the body via the gastrointestinal tract, but also via the respiratory tract. The disease is specific to dogs and foxes; the latter can spread the disease through the environment by the excretion of infected faeces or shedding contaminated blood. The urine of affected animals remains infectious for several months after clinical recovery.

Once in the body, the virus multiplies in the tonsils and various ganglia (nerve centres), then it may or may not spread. The fact that it can remain localized in certain areas explains why so many cases remain undetected. In the third phase of the disease, the viral particles multiply in targeted organs (the liver, kidneys, gastrointestinal tract and eyes), giving rise to the symptoms outlined above.

Treatment for infectious canine hepatitis involves the administration of a specific serum, which is effective when administered during the first 48 hours of the infection. This is followed by symptomatic treatment for the vomiting, diarrhoea and corneal clouding. Prevention involves isolating new arrivals and blood testing to look for antibodies against the virus. Vaccines are available; these contain CAV2, which is related to CAV1, but does not cause infectious hepatitis. This disease has almost disappeared now thanks to routine vaccination.

Infectious canine hepatitis

Also called Rubarth’s disease, infectious canine hepatitis (ICH) is an infectious disease specific to carnivores and is caused by a virus that was isolated in dogs in 1933. The disease was essentially encountered in Northern and Central Europe and the U.S.A., affecting mostly young dogs between 3 and 12 months of age, and occasionally adult dogs as well. It is now thought to have been almost completely eradicated.

The disease is caused by canine adenovirus 1 (CAV1), which can live for about 10 days in the environment, but is destroyed by heat and ultraviolet radiation. It has peracute, acute and subacute forms.

The peracute (very severe) form affects puppies, which die within a few hours without displaying any particular symptoms. The acute form comprises an invasion phase during which the dog is apathetic and has a fever for about 48 hours; and a clinical phase with the onset of gastrointestinal symptoms (diarrhoea, vomiting, gastroenteritis, anorexia and increased water intake). In addition, some of the lymph nodes are swollen and ocular symptoms such as con-

“**Infection results from contact with an infected dog, or by indirect contact with contaminated objects or food.**”

Distemper

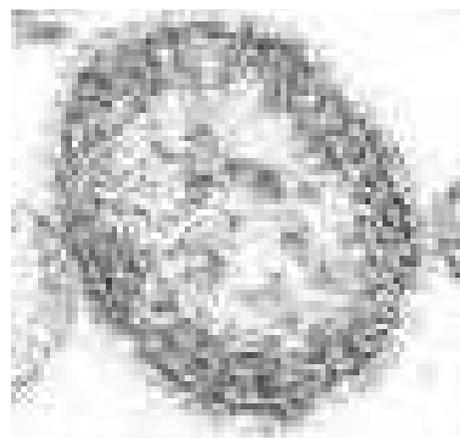
Distemper is a highly contagious disease which affects dogs and wild carnivores. It is caused by a virus from the *Paramyxoviridae* family. It has become rare since 1960, i.e. since the implementation of routine vaccination programmes. However since the beginning of the 21st century it has tended to re-emerge regularly in the form of localised epizootic outbreaks in certain regions. Distemper affects dogs of all ages; sensitivity to the infection varies from one individual to another. Dogs usually become infected by direct contact, inhaling the virus, which enters through the respiratory tract. Once in the body, the virus multiplies in the tonsils and bronchi before spreading throughout the body over a period of about 8 days. From this point, the disease can develop in three different ways. Half of all infected dogs develop a sufficient immune response and the virus disappears. These dogs recover after displaying only a few mild symptoms. In other dogs, however, the immune response is inadequate. These dogs have the characteristic symptoms of the disease. Finally, in a minority of dogs, apparent recovery takes place, but the dogs display neurological symptoms a month later.

The most classical form of this disease develops as follows. The incubation period lasts 3 to 7 days, during which time the dog displays no symptoms. The virus then spreads through the dog's body provoking pyrexia (fever) of up to 40°C, a yellow discharge from the eyes and nose and sometimes small pustules on the abdomen. This stage lasts 2 to 3 days and is followed by a stage in which the dog seems to return to normal, except for persistent conjunctivitis. Next comes the clinical phase, during which the majority of the classic symptoms of canine distemper are seen. The body temperature remains high (about 39.5°C), the mucous membranes are inflamed, a discharge appears from the nose and eyes, the dog has diarrhoea and coughing betrays the presence of tracheobronchitis.

The virus may be localized in various sites provoking rhinitis, conjunctivitis, bronchial

pneumonia (revealed by coughing and respiratory problems), gastroenteritis (causing diarrhoea and vomiting) and keratitis (inflammation of the cornea) with ulceration, which are all symptomatic of complications due to the presence of bacteria. Later on in the disease, the reaction of the immune system leads to the development of neurological symptoms. If the symptoms appear rapidly, paralysis, seizures, involuntary muscle contractions and incoordination may be observed. When the symptoms take longer to appear (up to several months) the dog still displays lack of coordination and this ataxia progressively develops into paralysis. Involuntary muscle contractions and visual problems also occur. There are various modes of progression including neurological, respiratory or dental.

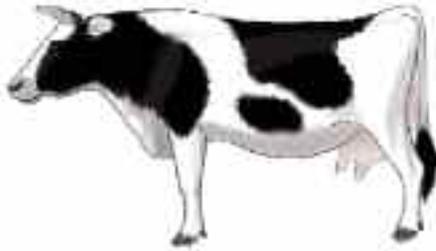
Atypical forms of the disease also exist. One form affects the skin and nerves, causing thickening of the nose and footpads, nasal and ocular discharge and persistent fever. This form progresses slowly. After a few weeks, encephalitis appears and leads to death. Another form of encephalitis (old-dog encephalitis) can affect old dogs, as the name implies.



Morbillivirus of Distemper.



Some of the vectors of rabies



Cow

In Europe



Badger



Roe deer



Fox



Wolf

At least four of the following six criteria must be met before a diagnosis of distemper can be confirmed: nasal and ocular discharge, gastrointestinal symptoms, neurological symptoms and persistent fever, observed in a young dog. Laboratory tests will confirm the clinical diagnosis.

The disease is transmitted by direct contact with infected animals. The virus is usually inhaled and all body secretions contain viral particles. Treatment includes the administration of high doses of a specific serum, and a more general approach to combat secondary infections and relieve gastrointestinal and respiratory symptoms. Prevention is the most effective way to protect a dog against this disease. In large populations of dogs, any new arrivals should be quarantined and the facilities disinfected regularly. Vaccines are available and can be used from eight weeks of age. Dogs should be immunized as soon as possible.

Distemper can also be transmitted to seals; this has led to legislation that forbids the introduction of dogs into the Antarctic in order to protect these endangered wild animals.

Rabies

This infectious disease, which can be prevented by vaccination, is caused by a heat-sensitive rhabdovirus which is inactivated by visible or ultraviolet light. It is preserved by cold. The rabies virus has a very marked affinity for nerve tissues. The virus is usually transmitted to dogs through a wound (bite, scratch, etc.) and multiplies locally. After multiplying in the muscle, the virus spreads through the body and enters the nerves. The symptoms of infection with the rabies virus are neurological and always result in the death of the dog. Several possible outcomes are possible following contact with the virus. Once the dog has been infected, the disease may take many courses. Infection may be asymptomatic. Very rare cases of contact with the virus without subsequent development of the disease have been reported; nevertheless, rabies is considered in both man and in the dog as being a fatal disease in 100 percent of cases.

Rabies infection passes through several phases: the incubation period, which last fifteen to sixty days on average, after which the dogs excrete the virus in its saliva - on average for three to ten days. Then the symptoms appear and the dog dies after a short period of evolution (between two and ten days). The symptoms can be classified into two categories, referred to as furious rabies and dumb or paralytic rabies.

During the first phase of the evolution of the disease, the dog simply presents with a change of character. It becomes worried and is constantly active. It looks for somewhere quiet to rest; this is followed by periods of apathy and excitation. The general status of the dog does not seem to be of particular concern.

The disease then progresses and leads to intense agitation along with generalised disorders and notable difficulty in chewing food. The dog then becomes furious and attacks everything in its path. Finally it becomes progressively paralysed and inevitably dies within 4 to 5 days on average.

The other clinical form is known as dumb or paralytic rabies, as the first symptoms to be seen are a paralysis of the jaws. The first phase of this form is also solely comprised of depression. Paralysis of the head region makes it impossible for the dog to feed itself, and the dog does not try to bite. This paralysis then extends to the rest of the body and leads to the death of the dog within two to three days.

Animals which present a danger to man are those in the final phase of incubation, when the virus is excreted in the saliva, as well as animals showing clinical signs of the disease. Numerous tissues and organs represent a source of the rabies virus. Some of these enclose the virus whilst staying in the body, whilst others are responsible for the excretion of the virus and are therefore dangerous for other dogs. This principally involves the saliva. The viral concentration is particularly high in the saliva, which explains why bite wounds are so dangerous for other animals and humans. The bodies of animals which have succumbed to rabies are also

dangerous as the virus is very resistant in the external environment. The contagion is essentially linked to bites, but not all bites are contagious.

Everything depends on the depth of the bite wound as well as the region bitten (areas with a high nerve supply are more dangerous). Other modes of contamination exist, although their importance is lower in comparison to bite wounds. Contact with the mucous membranes can cause contamination when there are lesions which may be difficult to see. If the saliva of a rabid animal has come into contact with an object, these can also be a source of contamination. A few rare cases of contamination via ingestion or inhalation have also been reported, as well as transmission from mother to pups.

The clinical diagnosis of rabies is very difficult to establish, and in fact only a brain biopsy performed at autopsy means that a definitive diagnosis of rabies in the dog can be made. Rabies should be suspected when a dog shows a change in behaviour or dis-

plays other characteristic symptoms, particularly in areas where rabies is still endemic. The dog's lifestyle may also provide an indication as to the likelihood of it coming into contact with an infected animal (fox, cat, another dog, etc.). There is no treatment for rabies, which is almost always fatal.

To keep dogs and other domestic carnivores from becoming infected, preventative measures must be implemented. Firstly, animals from countries which are not rabies-free should not be allowed to travel to other countries, as they may carry the rabies virus with them. Measures for excluding such animals can include denial of entry, requirement for a certificate of vaccination and good health, and quarantine. Secondly, wild animals, particularly foxes, are known carriers of the rabies virus: vaccination programmes have therefore been implemented in wild animals.

In the last few years, quarantine regulations have been relaxed, allowing the passage of animals between rabies-free countries on

In North America



Coyote



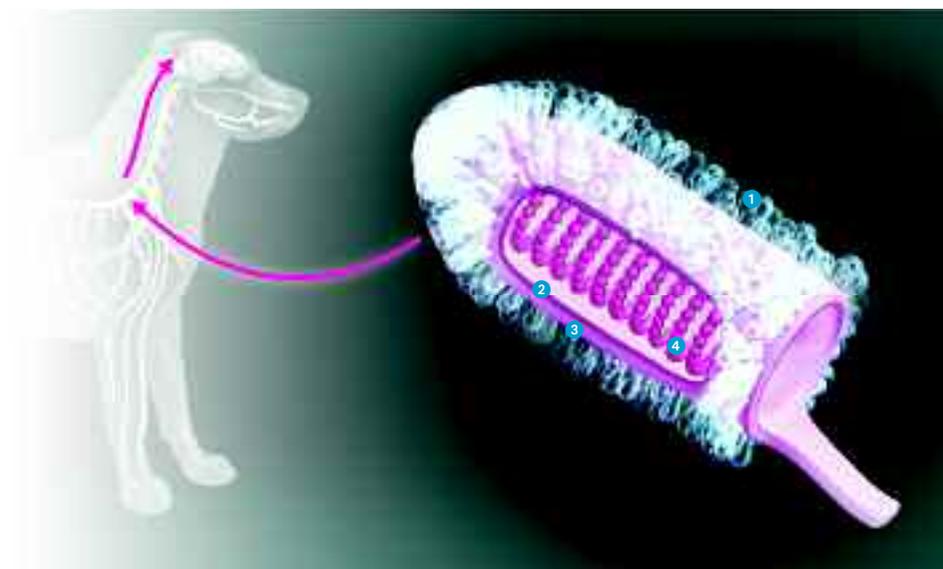
Raccoon

In South America



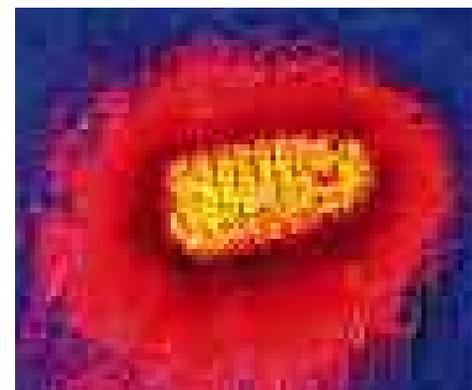
Vampire bat (*Desmodus species*)

The rabies virus (*Lyssavirus*)



- 1. Glycoproteins
- 2. Protein matrix
- 3. Envelope (membrane)
- 4. Ribonucleoprotein

Following a bite wound or simply by licking, the virus travels up nerve tracts to the brain, where it causes encephalitis.



Rabies virus

© ENVA



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“The best way to protect a dog against rabies is to vaccinate it.”

the condition that these animals have been correctly vaccinated prior to travel with proof of their immune status via blood testing. This laboratory proof of the dog's vaccination status enables the dog to travel to rabies-free countries. The UK's "Pet Travel Scheme" (PETS) is one example.

Individual precautions can be taken to prevent infection between dogs. Dogs which bite and which are suspected of carrying rabies are placed under medical surveillance. In France, suspicious cases are classified into one of several different legal categories. Clinical suspects are animals which display symptoms typical of rabies. Biting suspects are dogs which have bitten a person or another animal for no apparent reason, in an area where rabies is endemic. There is also a category of non-suspect biting dogs which have bitten for no apparent reason, in a rabies-free area.

"Clinical suspects" are placed under close watch, in a veterinary hospital, until the diagnosis of rabies can be confirmed. Animals that bite are placed under so-called "biter" surveillance, which involves a two-week period during which time the dog is examined three times by the vet. The first visit is within 24 hours of the bite, the second on the 7th day thereafter, and the third 15 days after the bite. During each of these

visits, if the dog is in good health, the vet draws up a certificate stating that on the date of the examination, the dog had no symptoms of rabies. This legal procedure varies from country to country, but the principle of monitoring remains the same. It is forbidden to give a booster shot of rabies vaccine during this period. Of course, the dog may remain with its owner. If at any time during this period the dog shows symptoms of rabies, it is immediately taken to the vet and placed under veterinary surveillance, as for a clinical suspect. The "biting dog" surveillance is then considered to be at an end.

The best way to protect a dog against rabies is to vaccinate it. The first vaccination cannot be given until the dog is at least three months old and is in good health. A single inoculation is generally sufficient, although a second one may be advised for a young dog. Booster injections must be given either annually or every 3 years depending on the country, and on the requirements of any country to which it is intended to travel with the dog.

Finally, it is important to remember that rabies can be transmitted to humans through bites or scratches, that a vaccine is also available for humans, and that the disease is also fatal in man if treatment is not provided very early on in the disease. Rabies is a major zoonosis.

Parvovirus

Parvovirus infection is a contagious disease which appeared in the U.S.A. and Australia in 1978, and is now found all over the world. It is caused by a member of the parvovirus family which is very resistant in the environment. This disease usually causes haemorrhagic gastroenteritis. Clinical signs appear after an incubation period of three to four days. The dog is initially prostrate and anorexic. It will then start to vomit, which is rapidly followed by bloody diarrhoea. After four to five days, the stools become pinkish-grey in appearance, which is characteristic of this disease and the dog has a distinctive odour.

In the peracute (very severe) form of this disease, the dog becomes extremely dehydrated and dies within two or three days. In the acute form, the reduction in blood volume caused by the diarrhoea and vomiting and the secondary bacterial infections result in death within five to six days. If it has not succumbed by the fifth day, the dog usually recovers.

This disease is particularly dangerous for young puppies aged six to twelve weeks, i.e. when the protection conferred by their mother's antibodies wears off. There is also a rare myocardial form of the disease which only affects one- to two-month old puppies who have not received any maternal immunity. The disease is usually fatal after a short period of respiratory distress. Surviving puppies usually suffer from cardiac problems. It is also possible for some dogs to be infected without showing any symptoms.

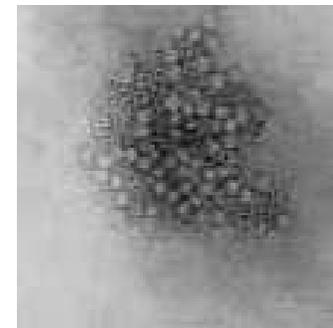
Dogs can be infected directly through contact with an infected dog. Indirect infection is also possible via contact with objects that have been soiled with contaminated faeces.

The virus enters through the nose or mouth, then multiplies in the ganglia (nerve centres) before spreading through the body via the blood stream between the second and fifth day. Once the virus has been disseminated in the blood, it multiplies in the gastrointestinal tract, destroying the cell-lining of the intestines and causing an intestinal infection. The virus is primarily excreted in the faeces and to a lesser extent in the urine and saliva. Young and old dogs are more susceptible to infection.

Diagnosis is more difficult in a single animal, but is fairly easy within a population. In group situations, the disease is highly contagious, affecting dogs aged between six and twelve weeks of age with a 50% mortality rate. Some animals suffer from haemorrhagic gastroenteritis. Those that live beyond the 5th day usually make a rapid recovery. Laboratory examination can confirm the diagnosis, either by detecting the virus in the stools, or by identifying antibodies specific for the disease in the blood.

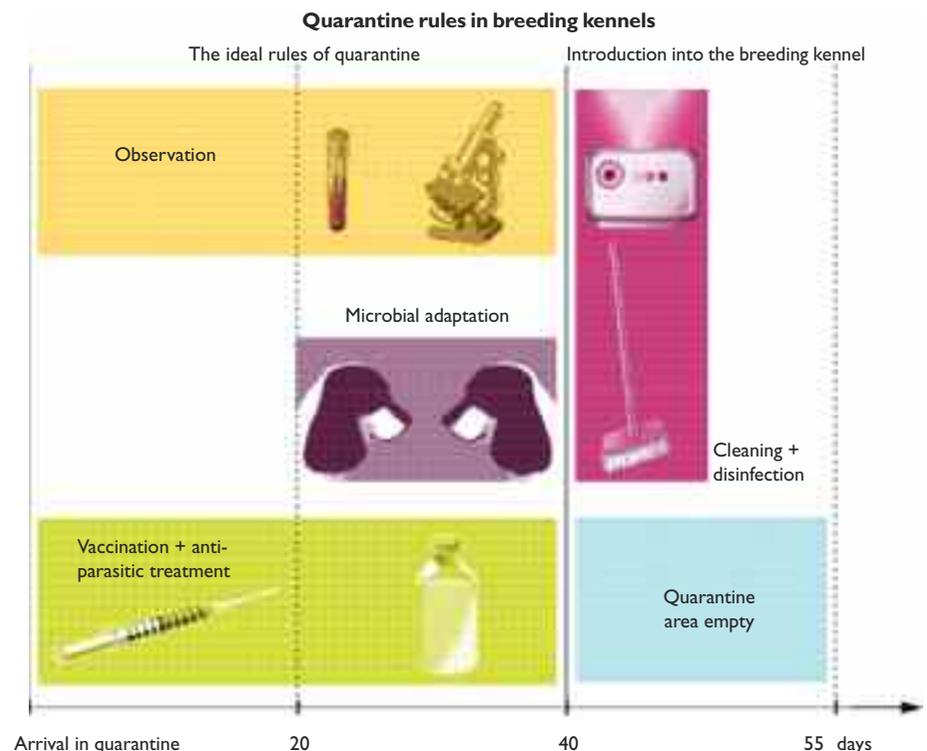
These antibodies can be detected as soon as diarrhoea appears. In both cases, it is important to differentiate between the "wild" virus that causes the disease and the strain used for vaccination. Symptomatic treatment can be given for about 4 days to stop the vomiting and diarrhoea and rehydrate the dog; secondary bacterial infections are prevented from entering through the lesions caused by the multiplication of the viruses in the cells of the gastrointestinal tract.

In breeding kennels, preventive measures are strongly recommended. Contaminated areas should be disinfected with bleach and affected animals should be quarantined (although this is made less effective by the fact that the virus is so resistant in the outside environment, particularly on the coat). Puppies can be vaccinated against parvovirus from six weeks of age.



Canine parvovirus.

If there is nowhere to quarantine the dog, then it can be given to a friend or neighbour to look after until the results of tests are known.





Vaccination

Vaccination prevents fatal contagious infectious diseases. Some vaccines are obligatory in certain geographic zones or in a given situation. They will not be effective unless they are administered at the correct time, according to a strict schedule.

Immunity of the dog

The word “immunity” defines the totality of the body’s defences against infectious or parasitic pathogens.

Puppies receive their immunity from their mother via antibodies in the colostrum, which are transmitted within the first few hours of the puppy’s life (up to a maximum of 24 hours) as it suckles. The success of this depends on the strength of the mother’s own immunity. The puppy’s intestinal cells are immature at birth, thus allowing the antibodies present in the colostrum to cross the intestinal wall within the first 24 hours. Subsequently, the colostrum antibodies are di-

gested like “normal” proteins. The concentration of maternal antibodies decreases in the puppy as it grows and they finally disappear altogether between the fourth and eighteenth week of life. This is the “critical period” for the puppy: it is no longer sufficiently protected by maternal antibodies, yet there are still enough present to neutralise the vaccinal strain and interfere with the effectiveness of a vaccine. The puppy’s immune system is not completely developed at birth and is not mature until about the sixth week. During the first few weeks of its life, the puppy’s only weapon against infection is the antibodies it received from its mother.

Planning your dog’s vaccinations

Initial vaccinations

Between 6 and 9 weeks of age:

- distemper, infectious hepatitis, parvovirus, leptospirosis [vaccination 1].

Between 10 and 13 weeks of age:

- distemper, infectious hepatitis, parvovirus, leptospirosis [vaccination 2].
- Rabies (minimum age 12 weeks) [vaccination 1].

Between 15 and 17 weeks of age:

- Leptospirosis (If initial leptospirosis vaccine not given between 6-9 weeks).

Boosters:

Rabies: every 1 to 3 years depending on the manufacturer and the country.

Leptospirosis: annually as a minimum, twice yearly in high-risk areas.

Distemper, infectious hepatitis, parvovirus: one year after first vaccination, then every two or three years.

Other available vaccines

kennel cough: two initial vaccinations given three weeks apart, then annual boosters.

Babesiosis (available in certain countries): two initial vaccinations given 3 weeks apart, then boosters every 6 months.

Herpes virus: two vaccinations during each breeding cycle.

It is important that the maternal antibodies, which may persist until the 10th or 12th week, do not interfere with the puppy's first vaccinations. However, vaccination programmes can be started as soon as the puppy is 8 weeks old.

The body's immunity is conferred by antibodies (molecules which circulate in the blood stream or other bodily fluids) and immune cells (certain types of white blood cells). By binding to a specific part of a pathogenic agent, antibodies inactivate it, making it harmless to the body. Immune cells recognise this pathogenic agent to which they have been sensitised and call other white blood cells for help. Together they destroy the virus or the bacteria.

Dogs should be vaccinated against any infectious diseases which could be fatal to them. In addition to rabies vaccination, which in many countries is a legal requirement, dogs should be inoculated against distemper, infectious hepatitis, leptospirosis and parvovirus.

The different forms of vaccine

When a dog is vaccinated, it is inoculated with tiny amounts of pathogenic microorganisms, or parts of them, which have been attenuated or killed so that the body can develop immunity against these viruses or bacteria.

Some vaccines, referred to as "live vaccines", contain microorganisms which can multiply within the dog without causing disease. This group includes:

- attenuated vaccines: these contain microorganisms with a reduced pathogenic capacity due to mutations obtained, for viruses, by successive passage through cultures of cells from other animals (chicken, guinea pig, etc.). The ability of the virus to cause a reaction in the dog is thus attenuated, or weakened. Other procedures are used to the same effect for bacterial vaccines.

What vaccinations are recommended for dogs?
Description of a vaccination programme

A vaccination programme for dogs has to take a number of factors into account. The two key questions that most veterinarians ask themselves are: what are the main pathologies in the region and what is the exposure risk for the puppies? The other aspect that needs to be considered is whether the mother has received "immunological preparation", which ensures she passes on the best possible protection to her puppies through her colostrum. An example protocol followed by vets begins when the puppies are six weeks of age, against the major diseases, such as puppy gastroenteritis, corona virus and parvovirus, as well as distemper, leptospirosis and infectious hepatitis. At least two boosters are recommended, at three-week intervals. Once the three doses have been administered, puppies are given the rabies vaccine. The puppies' immunity is strengthened with a dose of rabies vaccine and a dose of vaccine against other diseases, distemper, hepatitis, corona virus and parvovirus.

The vet can also administer vaccines against canine respiratory diseases in regions where it is deemed necessary.

*Veterinary Major
Carlos de Almeida Baptista Sobrinho
Commander of the War Dogs Section
of the 2nd Police Battalion
of the Brazilian Army*



If the strain used for the vaccination is the same as the strain responsible for the disease, the vaccine is said to be homologous. If a different microorganism is used that is closely related to the wild pathogen but is less virulent, the vaccine is said to be heterologous.

- genetically modified vaccines which have been altered so that they lose their virulence.

Inactivated or killed vaccines contain inert agents which cannot multiply inside the host animal:



© Casseleur, G.

“Rodent control and disinfection of the kennels are very helpful in eradicating the disease.”

- vaccines containing inactivated pathogens that have been killed by chemical means.
- sub-unit vaccines which contain only part of the microorganism responsible for the disease.

Inactivated vaccines are safer than live vaccines, but not as effective. They are therefore often associated with an adjuvant (a substance added to the vaccine to improve the immune response), which prolongs their contact with the body. If an adjuvant is used with the rabies vaccine, a second injection during the initial vaccination course becomes unnecessary.

To avoid the necessity for multiple injections, several vaccines are often given together (meaning that the dog is vaccinated against several infectious diseases at the same time). However, care should be taken not to mix vaccines from different manufacturers.

Rabies

The most widespread rabies vaccine contains inactivated rhabdovirus. The first vaccination is given to puppies at least 3 months old, with only one injection required if the vaccine is given with an adju-

vant. Subsequent boosters are administered every 1 to 3 years depending on the manufacturer and country, and on the requirements of any country it is planned to travel to with the dog.

Distemper

The vaccine is a live attenuated virus, and therefore not pathogenic. The vaccination is given in two injections one month apart, with the first taking place at about 8 weeks of age. If the puppy is older than three months, only one injection is needed. Booster vaccinations are given one year after the first vaccination, then every two or three years thereafter, depending on the vaccine used.

Infectious hepatitis

Puppies can be vaccinated from 8 weeks old. The vaccine is made from an attenuated related strain (CAV2) and is given as two injections one month apart. If the puppy is older than three months, only one injection is needed. Booster vaccinations are given one year after the first vaccination, then every two or three years thereafter, depending on the vaccine used.

Parvovirus

Vaccines for parvovirus are homologous, but the pathogen is attenuated. Puppies are given two injections, one at the age of 6 to 8 weeks, the other at the age of 12 weeks. If the puppy is older than three months, only one injection is needed. Booster vaccinations are given one year after the first vaccination, then every two or three years thereafter, depending on the vaccine used. Breeding dogs in infected kennels are vaccinated every year.

Leptospirosis

Unlike the preceding infectious diseases, leptospirosis, also known as canine typhus, is caused by a bacterium from the genus *Leptospira*.

Rodent control and disinfection of the kennels are very helpful in eradicating the disease. Dogs can also be vaccinated with inactivated leptospirosis antigens. They receive two injections 3 to 5 weeks apart, from 6 weeks of age. Booster injections are usually given annually, except in areas where the disease is endemic, where they are given twice a year.

Other vaccines

In at-risk situations or regions, or simply for the dog's well-being, they can also be vaccinated against tetanus, babesiosis, kennel cough and herpes virus.

- **Tetanus.** The tetanus toxin, secreted by tetanus bacilli, affects the nervous system. It is secreted at the site of entry of the bacteria into the body, which is often a very small wound. Tetanus is characterized by involuntary muscle contractions that eventually affect the animal's entire body. Vaccinations are mainly given to working dogs or dogs which live or work in areas where they might easily be injured (rescue dogs, collapsed buildings, building sites, etc.). There is no specific anti-tetanus vaccine for the dog. The horse vaccine, which is made from purified tetanus antitoxin, is used instead. The first vaccination is given as two injections four weeks apart. Booster vaccinations are given after one year, then every three years thereafter, and whenever there is a wound.

- **Babesiosis.** Dogs which spend a lot of time in densely wooded areas or other areas with large tick populations are at a high risk. The height of the tick season is in the spring and autumn. In some countries, dogs can be vaccinated with a vaccine containing parasitic proteins, which is effective for about 6 months. The first vaccination is given as two injections 3 to 4 weeks apart, with a booster every 6 months (preferably in summer and winter). Should a vaccinated dog contract Babesiosis, the clinical severity is reduced.

- **Kennel cough.** All dogs going to boarding kennels or a dog show should be vaccinated. The disease can be kept from spreading by placing animals in quarantine before introducing them into a group.

There are various vaccines on the market, made from inactivated viruses or bacteria (*Parainfluenza*, *Bordetella bronchiseptica*). The injectable forms of the vaccine are not very reliable. The primary vaccination is given as two injections three weeks apart, with an annual booster injection. A live attenuated virus administered intranasally seems to give better results.

- **Herpes virus.** Vaccination against this disease, which causes abortion and neonatal death, is advisable in breeding kennels, even if the disease itself does not generate any other clinical symptoms.

Finally in some countries there are vaccines available against Leishmania, Coronavirus or Giardia, but they are not yet readily available worldwide.

“Dogs which spend a lot of time in densely wooded areas or other areas with large tick populations are at a high risk.”



© Duhaier/Royal Canin

When and how should my dog be vaccinated?

Vaccination for babesiosis: (this vaccine is only available in certain countries)

Frequently asked questions

– *Should I take any special precautions before the vaccination?*

Prior to vaccination the dog should be in good physical health and should not be fed a large meal within 12 hours of the visit. Make sure that you tell your vet about any problems that the dog may have had over the past 12 months.

Vaccinations should only be administered to dogs in good health; a thorough physical examination is therefore advisable and the vet will probably take your dog's body temperature, check for inappetence, any changes in behaviour, and anaemia. If necessary, the absence of early babesiosis can be confirmed with a blood sample.

– *Is vaccination effective?*

No vaccine is capable of protecting 100% of individuals. Some individuals are incapable of producing sufficient numbers of antibodies for various reasons (age, poor health, concurrent infectious disease, physiological condition, ancestry, some concurrent treatments, recurring babesiosis, etc.).

While it is not specifically contraindicated, it is not advisable to vaccinate such dogs against babesiosis.

– *How long does it take for the vaccination to become effective?*

Initial vaccination requires two injections, and immunity does not appear until a few days after the second injection. Between injections, the dog is susceptible to the disease and so must be watched carefully during this period.

– *How old must the dog be to receive the vaccination?*

Puppies under three months of age should not be vaccinated, due to their immunological immaturity in relation to babesiosis. Immunological maturity is not complete until about five months of age.

– *How is the vaccine administered?*

The initial vaccination requires two subcutaneous injections at an interval of three or four weeks. This interval should never be less than fifteen days or more than six weeks. Boosters are given annually.

– *Should the vaccination be given at a certain time of the year?*

The prevalence of canine babesiosis is linked to the lifecycle of its arthropod vector, the tick. As a general rule, ticks are less active during cold, dry winters than during the summer. However, de-

pending on the area and the local climate, cases of canine babesiosis can occur year-round. Your vet will know the regional epidemiology of this disease and can advise you accordingly.

– *Does the vaccination have any side-effects?*

In rare cases, there may be temporary fatigue (lasting up to twenty-four hours), and possibly slight oedema (swelling) at the injection site, which should disappear within a few days. In the vast majority of cases the vaccine is very well tolerated by dogs.

Nevertheless, it is recommended that the dog be allowed to rest for twenty-four hours after the vaccination, and that no great effort (hunting, long walks, training sessions, etc.) is made during this period.

– *Can the babesiosis vaccine induce the disease in my dog?*

This is impossible since the vaccine is made from dead proteins derived from the parasite's membrane. However, a dog receiving the vaccine may already be incubating babesiosis and the disease can then flare up within a few days of the vaccination. This is why the vet will perform a thorough physical examination before administering the injection.

– *Can my dog be vaccinated for babesiosis and other diseases on the same day?*

Currently, the anti-rabies vaccine and leptospirosis vaccine can be given at the same time as the babesiosis vaccine.

– *My dog has had several babesiosis infections. Should I have the dog vaccinated?*

Although not specifically contraindicated, vaccination is not recommended in such dogs. These animals seem to be unable to protect themselves against this disease.

– *My dog has just recovered from babesiosis. When can it be vaccinated?*

You must wait eight weeks after the end of treatment before giving the initial injection.



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Vaccination against rabies

The initial vaccination involves one injection from 3 months of age. A second injection may be given in young dogs.

To be valid, the booster injection must be administered within one year of the first injection in some countries and within three years in others.

Boosters

The first booster injection against distemper, infectious hepatitis and parvovirus should be given one year after the first vaccination.

Subsequent boosters are given every two to three years, depending on the vaccine used.

The legislation for rabies varies from one country to the next and the booster vaccination may be given within one year or three years of the primary vaccination.

Protection against leptospirosis requires annual boosters, or even six-monthly boosters in endemic areas.

Vaccines which can be given together make annual booster injections much easier to organise.

Initial vaccination for distemper, infectious hepatitis (adenovirus type 2), parvovirus and leptospirosis

First vaccination: between six and nine weeks of age.

Second vaccination: between ten and thirteen weeks of age.

Important recommendations

1. Dogs in poor general health should not be vaccinated, particularly those heavily infested with ecto- or endoparasites. The dog should be treated for parasites before vaccination takes place.
2. If the vaccination program has not been maintained, it must be started again as soon as possible, no matter how old the dog is, with the same intervals between vaccinations.

The advantages and consequences of neutering

Etymologically, the word “sterilisation” comes from the Latin “sterilis”, which means “does not bear fruit”. This procedure therefore eliminates the production of reproductive cells: spermatozoa in the male and oocytes in the female. As a result, the animal can no longer reproduce. The term castration is by definition the removal of the male reproductive organs, i.e. surgical sterilisation.

Two methods of neutering are currently available. The most common is surgical neutering, which is a permanent solution. More recently chemical sterilisation has become available as a temporary means of reproductive control.

In Anglo-Saxon countries around 80 percent of the dog population is neutered, whereas only 30 percent of dogs are neutered in Latin countries.



How is a dog or bitch neutered?

- **Excision of the sex glands: gonadectomy**

This is a definitive surgical procedure involving the removal of the sex glands (ovaries in the bitch and testicles in the male). After this procedure, there are no more sex cells or hormonal secretions. The bitch therefore ceases to come into heat.

- **Obliteration of the ducts that serve to release the sex cells: ligation of the fallopian tubes (female) and vasectomy (male).**

This surgical procedure involves cutting the tubes that link the sex glands to the outside world. The animal retains its sex hormones but reproduction is impossible since the spermatozoa can no longer be released and the oocytes can no longer come into contact with the spermatozoa in the female genital tract. This technique is used in working animals in which there is a concern over the risk of a reduction in performance. For females, the technique offers very few advantages, since they will continue to come into heat.



An ovariectomy is the surgical removal of the ovaries. The bitch can no longer reproduce (no reproductive cells left) and will no longer come into heat (no sex hormones left).

- **Ovariohysterectomy**

This surgical procedure involves removing the sex glands (ovaries) and uterus in the bitch; it is the usual method chosen to neuter a bitch. It is systematically performed when the uterus is diseased (metritis, cysts, pyometra, tumours, etc.).

- **Reversible chemical sterilisation**

It is now possible to chemically sterilise a dog or bitch for a period of 6 months to a year, with products and techniques in this area evolving rapidly. This technique has the

advantage of being reversible, making it an interesting alternative for working or sporting dogs, although no studies have been conducted into the effects of such a treatment on performance.

What are the advantages of neutering a dog or bitch?

- **As a method of birth control**

Neutering makes it possible to control reproduction. The owners therefore have the opportunity to prevent their animal from reproducing. Neutering can also be a valuable tool in the fight against over-population amongst dogs in certain regions of the world where they present a danger to humans or their farm animals. In the bitch, neutering also prevents the inconveniences associated with heat (blood loss, attraction of males, escapology) and removes the future risk of disease of the reproductive tract.

For a breeder, neutering animals from their breeding unit enables them to preserve their genetic pool and improve it: only dogs and bitches that have been specifically selected are mated to improve the breed characteristics.

Finally, neutering helps to limit the propagation of genetic defects by preventing disease-carrying animals from reproducing. Genetic tests are currently available for certain diseases and can be used to select breeding animals free from the disease.

• Disease prevention

In the bitch, the development of mammary tumours is related to the secretion of sex hormones: by neutering the bitch before her first heat, the risk of developing mammary tumours is almost nil; it is 60 percent lower when the bitch is neutered after her third heat. For owners who do not wish to breed their bitch, neutering is an excellent means of prevention. The same applies to pyometra, a serious infection of the uterus. Neutered bitches do not suffer from this disease if the uterus was healthy at the time of ovariectomy (removal of the ovaries and uterus).

In ageing male dogs (over 7 years of age), prostatic hyperplasia is very common. This benign disease causes pain, constipation (compression of the colon by the enlarged prostate), blood in the urine and reduced fertility. This disease is male hormone dependent.

• Treating a disease

Surgical neutering is clearly indicated in the event of disease of the genital organs: testicular tumour, pyometra, repeated false pregnancies, etc. It is also strongly advisable to neuter diabetic bitches. The fluctuations in sex hormones during the oestrous cycle disrupt the secretion of insulin and thus destabilise treatment. The only means of stabilising a bitch in this condition is to neuter her.

The consequences of neutering

• Metabolic consequences: adapting the diet

Neutering leads to a reduction in energy expenditure, even at rest. Removal of the sex hormones results in a 20 to 30 % fall in energy expenditure, explaining why neutering is often associated with weight gain. It is im-

portant to remember that this is not inevitable, and not to accept it as a foregone conclusion! However, it is essential to monitor the animal's weight every fortnight for the first six months after surgery. If the dog gains more than 5% of its previous weight, rapid action is required and a change of diet may be necessary. Specially formulated diets are now available for neutered animals. These have a lower energy content (whilst being formulated to guarantee a balanced diet) to preserve sufficient dietary volume and ensure that the dog does not go hungry.

Neutering at a very young age (as little as a few weeks old in the United States) delays the closure of the growth cartilages (which enable the longitudinal growth of bones) and often means that these animals are bigger than average. Particular attention should be paid to the body condition of these dogs, as there is still a risk of obesity but it may be hidden by growth: the dog may seem to be gaining weight normally, but is it excessive? Recently diets have become available to tackle this specific situation, i.e. growth in neutered puppies.

• Physiological consequences

The first, and often the most frequently sought advantage, is the absence of oestrus in the bitch and thus the cessation of heats.

Urinary incontinence is a physiological inconvenience that can be associated with the neutering of bitches; this may occur many years after neutering. The impact of early neutering (before the first heat) does not increase the likelihood, but it is possible that any ensuing urinary incontinence, with a later onset in such cases, is harder to treat. This disadvantage does however only affect a small minority of bitches and is easily controlled with medical treatment.

• Behavioural consequences

Neutering is often requested to modify certain behaviours in the dog: aggression, escapology or hyper-sexuality. It is important to realise that it is completely ineffective in the majority of cases. From a behavioural point of view it is even inadvisable to castrate an aggressive male. The treatment required is primarily behavioural and neutering should not be seen as a miracle solution as the owner is likely to be disappointed.

A dog or bitch neutered relatively early (in the first few months of life) often retains a more juvenile character (more loving and playful). However, this should not be used as a reason for early neutering, as with all behavioural characteristics, neutering does not have constant or systematic consequences.

Neutering is a risk factor for obesity, since the energy requirements of the animal diminish, but this is not inevitable! Regular monitoring of the animal's weight and if necessary a change in diet will ensure that the dog retains perfect body condition.





Planning a journey with your dog

If you would like your dog to accompany you as often as possible, it is wise to accustom your dog to outings at an early age. You should also check that you are allowed to take the dog to the places you are planning to visit. Below are some practical tips to help you avoid unpleasant surprises.

Before you pack your bags

Before taking your dog on a trip, you should always check out the principal diseases that your dog may encounter in the geographical zone or country to which you are travelling in order to begin appropriate preventative care where necessary.

- At least one month prior to your departure, check that all vaccinations are up to date and if not, take the dog to the vet for boosters. In addition to the standard vaccinations (canine distemper, parvovirus, leptospirosis, infectious canine hepatitis and rabies), in certain countries it is also possible to immunize the dog against babesiosis (piroplasmosis), a disease transmitted by certain ticks, where travel to endemic destinations is planned. Topical products may be used to help to reduce infestations from ticks and other external parasites. If the dog is not used to rocky terrain, take him for frequent walks beforehand on hard surfaces to help toughen up his pads.

When dealing with hot weather in countries such as Cyprus the following should be taken into consideration.

The kennels must always be covered, with double insulation material and trees planted around. During the hottest hours spray the area with water or provide small swimming pools. Cutting the hair on some breeds may be required. Provide exercise only early in the morning. Feed late at night and reduce the amount of food, as the caloric need is decreased. Overweight dogs can suffer

more. Be extra careful with brachycephalic breeds or breeds that have a double coat!

Remember that prevention is better than treatment, forgetting the dog in the sun can be fatal...

Elisa Loizou
Breeder in Cyprus



- At least two weeks before: worm the dog and prepare an emergency medical kit. If travelling abroad, ask your vet to prepare a certificate of good health where needed and make sure that you have a canine passport with the dog's identification and the dates of all obligatory vaccinations. The regulations vary from one country to the next, and it is important to check with the embassy of the destination country (or on their website) to obtain the list of requirements and necessary documents for crossing the border. Also ensure you fulfil all necessary requirements to return your dog to your home country.

The day of departure

Give the dog a light meal approximately ten hours before departure. To limit the risk of vomiting, do not give the dog anything to eat during the trip, unless the journey lasts more than twelve hours.

Gather all of the equipment needed to care for the dog during your visit: water and food bowls, bedding and a brush (and/or comb).

If the dog becomes sick or anxious easily, give a travel sickness tablet or a sedative as prescribed by your vet. This will prevent the dog from becoming agitated.

Walk the dog prior to departure. Bring enough plastic bags and paper to clean up any mess when stopping at rest areas while travelling.

Food during the trip

There is no need to add extra stress to the dog by changing his diet. If the diet must be changed, try and introduce any changes gradually at least three weeks before departure.

While away, maintain the same meal times and frequency as normal. The dog may refuse to eat at the beginning of the trip. Do not worry too much and do not 'give in' by offering treats to whet its appetite, because this will lead to persistent begging. The quantity of food can be adjusted to the dog's activity levels. Make sure you offer water frequently in hot conditions.

Dogs and hotels

At hotels, basic good manners imply a few simple rules of behaviour:

- inform the hotel manager of the presence of the dog when making reservations (some hotels do not accept dogs);
- do not leave the dog alone in the room and walk it at least three times per day;
- keep the dog on a leash while inside the hotel;

- prevent it from barking;
- show respect for the furniture: set up a sleeping area for the dog somewhere other than the bed or sofa.

Such rules of good behaviour also apply in camp sites.

Dogs and restaurants

Many restaurants do not accept dogs, however if your dog is accompanying you, it is best to feed it before going out to eat so that it will not beg at the table.

Dogs and cars

Car travel should not pose a problem if the dog has been accustomed to riding in cars from a very young age.

However, to prevent any problems (such as restlessness, agitation, barking, vomiting, etc.) do not forget:

- don't feed the dog within at least three hours of the trip, but do offer water. If your dog tends to be travel sick, ask your vet to prescribe a treatment or even a sedative.

- don't allow the dog to stick its head out of the window as this may cause irritation of the eyes or ears.

During long trips, it is advisable to stop every two hours to allow the dog to stretch its legs and relieve itself if necessary.

Warning! Never leave the dog in a locked vehicle parked in the sun as this puts it at serious risk from heat stroke (the temperature inside a car may reach as high as 70°C (150°F). Finally, in the event of a car accident, treatment for any wounds suffered by the animal should be covered by the insurance of the driver who is at fault.

Long distance trips require maximum security. The ideal place for the dog is in the boot with a dog guard in place and the parcel shelf removed. If this is not possible, the dog may travel on the back seat if a pet seat belt harness is used or a well-secured cage.

Putting a dog in a covered boot is forbidden, because of the risk of asphyxiation from fumes. In all cases, ventilation openings must be adapted to meet safety standards.



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Dogs and trains

Train journeys do not normally cause any great problems for dogs, but the regulations vary from one country to the next and between train operators. It is therefore advisable to ask about the rules before taking the train. In some countries, dogs are not allowed in the passenger carriages, and must therefore be placed in a cage in a separate freight carriage on the same train.

Dogs in aeroplanes

To ensure that the dog travels comfortably without stress or sickness, follow these guidelines:

- do not feed the dog within ten hours of departure;

- where necessary administer a travel sickness treatment thirty minutes before boarding, or even a sedative prescribed by a vet for dogs which experience extreme anxiety;
- take it for a walk to relieve itself before putting it into its travel crate.

Before travelling on a plane with your dog you will need to contact the airline at the time of booking:

- some airlines refuse to accept dogs.
- others accept them under certain conditions.
- in some cases, small dogs (usually under 6kg) are allowed to travel in a bag in the cabin with their owners.

In boats

For all those contemplating a cruise, the main concern of cruise companies is to provide you with the largest array of fun and entertainment possible on board. However, you will have to forget about taking a "tour of the world" with your dog. International law forbids pets from boarding cruise ships.

On ferries, when the journey is relatively long, owners should be aware of the other vehicles parked around their car on the vehicle decks if their dog is spending the crossing in the car. The presence on board of refrigerated vans can be very dangerous for dogs as the refrigeration systems emit a large quantity of carbon monoxide and could result in serious poisoning for dogs in the surrounding cars. On some longer crossings, kennelling is provided for dogs.

Public transport

Dogs are widely "tolerated" on public transport in the majority of countries. The same rules apply: the dog must be kept on a leash, muzzled where required (certain countries) and the appropriate ticket bought. Dogs may only ride in taxis if the driver agrees.

“International law forbids pets from boarding cruise ships.”



Whatever type of transport is used, certain rules must always be followed:

- Make sure that the ambient temperature is not too high and if necessary provide ventilation or wet the dog's head with a moist cloth; special cooling mats are available; heat stroke is a very serious condition that requires emergency veterinary treatment.
- Make frequent rest stops and get the dog to drink regularly, at least every two hours in very hot conditions.



© Duhayer/Royal Canin

In parks and gardens

In many countries, dogs are not allowed in public gardens for health and safety reasons.

Some parks allow dogs both on and off the lead.

Dogs are not normally allowed in nature reserves or some national parks, even on a leash. They are allowed on some beaches if they are on a leash, provided that the owner cleans up and throws away any excrement the dog may leave and that the dog does not bother anyone: no inappropriate digging in the sand, no pushing over swimmers, etc. Many beaches ban dogs during the summer months.

Guide dogs for disabled people are an exception to the aforementioned rules. They are allowed to guide their owner everywhere.

Boarding Kennels

There are many types of boarding kennels depending on the number of dogs kept, whether inside the house or in kennels. It is important to visit the establishment first to be sure that it is licensed, clean and has pleasant surroundings.

Dogs adjust very well to kennel life even if they have not previously experienced it. The owner should not feel guilty if the dog whines when he or she leaves.

Whatever solution is chosen, the owner of the establishment should be informed of any health problems. The dog's vaccination card must be left and should include the vet's telephone number. It is also a good idea to provide information about the dog's diet and habits in order to avoid needless disturbances; the owner can also provide the dog's usual food to be fed during its stay.

Some of the dog's personal objects can also be left (bowls, blanket, toys, etc.). If the dog experiences marked separation anxiety, discuss the situation with the vet several weeks beforehand who will provide advice about what to do and an action programme so that the owner may leave the dog under good conditions.

Assistance and insurance

Some international insurance companies guarantee the repatriation of the animal in the event of a problem affecting its owners. In this case it is advisable to provide the address and telephone number of a friend or family member who can be contacted in such an event.

If you lose your dog during your trip, contact the nearest police station as soon as possible.

Finally, to avoid any problems if you lose your pet's paperwork, make photocopies of all the documents before you leave. If there is a problem, simply contact the vet who vaccinated the animal so that they can send a copy of the certificate, and inform the police to obtain a certificate of loss or theft. The health certificate required for crossing the border can be obtained from the nearest vet in the country that you are visiting.

“Dogs are allowed on some beaches if they are on a leash, provided that the owner cleans up and throws away any excrement the dog may leave and that the dog doesn't bother anyone.”



Diseases of the dog

It takes many years for a vet to obtain the knowledge and experience required to understand how a dog “works” and to diagnose and treat the diseases that may affect it. The aim of this chapter is not therefore to provide an exhaustive treatise of veterinary medicine. We have simply tried to provide the reader with the information that will enable them to have a better understanding of a disease that their dog may suffer from, and to be able to understand the therapeutic options proposed by the veterinarian.

“The owner knows his or her dog better than anyone else.”

What happens during a visit to the veterinarian?

When you take your animal to see the vet, whether for a vaccination or because it is unwell, the vet will examine your pet from head to tail. Even if you are not aware of it, the vet will follow a very precise protocol when examining your animal, ensuring good clinical practice.

The National Veterinary College Alfort (ENVA) is a very famous university, particularly renowned for its clinical and research activities in relation to companion dogs. ENVA was one of the first institutions to develop clinical activities in specialised canine medicine and surgery, and to create a residency for young veterinarians.

Clinical activities for companion animals are being developed all the time and there are now between 40,000 and 50,000 interventions per year. In autumn 2009, we opened a hospital entirely devoted to dogs and cats. Canine medicine and surgery are dominant activities. The Veterinary University Hospital Centre, covering almost 3,600 m² (39,000 square feet), houses rooms specialised in every clinical field. It is open 24 hours a day every day of the year, providing owners and veterinarians with the best possible medical and surgical services in an optimal, state-of-the-art environment.

These advances have helped maintain ENVA’s reputation as the best service provider in the Paris region, which is surely one of the world’s most densely populated regions when it comes to dogs.

*Professor Jean Paul Mialot,
Veterinary surgeon,
Director, National Veterinary College Alfort,
(France)*



Visual inspection

The veterinarian starts by watching the animal, how it behaves and how it walks as it enters the consultation room. Any lameness or behavioural problem (for example indifference) will be noted. The vet will also note the dog’s body condition (thin, normal, overweight or obese) and the condition of its coat. Any anomalies will be entered into the list of clinical signs and will help to pinpoint a diagnosis and orientate the treatment. During this time, he or she will allow the dog to familiarise itself with the environment. You can help to reassure your dog by conversing calmly with your vet. The vet will ask you why you have brought your dog to see him and will listen to your account of the events that have prompted the consultation. During a vaccination visit, the vet will ask general questions about the



The consultation starts even before you enter the consulting room. The veterinarian will note the way in which the dog moves and how it reacts to its environment. These elements form part of the clinical workup.



The dog's owner is the most qualified to note any changes in their dog's mood and behaviour. It is important to inform the vet of any such changes to help with the diagnosis.



The veterinarian will use his stethoscope to listen to the animal's heart sounds. He will note any anomalies in the frequency (number of beats per minute), rhythm (the famous "lub dub" with the contraction of the ventricles and atria) and the presence of any abnormal heart sounds (heart murmurs).

dog's health, behaviour and usual diet. It is important at this point to speak of any worries you may have or any changes in the dog's behaviour or routine. The owner knows his or her dog better than anyone else. For dogs that have a tendency to become aggressive, it is important to muzzle them to prevent any accidents.

Palpation

Whenever possible, the veterinarian will request that the animal is placed on the consulting table. He will usually start the examination at the muzzle and finish with the tail. He will pay particular attention to the ears, eyes and teeth. Then he will start to palpate the animal. Palpation is useful for detecting any skin problems (spots, cuts, lumps), but also for checking the subcutaneous lymph nodes. He will palpate the abdomen to feel the different internal organs (liver, stomach, intestines, kidneys and bladder). He will conclude the examination with the anal glands to check that they are not blocked.

Auscultation, eye and ear examination

To do this, the veterinarian uses specific examination tools: an ophthalmoscope for the eyes, otoscope for the ears and stethoscope for the heart. If the animal is ill, the

veterinarian will then concentrate more specifically on the organs that could be causing the visible clinical signs and those mentioned by the owner.

To complete this information and establish a diagnosis, the vet may prescribe or perform further diagnostic tests and examinations.

“The veterinarian will usually start the examination at the muzzle and finish with the tail.”

My dog has bad breath, where does it come from?

Bad breath is one of the most common causes of concern and reasons pet owners visit their veterinarian. Bad breath can be caused by gum disease or an upset stomach. Gum disease is caused by bacteria attaching to the tooth surface and breaking down to produce a disagreeable sulphur odour in addition to redness and swelling of the gums. Gum disease can be prevented. With good home-care, including feeding a diet which massages the gums and removes the bacteria, toothbrushing, if the pet will allow, and regular visits to the veterinarian, the pet's teeth and gums should remain healthy and the breath pleasant.

Dr David E Clarke
 BVSc, Diplomate AVDC, Fellow AVD, MACVSc
 Registered Specialist, Veterinary Dentistry
 Hallam, Victoria
 (Australia)



What happens during surgery?

When a dog is about to undergo surgery, whether the surgical procedure is elective or performed as an emergency, the veterinarian will examine the animal and assess the risks of the procedure to adapt the protocol. Only then will he begin the surgery.

Assessment of the anaesthetic risk

An anaesthetic is always associated with a risk. However different anaesthetic protocols are available depending on the status of the patient thus maximising the safety of the procedure. To choose the protocol, the vet will conduct a complete examination of the animal with further diagnostic tests if necessary such as blood tests, radiographs or an ultrasound scan. In all cases, the surgery will be carefully planned by the veterinarian and the supporting team.

Monitoring surgery

Surgery in a dog requires the same rules of asepsis (disinfection, limitation of contamination) as in man. The veterinarian will have at least one room in the practice reserved for surgery. This room is kept clean and away from the passage of people and animals. There are several possible anaesthetic protocols, of which the following is just an example. The dog is prepared in a room adjacent to the operating theatre: a catheter (intravenous line) is inserted and

the dog is anaesthetised by intravenous injection. The operating site is clipped then cleaned. During this time, the dog may be equipped with an intravenous drip to provide physiological saline (and to administer pain killers or antibiotics where necessary), an endotracheal tube (intubation) is placed and leads attached to enable cardiac monitoring. The dog is then taken into the operating theatre and “plugged in” to the various machines (ECG, anaesthetic machine, drip line, etc.). The respiration, heart rate and rhythm and the depth of the anaesthesia can therefore be monitored throughout the surgery for the animal’s safety. The use of gaseous anaesthetics during the procedure enables precise adjustment of the doses until recovery, which is progressive.

Monitoring post-op recovery

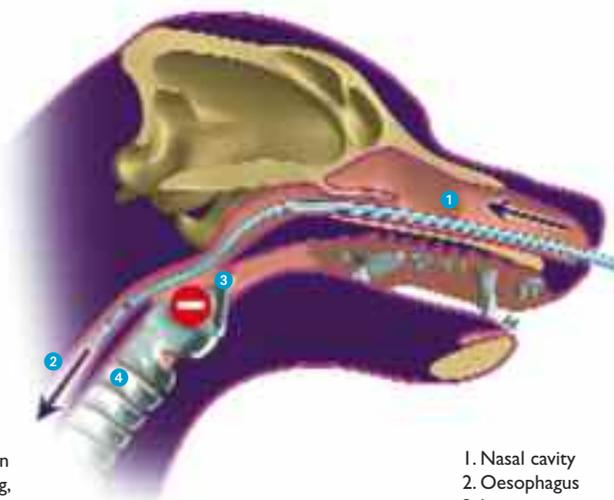
When the surgeon has finished the procedure, the animal is progressively awakened. The use of analgesics prior to the intervention helps to prevent pain on recovery. The endotracheal tube is removed when the animal starts to wake up and cardiac moni-

toring is continued until the animal has regained consciousness (or even later depending on the type of surgery). Where used, the drip is usually continued until after full recovery from the anaesthetic. The dog is warmed and placed in a cage in a quiet area. Close monitoring is continued until the animal has stood up or regained full consciousness. A little food and water may then be offered. Antibiotics and pain killers are continued for several days if necessary. The animal is not returned to the owner until the effects of the anaesthetic have worn off and it is fully conscious.

Regular monitoring during the recovery period

The dog goes home and the owner provides the post-operative care. The skin wound will take around ten days to heal. The veterinarian will often ask to see the animal again within four days of the surgery to monitor the skin wound. The veterinarian thus relies on the owner to report any problems, such as if the dog shows any reluctance to move or eat. The duration of the recovery period will depend on the reason for the surgery. After castration, a young dog should recover within 24 to 48 hours. Pain management is essential as there is absolutely no benefit to be gained from letting the animal suffer. However, for some surgery, and in particular orthopaedic procedures, the use of pain killers will enable the dog to run around, which is strictly inadvisable. It is therefore up to the owner to be reasonable for both themselves and their pet. The use of an Elizabethan collar is also often poorly accepted by the owner and the dog. The animal usually takes 24h to get used to it. However, there are a few precautions to be taken: outdoors, the dog should be kept on a lead whilst wearing the collar as it could scare other dogs and pro-

Nasooesophageal tube



Nasooesophageal tubes can be used for feeding a dog, for example following surgery to the jaw.

1. Nasal cavity
2. Oesophagus
3. Larynx
4. Trachea

voke an attack (appearance is very important in canine communication), and it will also affect the dog's hearing (it will not hear sounds coming from behind it or from the sides). This collar can be essential, as the healing wound will start to itch from the third day. The dog will therefore scratch and bite himself and sometimes pull the stitches out.

During this recovery phase, the vet may prescribe a specific diet to promote healing or one that is adapted to the dog's illness. It is an essential element in the recovery phase. Similarly, if the vet prescribes exercise restriction, it is important to monitor the dog's weight to prevent excess weight gain, which will be harmful to its recovery.

Returning to exercise and physical reeducation

Following surgery on the bones or joints, the immobilisation of one or more limbs /

joints and exercise restriction will result in the loss of muscle mass from the affected leg. It is therefore important to make a progressive return to exercise. Functional reeducation programmes are now available for dogs (the equivalent to physiotherapy in humans): depending on the requirements, this may include massages (mechanotherapy), work on a treadmill or in a swimming pool (hydrotherapy). This form of therapy is used to remobilise stiffened joints or build up muscle mass under surveillance.

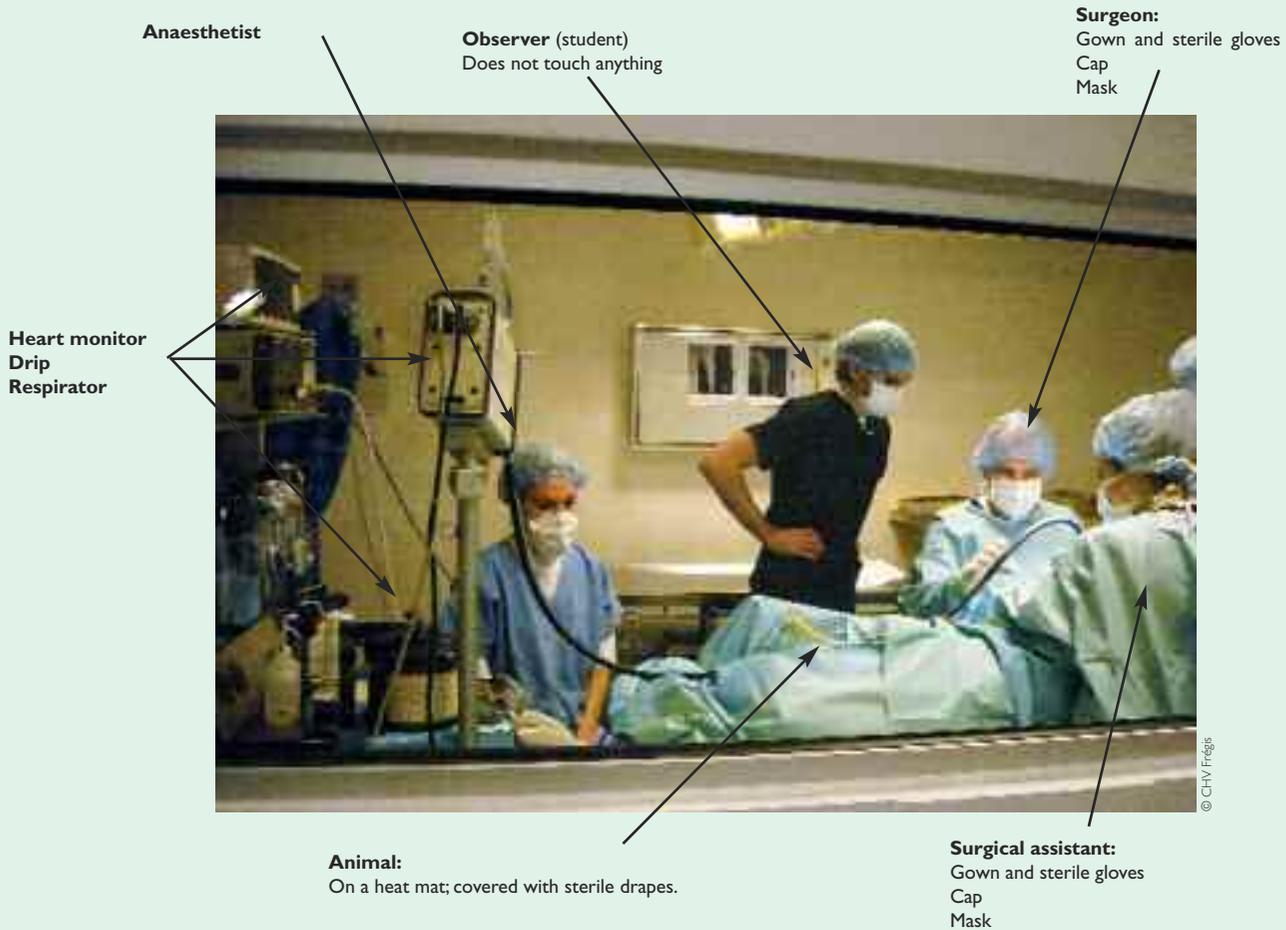
Surgery is always a worrying time for the owner. The vet will always weigh up the risks and benefits of the procedure for the animal and be able to advise the owner. By assessing and identifying the risks, they can adapt the anaesthetic and monitoring protocol to guarantee maximal safety for the animal. During convalescence, the owner's common sense must always prevail, rather than the dog's choice!

Improving proprioception.



Dunayer/Royal Canin

Veterinary operating theatre



Standard rules of asepsis apply in the veterinary operating theatre. The veterinarian and team have all the equipment needed to perform and monitor the anaesthesia of the animal to ensure that the surgery is performed under the best possible conditions.

Is chronic pain a problem for dogs?

Chronic pain is a problem which affects the entire body, with a major impact on the animal.

Generally, response to treatment is limited and pain often persists over time, even after the disappearance of the cause. Modern medical practice considers this a true illness and not just a symptom.

Often dogs of all ages with pathologies such as cancer or arthritis suffer from chronic pain and it is not easy for the owner to recognize.

An appropriate environment and nutritional therapy along with medical treatment and physiotherapy are the key to enable the well being of these animals and to give them the best possible quality of life.

**Dr Marcelo Zysman, veterinary surgeon,
Chronic pain medicine in dogs and cats
(Argentina)**



My dog can't walk normally, he sits down a lot and moves by adopting a bizarre position. Is this lameness or paralysis?

Loss of voluntary movements of hindlimbs is referred to as paralysis caused by motor disturbances. (Where it occurs to a lesser degree it is called paresis). Lameness results from abnormal movement of a joint such as a deformity of the hip joint caused by chronic inflammation, rupture of the ligaments in the knee joint, etc. Hip lesions result in visibly shortened stride of the hind limbs. Lameness is usually associated with pain. It is essential to take the dog to vet for orthopaedic examination and pain relief as soon as possible.



*Dr. Andras BANFI D.V.M.,
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Can epilepsy be prevented?

The most effective way to prevent hereditary idiopathic epilepsy in small animals is by breeding healthy animals. The early detection of affected and carrier dogs and subsequent elimination of them from breeding have been problematic. Environmental factors play an important role in the occurrence of seizures but the fundamental question of why seizures occur in a particular situation is still unanswered. Stress, changes in sexual cycle, feeding habits, food quality, concurrent disease and other factors influence the onset of seizures in affected animals. Identification of both genetic and environmental factors should reduce the occurrence of epilepsy and susceptibility to seizures in small animals in the future.

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We had a dream...



©Stephan Mornrocht/Fotolia

Yes, as doctors, since the earliest days of medicine, we have all had the same dream: to be able to see inside the body.

It began by introducing cameras into the stomach or the bladder and progressed by making 2 to 10 mm incisions to see into the joints, the abdomen or the thorax.

In veterinary medicine, keyhole (minimally invasive) surgery has become the gold standard for many procedures: neutering by laparoscopy, abdominal or thoracic biopsies, inspection of joints and treatment of cartilage disease.

The advantages of keyhole surgery are: less pain, quicker recovery, better visualisation and smaller incisions.

These procedures are now performed by most expert veterinary surgeons.

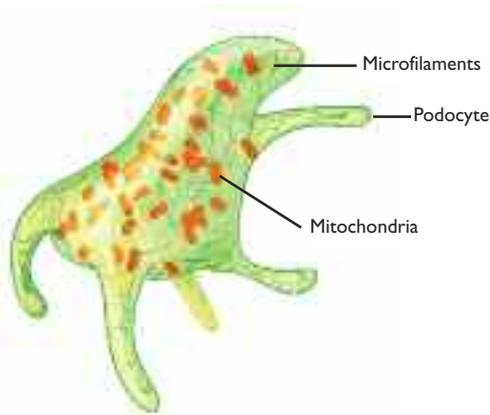
*Dr Gilles Dupré, DVM
Head of Small
animal surgery
Veterinary University of Vienna
(Austria)*



Further diagnostic tests

After performing a complete clinical examination, including visual inspection, palpation and auscultation, the vet may need to perform additional examinations to reach a more precise diagnosis. Many diseases share the same symptoms and it can be impossible to determine the exact cause of an illness on the basis of the symptoms alone.

Platelet



Platelets do not have a nucleus and are thus almost dead, yet no other cell is more active, more elastic or more mobile. Furthermore, thanks to their numerous membrane receptors, they communicate with a large number of cells, notably the epithelial cells.

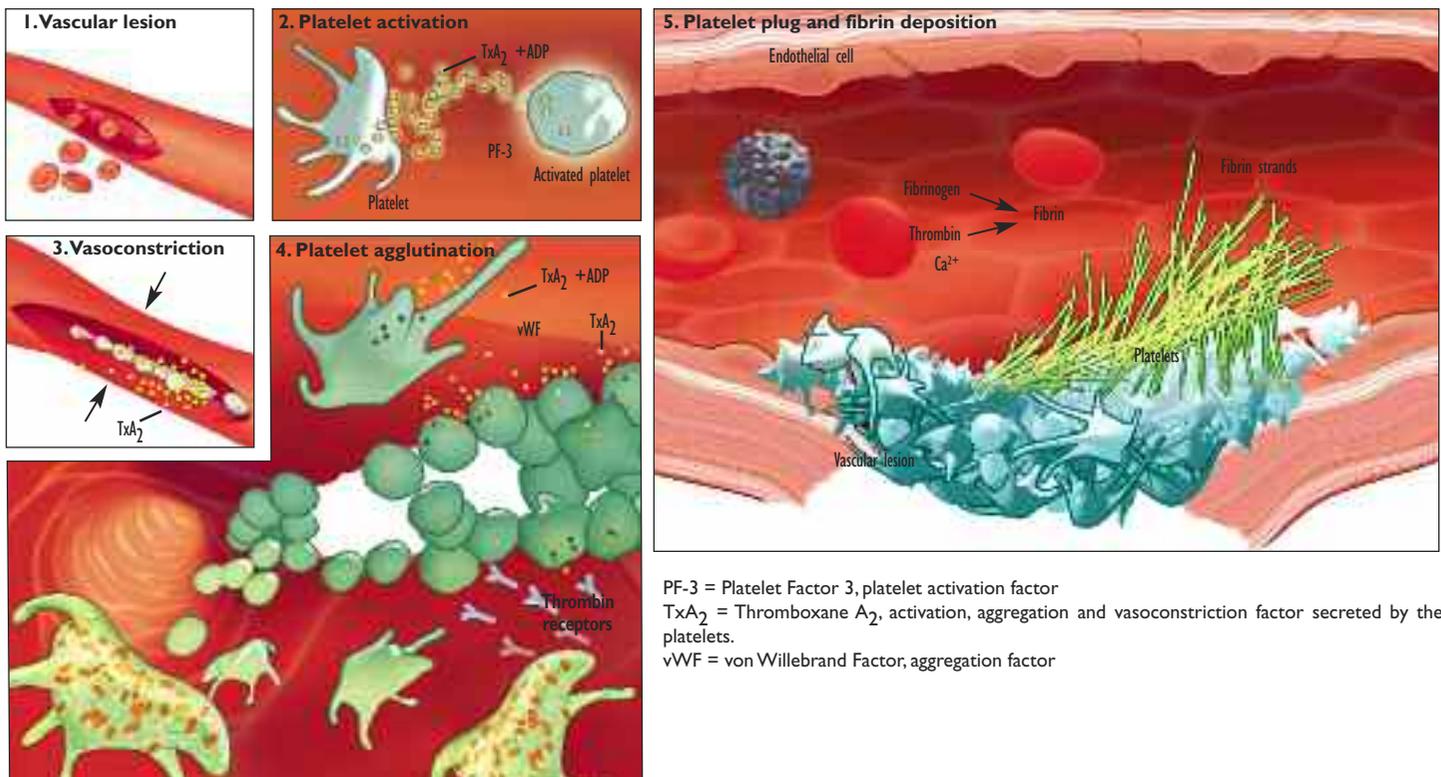
Haematology

Haematology is the microscopic examination of the cells present in the blood stream, both quantitative (number of cells present) and qualitative (type and appearance of the cells). Clearly, haematology necessitates the withdrawal of a blood sample.

The numbers of each cell type are counted, and their appearance observed on a blood smear (a drop of blood is spread onto a microscope slide).

Red blood cells (erythrocytes) transport oxygen to the tissues. Their numbers may be reduced, for example following haemorrhage, leading to anaemia. White blood cells (leucocytes) are classified into several different categories depending on their function. An increase in leucocytes is indicative of inflammation in the body, which may be caused by an infection, parasite burden or some types of tumours, etc. Their numbers may also decrease in diseases which lower the immune response. Platelets (thrombocytes) play an essential role in coagulation (clotting), and therefore the cessation of bleeding in the event of a wound.

Mechanism of blood clotting following a small wound in a blood vessel.



Numerous diseases may cause haematological modifications. Monitoring these parameters provides an indication of the effects of the disease on the body and the type of causative agent (infectious, autoimmune, etc.). On its own, this examination rarely provides a definitive diagnosis.

Clinical biochemistry

Clinical biochemistry is the determination of the concentration of the molecules found in the body fluids (blood, urine, cerebrospinal fluid, etc.). It is used to identify any changes in organ function and sometimes structural changes. In elderly dogs, biochemical monitoring can be used to detect changes in organ function before the onset of the first clinical signs. Preventative medical treatment can then be implemented.

The choice of molecules to be examined is made as a function of the dog's symptoms, or of the organ that is thought to be dysfunctioning. Below are a few examples of some of the parameters that can be measured:

- urea, creatinine (renal dysfunction)
- glucose (diabetes for example)
- ALP, ALT, AST (hepatic dysfunction)
- electrolytes (calcium, potassium, sodium, etc.), all changes which can have serious consequences for the dog's health.
- Hormones (thyroxine for the thyroid gland, cortisol for the adrenal glands, etc.)

When an anomaly is detected, the progression of the disease can be monitored with regular blood tests.

Urinalysis involves

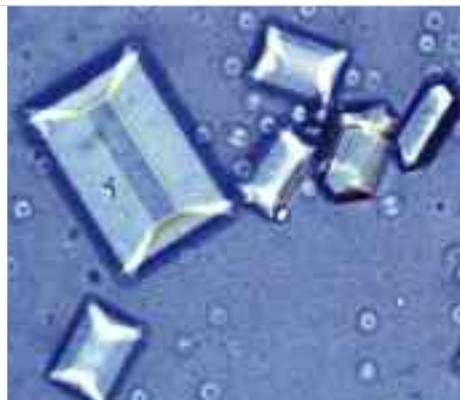
Urinalysis involves the detection of the presence of certain elements in the urine. The sample is either collected into a container when the dog urinates or withdrawn directly from the bladder using a needle (cystocentesis) by the vet, or by inserting a urinary catheter. There are various possible examinations:

- Urine dipsticks provide a quick and easy means of detecting pathology of the urinary tract. These "sticks" comprise several coloured indicators that change colour as a function of the presence, absence, or concentration of various elements. They can be used to detect the presence of blood, proteins, leucocytes, glucose, ketones and to determine the pH level of the urine. Owners of diabetic dogs often perform the test at home to adjust the treatment themselves.
- Bacteriological analysis, which is performed if bacterial cystitis is suspected following the dipstick test.
- Microscopic analysis of the elements present in the urine in which the exact nature of any urinary stones is determined. It is essential to implement effective prevention by adapting the diet to prevent the onset or build-up of these calculi (stones) in the bladder.

Example of urinary crystals



Oxalate.



Struvite.

Why should I collect my pet faeces for analysis?

When your vet asks you to collect your pet's faeces you feel it's a nasty task and besides if there are so many medicines to worm pets why don't give it a pill and that's all?

Many different parasites including worms live in the gut and produce eggs in the faeces that can be studied and identified with faecal analysis. Some of these produce diarrhoea or vomiting and some no apparent illness until the pet is injured, the immune system suffers and the worms start sucking blood or causing other damage. Unfortunately, different

worms have different life cycles so antiparasitic drugs must be given at different intervals. Moreover not every worm is killed by the same drug which is why we must know who the enemy is in order to give the best treatment in the most appropriate period.

Gabriela Pérez Tort, DVM
Veterinary Faculty of Parasitology
and Parasitic Diseases
University of Buenos Aires
(Argentina)



Coprology

Faecal analysis is the examination of the dog's stools, and is useful for detecting parasites. The faeces are first analysed without the microscope (some worms can be seen with the naked eye), then under the microscope. A single faecal culture is not enough to determine whether worms are present or not, and the vet usually needs to take several samples. Microscopic examination of the faeces provides information as to the exact nature of any parasites, which is vital for choosing the most appropriate wormer.

Medical imaging

Medical imaging comprises various techniques whose objective is to visualise the internal structures of the body (organs, bones, vessels, etc.) and sometimes to see whether they are functioning correctly. It provides the opportunity to explore the body without the need for invasive surgery. The imaging technique is chosen depending on the type of structure to be studied.

Radiography and CT-scans use X-rays.

These penetrate the body to varying extents depending on the density of the struc-

tures that they encounter. Radiography is extensively used to examine bone lesions and is widely available. The CT-scan provides improved definition and enables fine sections to be made of the structures. However, the latter is not widely available in veterinary medicine.

Ultrasonography works by sending ultrasound waves through a structure. These waves are then returned to the probe at varying directions and intensities depending on the structures they encounter. This method makes it possible to visualise cross-

Radiography.



Ultrasonography is painless, non-invasive and very well tolerated by dogs.

sections of the organs and is currently widely used to investigate abdominal and cardiac diseases. The use of Doppler enables the visualisation of blood flow in the vessels.

MRI (Magnetic Resonance Imaging) uses a magnetic field to generate images. This examination requires general anaesthesia. The images obtained provide excellent contrast, even within an organ, which can be used to detect brain tumours for example. It is primarily used for the diagnosis and monitoring of neurological problems. It is not yet widely available in veterinary medicine.

Scintigraphy uses a radiographic tracer (for example radioactive iodine). The movement of this tracer in the body is followed and the data is analysed by a computer, which reveals the zones that accumulate and use the tracer. This technique provides interesting information on a functional level but is not widely used. Animals which undergo the examination and their excreta remain radioactive for several days after the end of the examination, which can pose health and safety problems for humans.

Histology

Histology is the microscopic observation and analysis of tissue samples. When an anomaly is found in an organ, simple visual observation is often insufficient to determine the exact nature of the problem. The sample can be taken during surgery (for example, following the removal of a tumour), by biopsy (sampling of a small fragment of tissue) or sometimes at post-mortem. The tissue is fixed and sections are made. A coloured stain is often needed to differentiate the different cell types. The observer looks for structural anomalies in the tissue and the types of cells present, and correlates their observations with those made during the clinical examination of the dog. This analysis is very important for suspected cases of cancer, as it provides an exact determination of the nature of the tumour and therefore provides a prognosis.



Magnetic Resonance Imaging (MRI) is one of the latest technologies, enabling the precise visualisation of organs.

© CTV Freigs

Endoscopy

Under general anaesthesia, a camera is introduced using a flexible tube into one of the body's tracts or cavities that cannot be explored with the naked eye. This method is essentially used to diagnose diseases affecting the respiratory and gastrointestinal tracts. Access to these cavities is achieved by the natural routes. Samples (biopsies) for histological analysis are sometimes taken at the same time.

Electrocardiogram (ECG), electroencephalogram (EEG) and electromyogram (EMG)

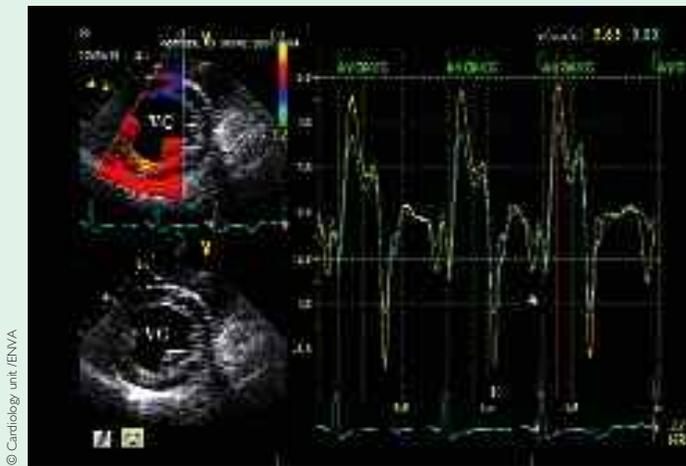
These three techniques all analyse the electrical properties of a structure to provide information about its function.

To perform an ECG, electrodes are placed on the skin surface to record the electrical activity of the heart. The resulting graph is

analysed to provide information about heart function and provide an early diagnosis of dysfunction or disease.

An **EEG** is performed by placing electrodes on the clipped skin of the dog's head to provide a record of the electrical activity of the brain. The regularity, quantity and location of the waves are analysed. Not widely available, this examination is currently more widely used in research than for diagnostic purposes.

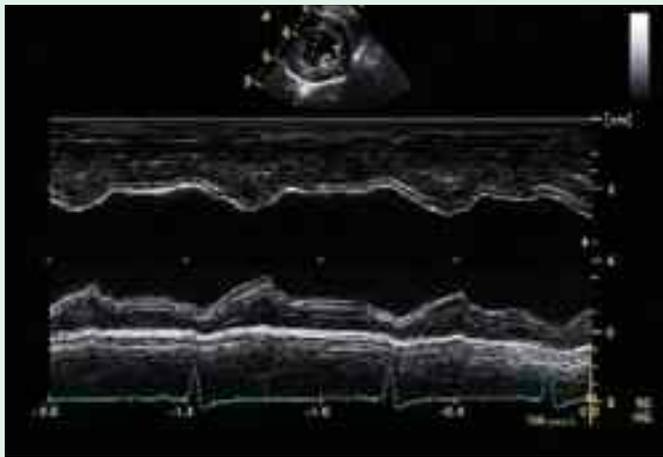
An **EMG** involves stimulating muscle contractions by sending an electrical impulse through the nerve that controls the contraction of a specific muscle. The speed of transmission of the electrical impulse is measured by the delay between the electrical stimulation and the contraction of the muscle. When a nerve is damaged, transmission is altered (slowed or absent if the nerve has been completely sectioned).



Colour Doppler of a dog's heart.
LV = left ventricle.



Electrode placement.



Ultrasonography of a dog's heart in TM mode (time-motion).



Vassiliki Gouni

Echocardiography has been a very important tool in human and veterinary cardiology for more than 30 years. Technological developments over the past decade have widened the scope of application considerably. Three methods are currently used, M-mode, two-dimensional (2D) and

Doppler. The last of these has become most widespread, including spectral Doppler, colour Doppler and tissue Doppler. The aims of a conventional echocardiograph examination are as follows:

- Evaluating heart anatomy and adjacent structures by the 2D mode.
- Measuring the various heart chambers precisely.
- Evaluating the blood flow through the valves by pulsed and continuous Doppler.

The incorporation of all these modes permits an evaluation of the heart anatomy, the integrity of the heart valves, the systolic and diastolic function, and indirectly the estimation of endocardiac pressure and the pressure between the pulmonary artery and the aorta. Doppler tissue imaging (DTI) is a more recent so-called conventional ultrasound technique which allows the quantification of the regional, radial and longitudinal myocardial region by measuring the speed of movement of the myocardium in real time. DTI is a non-invasive method for analysing regional myocardium movements, using DTI 2D colour, which, unlike the two other modes (pulsed DTI and colour M-mode DTI), allow the simultaneous quantification of the speed of several myocardial segments belonging to one, two or three different walls, thus providing a precise evaluation of intra- and interventricular myocardial synchronism. Potential applications of DTI in cardiology are extremely promising. The advantage of this imaging technique is that, like conventional ultrasonography, it does not involve bleeding. It also appears to be more sensitive to detecting myocardium alterations at an early stage in humans and dogs, which means it could potentially be used for the early detection of some heart diseases in veterinary medicine (dilated cardiomyopathy in dogs and hypertrophic cardiomyopathy in cats, for example).

Vassiliki Gouni, Veterinary surgeon
Professor Valérie Chetboul, Veterinary surgeon
Cardiology Unit
National Veterinary College Alfort,
(France)



Valérie Chetboul

Hearing tests

AEP (Auditory Evoked Potential) tests involve recording the electrical activity of the cochlea (internal structure of the ear) following acoustic stimulation. This examination is performed under sedation by a specialist veterinarian. Each ear is assessed separately. This examination is strongly advisable in certain breeds of dog, notably Dalmatians, in which 15 % of puppies are born with unilateral deafness and 5% with bilateral deafness.

Ophthalmological tests

Following an external examination of the eye, the veterinarian may need to examine the internal structures of the eye: lens, retina, optic disc. The optic disc is an area of the retina on which the size and shape of the blood vessels, colour and general homogeneity give information about the condition of this structure, which receives visual information. This examination is performed using an ophthalmoscope. In the event of an anomaly, it is repeated on a regular basis to monitor the progression of the disease.

An electroretinogram assesses the electrical response of the retina to stimulation with flashes of white light (diurnal vision) and blue light (night vision). It enables the de-



© Duhayer/Cogis

tection of functional anomalies of the retina. Prior to the arrival of genetic testing, this examination was used to screen for progressive retinal atrophy, which affects numerous breeds particularly the Cocker Spaniel and Labrador.

“Hearing tests are strongly advisable in certain breeds of dog, notably Dalmatians.”

Otitis externa

Normal ear

1. Pinna (ear flap)
2. Auditory canal
3. Tympanic membrane



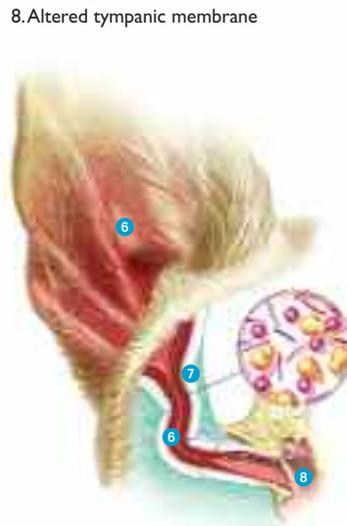
Erythematous-ceruminous otitis

4. Inflammation of the pinna
5. Inflammation and early stenosis of the auditory canal



Chronic otitis

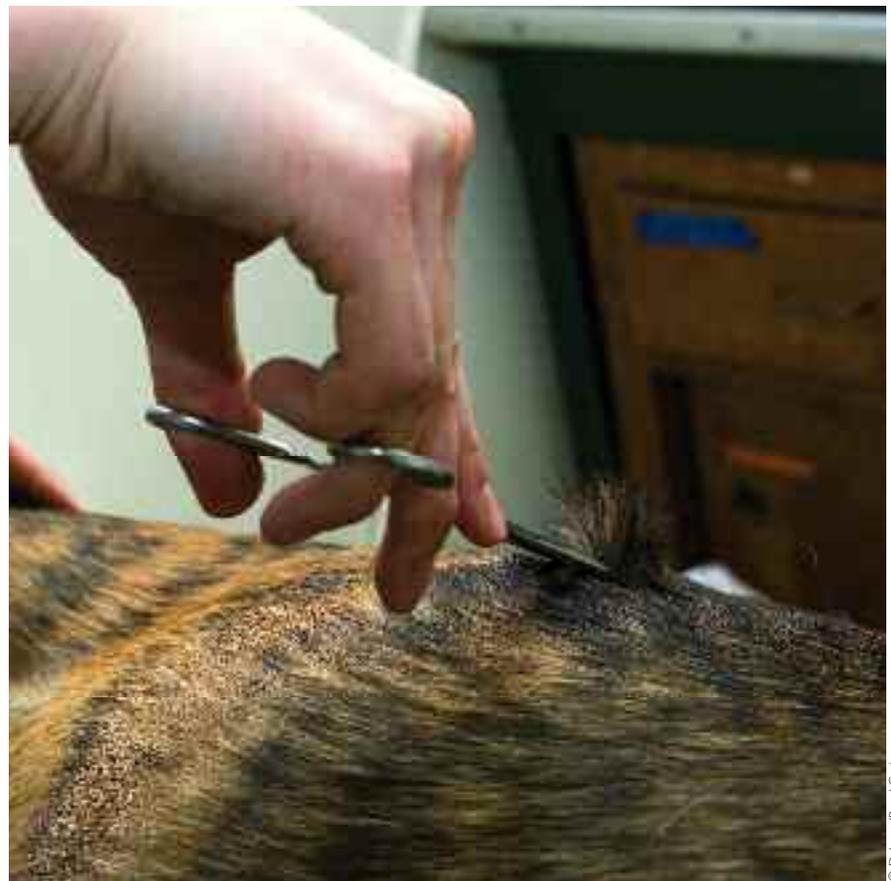
6. Severe hyperplasia of the pinna and auditory canal
7. Calcification
8. Altered tympanic membrane



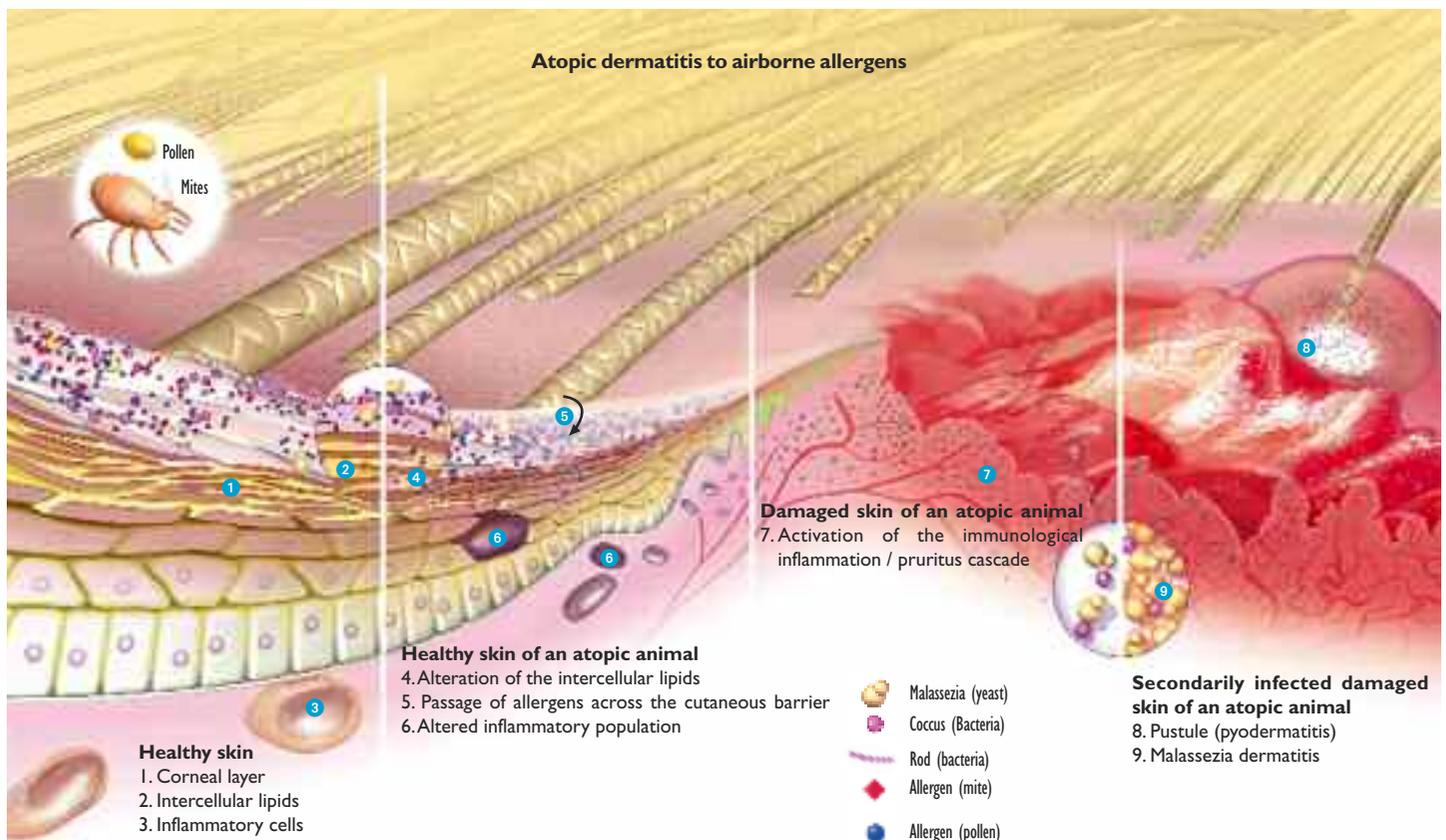
Dermatological tests

The vet may take samples of cutaneous lesions to determine the cause of disease. The collection of a few hairs, which are then examined under the microscope, can be useful for detecting the presence of parasites. A skin scrape using a scalpel blade is used to take a sample of the superficial cells of the skin and any bacteria or parasites that can then be examined under the microscope after staining. This makes it possible to adapt the treatment to the cause.

An ear swab involves taking a sample of the cells and wax from the ear using a swab. The swab is then spread onto a slide, stained and analysed. This enables the detection of individual bacteria, fungi, etc. which cause otitis and can then be treated with a specific treatment.



Taking a hair sample.



The importance of clinical nutrition

Good quality maintenance diets adapted to the size, breed and activity levels of the dog are powerful allies in preventive health care. When an accident or disease arises during the course of its life, the diet can be adapted to support medical treatment. Clinical nutrition is a discipline which adapts the diet of the dog to its disease, to improve quality of life and increase longevity.



© Dunayer/Royal Canin

Hippocrates (460 BC – 377 BC)
by Peter Paul Rubens

What is a clinical diet?

A clinical diet is a complete feed designed for nutritional support in therapeutic regimes. It is specially formulated to meet the specific nutritional requirements of certain diseases. It is prescribed by a vet and requires regular monitoring (at least three times a year, but more frequently with certain conditions.). The vet will check the progression of the disease and the efficacy of the dietary support and make any necessary adjustments.

Veterinary medicine, unlike human medicine, is very fortunate to have a whole range of appetising commercial feeds that can be adapted to every situation to promote optimum health and longevity for our companions.



© UNES

This Greek doctor is one of the great figures of medical history. He was also a forerunner of therapeutic dietetics. He stated: "let your food be your medicine and your medicine be your food"! Clinical nutrition, although not quite so absolute, forms an essential part of the treatment of a disease.

Can nutrition influence the skin barrier function?

Canine atopic dermatitis (CAD) can result from a defect in the skin barrier, which maintains an allergic response. This fault is perhaps caused by disrupted lipid synthesis.

In a preliminary study of dogs with CAD fed diets with high or low ratios of omega-6/omega-3 fatty acids, the non-lesional skin of dogs which responded in a positive way (more than 50% improvement) contained a lower percentage of arachidonic acid (which can lead to less inflammation) than those dogs whose improvement was less than 50%.

Variations in linoleic acid content did not influence success.

In addition, pantothenic acid, nicotinamide and a combination of inositol and choline not only improved lipid synthesis but also reduced transepidermal water loss in dogs after 9 weeks, suggesting a role in repairing skin barrier function.

Professor Ton Willemse,
DVM, PhD, DipECVD
Utrecht University
(Netherlands)



Clinical diets... in treatment of disease

The introduction of a clinical diet will provide optimum nutritional adjustment and support for the pet and thus play a key role during amelioration or resolution of the clinical signs. In such cases the diet is a means, sometimes the only one, of providing appropriate support to the animal.

Nutritional management of obesity

Clinical diets specifically formulated for weight loss enable the dog to safely shed excess fatty mass without going hungry.

Key points required in the clinical diet:

- Sufficient quantity of protein to limit the loss of muscle mass during weight loss.
- Proteins selected to help provide a sensation of satiety (fullness).
- Fibre to increase the volume of the feeding amount whilst decreasing the energy density and helping to create a sensation of satiety.
- Enriched mineral and vitamin content to compensate for the energy restriction.
- Kibble designed in such a way as to provide the dog with a greater volume of food for an identical calorie intake.

Indications

- Obesity
- The high fibre content can be helpful in the treatment of constipation or fibre-responsive colitis.
- The low lipid content can help in the treatment of hyperlipidemia.

Therapeutic goals

- Decrease the calorie intake (restricted fat intake, addition of dietary fibre) whilst maintaining an adequate volume of food to provide a sensation of satiety.
- Ensure the dog loses weight safely by providing an enriched nutrient content.



Bowl n°1: maintenance food for an adult dog; 250 g providing 1,000 kcal (Medium Adult).



Bowl n°2: weight-loss diet; 345 g providing 1,000 kcal (Satiety Support). If the volume of Satiety Support were reduced to the same as that of the Medium Adult, the calorie content would therefore be less than 1,000kcal.

As we can see above, for the same volume of food, we can reduce the dog's daily calorie intake without causing frustration. The weight loss diet is specially designed to supply the essential nutrients needed to maintain the dog's muscle mass whilst reducing calorie intake, all whilst maintaining a satisfactory volume of food so the animal does not feel hungry. Recent progress has made it possible to increase the ability of weight loss diets to provide a feeling of satiety, to improve the well-being of the dog... and its owner.

Nutritional management of dietary allergies

Once a food allergy has been diagnosed, a "hypoallergenic diet" that is tolerated by the animal can relieve the clinical signs (intense scratching in particular). The dog remains allergic to the triggering protein(s), but its modified diet no longer triggers an allergic response, thus obviating the need for long term medical treatments. The use of these diets in dogs with chronic diarrhoea due to an allergy or dietary intolerance may also result in clinical recovery.

Key points required in the clinical diet:

- Highly digestible hydrolysed proteins (artificially digested into small peptides) with a weak antigenic action.
- Nutrients with proven efficacy in the treatment of skin conditions (group B vitamins, essential fatty acids, antioxidants, minerals, etc.).
- Omega-3 essential fatty acids: eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).
- A highly digestible gluten-free source of carbohydrate.
- Fermentable fibre (sugar beet pulp, fructooligosaccharides) to promote a well-balanced gastrointestinal flora.
- Protection of the gastrointestinal mucosa (zeolite, a type of clay).

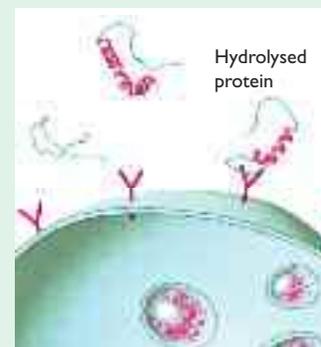
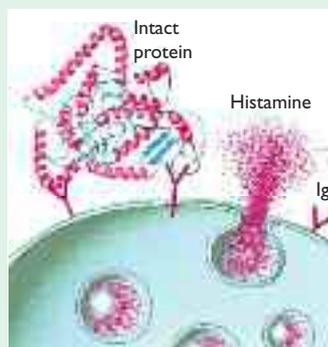
Indications

- Food allergy (with cutaneous and / or gastrointestinal symptoms)
- Dietary intolerance
- Chronic diarrhoea
- Inflammatory bowel disease

Therapeutic goals

- Avoid stimulation of the immune system and thus avoid triggering the clinical signs of the food allergy.
- Strengthen the natural efficacy of the cutaneous barrier via a targeted provision of nutrients.
- Control existing inflammation with essential fatty acids.
- Protect the gastrointestinal mucosa and help to balance the gastrointestinal flora.

Hydrolysed proteins have a lower antigenicity than intact proteins



A hypoallergenic clinical diet contains hydrolysed proteins, which are less likely to interact with the immune system.

Clinical diets...nutritional support in prevention of disease recurrence

Whether a disease was cured with medical, nutritional and / or surgical treatment, a change in diet may help to limit the risks of recurrence. The goal of the clinical diet in this case is to keep the animal healthy for as long as possible, knowing that it is predisposed to a disease from which it has already suffered.

Prevention of periodontal disease

Periodontal disease is the most common condition of the buccal cavity in the dog. Bacterial contamination and the deposition of plaque and tartar cause halitosis and, in the most serious cases, tooth loss. Some breeds, particularly small ones, are predisposed to this.

Although daily mechanical brushing is the best means of prevention, diet is also a useful tool in the fight against dental plaque and tartar formation, the ideal solution being to combine tooth brushing with a specific dental diet.

Key points required in the clinical diet:

- Kibble shape and texture which obliges the dog to chew, and adapted to the dog's size.
- Agents which actively protect the oral cavity against tartar deposition (polyphosphates, zinc, polyphenols, etc.).

Indications

- Daily orodental hygiene.
- Following scaling to limit further development of dental plaque and tartar.

Therapeutic goals

- Obtain a gentle abrasive effect on the teeth during feeding.
- Supply active agents which when mixed with the saliva during mastication limit the deposition of dental plaque and the formation of tartar.

Action of trisodium polyphosphate on the formation of tartar

Without sodium polyphosphate



With trisodium polyphosphate



Dental plaque is formed from an aggregation of bacteria (over 300 different species) and complex carbohydrates (polysaccharides and glycoproteins), which literally stick to the teeth. This plaque then calcifies to form tartar.

Trisodium phosphate chelates the calcium ions in saliva, which are thus unavailable to calcify plaque and form tartar.

Prevention of urinary calculi

When a dog has had an episode of urinary crystals or calculi, managed by diet or surgical intervention, the implementation of a maintenance diet to control urolithiasis can limit the risks of further recurrence. The majority of urinary calculi present in the dog can be controlled using a diet which targets struvite and calcium oxalate calculi or a diet which targets urate and xanthine calculi.

Key points required in the clinical diet:

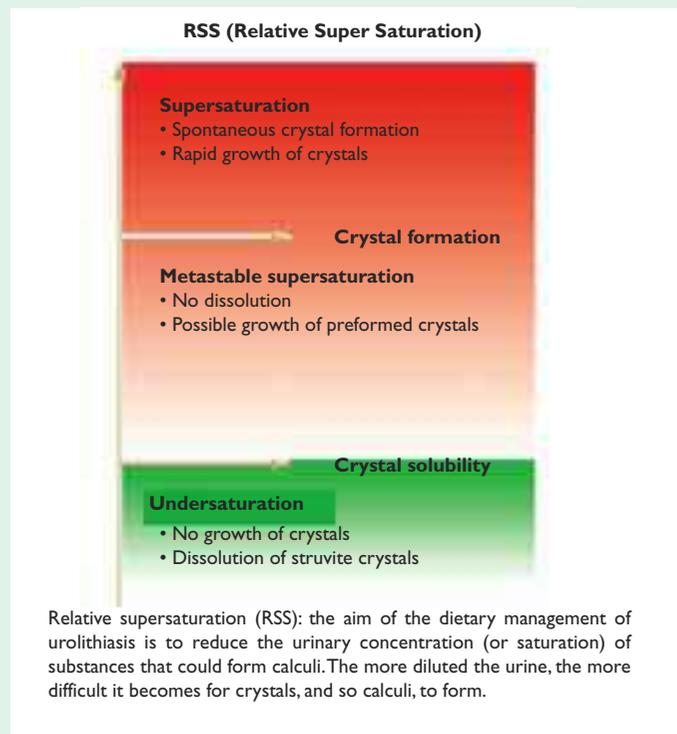
- Carefully selected ingredients and a precise recipe to ensure a constant urinary environment.
- A supply of nutrients that help reduce the concentration of crystalloids in the urine.

Indications

- Dissolution of struvite uroliths
- Reduction of recurrent urolithiasis
- Bacterial cystitis (which may lead to urinary crystal and calculi formation).

Therapeutic goals

- Decrease the concentration of minerals in the urine.
- Increase urinary volume.
- Obtain a stable and controlled urinary pH.



Clinical diets... nutritional support in prevention of disease recurrence (continued)

Prevention of weight gain following weight loss

Some breeds, such as the Labrador Retriever, are predisposed to obesity. Neutering also promotes weight gain. In these situations or following a successful weight loss diet, obesity can be prevented by providing a clinical diet that has been specially formulated to limit weight gain.

Key points required in the clinical diet:

- Proteins selected to help provide a feeling of satiety.
- Fibre to increase the volume of the feeding amount whilst decreasing the energy density and helping to create a feeling of satiety.

Indications

- Maintenance of optimal weight following a weight loss programme.
- Dogs predisposed to obesity.
- Neutered dogs
- The high fibre content can be helpful in the treatment of constipation or fibre-responsive colitis.
- The low lipid content can help in the treatment of hyperlipidemia.

Therapeutic goals

- Maintain ideal weight
- Offer the dog an acceptable volume of food.

How can nutrition support dogs with liver diseases?

Nutritional support is important for liver disease associated with portosystemic shunting and for hepatitis. Shunting of portal blood past the liver and reduced liver function may lead to hepatic encephalopathy. Congenital portosystemic shunts, primary portal vein hypoplasia and arteriovenous fistula are examples.

These dogs may be kept on dietary support life long. It is essential to reduce the exposure to neurotoxins such as ammonia, but at the same time provide sufficient protein to avoid hypoalbuminaemia and ascites due to poor liver function.

A diet with a slightly reduced content of highly digestible soy-based protein, and containing soluble fibre or lactulose, performs best to reduce the production and intestinal absorption of ammonia.

Low protein formulas contain too little protein for long term maintenance of such patients.

Hepatitis is often (up to 30%) caused by copper accumulation and is associated with oxidative damage. Supporting diets should contain low levels of copper and high zinc: copper ratios to reduce intestinal copper uptake. Antioxidants may help to prevent ongoing cell damage.

*Professor Jan Rothuizen,
Veterinary University
of Utrecht
(Netherlands)*



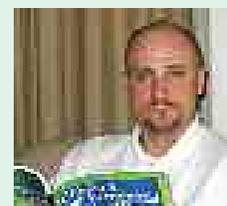
Which food is better for preventing tartar in dogs?

Epidemiological studies show that feeding a dry food diet can have a positive influence on oral health, decreasing the occurrence of dental deposits and periodontal disease in dogs.

Animals fed soft food may have greater dental deposits and benefit from additional oral hygiene measures such as daily tooth brushing, use of oral rinses and dental chews.

Whatever food is used there is nothing better for oral prophylaxis than correct daily tooth brushing and systematic dental checks by a veterinarian.

*Jerzy Gawor DVM, PhD
Fellow of the Academy of Veterinary Dentistry
Klinika Weterynaryjna Arka
Kraków (Poland)*



Clinical diets... nutritional support for medical treatment

These diets are prescribed to provide nutritional support to medical treatment and to provide optimum support for organ function and the animal.

Nutritional support of cardiac disease

Salt restriction is the best known of the recommendations for dogs with heart problems, but it is not the only way to help support the pet with this disease. In addition, such restriction should be progressive. Heart failure is a cachectic disease, i.e. it leads to weight loss (loss of fat, but also loss of lean tissue mass) which worsens with the progression of the disease. A clinical diet for heart problems, through its composition and taste, helps maintain the animal's lean mass, thus preserving quality of life for as long as possible.

Key points required in the clinical diet:

- A moderate to restricted salt content, depending on the severity of the disease.
- Highly palatable.
- Sufficient quantities of high quality proteins.
- Antioxidants to combat oxidative stress.
- Nutrients which promote cardiac function (taurine, L-carnitine)

Indications

- All cardiac diseases
- Arterial hypertension

Therapeutic goals

- Limit water retention through sodium restriction
- Prevent muscle wastage (the heart is a muscle too).
- Ensure the correct functioning of cardiac cells.
- Limit electrolyte imbalances (e.g. magnesium, potassium) caused by treatment.
- Maintain food intake.

Nutritional support of skin disease

The skin is an important organ with numerous essential roles (including protection against the external environment). It is constantly being renewed (every three weeks or so) and therefore has significant nutrient requirements. Healthy skin and a shiny coat are the reflection of the dog's health and a balanced diet. Dermatological clinical diets are an essential preventative tool in dogs with specific needs and sensitivities, but also as part of the nutritional support of treatment for cases of dermatitis (inflammation of the skin) of various origins.

Key points required in the clinical diet:

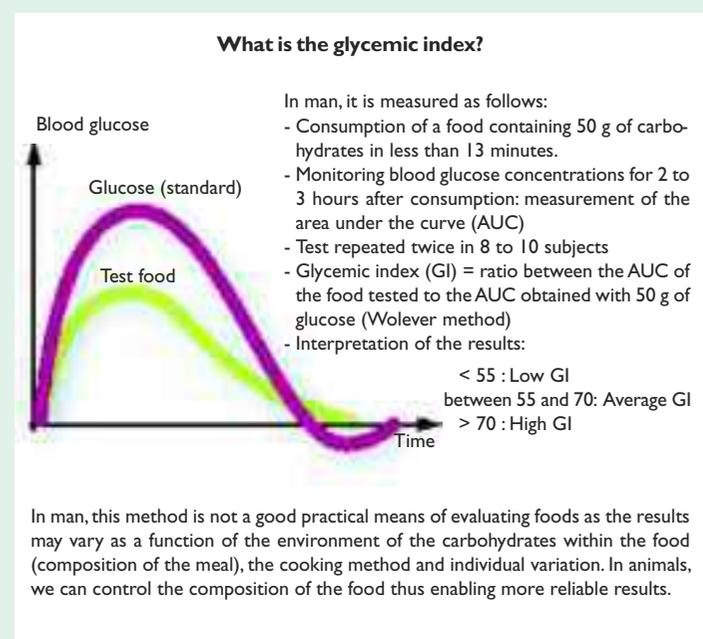
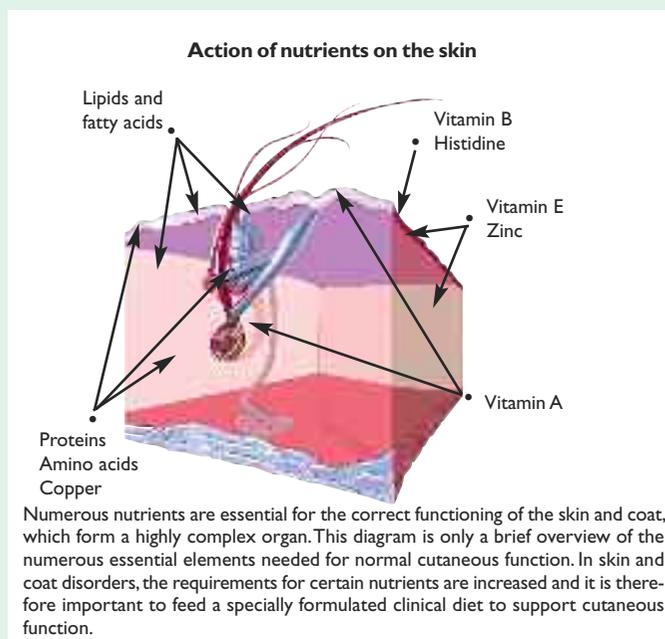
- Nutrients with proven efficacy at the cutaneous level (group B vitamins, essential fatty acids, antioxidants, minerals, etc.).
- Omega-3 essential fatty acids: eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

Indications

- Hair loss, skin lesions.
- Inflammation of the skin: atopic dermatitis, flea allergy dermatitis, otitis externa.
- Skin infections: pyodermatitis

Therapeutic goals

- Meet the significant nutritional requirements for maintenance and renewal of the coat.
- Strengthen the natural efficacy of the cutaneous barrier via a targeted provision of nutrients.
- Control existing inflammation with essential fatty acids.



Clinical diets... nutritional support for medical treatment (continued)

Nutritional support of diabetes mellitus

A combination of clinical diet and insulin therapy can be used to control diabetes mellitus in the dog. Clinical diets specifically formulated for diabetic dogs improve the action of insulin and, in the majority of cases, enable a reduction in the daily dose of this essential hormone.

Key points required in the clinical diet:

- A reduction in carbohydrate intake (which limits the postprandial rise in blood glucose levels).
- Carbohydrates with a low glycaemic index (such as maize).
- Dietary fibres which slow digestion.
- Antioxidants to combat the oxidative stress associated with the disease.

Indications

- Diabetes mellitus
- The high fibre content can be helpful in the treatment of constipation or fibre-responsive colitis.

Therapeutic goals

- Decrease the postprandial spike in blood glucose.
- Spread the absorption of carbohydrate over time to reduce hyperglycaemia and provide energy throughout the day.
- Decrease the amount of insulin needed.

Nutritional support of renal failure

Renal clinical diets have proven their efficacy in improving the animal's quality of life and life expectancy. As with heart failure, renal failure causes cachexia, inducing the loss of both fatty and lean mass (muscles, organs). Renal clinical diets should have a reduced protein content without compromising the animal's appetite, and must still provide sufficient protein to meet essential requirements for body functions and maintenance of lean mass.

Key points required in the clinical diet:

- Carefully selected, very high quality proteins
- A controlled protein content to limit waste in the form of urea.
- Restricted phosphorus content (slows the progression of the disease)
- A raised intake of fish oil (rich in omega-3), which supports renal function, helping to reduce chronic glomerular inflammation and maintain the glomerular filtration rate.
- Antioxidants to strengthen immunity and delay cellular ageing.
- Gastrointestinal mucosal protectors (zeolite clay) to combat the effects of uraemic toxins (e.g. diarrhoea).
- Fermentable fibres (sugar beet pulp, fructooligosaccharides) to promote a well-balanced gastrointestinal flora and promote the use of nitrogenous waste (urea, ammonia).
- Highly appetising, easy to chew kibble.

Indications

- Chronic renal failure

Therapeutic goals

- Limit the production of toxic waste products
- Support renal function and slow the progression of the disease
- Maintain adequate food intake and the animal's body condition and quality of life.

Nutritional support of joint disease

Arthritis is a common problem in dogs and it may even affect young animals. A clinical diet targeted at achieving and maintaining optimal body weight and formulated with joint supplements can limit the severity of the symptoms and their frequency. This dietary change can be accompanied by a reduction in medical treatment and an increase in the animal's mobility and well being.

An appropriate diet can multiply by 3 the median survival time in a dog with chronic renal failure.



© Cynocleto/Fotolia



© Royal Canin

Extract of New Zealand Green Lipped Mussel (GLM) is obtained using an exclusive patented process involving low-temperature dehydration, which preserves its efficacy. This mussel has been fished for many centuries along the coast of New Zealand by indigenous tribes. A very low rate of arthritis has been observed in the Maori population who regularly consume this crustacean.

Clinical diets... nutritional support for medical treatment (continued)

Key points required in the clinical diet:

- A reduced energy density to limit the risk of weight gain.
- Joint supplements (chondroitin, glucosamine)
- Omega-3 essential fatty acids: eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).
- Carefully selected, very high quality proteins
- Antioxidants to delay cellular ageing

Indications

- Support the articular mobility of the dog (arthritis, elderly animals)
- Dysplasia

Therapeutic goals

- Control existing inflammation with omega-3 fatty acids
- Protect the cartilage and stimulate the metabolism of the articular cells
- Improve and maintain the dog's mobility.

- A consistency that enables administration via a feeding tube, or with a syringe directly into the animal's mouth if necessary.

Indications

- Malnutrition
- Anorexia
- Convalescence

Therapeutic goals

- Meet the animal's nutritional requirements in a small volume
- Stimulate the appetite
- Easy to eat by licking
- Support immune functions
- Promote healing and cellular regeneration

Nutritional support of convalescence

Over the course of cachectic diseases (diseases accompanied by weight loss), such as heart failure, cancer or during convalescence, a specifically formulated clinical diet for intensive care is essential to maintain the animal's lean body mass (muscles, bones and organs). These diets are composed of ingredients of the highest quality and are formulated to stimulate the animal's appetite (high energy density, highly appetising).

Key points required in the clinical diet:

- High energy density
- A high intake of essential nutrients
- Highly appetising
- Antioxidants to combat oxidative stress

The diet plays an essential role in treatment during the hospitalisation period and convalescent period at home. Malnutrition delays convalescence in the dog.



The DragonFoto.com



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Can dogs wear dental braces?

Orthodontic braces can be used for dogs to correct malocclusions. Malocclusion is the malposition of the teeth resulting in poor contact between the upper and lower teeth when the jaw is closed. Since malocclusion is an inheritable condition, genetic counselling is advised. The dog may be excluded from dog shows and breeding programs.

Malocclusion of the teeth can lead to eating problems, periodontal disease, soft tissue trauma, asymmetries and deformities of the oral cavity and face, and mandibular joint disorders.

The aim of the orthodontic treatment is to provide a functional and aesthetic occlusion.



Camil Stoian, veterinary surgeon
Veterinary University of Vienna
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The body condition of a dog is correlated to that of its owner. To maintain good health, regular physical activity and an appropriate and controlled diet are essential... the same can be said of the owner!

The specific case of obesity

Obesity is defined as an excess of weight through the accumulation of adipose tissue (fat), which is accompanied by deleterious effects on health in terms of morbidity (sensitivity to disease) and mortality. As with humans, canine obesity is becoming increasingly prevalent in developed countries. The World Health Organisation considers obesity as a disease which should be prevented and treated in the same way as other diseases.

Obesity can be defined as an excess of more than 20 percent in comparison with the animal's optimal weight. Thus a Labrador Retriever with an ideal weight of 28 kg is said to be obese when it weighs 34 kg.

Obesity in the dog: the statistics

According to the scientific literature, between 18 and 44 per cent of dogs are overweight or obese. In two surveys conducted at the National Veterinary School of Alfort in France, nearly 39 per cent of the dogs presenting for vaccinations were overweight. Studies conducted in several American or European universities give very similar results. This figure rises to 50 per cent in the population of hospitalised dogs, and the prevalence is increasing in all developed countries. It is therefore important not only to detect this disease and treat it, but also prevent it.

The causes of canine obesity

Although certain hormonal diseases (Cushing's disease, hypothyroidism) can cause obesity in the dog, the main cause is excess energy intake: the dog eats more calories than it uses, and therefore stores the excess as fat. The reasons for this finding are multiple.

Owners' sedentary lifestyles

There is a proven link between the body condition of the owners and that of their dog. This phenomenon is fairly logical, given that pets are obliged to "suffer" the decisions and behaviour of their owner. Human obesity campaigns recommend at least 30 minutes of energetic walking per day ... dogs are no different to man in this respect. It is becoming increasingly difficult in some cities to find open spaces for dogs to run and play together. However, having a dog also implies that one must take them to play areas or authorised walking places compatible with their well being.

Choosing the most suitable breed of dog is also all about making sure that one has the motivation and time needed for the animal. It is also important to remember that a small dog does not necessarily need less exercise than a big dog. It would therefore be unthinkable to advise a Jack Russell Terrier for an elderly person who has difficulty getting around or an English Bulldog for an endurance runner!

The significance of food

The vast majority of dogs are fed on complete commercial diets, principally in the form of dry biscuits (kibbles). The development of these diets represents real progress for the health of our four-legged companions. Unlike a standard home cooked diet (meat, vegetables, rice) complete commercial diets cover all of the animal's nutritional requirements. For kibbles, the dehydration of the feed (8 to 10% water) means that the feeding volume is smaller than that of a wet ration (which consists of 80 percent water). This is not a problem in itself, but the relationship between humans and dogs is all too often centred around food; for the owner, small helpings are often synonymous with cruelty, whilst the dog is only thinking about eating! It is however obvious that if the owner regularly offers treats or table scraps, the dog will constantly be thinking about food. Dogs function by association of ideas and conditioned reflexes: if every time we eat cheese we give them a piece, they will soon learn to come to the table and start drooling as soon the cheese platter arrives ... nothing to do with whether they are actually hungry or not!

How to prevent obesity... and maintain your dog's well-being

- 1 – Check your dog's bodyweight and condition score at least every 3 months.
- 2 – Adapt its diet to its specific needs: size of the dog, breed, appetite, energy requirements, disease.
- 3 – Provide it with regular physical exercise as well as social interactions with other dogs.
- 4 – Do not use food as a means of communication: petting and playing work just as well.



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Beagles and Cocker Spaniels are breeds that are “economic” with energy.

Why did you feel it was necessary to open the first obesity clinic for pets?

We recognised that obesity was becoming an ever-increasing problem, and one that was frequently not handled well by veterinarians. This was mostly due to time constraints of vets in general practice, to a lack of awareness of the medical risks associated with obesity, and a lack of knowledge about management strategies. By opening a weight management referral clinic we could do a number of things to correct the problem:

1. We could provide advice and guidance on current cases, either those referred directly to us, or by providing phone advice.
2. We could improve the awareness of our undergraduate students to the problem of obesity.
3. We could improve the public awareness of obesity as a concern.
4. By monitoring the cases recruited and our success with management, we knew we would have the opportunity to understand the problem better and to improve future management strategies.



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The energy density of the food (quantity of calories per gram of feed) will determine the quantity needed. For the same energy intake, it is therefore possible for a meal to be larger or smaller depending on the food used. Recently, commercial diets have become available which offer solutions in terms of satiety, volume and comfort for the animal... and for its owners.

The predisposition of certain breeds

Some breeds of dog, even at rest, need less energy than others. This is the case of all northern breeds, and of course the Labrador Retriever. The Lab requires 20% less energy than another breed of equivalent size. If we then consider that it's a somewhat greedy hunting dog, it is easy to understand that this dog is predisposed to obesity. Beagles and Cocker Spaniels are also “economical” with energy. This is not a hard and fast rule, and it does not mean that such breeds will always become obese. It simply means that we have to be more vigilant about their body condition and their weight and adapt their diet so that they maintain an ideal weight, which is their healthy fit weight.

Neutering

The withdrawal of sex hormones is accompanied by a decrease in energy expenditure of 20 to 30 per cent. It is therefore easy to understand that a neutered Labrador has two coefficients of reduction of energy requirements that add together, making it particularly sensitive to obesity. However, nutritional solutions are available to maintain the animal in a perfect body condition: by combining a healthy lifestyle and an appropriate diet, it is perfectly feasible to maintain these animals in good condition.

Beauty criteria

In some breeds, the accepted beauty criteria are sometimes accompanied by obesity. The increasing awareness of breed societies to this phenomenon will help to reconcile beauty and health in the future.

An inappropriate diet during the growth phase

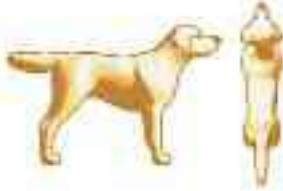
In the same way as large breed puppies are predisposed to osteoarticular problems when they are fed an inappropriate diet, small breed dogs are predisposed to obesity.

The latter are born at a more advanced stage of growth than large breeds. The tissues of the body are formed in successive waves (nerves, then bones, then muscles, and finally adipose tissue), so most of them have already started to produce adipose tissue by the time of weaning. Any dietary excess during the growth phase will therefore result in the production of large quantities of adipocytes (fat storage cells). These then fill with fat, like little balloons, generating obesity that is very difficult to treat in adulthood. It is therefore essential for all owners of small breed puppies to be aware of this, especially given that at this age the puppy is very cute and looks like a little ball of fur so that it is not easy to detect excess weight gain. This danger justifies the existence of complete diets specifically designed for small breed puppies, or even some breeds more at risk than others.

The consequences of canine obesity

Obesity is a disease. The presence of excessive adipose tissue has repercussions on the entire animal through chemical communi-

5-point body condition score

Score	Silhouette	Dog
1. Cachexia: more than 20 percent below optimal weight.		<ul style="list-style-type: none"> - Ribs, spine and pelvic bones are easily visible (short haired breeds). - Obvious loss of muscle mass. - Palpable loss of fat over the rib cage.
2. Thin: 10 to 20 percent below optimal weight.		<ul style="list-style-type: none"> - Ribs, tops of the vertebrae, pelvis bones visible. - Obvious waist. - No fat felt over the rib cage.
3. Ideal weight		<ul style="list-style-type: none"> - Ribs and spine not visible, but easily palpable. - Obvious waist. - Thin layer of adipose tissue palpable over the rib cage.
4. 10 to 20 percent over the ideal weight.		<ul style="list-style-type: none"> - Ribs and spine hard to feel. - No waist. - Obvious adipose deposit on the spine and base of the tail.
5. Morbid obesity: from 40 percent over the ideal weight.		<ul style="list-style-type: none"> - Massive adipose deposit on the thorax, spine and base of the tail. - Obvious abdominal distension.

The weight increases by ten percent for each half point over a condition score of 3. A dog with a score of 4.5 is therefore 30 percent over its ideal weight.

cations. For example, obesity is responsible for a continuous low level inflammatory state. Obese dogs are less resistant to infections, less tolerant to physical effort. The anaesthetic risk during surgery is also higher. Obesity therefore definitely reduces life expectancy.

Obesity is also responsible for exacerbating other diseases. For example, in dogs with arthritis, obesity worsens their handicap and increases their suffering. Adipose tissue also induces insulin resistance, which can result in diabetes. In such cases, weight loss provides a marked improvement in the state of the dog and above all its quality of life.

Treatment and prevention

When addressed early, moderate weight gain is easy to treat. Yet owners must be aware that a dog cannot lose weight by simply reducing the meal size of a normal maintenance food: not only will the animal go hungry, but it will be at risk from deficiencies in certain essential nutrients, which will compromise its health. When obesity has become established, treatment requires medical help: the vet will prescribe a specific clinical diet for weight loss, accompanied by lifestyle changes and exercise. The ideal weight loss diet combines a low energy density with a formulation that provides a sensation of satiety whilst meeting the animal's nutritional requirements. Medically, and for risk-free weight loss, the recommended target rate weight loss is between 1 to 2 percent per week: this means that getting a 30 kg dog to lose 10 kg will therefore take around one year! Another good reason for making sure that the dog does not get fat in the first place.

Prevention is the best treatment for obesity. This involves regular monitoring (at least every three months) of the animal's weight and an assessment of its body condition. It is also essential to give the dog regular exercise. A diet adapted to its size and appetite will make it possible to meet the animal's requirements without forgetting that the dog is not a human or a dustbin.



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Physiotherapy and functional re-education

Physiotherapy is a medical discipline which seeks to maintain and restore normal movement and functional ability using various non-invasive treatments such as thermal treatments (e.g. ultrasound), passive mobilisation of a limb, neuromuscular stimulation or a simple active re-education exercise. The use of scientific physiotherapy techniques to improve the recovery process in the canine athlete, or in a dog which has undergone bone or muscle surgery, has recently become available in veterinary medicine. However, the use of these methods to improve the recovery process in the canine athlete is still under development and more commonly practiced in certain countries (United States, France, Great Britain, Italy, Germany, Argentina, Japan, Korea, etc.).

The benefits of physiotherapy

The objective of physiotherapy is the restoration of normal function for the affected anatomical element. Very commonly, the surgical treatment of a muscle, tendon or ligament injury, or the stabilisation of a fracture, is only the initial phase of the animal's rehabilitation. When appropriate rehabilitation is not undertaken, there is invariably a reduction in the animal's physical capacities and reduced athletic performance or even failure to return to normal locomotor function. In humans, it is difficult to envisage orthopaedic surgery without subsequent functional re-education, and the same applies to dogs. Physiotherapy provides the following benefits for the canine patient:

1. Increased blood and lymphatic flow
2. Early regression of inflammatory processes
3. Increased production of replacement tissues
4. Prevention of periarticular contraction
5. Promotion of the return to normal function of the injured joint
6. Prevention of muscle atrophy

Another highly positive aspect of physiotherapy is it includes the owner in the success of the treatment, making owners feel partially responsible for the dog's complete

recovery. They then feel involved and play an essential role in encouraging the dog to cooperate in the execution of the programmed exercises.

Thermal treatments

Heat

Heat is a very ancient method and often proves to be highly effective. It has beneficial effects on the following:

- reduction in the inflammatory response (heat, pain, swelling, muscle contractions),
- increase in the metabolism of the warmed tissues,

- fibrous scar tissues become easier to stretch,
- increase in blood flow,
- decreased pain.

Thermal treatments can be superficial (self-heating bags, heat lamps, hydrotherapy), in the event of an injury to the toes for example, or can make use of "relative heat dispersion" techniques obtained using ultrasound or microwaves for example (the latter are referred to as diathermal methods). Thermal treatment can also be applied to deep injuries using the ultrasound machines most physiotherapists have. Ultrasounds

What is the benefit of physiotherapy?

In human medicine physiotherapy is an integral part of conservative and surgical therapy in orthopaedics, neurology and rehabilitation. For some years these valuable methods have also been used in veterinary medicine. The effectiveness of physiotherapy for dogs and cats has been proven in numerous clinical trials and the worldwide involvement of universities helps investigation of the underlying mechanisms of the various methods used. The work of clinicians and scientist over the last few years has established physiotherapy as a valid treatment, which is important not only in post surgical rehabilitation but also in pain management and conservative therapy.



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Examples of physiotherapy protocols

Case number 1:

Greyhound which has undergone reparative orthopaedic surgery on a tarsal fracture.

<i>Weeks 1 and 2</i>	- Immobilisation with a plaster cast. - Passive mobilisation of the hip and stifle. - Stimulation of the quadriceps muscle.	- Passive mobilisation of the hip, stifle, hock joint. - Stimulation of the gastrocnemius and cranial tibial muscles. - Daily swimming (for a few minutes).	<i>Week 7</i>	- Short runs off the lead. - Daily swimming. - Long slow walk.
<i>Weeks 3 and 4</i>	- Immobilisation with a plaster cast. - Passive mobilisation of the hip and stifle.	- Cage rest, with short walks on a short lead to relieve himself.	<i>Weeks 8 and 9</i>	- Progressive increase in the time and intensity of the walk, trot, run.
<i>Week 5</i>	- Removal of the plaster cast. - Radiographic examination of the fracture.	<i>Week 6</i> - Very short walks on a short lead. - Daily swimming. - Passive mobilisation of the tarsal joints.	<i>Week 10</i>	- Return to training.

Case number 2:

Australian sheep dog which performs agility, with an anterior cruciate ligament rupture surgically repaired.

<i>Week 1</i>	- Passive mobilisation of the stifle (10 - 15 movements of flexion/extension) - Massage of the quadriceps with an analgesic balm or Arnica based cream. - Application of cold compresses on the wound site to prevent inflammation and oedema. - Walks on a short lead to relieve himself.	ultrasound therapy of the stifle (3 minutes two to three times per week). - Swimming (5 minutes two to three times per week) - Walks on a short lead to relieve himself.	- Swimming (15 to 20 minutes two to three times per week)
<i>Week 2</i>	- Passive mobilisation of the stifle. - Massage of the quadriceps. - If necessary, application of cold compresses. - Removal of the stitches at the end of the week. - Walks on a short lead to relieve himself.	<i>Week 4</i> - Passive mobilisation of the stifle. - Massage and ultrasound therapy of the stifle (5 minutes two to three times per week). - Swimming (8 to 10 minutes two to three times per week) - Walks on a lead.	<i>Weeks 7 and 8</i> - Massages and ultrasound therapy of the stifle if necessary. - Swimming (20 to 25 minutes two to three times per week) - Physiotherapy performed by the owner. - Walks on the lead, hills, ramps or stairs.
<i>Week 3</i>	- Passive mobilisation of the stifle. - Massage of the quadriceps and stifle with	<i>Weeks 5 and 6</i> - Massage and ultrasound therapy of the stifle (5 minutes two to three times per week). - Walks on a lead with hill work.	<i>Weeks 9 and 10</i> - Swimming (20 to 25 minutes two to three times per week) - Progressive return to training with warm-up of the stifle with massages and use of apparatus but no jumping. - Slopes, ramps, stairs and progressive resumption of walks off the lead.

are waves which are transformed into heat as they pass through the tissues, and can thus penetrate deep down to the surface of the bone. They create micro-massages during their passage, which enables a more precise and targeted action within the affected tissues or joints.

Cryotherapy

Cryotherapy uses cold, which when applied locally can successfully stop or at least reduce an inflammatory or oedematous process.

This is achieved through the application of refrigerated cold bags or special instruments that produce a stream of pressurised cold “vapour”, which enables penetration to a short depth into the damaged tissues (this vapour is actually composed of micro-droplets of very cold water).

Passive mobilisation and massages

Passive mobilisation is a movement that is imposed by the therapist with the aim of recovering articular amplitude or compensating a loss of suppleness and elasticity of the soft tissues. It is used after traumatic injuries or lengthy immobilisation to prevent tissue adhesions and maintain normal joint motion. It increases the drainage of blood and lymph and prevents muscle contractions and the stiffening of the joints through ankylosis or calcification. Passive mobilisation reproduces flexion and extension

movements of the joint, which enables the synovial fluid to nourish the joint cartilages via a “pumping” motion. Such treatment should start on the same day as a surgical intervention and continue for two to three weeks. Massage can be useful, when there are no serious muscle lesions, for reducing pain and improving blood flow, but also to eliminate adhesions of scar tissue and connective tissue between the skin and the underlying soft tissues. Massaging a weakened joint can also help warm and prepare it for exercise. Any session of functional re-education can also be completed by a massage, which promotes muscle relaxation after physical effort, enabling good blood and lymphatic flow as well as the correct elimination of toxins.

Specific physical exercises

Functional re-education is a medical science in its own right. The veterinary therapist therefore needs to analyse each case separately and devise a clearly laid out therapeutic plan, which may involve the prescription of a few simple exercises for the dog, aimed at re-educating a specific muscle or joint. Such exercises may involve the use of a staircase, large balls, horizontal ladders placed on the floor, specific obstacle courses, or other “games”, which are used in various ways depending on the problem to be resolved in the dog in question.

Hydrotherapy

Swimming is an ideal exercise for post-traumatic, post-surgical and post-nerve damage locomotor recovery, as it’s the least traumatic form of exercise for the injured structures. More than 60 percent of the body-weight is carried by the water, which enables the animal to move its limbs through their full amplitude with more ease, without the trauma induced by ground impact. It is a complete technique that gets the entire body working; cardiorespiratory apparatus, all of the muscles (limbs, dorsolumbar muscles) and all of the joints. The massaging and draining effects of the water on the blood and lymphatic circulation are also a positive factor. The use of hot water (between 25 and 30°C) helps to relax the muscles, which loosens the animal up and relieves pain. Hydrotherapy (or water therapy) can be implemented very soon after a surgical procedure, as soon as the surgical wound has healed, or following any other injury without an open wound.

The association of walking and water is increasingly popular in functional re-education centres for dogs; the dog is placed on a treadmill which is in the bottom of a pool that can be filled to varying depths, thus enabling less weight to be taken off the joints as the dog progresses. These machines are undoubtedly the most effective means of simple motor function re-education; however they are very expensive.

Cryotherapy is the application of cold.



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Hydrotherapy is a gentle method of re-education that allows a comprehensive workout with a full range of movements.



© UMES



Laser.



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Electrostimulation

Small portable neuromuscular electrostimulation machines are used to rhythmically contract the main muscle groups via the skin. They prevent the muscle atrophy that is associated with enforced rest or prolonged partial immobilisation. Depending on their intensity, the low frequency electrical impulses can also help to reduce pain and stimulate blood flow and nerve sensitivity.

Low energy laser

Various types of lasers can be used in the dog to help resolve muscle problems or tendonitis. Their efficacy is based on their technical characteristics. In general “soft” lasers are used for acupuncture in the dog, “moderate” lasers for muscle or joint problems, and “hard” lasers in surgery. This classification reflects the intensity and power of the laser beam. The therapeutic effects of lasers help prevent inflammation and oedema and decrease pain (analgesic effect); and they accelerate the healing process in the event of a lesion or rupture. Low energy lasers represent the non-invasive treatment of the future in athletic dogs, so specialist vets are now often equipped with such lasers despite their high cost.

We should also mention the application of pulsed electromagnetic fields, which is sometimes used in physiotherapy with apparently good results in the resolution of muscle and tendon injuries.

Shock waves

A new technique widely used in equine medicine has appeared in canine treatment over the last few years: this is the use of shock waves. These waves are produced by a generator under a discontinuous pulsed mode and the frequency is adapted to the pathology being treated. The session is usually coupled with cryotherapy (application of cold) for its anti-inflammatory and anal-



© Duhaier/Royal Canin

Electrotherapy.

gesic effects. The technique is principally used for tendon injuries and inflammation of the bone (periostitis). Improvements of 60 to 70 percent are seen after three sessions, even for refractory tendonitis. This technique is becoming increasingly popular in sports dogs.

A well-planned physiotherapy programme is an essential element in the dog's recovery. Using the above methods, a functional re-education schedule very similar to those devised for humans can be implemented with the owner over several weeks.

Whenever physiotherapy techniques are used during re-education, it is very important to ensure that the animal's progress is recorded on a weekly basis and to adapt the techniques depending on the animal's capabilities and the evolution of the clinical signs.

In a plan spread over several weeks, moving to the next step should not be done until the objectives of the previous week have been attained and only if the animal is capable of this. It is important not to generate any new pain in the application of the techniques and exercises.

The owner should only be allowed to continue the treatment themselves once the animal is weight-bearing normally once again. Regular maintenance is needed, as well as performing correct warm-ups and regular training, combined with an appropriate high-quality diet. Sporting dogs are considered in the same way as a human athlete, for whom all these elements are essential in the prevention of injuries, the maintenance of acquired performance and its improvement.



© Hermeline/Diffimédia

Exercise involving the flexion of the joint to improve articular suppleness.



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Alternative medicines

At the end of the 20th century, “alternative” medicines became more popular than ever following demonstrations of their efficacy and a more scientific approach to their application. In practically all cases they are a useful complement to more traditional medicine; their use also depends on the cultures of each country or geographical zone.

Homeopathy

The basic principle of homeopathic medicine (“similia similibus curentur”, let like be cured by like) was born in 1790 and resides in the treatment of disease with the disease itself: a product or substance responsible for a given disease is diluted to attain an infinitesimally small concentration that is thus capable of combating this disease. This “Hahnemann therapy”, named after its creator, has since spread and evolved, as even though the causative substances or molecules are still diluted several hundred times, they are not always directly involved in the disease being treated. Homeopathic drugs are available in liquid or granular form, diluted centesimally (CH) or decimally (DH).

They are normally given between meals, several times per day. The ideal therapy involves restoring health quickly, safely and durably, and of “destroying” the disease in its entirety via the shortest, safest and least harmful means for the patient. There are 8 modalities (the circumstances of onset, the sensations felt, the times of onset and

periodicity, the alternate nature or concomitance of other symptoms, improvement or exacerbation, mood changes) which are used to choose these homeopathic treatments, which can be used by any veterinarian.

Phytotherapy

Increasingly well developed in canine medicine, phytotherapy is classified as an alternative medicine despite the fact that certain plants have proven medicinal qualities. The surge in interest for these forms of medicine in the media has led many people to forget that the majority of allopathic (or conventional) medications are actually derived from the plant kingdom. It is perfectly normal, from a scientific point of view and if one does not assume that plants can treat everything, to exploit the curative properties of certain plants. The latter can be used whole (“simple”), in the form of extracts of essential oils (“aromatherapy”), via the use of certain specific parts of the plant that contain a higher concentration of active ingredient (buds, roots, shoots, etc. known as “gemmotherapy”), or in the form of floral elixirs, solar preparations of flowers, the best known of which are the Bach Remedies (known as “floratherapy”).



© Marilyn Barbore/Fotolia

The use of certain clays, such as smectite or zeolite in the treatment of simple diarrhoeas, is based on the same principle of natural therapy. Clinical nutrition has long been using certain plants or extracts in the formulation of specialised diets.

Acupuncture

Directly derived from 3,000-year old traditional Chinese medicine, acupuncture, which uses needles placed at perfectly defined anatomical sites, can also be used in the dog. This discipline has long gained credibility in medicine, and some vets are specialised in this field with good results, notably for the treatment of chronic lameness, but also in the treatment of behavioural, gastrointestinal, respiratory and urinary disorders. Painful points on the skin are directly related to the organ(s) that is (are) dysfunctioning and can therefore be treated either by the insertion of a needle on these same points, or using massage, or by heating these points. The main principle of Chinese medicine is to consider the organism as a whole at the centre of an environment, so it takes into account external influences such as stress, climate, air quality, diet and the physical condition of the patient in order to restore equilibrium with its

environment. The College of Veterinary Medicine in Beijing provides their students with complete training in this field; certain surgical anaesthesia can be performed using acupuncture alone.

Osteopathy

The term osteopathy is probably not the most appropriate for designating an unquestionably effective medical practice, provided that it is practiced by someone with serious medical biological training, i.e. a veterinarian in the case of a dog. It is more of a hands-on form of medicine, which differs from other forms of medicine by the importance of detecting or “feeling” the sensations produced by a pathology. The vertebral column acts as scaffolding for the living body; all of the nerves originate within it before irradiating out to every point of the body. In certain cases (pain, lameness, neuralgias) the intelligent manipulation of the vertebrae, limbs and sometimes fascial planes enables the restoration of order where conventional treatments have failed.



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Some of the acupuncture points in the dog.



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“Acupuncture, which uses needles placed at perfectly defined anatomical sites, can also be used in the dog.”



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First aid procedures

A dog's life may be threatened by an accident or the sudden onset of a stroke or disease, and it is important for anyone likely to be confronted with such a situation to be able to protect the dog from further accidents and alert the emergency services if necessary. The dog's owner should also be capable of performing simple procedures to keep the animal alive until the vet can continue the treatment.

Protect, Alert, Prevent

Protect from further accidents

Access to the "danger" zone should be prohibited by setting up a safety perimeter. Injured or suffering dogs may become aggressive and bite.

Alert

When?

- Whenever there is any danger concerning the animal.
- As soon as possible after a succinct and rapid analysis of the situation and the risks.

Who?

- If the dog or situation presents a danger for the public, call the emergency services (999).
- If the dog does not present any immediate danger for man:
 - in the daytime call the closest veterinarian.
 - at night, on Sundays and bank holidays call the closest on duty veterinarian to the site of the accident.

What should you say?

Knowing how to give a clear and succinct report is very important:

- Nature of the problem (fall, road traffic accident, etc.) and possible risks (fire, explosion, collapsed building, chemicals, a person has been bitten, etc.).
- Give a very precise location of the event.
- Number of dogs involved.
- Size, age and breed of the dog (wherever possible).
- Assessment of the severity of the dog's condition.
- First measures taken and procedures performed.
- Contact details of the dog's owner (where available).
- Wait for any instructions before hanging up.



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How to prevent further trauma

Dog injured on the road

1) *The dog lets you approach and touch him*

- Set up a safety perimeter with the help of other people.
- Move the dog carefully if necessary to prevent further accidents.
- Perform any first aid procedures where necessary.
- Call the emergency services (where injury or risk to people or property is involved) or the nearest vet and follow their instructions.

2) *The dog does not allow you near him.*

- Put barriers around the dog to create a safe perimeter and divert the traffic if necessary.
- Call the emergency services and specify that the dog could be dangerous (may bite, etc.). Follow their instructions.

Dog that suddenly falls ill

- Leave him in a calm, dimly lit place.
- Perform any first aid procedures where necessary.
- Call the veterinarian or the emergency vet and follow their instructions.

Moving a dog in an emergency

Objectives

- Know when and how to move a dog.
- Move the animal away from the cause of its distress and from any risk of further accidents if it is unconscious or unable to move by itself.

Emergency situations

- The dog is lying on the road with heavy traffic.
- The dog is in a smoke-filled or burning room.
- The dog is threatened by a mudslide, landslide, flood or collapsed building.
- The dog has heat stroke or is in an overheated car or one that is about to burn.

Techniques

If the dog is conscious, tie a strip of material around his muzzle before trying to move him. It is important to handle the dog with care to avoid aggravating any lesions.

Carrying a dog alone

- Pass one hand under the abdomen and the other under his neck.
- Or pass one hand behind the knees and the other under the neck or behind the forelimbs.

Carrying a dog between two people

- Place the dog on a rug or on a hard surface (plank), one takes the front and the other the back.
- Alternatively, one person carries the dog by the shoulders and the other carries the hind end.

Don't

- Carry a dog, whether you are familiar with it or not, without muzzling it first.
- Move a dog by pulling its legs.

Status and monitoring

Objectives

Know how to observe the status of vital functions and recognise the signs of a life-threatening emergency. The body is made up of cells for which oxygen is essential; three functions participate in the distribution of oxygen throughout the body: the nerves, respiratory system and circulation.



“Carrying a dog between two people”



Check for reactions or stimulate the dog to assess his state of consciousness.

A life-threatening emergency is defined as the failure of one or several of these functions which can rapidly lead to death. It is therefore important to be able to immediately recognise the signs of these failures to provide effective treatment before it's too late.

Implementation

Status of the vital functions

1 – Assess the state of consciousness

Call the dog, snap your fingers, clap your hands. If the dog reacts (turns his head,

pricks his ears, etc.), he is conscious.

In which case continue the examination whilst monitoring the dog. If not - the dog is unconscious – respiratory and cardiac functions should be checked.

2 – Make sure that the airways are clear

Remove the collar and slowly and gently tilt the dog's head back to clear the entry to the trachea and help the air to flow freely.

3 – Assess breathing

Leaning over the dog, place your ear or cheek above his nose. The expired air flow may be normal, increased, weak or absent. Respiratory movements of the chest can also be assessed (movements of the ribs).

If ventilation is absent, blow into the nose (holding the mouth shut) twice or massage the chest twice before checking circulatory function.

4 – Assess circulatory function

This is done by taking the femoral pulse (pulse in the hind leg). Note the presence or absence of this pulse, and whether it is clear and strong or thready. The heart rate should also be taken by placing your hand on the left side of the chest just behind the elbow (apex beat). The heart rate can give an indication of the dog's condition, for example it may be raised if there is stress or bleeding or decreased if the dog is in shock.

Finally, check the colour of the mucous membranes:

- Pink: normal,
- Red: indicates inflammation or hyperthermia,
- White: indicates bleeding or shock,
- Blue: indicates a lack of oxygen in the blood,
- Yellow: indicates a problem with the liver.

These observations can be made on the mucosa that covers the eyelids by gently lifting them, or on the gums or genital mucosa.



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Assess breathing, heart rate and pulse.

Progress and monitoring

Once you have checked that there are no life-threatening signs, you should start monitoring the dog. The following should be monitored:

- State of consciousness,

- Respiratory rate,
- Femoral pulse rate (regular and strong),

The colour of the mucous membranes and the capillary refill time. (When an area of the gums is pressed with a finger, blood is forced out of the small blood vessels - cap-

illaries. When the pressure is released, the blood should almost immediately refill the capillaries, so they become pink again).

Don't

- Waste time trying to find a pulse on the paw or neck in the dog.

If the animal is unconscious

Objectives

Know what to do if the dog is unconscious but breathing.

An unconscious animal is predisposed to respiratory distress, which may lead to respiratory and circulatory arrest if no action is taken.

The causes

These can be traumatic, medical or toxic.

The risks

- Respiratory arrest.
- Obstruction of the airways by the tongue or by liquid secretions (saliva, stomach contents, blood) in the trachea.

What to do

Check the dog's conscious state:

- Click your fingers,
- Pet,
- Whistle,
- Call the dog by its name (if you know it).

Make sure that the airways are clear: remove the collar, lead or harness, open the dog's mouth and pull out its tongue, leave the head extended.

If the dog is in respiratory arrest, pull several times on the tongue to trigger the respiratory reflex. Whilst awaiting the vet, change the dog over onto a different side regularly if the lesions allow it (whilst avoiding bringing any wounds into contact with the ground).

Don't

- Muzzle an unconscious dog.

“If the dog is unconscious, monitor him closely until the arrival of the vet.”



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Thoracic respiratory massage.

Respiratory distress and arrest

Objectives

Know how to recognise respiratory distress and take the appropriate actions.

When a dog is in respiratory arrest, he will need to be ventilated artificially once the airways have been cleared.

The causes

- Obstruction of the airways (object, bone, etc.).
- Abnormal air composition (smoke intoxication, irritant gas or lack of oxygen in the air).
- Strangulation.
- Pulmonary diseases (acute oedema of the lung, pneumonia, pneumothorax).
- Rupture of the diaphragm.
- Pleural effusion.
- Internal thoracic bleeding.
- Gastric dilatation and volvulus (GDV).

Respiratory distress

Signs

Markedly accelerated breathing, panting, scraping noise, whistling, wheezing or laboured breathing. The dog may be con-

scious or unconscious. The mucous membranes are often bluish (cyanotic).

What to do

Move the dog away from the cause of the distress (out of a burning building for example). Place it in a cool, well ventilated and quiet place. Do not take it in your arms or compress its thorax. If the dog is unconscious, monitor it whilst awaiting the arrival of the vet.

Respiratory arrest

Signs

Cessation of thoracic and abdominal movements.

What to do

Move the dog away from the cause of the distress (turn off the electricity, move him out of a burning building for example, taking care not to put yourself at risk of electrocution, burning etc).

- 1 – If the animal is unconscious and ventilation is present but threatened, with regular movements of the thorax and abdomen: monitor the dog constantly.
- 2 – If the animal is unconscious, without ventilation and respiratory movements, and cyanotic mucous membranes: check that the airways are clear (remove the collar, open the mouth and pull the tongue out, leave the head extended and tilting downwards, look for any obstructions (object, bone) at the back of the mouth).

Then perform two “mouth to nose” breaths.

If the thorax rises, the airways are clear and the femoral pulse should be checked:

- present: continue artificial respiration,
- absent: combine with cardiac massage.

If the thorax does not lift, then the airways are obstructed at the level of the trachea. In which case, a movement similar to the Heimlich manoeuvre in man can be performed, which involves making one violent compression at the base of the ster-

num to eject the foreign body with a forced expiration.

3 – If the animal is unconscious and the thorax does not rise after the first two breaths, or if the animal is conscious but has choked on something:

if possible hold the dog by the back legs with the head down.

4 – If the animal is unconscious, in respiratory arrest, and no pulse can be felt: refer to the paragraph entitled “cardio respiratory arrest”.

Positive signs

- Resumption of spontaneous breathing with ample thoracic movements, regular, and at a normal frequency.
- The mucous membranes turn pink again.



If the dog has swallowed something the wrong way and is choking, hold his head down with the back end raised and exert a sudden pressure on his abdomen.

Mouth to nose resuscitation

Mouth to nose: hold the muzzle shut with the hands, blow into the nostrils of the dog progressively then release the nostrils and jaws. Expiration is passive.

Frequency of breaths:

- 12 to 16 breaths per minute for a big dog,
- 15 to 20 breaths per minute for a small dog.

If you cannot bear to place your mouth over the dog's nose, it is possible, although much less effective to perform a chest massage to restart respiration. In the latter case, the dog is placed lying on its side on a hard surface and pressure is exerted with both hands on the ribs to expel the air from the lungs. The depression created by this movement will provoke an immediate intake of breath.



Mouth to nose resuscitation.

Cardiorespiratory arrest

Objectives

Know how to recognise cardiorespiratory arrest and know what to do.

Artificial respiration alone is not sufficient in the event of cardiac arrest. The earlier the intervention the better the prognosis.

Technique for chest compression

Dog unconscious and in respiratory arrest

- Perform two breaths and feel for a femoral pulse or a heart beat. If there is no palpable femoral pulse, perform chest compression.

Large dog with a round thorax or obese dog

- Lie the animal on its right side, on a hard surface or the floor. The compression is performed behind the point of the elbow (4th to 6th intercostal space).
- Press the heel of your hand into the chest behind the elbow.

Place the other hand over the first.

Small dog or dog with a flat thorax

- Place one hand on either side of the thorax, just behind the elbows.

- With your hands flat, press with the heel of each hand.

Frequency of compression

- Perform 60 to 100 compressions per minute, with one breath for every five cardiac compressions.

- The passage from one to the other should be made as quickly as possible for maximum effectiveness, or can be performed by two people (one performing cardiac compression and the other mouth to nose respiration).

Perform the massage for one minute then check the femoral pulse.

- If it is present and distinct, stop the chest compression and check respiratory function.

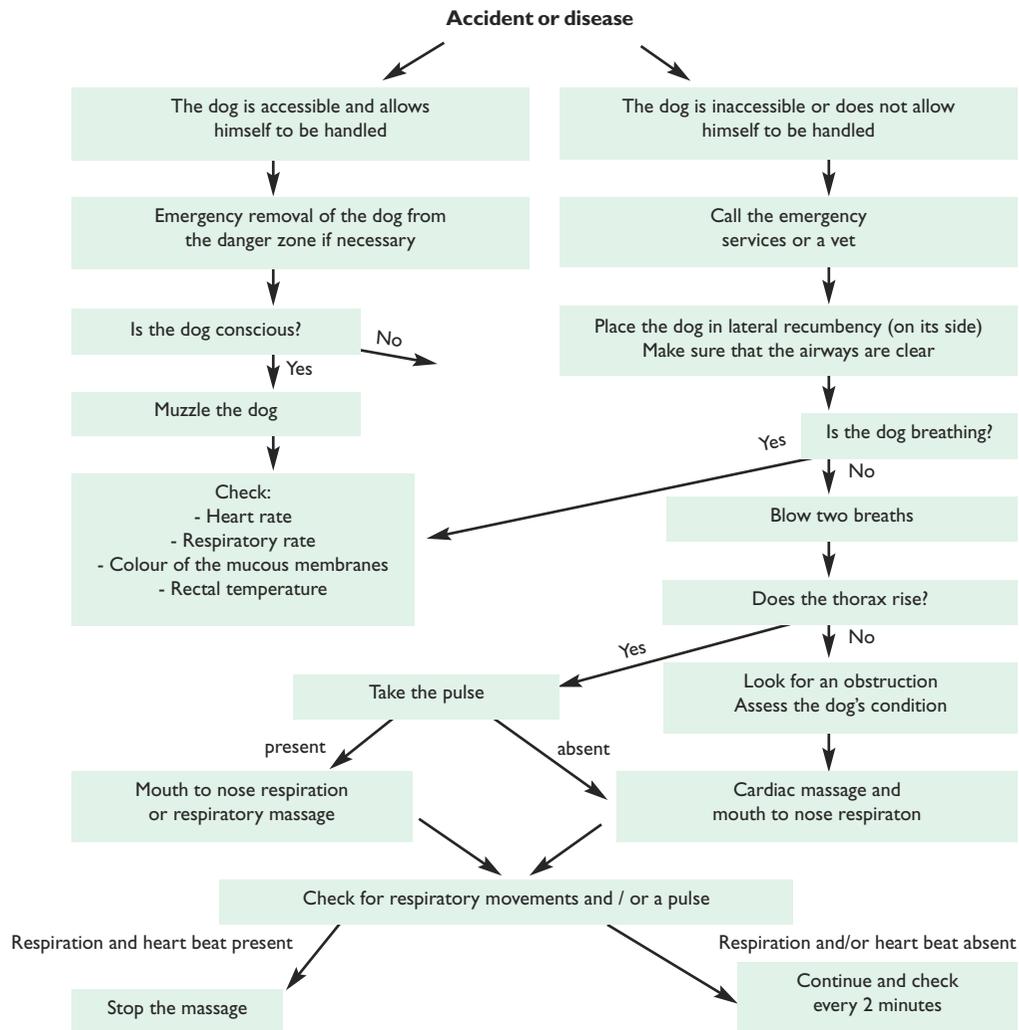
- If it is absent, continue chest compression and check again in two minutes.

Don't

Carry out chest compression in a dog whose heart is already beating.

Technique for heart massage and chest compressions.





Haemorrhage

Objectives

Know what to do in the event of visible haemorrhage (blood loss).

External, externalised or internal haemorrhaging requires quick and effective action.

The dangers of haemorrhage

Bleeding may be caused by a wound or a disease. Its gravity is determined by its location and the volume of the blood lost. It may lead to serious circulatory distress if no action is taken.

External haemorrhage

Definition

This is haemorrhage in which the blood flows from the animal to the exterior via a visible wound.

Signs

Bleeding from a cut or skin lesion.

True haemorrhage: a handkerchief will become soaked within seconds (watch out for bleeding that is hidden by the coat).



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Compression points for use in the event of external haemorrhage in the dog.

What to do

- Stop or at least slow the bleeding as quickly as possible, to prevent circulatory distress.
- Get help.
- Monitor the dog, notably the colour of its mucous membranes and the femoral pulse.
- Do not give it anything to drink.
- Stop the animal from moving around.
- Soothe the animal.
- Implement oxygen therapy as soon as it becomes available.

Techniques

- Compress the site of bleeding with the fingers or hand. Then use a handkerchief, cloth or swabs held in place with a wide bandage (headscarf, crepe bandage or tea towel for example).

Compression should be maintained until a vet can examine the wound.

- Compression at a distance, if direct compression is:
 - impossible (open fracture, wound with foreign body).
 - ineffective.

Points of compression

- hind leg: on the femoral artery (at the point where the pulse is taken).
- front leg: the compression should be made above the elbow, on the inside of the leg.
- head: the compression is made on one of the two jugular veins.

The use of a tourniquet

When compression at a distance is difficult or ineffective or if it cannot be maintained by one person alone who needs to leave the dog to call for help. The tourniquet is placed at a distance from the wound, between the wound and the point of compression. It is made with a wide tie; string or elastic bands should be avoided. Once in place, it should be loosened slightly every 10 minutes, the time of placement (hours and minutes) should be carefully noted.

It should be remembered that a tourniquet can present a risk in itself for a bleeding animal, and it is always preferable to try and stop the haemorrhage with direct compression.

Positive signs

Cessation or slowing of the haemorrhage.

Monitoring

Note any signs of deterioration in circulatory function:

- pallor of the mucous membranes
- increase in the heart rate
- weak femoral pulse

Externalised haemorrhages

Definition

The blood flows from a natural orifice: nose, mouth, ears, anus, urinary or vaginal orifice.

NB: If the blood is coming from the mouth, open the mouth to check that the dog has not simply bitten its tongue or cheeks.

What to do

This type of haemorrhage requires immediate medical attention from a vet. The amount of blood lost and the variation in the colour of the mucous membranes are used to determine the severity of the haemorrhage.

Internal haemorrhage

Definition

The blood does not leave the animal; it accumulates in an internal cavity: abdomen, thorax, cranium.

Signs

Intra-abdominal haemorrhage

Rapid swelling of the abdomen with extreme pallor of the mucous membranes, respiratory distress and a significant increase in the heart rate; the belly becomes tense and hard to the touch. If the haemorrhage is slight, the only visible signs will be a slight pallor to the mucous membranes and

Seizures and strokes

Objectives

Seizures and strokes may be short-lived or longer lasting and may be accompanied by subtle or more obvious signs. There is not necessarily any relationship between the duration and strength of these signs and the severity of the disease.

Definitions

Convulsions are the manifestation of cerebral pathology and combine the following in varying degrees:

- reduced awareness,
- disrupted muscle tone and lack of coordination,
- sensory disturbances,
- salivation, urination, involuntary defecation.

Acute pulmonary oedema is the invasion of the pulmonary tissues by fluid.

an increase in the heart and respiratory rates.

Intrathoracic haemorrhage

There is no visible swelling, but the mucosae are pale and there is significant respiratory distress and an increase in the heart rate.

Intracranial haemorrhage

The mucosae are pale, there are neurological symptoms (locomotor disturbances, blindness, deafness, seizures, etc.), and possibly even unconsciousness.

What to do

This type of haemorrhage requires immediate medical attention from a vet. The speed of onset of the clinical signs and their progression provides information about the severity of the haemorrhage. Any suspicious signs should therefore be recorded and communicated to the vet.

Heat stroke is cerebral oedema due to the failure of thermoregulatory mechanisms. It is more common in brachycephalic breeds (dogs with a short nose) and when the dog is subjected to a hot and humid climate with poor ventilation, such as being left in a car on a warm day.

Stroke

Indicative signs

Paralysis, possibly temporary, of one or several limbs or of the face.

- Significant agitation, uncoordinated movements.
- Abnormal femoral pulse:
 - weak, hard to detect,
 - perceptible but fast (> 160) or very slow (< 40).
- Nausea, prolonged or repeated vomiting.

In the absence of these signs, the stroke is probably minor but if you are in any doubt, consider it as being serious.

Don't

Leave a very tight tourniquet on for more than 10 minutes at a time.

- Compress both jugular veins at the same time.
- Apply pressure to a fracture site.

“The amount of blood lost and the variation in the colour of the mucous membranes are used to determine the severity of the haemorrhage.”

What to do

- Assess the state of vital functions. Correct if distressed.
- Recognise and assess the signs of the stroke.
- The animal should be lain down on its side.
- Monitor vital functions to detect any possible signs of difficulty.

If there is at least one sign of a serious stroke, seek immediate veterinary help.

Seizures (fits)

Indicative signs

- Reduction in consciousness, from slight up to complete loss of consciousness.
- Incoordination of movements with uncontrollable muscle tremors.
- Involuntary defaecation, urination and vomiting possible.

What to do

It is advisable to leave the dog in a dark, quiet place until the seizure is over. In all cases, the vet should be consulted as soon as possible to determine the origin of the

seizures (metabolic disorders, poisoning, malformation, brain tumour or epilepsy); the treatment will of course depend on the cause.

Acute pulmonary oedema

Indicative signs

- The dog presents with significant respiratory difficulty and possibly marked and painful abdominal movements to help it to breathe.
- Bouts of coughing and pink or frothy discharge from the mouth or nose.
- The mucous membranes become cyanotic (blue).

What to do

The dog should be left to rest in a quiet place and given oxygen as soon as possible. It is essential to consult a vet, to provide the dog with the emergency treatment that it needs.

Heat stroke

Indicative signs

- The body temperature rises sharply (up to more than 41°C).
- The respiratory rate is markedly increased.
- The mucous membranes are blue or even purple.
- Respiratory wheezing is heard.
- The dog trembles and may have seizures (fits).
- Awareness is reduced and the dog may go into a coma.

What to do

After placing the dog in a cooler area (get it out of the car, put it in the shade), it must be cooled progressively. Start by wetting the neck area, where the thermoregulatory centres can be found and the blood vessels that supply the brain, then the rest of the body.

Once the dog is moistened, it can be completely immersed in cool water, until the rectal temperature has returned to normal (38-39.2°C).

Epilepsy.



A vet should then complete the treatment with intravenous rehydration if necessary, as well as providing treatment for cerebral oedema (treatment for shock).

Don't

- Immerse a dog with heat stroke in icy water.
- Over-handle a dog that is having seizures.



Progressively cooling the neck area will help to prevent heatstroke.

Wounds and burns

Objectives

Know how to treat cuts or burns. Cuts and burns, which are commonly encountered, may be immediately life-threatening (haemorrhage, circulatory and / or respiratory distress) or have delayed consequences (infection, tetanus, etc.).

Wounds

Definition

Skin lesions due to a cut, graze or bite, with or without damage to the underlying tissues.

Description

1 – Simple wounds

Small superficial cut or graze with little bleeding, not located close to an orifice.

What to do

- Clip the hair around the wound and clean it with water and antiseptic.
- Protect the lesion with a simple dressing.

Monitoring

Consult a vet if there is any redness, heat or swelling.

2 – Serious wounds

Any non-superficial cut or serious graze such as cuts with haemorrhage, bites, extensive wounds, penetration of a foreign body, eye lesions or those located close to an orifice.

What to do

- Assess the amount of bleeding.
- Take the dog to a vet.
- Monitor the vital signs.

3 - Tetanus

A serious, life-threatening disease caused by the contamination of the wound with bacteria (*Clostridium tetani*). Tetanus results in generalised muscle rigidity and spasms with characteristic stiffness of the ears and jaw, hypersalivation, seizures and cardiorespiratory compromise. Consult a vet immediately. The incubation period (time before the onset of the symptoms) can vary from 5 to 21 days.

Although dogs are relatively resistant, there is a risk of tetanus with any deep, contaminated wounds.



Disinfecting a wound by swabbing with an antiseptic solution.



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Burns

Definition

Lesions of the skin, airways or gastrointestinal tract caused by heat, chemicals, electricity, radiation or friction.

Description

1 – Simple burn

Redness affecting only a small area of the skin.

What to do

- Cool the burned area as soon as possible under a gentle stream of cold water for at least 5 minutes and continue until any pain appears to have stopped.
- Protect the wound with a simple dressing.

2 – Serious burn

Extensive redness, deeper destruction, specific localisation (head, natural orifices, joints).

What to do

- Cool the burned area as soon as possible under a gentle stream of cold water for at least 5 minutes and continue until any pain appears to have eased.
- Clip the hair around the wound.
- Take the dog to a vet.
- Monitor the vital functions whilst awaiting help.

Possible complications

- Infection.
- Circulatory distress.
- Possible respiratory distress.
- State of shock.

3 – Specific cases

Chemical burns: rinse the area abundantly with cool, running water as quickly as possible, continuing for 20 minutes.

Electrical burns: these are always serious. Monitor the dog and take it to the vet as quickly as possible.

Internal burns due to inhalation: monitor respiratory function and take the dog to a vet as quickly as possible.

Internal burns due to ingestion: do not make the dog vomit, do not give it anything to drink, monitor the animal and take it to the vet as quickly as possible.

Don't

Remove a foreign body (e.g. a nail, piece of wood, glass) from a deep wound. (The vet must do this).

Traumatic injuries to bones and joints

Objectives

- Recognise these traumas, which are common in the legs and less so in the head and vertebral column.
- Avoid the dangers associated with inappropriate action, because this may do more harm than good.

Definition

The bone may be broken (fractured). A joint may be sprained, which is the tearing or stretching of the ligament that holds the joint in place, or luxated (dislocated), where

the head of the bone has come out of its articular position.

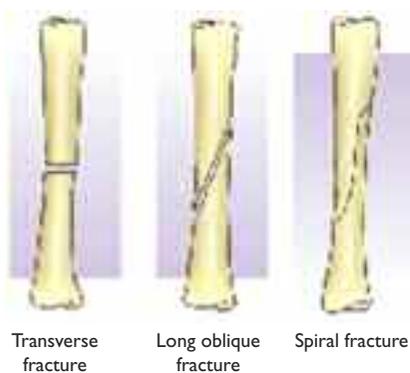
Indicative signs

Traumatic damage to the bones or joints results in acute pain, swelling, lameness with or without difficulty in weight-bearing, difficulty or impossibility to move.

Causes

These problems may result from trauma, a fall or an awkward movement.

Different types of fracture

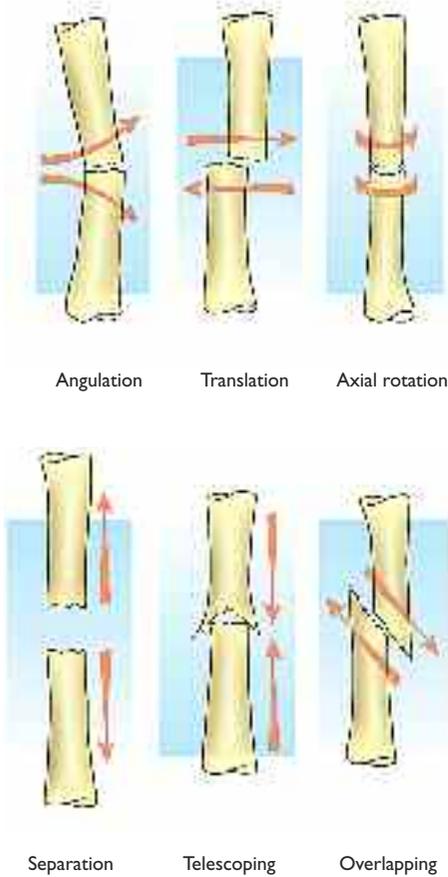


Transverse fracture

Long oblique fracture

Spiral fracture

Movement of the bones following a fracture



What to do

The most common accidental traumas that require emergency treatment are facial traumas (fracture of the lower jaw), leg injuries (fractures, luxations - hip or knee, tendon or ligament ruptures), and injuries to the vertebral column.

In the event of lameness

- Place a tie around the dog's muzzle.
- Check the condition of its paws.
- Palpate the dog all over to check for signs of local pain (proceed gently and cautiously).

In the event of pain

- Look for a wound, fracture or joint problem.
- Mobilise the painful site to check for the sound of bone on bone: if this occurs over a joint, it may indicate a fracture, sprain or luxation; if it is present over a long bone, it is more likely to be a fracture.

Irrespective of the type of fracture:

- Immobilise the joints above and below the fracture site before moving the animal.

Take the dog to the vet as quickly as possible.

When placing a splint, if the dog shows too much discomfort it is best not to persist. In this case, handle the dog with great care and put him into the car for immediate

transport to the vet. He will find the most comfortable position by himself.

In the event of an open fracture

The fractured bone is open to the outside via a wound.

- Place a tie around the dog's muzzle.
- Clip the fur around the wound.
- Cover the wound with a dressing or clean cloth to keep it clean.
- Immobilise the limb as explained previously.

Take the dog to the vet immediately.

In the event of an injury to the vertebral column

This may occur following a road traffic accident or a fall for example. The symptoms will vary depending on the extent of the trauma:

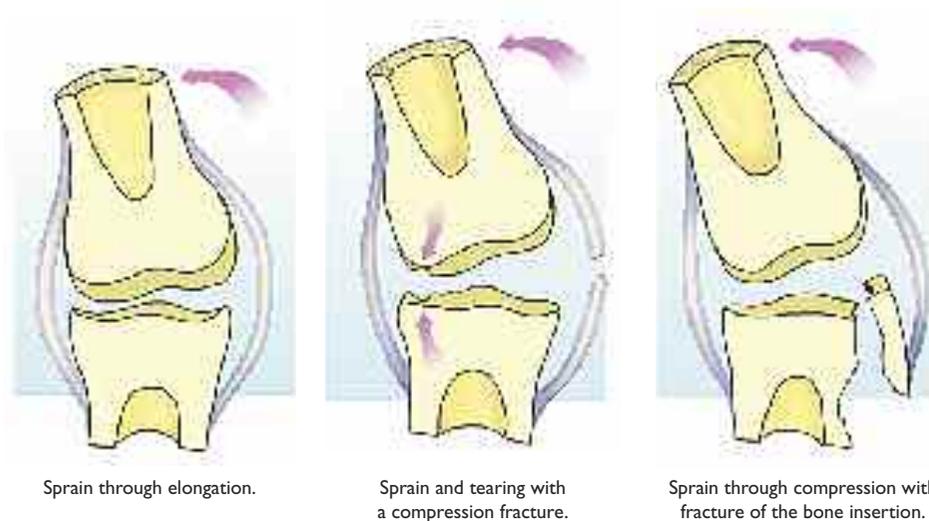
- Simple absence of superficial sensitivity: this is checked by successively pinching the skin starting from the dog's hind end and moving towards the head. A skin tremor indicates the presence of this sensitivity. The absence of a reaction at a specific location is indicative of a spinal cord lesion.
- Absence of deep pain: this is diagnosed by pinching the skin between the toes very hard, or the pads of the paws of each foot in turn. Complete flexion of the leg indicates the presence of this sensation (watch out that the dog does not bite in response to the pain).
- Complete paralysis of one or several limbs.

What to do

- Move the dog with great care; if possible strap the dog to a rigid board for transport.
- Watch the animal to make sure that it moves as little as possible.
- Monitor the vital signs.

The sensitivity of dogs to this type of handling will vary from one dog to another. Some dogs will not show any skin movement, even in the absence of spinal lesions.

Different types of sprain



Sprain through elongation.

Sprain and tearing with a compression fracture.

Sprain through compression with fracture of the bone insertion.

Gastric dilatation and volvulus (GDV)

Objectives

Know how to recognise the presence of an abnormal dilatation, or even torsion, of the dog's stomach, which is a very serious and relatively common problem, especially in large breed, deep-chested dogs after meal times. Discuss preventative measures with your vet.

What to do

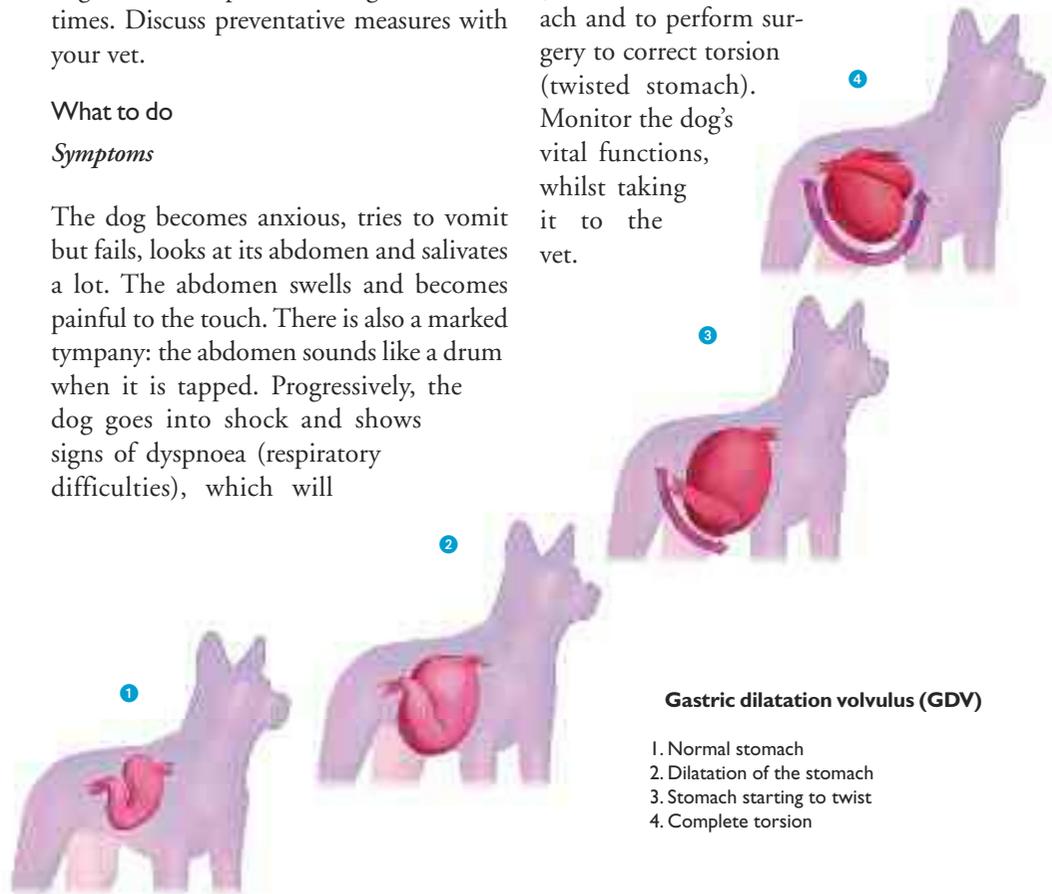
Symptoms

The dog becomes anxious, tries to vomit but fails, looks at its abdomen and salivates a lot. The abdomen swells and becomes painful to the touch. There is also a marked tympany: the abdomen sounds like a drum when it is tapped. Progressively, the dog goes into shock and shows signs of dyspnoea (respiratory difficulties), which will

lead to death if appropriate treatment is not given immediately.

First aid

The dog must be taken to the nearest vet immediately at the first sign of GDV, for emergency treatment for shock, to free the gas that is trapped in the stomach and to perform surgery to correct torsion (twisted stomach). Monitor the dog's vital functions, whilst taking it to the vet.



Treatment must be given as quickly as possible to free the gas that is trapped in the stomach and relieve the dog.



Poisoning

Objectives

Know how to react if a dog is poisoned (by a poisonous substance, food, plant, snake or insect bite). The majority of poisonings are accidental, often due to the incorrect storage of toxic products in the home. However, it is not unheard of for a dog to have been poisoned intentionally. Snake and insect bites are always possible when out for walks in the countryside. Irrespective of the toxin or venom in question, rapid intervention is essential for the survival of the dog.

Snake or insect bites

Origin

Poisoning may occur following a venomous snake bite, insect bite (bees, wasps, hornets, etc.), spider bite, or by licking or playing with toads or certain caterpillars.

Symptoms

These depend on the venomous species in question, the quantity of venom injected and the zone affected. The following symptoms may be observed:

- Swelling of the bitten region.
- Neurological symptoms (agitation, which is rapidly followed by hypotension, depression, prostration with tremors, dilated pupils and eventually collapse, coma and death),

- Gastrointestinal symptoms (hypersalivation, vomiting and diarrhoea are common following the injection of venom),
- Skin and eye irritation following contact with the venom.
- Respiratory difficulties.

What to do

- Stay calm so as not to stress the dog.
- Carry the dog to limit the diffusion of the venom and avoid accelerating the heart rate.
- Apply cold compresses to slow the progression of the oedema.
- Rinse the eyes and mouth to get rid of the venom.

Poisons

Toxins

The list is extremely long; among the most commonly encountered are:

- household chemicals: bleach, ethylene glycol (antifreeze), disinfectants, soaps, nitrates, nitrites, chocolate, onion, grapes, raisins etc.
- agricultural chemicals: mole control, herbicides, slug pellets (metaldehyde), insecticides, rodenticides.



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What are the foreign bodies most often swallowed by dogs?

In the dog's stomach, one can find a great variety of objects, both those detectable by X-rays and those which are not. These include stones, pieces of sofa and armchairs, small toys, coins, elastic bands, hair nets and balls of hair or fibre.

Even though some animals well tolerate the presence of these objects, they can be the cause of chronic vomiting as they can lead to diffuse inflammation, ulcers, delayed gastric emptying and pyloric hypertrophy. They can

also cause obstruction of sphincters and intestine if they continue to move down the gastrointestinal tract.

This can lead to collapse and necessitate emergency removal via gastroscopy or a gastrotomy or enterotomy.

To avoid this happening, the owner should ensure the dog does not ingest small objects and use toys which are an appropriate size for the dog and strong enough to resist its jaws.

Professor Fausto Quintavalla
Rome Veterinary University
(Italy)



Eye accidents

Objectives

Know how to react when a dog suffers an injury to the eyes.

Definition

Ocular trauma may result in the following lesions: the presence of a foreign body with or without corneal penetration (grass seed, hair, splinter), chemical burns (corrosive products) or thermal burns, partial or complete protrusion of the eye from its socket, wounds to the eye (branches, scratches).

Indicative signs

Any contact with the eye provokes intense pain, which produces the following symptoms:

- constant blinking or even complete closure of the eyelids,
- various types of discharges (translucent, haemorrhagic, mucopurulent),
- redness of the ocular mucosae,

- possible swelling of the eye,
- frequent rubbing of the eye against a hard surface or with one of the paws.

Dogs with injured eyes will seek dimly lit areas that are protected from the wind.

If there is a foreign body it may be visible directly on the cornea or under the eyelids.

What to do

Take the dog out of strong light and wind.

If the dog will let you:

- gently open the eyelids to look for any lesions to the cornea and conjunctivae
- do not touch the eye with your fingers or you may worsen the lesion and provoke secondary bacterial infection
- stop the dog from rubbing its eyes (using an Elizabethan collar)
- do not try and remove any foreign bodies that are sticking into the eye.

If the dog does not let you handle it, simply stop it from rubbing its eyes (collar or protective dressing).

In all cases, consult a vet as quickly as possible. Do not forget to describe the circumstances of the accident to the vet, if you know them (burns, foreign body, etc.).

When a non-traumatic foreign body is lodged in the fold of the lower eyelid (grass seed, hair), it can be gently removed using a moist swab. If the dog moves or reacts violently, it is preferable to consult a vet.

Don't

Never remove a foreign body which is embedded in the eye.

“Any contact with the eye provokes intense pain.”

Manual removal of a grass seed embedded in the inner corner of the eye.



Stop the dog from rubbing its eyes by fitting an Elizabethan collar.



Basic procedures

Using a tie as a muzzle.

A dog that is ill or has been in an accident should always be considered as potentially dangerous. Pain or loss of one of the senses may provoke defensive reactions in even the most gentle of dogs. All owners that do not have a muzzle ready to hand should know how to make one from a simple tie (e.g. a bandage):

- Tie a simple loop around the dog's nose.

- Tighten the loop sufficiently to prevent the dog from opening its mouth, but not enough to interfere with its breathing.
- Cross the ends of the tie under the mouth.
- Make a knot behind the ears.

In this way, the dog can be handled safely. It is also still possible to lift the gums and check the colour of the mucous membranes, which is impossible with a standard muzzle.



Taking the pulse

To check circulatory function, the dog's heart rate must be taken. Two sites are easily accessible for this.

The femoral artery

This is located inside the thigh, between two large muscle masses, just beneath the skin. By placing the fingers in the middle part of the thigh, the heart rate can be determined, and the quality of the pulse – strong, weak or absent – can also be felt.

Apex beat (thoracic)

When the hand is placed over the heart, i.e. behind the left elbow, the shock waves from the heart can be felt against the rib cage with each beat. This means the heart rate can be identified, but not the pulse characteristics. In obese dogs, the apex beat is harder to detect.

Taking the pulse at the femoral artery.



Taking the pulse by feeling for the apex beat.





Checking the colour of the mucous membranes

To determine the quality of the blood circulation and the oxygenation of the blood, the colour of the mucous membranes must be checked. Three sites can be used.

The gums

The dog's gums, and hence the oral mucosa, can be seen by lifting the lips. Normally it is pink, except in dark coated dogs with a black mask, where certain zones (or even the totality) of the mucosae are black.

The ocular mucosae

When the oral mucosa is too pigmented, or if the dog is bleeding from its mouth, the colour of the mucous membranes can be checked on the third eyelid. To do this:

- push the lower eyelid down with the thumb,
- with the other hand, gently press the eye-ball through the upper eyelid.

This procedure makes the third eyelid come up: the latter is never pigmented.

The genital mucosae

Finally, if the head is inaccessible, the state of the circulation can be checked on the genital mucosae: the sheath in the male and the vulva in the female.

To be effective in the event of an emergency, it is important to be familiar with these procedures (placing a tie over the muzzle, taking the pulse and checking the mucous membranes) and to practice them regularly in healthy dogs. It is always easier to detect an anomaly when familiar with the normal state. These procedures, which are perfectly safe for the dog, are easy to perform. A veterinarian can show you how to perform them during a routine consultation.



Checking the colour of the mucous membranes.

Is veterinary critical care as sophisticated as human medicine?

Veterinary critical care has become an essential specialty. We offer most of the advanced therapies available in human medicine including dialysis for kidney failure, mechanical ventilation for breathing failure, advanced imaging including MRI and CT scans, and blood and plasma transfusions.

Specialty hospitals have an intensive care unit where pets can receive intensive nursing care and constant monitoring. Veterinary critical care specialists have a similar level of training as their human counterparts including four years of veterinary school, one year of internship, and three years of residency. This training has made a dramatic difference in helping pets survive severe illness.

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Applying a dressing to the paw.



Bandaging the paw

Wounds on or between the toes, or on the pads, are never easy to bandage. There are a few simple rules to follow:

- place pieces of swab or cotton wool between the toes (this stops the claws from rubbing against the adjacent toes under the dressing and creating further lesions)
- start with the bandage under the foot
- bring it up onto the top of the foot
- make a quarter turn
- unroll the bandage around the leg up to the desired height

- fix the bandage in place using an adhesive dressing that covers both the dressing and the fur. This type of dressing should always be performed from the bottom up. This is because all dressings provoke mild compression. By starting the bandage at the top or in the middle of the foot, the blood will be pushed into the toes and won't be able to go back up, thus provoking painful and dangerous swelling.

This procedure requires a certain amount of dexterity; it is therefore preferable to have a helping hand.

Lying a dog on its side



Starting position: take the two legs that are on the side nearest to you.



Gently roll the dog towards you, breaking its fall and keeping a firm hold on the two legs.



Keep the dog lying down (lateral recumbency).



First aid kit

When travelling and at home, or for sporting or agility dogs, it is important to have a small first aid kit ready to hand which can be extremely useful in an emergency situation. At its most basic, your first aid kit should include the following:

- Cloth tie (e.g. a bandage) that can be used as a muzzle for conscious or dangerous dogs or those in acute pain (do not muzzle an unconscious dog).
- Thermometer (in the event of heat stroke).
- A wide bandage (scarf or something similar) to make a tourniquet if needed.
- Antiseptics (soap and an antiseptic solution).
- Swabs, both for direct compression and for simple dressings.
- A pair of curved, round-ended scissors to cut the fur around a wound or burn.
- A pair of rat-toothed forceps, which can be used to test the cutaneous sensitivity of the dog in the event of a lesion to the spinal column.
- A large needle (which should only be used by trained persons in the event of dilatation of the stomach).
- A splint (to immobilise a fracture or luxation).



Administering tablets.

© UMES

Simple medical treatments: administering treatment to your dog

When a dog is ill, and a diagnosis has been made, the vet will advise the administration of medicines to treat the disease. The ease of administering these will depend on their form.



Giving a tablet hidden in a piece of cheese.

© Hermeline/Diffonédia

Tablets and capsules

Tablets and capsules are the most common form of medication. They are not always easy to administer. Some dogs accept them if they are hidden in a piece of meat, cheese, butter or a treat, while others will eat the food but spit out the tablet. To make sure that the dog swallows the tablet, open the mouth wide, place the tablet at the very back of the throat, close the mouth again and massage the throat to trigger the swallowing reflex. Some medicines are available as palatable tablets.



Administering ear drops.

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Administering ear drops

The “L”-shaped anatomy of the dog’s ear means that it is always difficult to administer drops or lotion. To ensure that the entire ear canal is treated, the outer ear should be lifted as high as possible to open the auditory canal as much as possible. A few drops are then instilled whilst preventing the dog from shaking its head. The base of the ear is then massaged (the auditory canal can be easily felt) to enable the liquid to flow into the horizontal part of the canal. Only then can the dog be allowed to shake its head to remove the excess liquid.



Administering a liquid treatment via a syringe.

© UMES

Administering oral solutions

Some liquids can be mixed with the dog’s food for easier administration. However, they are not all tasty and some dogs may refuse to eat their food, in which case the liquid should be administered directly into the mouth.

The solution is drawn up into a syringe of sufficient size to enable the full dose to be administered in one go. The end of the syringe is then placed between the back teeth and directed towards the dog's throat. The liquid is then slowly injected into the mouth, making sure that the dog swallows regularly.

Administering eye drops

The treatment for most eye disorders involves the administration of eye drops. To do this, two people are needed; one holds the dog whilst the other administers the treatment. With one hand the eye lids are opened, whilst the second squeezes a drop into the upper corner of the eye, out of the dog's field of vision. The drops therefore fall onto the top of the eyeball and cover the whole surface of the cornea before being evacuated through the tear ducts.



Administering eye drops.

Applying "spot-on" treatments

Some long-acting drugs are available as a "spot-on" or little pipette which is emptied directly onto the dog's skin. The product is applied between the shoulder blades. The fur should be parted to allow the product to fall directly onto the skin. The product then diffuses across the skin to exert its action systemically.



Applying a "spot-on".

Injections

Injections are most usually given by the vet. There are three possible types: subcutaneous, intramuscular and intravenous. Subcutaneous injections are usually given in the back of the neck or between the shoulder blades. The product is injected just under the skin. Intramuscular injections are usually given in the lumbar muscles, at around three centimetres from the spinal column. This type of injection can be painful if the product is thick; the dog should therefore be firmly held. Intravenous injections are usually given into the cephalic vein (anterior part of the foreleg).



Subcutaneous injection.

Applying creams

Creams should be applied to clipped, clean skin using gentle massaging movements until completely absorbed. Dogs may find some creams tasty; it is therefore strongly inadvisable to let the dog lick itself.



Administering a topical cream.

Cleaning a wound

The fur should be clipped to produce a two centimetre border around the wound to enable good visualisation. The wound is cleaned with a swab (not cotton wool, which sheds small fibres that then become embedded in the wound) and antiseptic soap, or even just simple soap.

A dry dressing can then be applied to prevent secondary infections. After consultation with the vet, the latter may prescribe regular dressing changes and cleaning to encourage rapid healing. Infected wounds often require systemic antibiotic treatment.

Cleaning a foot wound.



1. Cutting the fur between the toes.



2. Cleaning the wound with antiseptic soap.

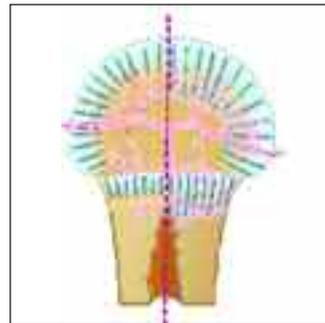
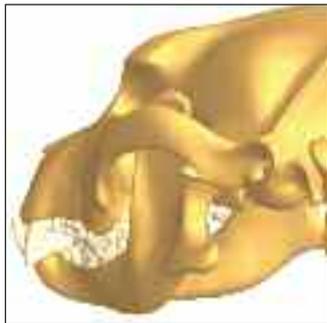
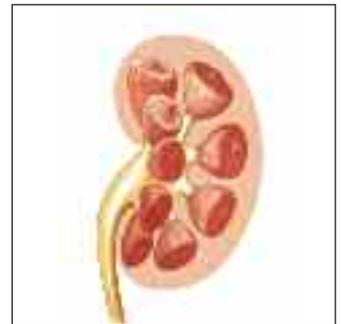
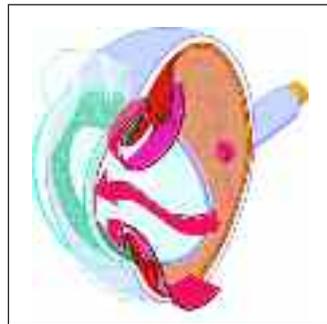
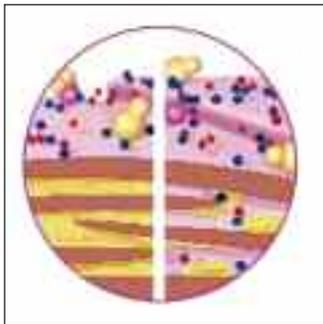


3. Flushing a wound with antiseptic solution.



4. Applying a dressing

Glossary of medical and surgical terminology



Medical terminology (whether veterinary or human) can be incomprehensible to many people. To get around this problem, but also because this encyclopaedia is not an exhaustive guide to veterinary medicine, this glossary provides an explanation of many of the terms that your vet might use.

A

Abortion

Interruption of pregnancy before term. The causes may be infectious (viral, bacterial, etc.), traumatic, environmental (stress), etc.

Abscess

Accumulation of pus in a cavity that forms a shell. It is painful, causes reddening and usually a decline in the animal's general wellbeing. As the abscess matures it may require an incision to allow it to drain correctly. It can be internal or external.

Acanthosis nigricans

Disease essentially affecting the Dachshund, it is characterised by brown, then black patches at various points on the body, which appear at around six months of age. Obesity is an aggravating factor; the diet should be monitored carefully.

Acidosis

A fall in the blood pH due to the accumulation of acidifying molecules or a deficit of buffering agents in the blood. The diagnosis is made using blood gas analysis. The cause may be external (poisoning) or internal (renal dysfunction for example).

Acrocyanosis

Cyanosis of the extremities due to their poor vascularisation.

Acromegaly

Excess growth hormone of iatrogenic or neoplastic origin (pituitary tumour) leading to enlargement of the extremities and organ hypertrophy.

Acute abdomen

Sudden onset of abdominal pain. The abdomen swells and becomes painful to the

touch. There are numerous causes and the determination of the origin requires further diagnostic tests.

Acute retinal degeneration

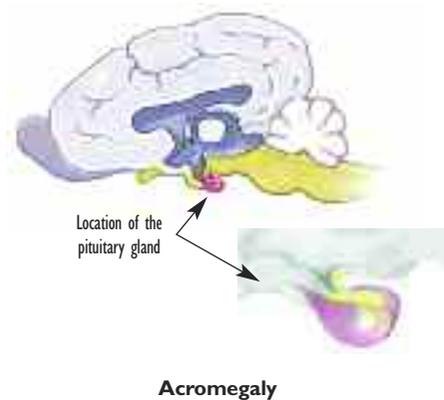
Sudden loss of the normal structure of the retina leading to sudden blindness. The pupil is dilated and non-reflective. This problem is especially common in obese dogs and those with polyuria and polydipsia.

Addison's disease

Disease caused by a reduction in the secretion of glucocorticoids caused by dysfunction of the adrenal glands, pituitary gland, or hypothalamus. The disease is fatal if left untreated and results in gastrointestinal and cardiac disorders and marked depression.

Adenocarcinoma

Malignant tumour of the epithelium. The location, origin, timing of treatment and the presence of metastases will determine the prognosis. Removal of the tumour is generally essential. Histological analysis will provide a diagnosis of the type of tumour.



Adenoma

Benign tumour of a gland or certain mucous membranes. An adenoma may cause symptoms if it is very large or if it affects certain parts of the body such as the pituitary gland, as it can then compress the brain. Excision is often necessary.



Adenoma

Example of prostatic adenomas compressing the ureter.

Adenomegaly

Increase in the volume of the lymph nodes.

Agalactia

Absence of milk production after giving birth.

Agenesis

Incomplete formation of an organ, often congenital. It may affect all organs and can cause neonatal mortality.

Allergy

Exaggerated reaction of the dog's immune system, caused by contact between the dog and an allergenic substance. It causes pruritus, occasional digestive upsets and in extreme cases may lead to anaphylactic shock.

Is it better to give dogs with food allergies white meat?

Feeding dogs with food allergies a white meat diet is a common idea. A great many allergies in dogs lead to itching and skin lesions (reddened and flaking skin).

In humans, it is often said that pallid individuals should eat red meat. Conversely, it is easy to think that a red dog should eat white meat, but this idea has no scientific foundation.

In fact the response to a known food allergy is usually to change the source of protein and feed the dog either hypoallergenic foods or a “selected protein” the animal has never eaten in the past.

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Anastomosis

Communication between two passages or structures, which may be natural or surgical.



Anastomosis
Example of a venous anastomosis

Alopecia

Hair loss of various origins: parasitic, hormonal, nutritional, immune-mediated etc. Depending on the origin it may be reversible (for example parasites) or not (certain hereditary alopecias such as the alopecia of coat colour mutations).

Amyloidosis

Accumulation of amyloid substance in an organ leading to altered function. This protein-based substance is normally found inside the body's cells. It is easy to detect on histology using the Congo red stain. Certain breeds such as the Beagle, Shar Pei and Brittany Spaniel are predisposed to renal amyloidosis, which induces chronic renal failure.

Anaemia

Lack of red blood cells, which is easy to diagnose by examining the mucous membranes, which are paler than in a healthy dog. There are numerous causes: excessive loss of red blood cells (e.g. haemorrhage after trauma or poisoning with rat poison for example), defective function of the red blood cells (e.g. due to ehrlichiosis) or defective red blood cell production (e.g. tumour of the bone marrow). In the latter case, the anaemia is said to be non-regenerative. Haemolytic anaemia is a specific case where the red blood cells are destroyed by the body itself.

Analgesia

Pain relief.

Angiography

Advanced diagnostic test performed under general anaesthesia during which a contrast product is injected to reveal the blood vessels on a radiograph. It can be used to diagnose an aortic thromboembolism or portosystemic shunt.

Anisocoria

A difference in size of the two pupils.

Anoestrus

Period during heats in the reproductive cycle of the bitch.

Anorexia

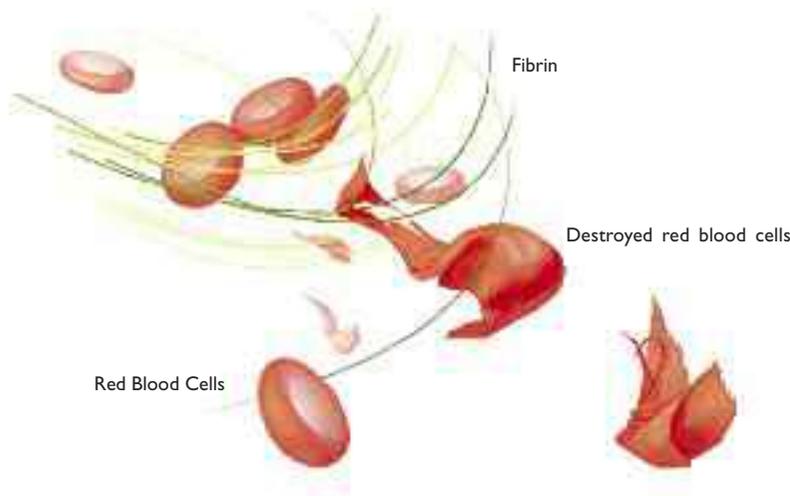
Lack or loss of appetite. This symptom is often indicative of pain or disease. The vet should be consulted as soon as possible as anorexia can lead to liver problems and induce serious electrolyte imbalances.

Anosmia

Dysfunction of the sense of smell, which may be linked to a cerebral or hormonal problem or be caused by rhinitis (inflammation of the nasal passages).

Antibiotic therapy

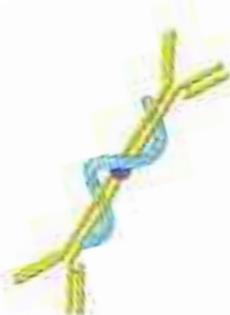
Treatment with antibiotics for bacterial infections.



Haemolysis (intravascular destruction of red blood cells)
Haemolytic anaemia: the red blood cells are destroyed by the body itself.

Antibodies

Proteins synthesised by the B lymphocytes and plasma cells, capable of recognising an antigen and of binding to it to destroy it.



IgA antibodies

Antigen

Substance or element capable of triggering an immune reaction.

Anuria

Marked decrease in urine passed, either due to the cessation of urine production (severe renal dysfunction) or due to complete obstruction of the urinary tract (often by a calculus). Anuria is a life-threatening emergency.

Arthritis

Inflammation of a joint; this may be septic or immunological in origin. The joint is hot, painful and sometimes causes lameness. The vet may take samples to determine the nature of the arthritis and implement appropriate treatment.

Ascites

Accumulation of liquid in the abdomen. This may be blood, pus, serous fluid (translucent and rich in proteins), etc. The nature of the liquid provides an indication of the origin of the ascites (traumatic, cardiac, gastrointestinal, etc.).

Ataxia

Abnormality of the gait, equilibrium and posture. The dog falls down, sometimes has a tremor and carries the head to one side. It is often caused by a lesion in the cerebellum (first part of the cerebral trunk) or the vestibular apparatus.



Atopy

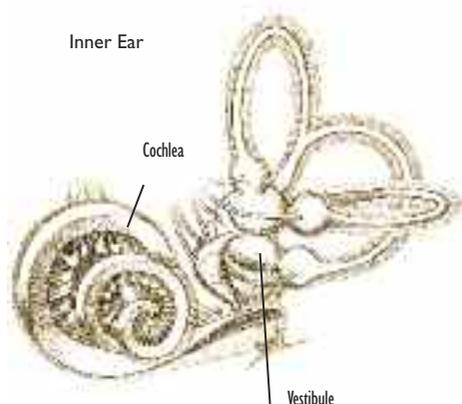
The axillae, groin, abdomen, thorax, neck and interdigital spaces are the most common sites of atopic lesions.

Atlanto-occipital instability

Instability of the junction between the occipital bone and the atlas leading to the risk of spinal cord compression and neurological disorders of all four limbs of the dog which may result in paralysis.

Atonia

Lack of muscle tone. When the bladder sphincter is involved (sphincter atonia), it causes incontinence. The sphincter itself may be at fault (defective muscle tone) or the nerves which control the contraction of the sphincter. This can occur following a road traffic accident for example. When a bitch gives birth, we refer to atonia when



Ataxia

The inner ear is a bony cavity of the skull, which communicates with the tympanic bulla. It contains the cochlea - the auditory organ - and the vestibule - the organ of equilibrium.

the uterus cannot contract. The puppies cannot then be expelled from the uterus. In this case, a vet should be called immediately.

Atopy

Dermatological problem that is first seen in dogs between one and three years of age and results in significant itching which is restricted to certain specific areas of the body (face, between the toes, on the legs, etc.). Atopy is caused by an allergy, either dietary or due to agents present in the environment. Treatment requires the elimination of the causative agent, or long-term desensitisation.

Atrial fibrillation

Serious cardiac rhythm disturbance caused by the uncoordinated contraction of the atria leading to the rapid contraction of the ventricles. Cardiac arrest occurs soon after, unless appropriate defibrillation is performed.

Autoimmune disease

Disease caused by dysfunction of the immune system, which then attacks the components of its own body.

B

Bacterial folliculitis

Infection of the hair follicle.

Balanoposthitis

Inflammation of the sheath and penis resulting in a discharge that is often purulent, which the dog licks. This pathology is rarely painful and usually resolves spontaneously.

Barium transit study

Radiographs taken after the ingestion of a barium-containing meal by the dog (barium is opaque on x-rays), enabling clear visualisation of the entire gastrointestinal tract.

Biopsy

Sampling a small fragment of tissue or organ from a living dog, either by cutting off a small piece of tissue or by aspirating cells

Can dogs get sunburnt? What precautions should I take?

Exposure to the sun can cause two types of problem in dogs. The first is the burning suffered by dogs exposed to the hours of maximum sunlight. Particular attention should be paid to sports dogs and to dogs visiting beaches. The second is the chronic exposure which leads to progressive skin changes, beginning with solar keratosis, solar comedones, fibrosis and elastorrhexis. At this stage, if exposure continues, the animal could develop a malignant carcinoma, a very aggressive form of cancer.

Lightly pigmented dogs or those with sparse hair are more at risk including Dalmatians, Whippets, Greyhounds, Italian Greyhounds, Beagles, Bassets, Bulldogs and Dogo Argentinos.

The parts of the body most affected are the abdomen, ventral flanks and inner thighs of dogs with short, white or piebald coats. Solar radiation reaches the skin directly or by reflection from light surfaces. Prevention is by avoiding the sun during hours of maximum strength in at-risk breeds and using dark flooring in kennels. Application of sun cream can give a false sense of security to the owner because it is necessary to reapply it 6 to 10 times a day to obtain effective protection. Consequently the author does not recommend this practice.

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with a needle. It can be performed under ultrasonography (ultrasound-guided biopsy) or during endoscopy or directly, as in the case of skin samples.

Blepharitis

Inflammation of the external part of the eyelids. This is characterised by oedema of the lids, eyes that are almost closed (blepharospasm) and ocular discharge. There are numerous causes: infection (bacterial, fungal, parasitic), trauma, allergy, etc. The treatment will depend on the cause.

Blindness

Loss of vision. This may be linked to an anomaly in the eye itself (e.g. abnormal ocular pressure, retinal atrophy, cataracts) or in the brain. It may be acute (e.g. following trauma that causes retinal detachment) or chronic (progressive retinal atrophy).

Blood group

System of membrane markers located on the surface of the red blood cells, which can lead to the rejection of blood that is transfused from one dog to another. A single transfusion can be performed safely without blood testing, but from the sec-

ond transfusion onwards it is essential to test the compatibility between the donor and the recipient.

Blood pressure

Pressure of the blood circulating in the arteries. Arterial hypertension causes lesions in the blood vessels or other organs.

Bone callus

Regenerative tissue that fuses two fragments of fractured bone.

Bone chip

Splinter of unattached bone following a fracture.

Botulism

Bacterial disease characterised by flaccid paralysis. It is caused by the consumption of food that has gone off or dead animals containing the infectious agent.

Bradycardia

Reduction in the heart rate. This may be caused by electrolyte imbalances, hormonal disorders, poisoning, compression of the heart, etc. When it is very marked the dog should be monitored for cardiac arrest.

Bradypnoea

Reduction in the respiratory rate. This may be caused by a toxin, respiratory pathology etc. The dog should be monitored for respiratory arrest.

Bronchitis

Inflammation of the bronchi in the lungs. This causes coughing. It can be acute (often viral in origin) or chronic (very common in elderly dogs due to the presence of dust particles).

Small breeds are more predisposed to this disease.

Bronchoalveolar lavage

Further diagnostic test or treatment that involves the injection of a sterile liquid into the bronchi and pulmonary alveoli.

The liquid is then re-aspirated to determine the nature of the germs causing infection.

During this examination, antibiotics or an anti-mucolytic agent can be administered "in situ".

Bronchopneumonia

Purulent inflammation of the bronchioles and adjacent alveoli. Affected dogs cough, have a temperature, increased respiratory rate and dyspnoea. It is essential to consult a vet to instigate early and appropriate antibiotic therapy.

Burns

These affect the skin or mucous membranes. The severity depends on the extent, cause and location of the lesions. They may be thermal (fire, boiling water, etc.), chemical (acid or caustic soda), or electrical (lightning, electrocution). The treatment is based on abundant irrigation of the exposed area (with cool water), except in the case of an electrical burn where cardiorespiratory resuscitation is often necessary.

C

Cachexia

Extreme thinness with loss of fat and muscle mass.



Calcium oxalate



Calcium phosphate



Urate

Examples of calculi

Calculi (stones)

Accumulation of mineral salts caused by the precipitation of crystals. They are often found in the urinary tract (bladder and urethra most commonly, sometimes in the kidney or ureter) and cause significant pain



Diagrammatic representation of the different layers of a calculus

Quantitative analysis provides a precise determination of the mineral composition of each of the four layers: the crystalline nucleus, the heart, the envelope and the surface crystals.

Why do dogs get bladder stones?

The most common types of bladder stones are magnesium ammonium phosphate (struvite) and calcium oxalate. Less commonly reported are ammonium urate, cystine, xanthine, silicate and calcium phosphate.

Struvite stones occur most often in female dogs due to urinary tract infections. Dietary factors probably play a role in oxalate stone formation as does breed predisposition and certain disease conditions.

With other stone types, genetics and underlying metabolic disorders are contributory factors.



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What breeds of dogs are predisposed to bladder stones?

Struvite and calcium oxalate bladder stones are most common in small breeds of dogs including the Miniature Schnauzer, Bichon Frise, Shih Tzu, Miniature Poodle, Yorkshire Terrier and Lhasa Apso. Dalmatians are genetically at risk for ammonium urate stones while breeds including the Newfoundland, Dachshund and Deerhound (to list but a few) are predisposed to cystine stones.

What clinical signs should I watch out for?

Signs include blood in the urine, straining/difficulty urinating, painful urination, small amounts of urine being passed more frequently, inappropriate urination (urinating in the house).

and difficulty in passing urine. Their migration into the urethra may completely block the passage of urine. The bladder then becomes much distended. At this stage, it is a life-threatening emergency for the dog. A vet will introduce a urinary catheter to enable the dog to eliminate the urine.

The analysis of the nature of the calculi will determine their origin and adaption of the diet will produce the required urinary modifications. It is also possible to find stones in the biliary tract. This is known as cholelithiasis.

Callus

Thick, hyperpigmented (black) lesions particularly common on areas exposed to friction (the point of the hock or elbow).

Cancer

Process of uncontrolled cellular proliferation.

Canine brucellosis

A zoonosis caused by *Brucella canis* causing infertility in the dog. The majority of dog breeders test their stud dogs for this disease. There is no treatment.

Canine herpes virus

A very common viral infection in group situations, representing one of the commonest causes of mortality in puppies in breeding units. The virus develops in the mucous membranes when the body temperature is too low (newborn puppies) and causes respiratory and gastrointestinal disorders in the young. In adults, herpes virus causes fertility problems.

Carcinoma

A malignant, invasive tumour that derives from epithelial tissue (e.g. skin, mouth, kidneys, bladder, respiratory tract, etc.) and tends to metastasise. The prognosis depends on the location, early treatment, the extent of the tumour and whether metastases are present or not.

Cardiac abnormalities

These can be congenital (present from birth) or acquired (appear over the course of the dog's life).

Cardiac arrhythmia

Abnormality in the regularity of the heart rate. (Respiratory arrhythmia is normal in the dog).

Is chemotherapy a good option for treating my pet's cancer?

As we all know, the life expectancy of our pets has increased considerably in recent years. One consequence of this is the higher probability that they will develop a neoplastic disease (cancer) in the course of their life.

Nowadays, "cancer" is regarded as a chronic disease characteristic of ageing dogs, with various therapeutic options to improve the quality of life of our dog and improve its life expectancy.

One of these possibilities is chemotherapy, i.e. the administration of anti-neoplastic medications to control the disease, prevent its spread and precede surgical treatment, among other things. There are various options. Chemotherapy can be administered as the sole treatment (lymphoma, leukaemia) or combined with other therapies, such as surgery (mammary or skin tumours) and radiotherapy (sarcomas, inoperable tumours).

Contrary to popular belief, chemotherapy in veterinary medicine has very few side effects, given that, as stated above, its purpose is to improve the patient's quality of life. Thus, the doses administered in dogs are of limited toxicity. Undesirable effects may however be observed – such as slight gastroenteritis, neutropenia (a fall in the white blood cell count) and cystitis – but they are typically minor and easy to manage.

How can we prevent cancer in our pets?



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Our companion animals are increasingly enjoying much longer lives. This has increased the probability that they will develop pathologies characteristic of old age, including cancer.

Some types of tumour (mammary, ovarian, uterine, testicular) can be easily controlled or prevented (ovariohysterectomy, orchiectomy). A good example is mammary tumours in females, which can be very effectively prevented by neutering before the age of two years.

The most effective way of controlling and detecting other neoplasias at an early stage and helping to prevent them in the first place

is to take the dog to the vet every 6 to 12 months from the age of 7 to 9 years. The vet will be able to check the animal's health and determine whether any problems are a consequence of ageing (limps due to arthritis, for example) or are signs of cancer (limps due to osteosarcoma).

These check-ups involve a full clinical examination, with blood test, chest x-ray and abdominal ultrasound to detect diseases of ageing.

What is the best diet for pets diagnosed with cancer?

The ideal nutrition for cancer patients is not definitively known. The focus should be on high quality food that your pet will eat.

Diets higher in fat and protein are thought to be beneficial. High quality protein improves wound healing, muscle mass, organ function and immune response. Fats play an important role in energy balance and the maintenance of body weight. Omega 3 fatty acids inhibit tumour formation and improve the immune system's response.

Carbohydrates should be minimized, as they are rapidly utilized and may contribute to weight and energy loss.

Fibre improves the health of the entire intestinal tract.

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What are the most common cancers in dogs?

The most common tumours in dogs are benign skin tumours including lipomas, which are derived from fat cells, and sebaceous adenomas, derived from oil glands in hair follicles. The most common malignant skin tumours in dogs are mast cell tumours and soft tissue sarcomas. In intact female dogs, mammary cancer is also very common.

The risk of mammary cancer is greatly reduced if a female is spayed before her first heat. Lymphoma, a cancer derived from an immune cell, is the most common systemic malignancy that occurs in dogs. Other common malignancies include osteosarcoma, haemangiosarcoma and melanoma.



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Cardiac ultrasonography

Described in the chapter on further diagnostic tests.

Cardio-respiratory arrest

The heart stops and breathing ceases. Often the heart stops beating after breathing has ceased. The prognosis is very poor. To have a chance of saving the dog, it is essential that cardiac compression be started within three minutes of the cardio-respiratory arrest. It may occur following severe haemorrhage, in the terminal phase of pulmonary oedema, etc.

Cardiomegaly

Heart defect in which the heart is larger than normal. It is also classified depending on whether it is globular (dilatation of the entire heart), right-sided (dilatation of the right side of the heart) or left-sided (dilatation of the left side of the heart).

Cardiomyopathy

Disease of the heart muscle. There are several different types:

- dilated cardiomyopathy: the chambers of the heart have a greater volume than normal and the walls of the heart are very thin, so that they do not contract properly.

This anomaly is often related to a taurine or L-carnitine deficiency. Boxers, Cocker Spaniels and Dobermanns are particularly predisposed to this disease. Choosing a diet with a high L-carnitine and taurine content helps with prevention.

- hypertrophic cardiomyopathy: the walls of the heart are highly developed and the volume of the chambers is thus restricted. This type of cardiomyopathy is very rare in the dog.

These diseases lead to heart failure and the risk of pulmonary oedema.

Cardiorespiratory resuscitation

Emergency treatment following cessation of cardiac and respiratory function.

Cataracts

Condition of the lens resulting in a loss of transparency, thus preventing rays of light from reaching the retina. This disease leads to a progressive loss of vision.

It may be caused by age-related degeneration or by disease (diabetes for example). The affected lens can be removed surgically and it is even possible to insert a synthetic lens.

Cerebellar disease

Conditions of the cerebellum (trauma, neoplasia, degenerative disease, etc.) in which the dog has a drunken gait, head tilt and sometimes falls over.

Cerebral vascular accident (CVA) or stroke

Sudden onset of neurological signs (altered state of consciousness and gait abnormalities) linked to poor vascularisation of the cerebral tissue.

Cerebrospinal fluid

Liquid present around the central nervous system, which acts (among other things) as a shock absorber in the event of external shocks. Its composition changes in the event of inflammation, which is why a sample is often taken for analysis in the case of central nervous system diseases.

Cleft palate

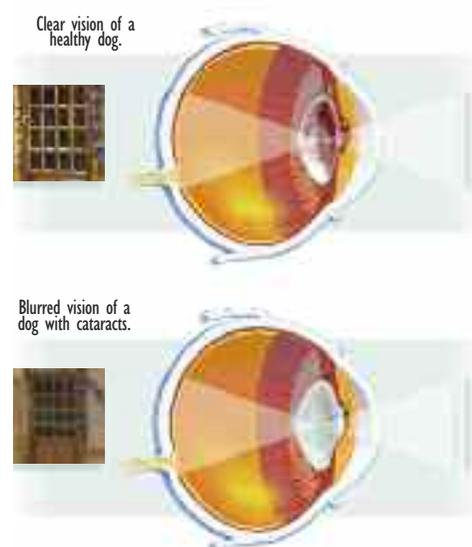
Congenital (primarily in brachycephalic breeds) or acquired, this is an opening in the palate that results in a direct communication between the nose and the oral cavity. Without surgery the dog will die from bronchopneumonia.

Contact dermatitis

Inflammation of the skin caused by contact with an irritant or allergenic substance. The symptoms depend on the causative substance, but usually include significant pruritus.

Cough

Forced and noisy expiration of air from the lungs.

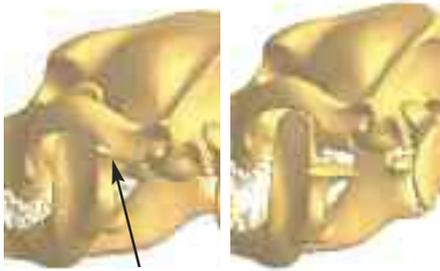


Cataract

The word cataract is derived from the Greek "katarakēs" meaning "rupture": the lens loses its transparency.

Craniomandibular osteopathy

Anomaly of the craniomandibular joint seen in West Highland White Terriers, causing pain and difficulties opening the mouth. It may be necessary to feed the animal on a liquid diet.



Healthy craniomandibular joint

Craniomandibular osteopathy

Cushing's Disease (Hyperadrenocorticism)

The production of too much adrenal hormone, in particular corticosteroids. This may be caused by a tumour of the adrenal glands, or more frequently a tumour of the pituitary gland. It can also be iatrogenic i.e. caused by corticosteroid therapy.

The dog has increased appetite, thirst and urination, symmetrical hair loss on both sides of the body, thinning of the skin and pendulous abdomen. Blood tests are performed for diagnosis. Lifespan is restricted

and treatment, which depends on the cause, is to improve quality of life.

Cutaneous asthenia or Ehlers-Danlos syndrome

Incurable hereditary disease characterised by significant fragility of the skin, which may tear spontaneously.

Cyst

A closed pocket delimited by a membrane that develops within an organ and may contain air or liquid. The formation of a cyst on the prostate is very common in entire male dogs from six years of age.

D

Degenerative myelopathy

Degeneration of the spinal cord common in German Shepherds over seven years of age and leading to posterior paresis and ataxia.

Dehydration

Water loss from the body. This is often accompanied by electrolyte disorders.

Demodectic mange

Parasitic disease characterised by the infection of hair follicles with *Demodex canis* mite. Treatment is long term.

Dermatitis

Inflammation of the cutaneous tissue. The causes are multiple:

- licking (in anxious animals or animals with a wound, etc.).
- hot-spot (localised zone that the dog licks to resolve a pruritus).
- sun (lesions of the nose, particularly in white-coated dogs)

Dermatophytosis (tinea or ringworm)

Skin disease caused by a fungus that develops in the claws and coat. It causes areas of alopecia, erythema, hyperpigmentation and variable pruritus. A hair sample for microscopic examination (trichogram) and examination with a Wood's lamp can help to narrow down the diagnosis.

Desensitisation

The treatment of certain allergies by injecting very small doses of the allergenic substance into the body. It is used to treat cases of atopy. The result is reliant on the correct choice of the allergens and on the regularity of the treatment.

Diabetes insipidus

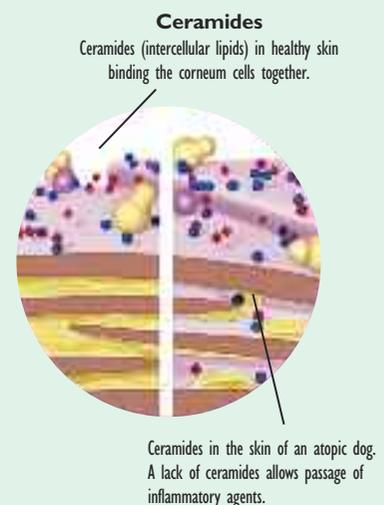
Anomaly in the regulation of water metabolism. It may be central (deficient secretion of anti-diuretic hormone) or secondary (through a lack of response to anti-diuretic hormone in the kidneys). It causes polyuria, which the dog tries to compensate with polydipsia.

What are the most common causes of skin disease in dogs?

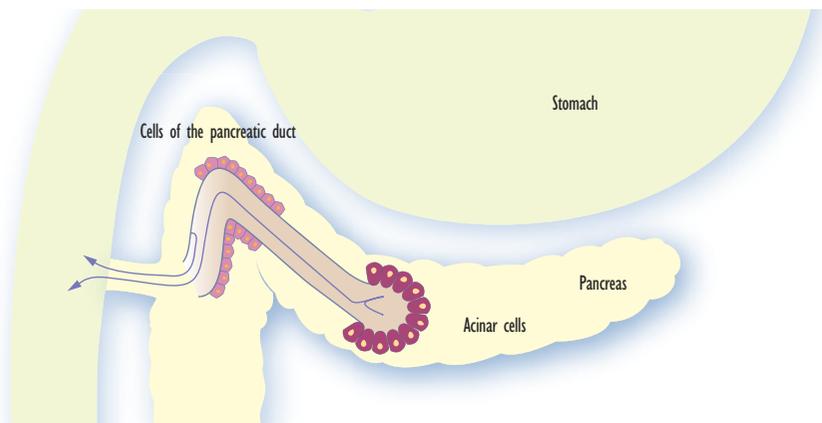
Parasites, infections and allergies are very common causes of skin problems in dogs. Modern parasite control methods make it relatively easy to keep your dog free of skin parasites such as fleas, ticks and mites – as long as you use them regularly and correctly! Skin infections with "staph" bacteria cause sores and itchiness, but are in almost all cases readily treatable and not contagious to other pets or to people. Allergies to environmental substances and/or foods are very common causes of itchy skin, and at least in part are related to genetic influences.



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Ceramides
 Ceramides (intercellular lipids) in healthy skin binding the corneum cells together.
 Ceramides in the skin of an atopic dog. A lack of ceramides allows passage of inflammatory agents.



Diabetes mellitus

The acinar cells of a healthy pancreas produce insulin, the hormone which regulates the passage of sugar into the cells. A lack of insulin leads to diabetes mellitus.

Diabetes mellitus

Hormonal disease characterised by hyperglycaemia (too much sugar in the blood) and constant glycosuria (constant presence of glucose in the urine). Diabetes is caused by either deficient insulin production (type I diabetes) or by a resistance of the body to the insulin (type II diabetes). The dog presents with polyuria and polydipsia, polyphagia and sometimes cataracts. It may be complicated by ketoacidosis (accumulation of ketones in the blood) in which case the dog is depressed, vomits and its breath smells of “pear-drops”. At this stage, emergency veterinary treatment is needed. Treatment involves the subcutaneous administration of insulin, neutering bitches (the treatment regime is adversely affected with every heat) and an appropriate diet (high in fibre, low in soluble carbohydrates, ensuring the maintenance of a healthy body weight; mealtimes should be timed to coincide with insulin injections.)

Diarrhoea

Soft or even liquid stools produced in large quantities and at a higher frequency than normal. Diarrhoea can be acute (sudden onset) or chronic (persistent over time). There are very numerous causes and the severity is highly variable (age, cause, intensity). The characteristics of the diarrhoea provide clues as to whether it originates in the colon or small intestine. The cause must

be determined in order to prescribe the appropriate treatment. A diet adapted to the type of diarrhoea should be implemented.

Dirofilariasis (heartworm):

Mosquito-borne parasitic disease characterised by the accumulation of parasites in

the pulmonary artery and occasionally the right ventricle. The dog is easily tired and has a heart murmur and respiratory difficulties. Ultrasonography of the heart is the preferred means of diagnosis.

Discospondylitis

Bacterial infection localised in the vertebral bodies of one or several vertebrae. The dog presents with spinal pain, pyrexia and locomotor difficulties. Antibiotic treatment is very long.

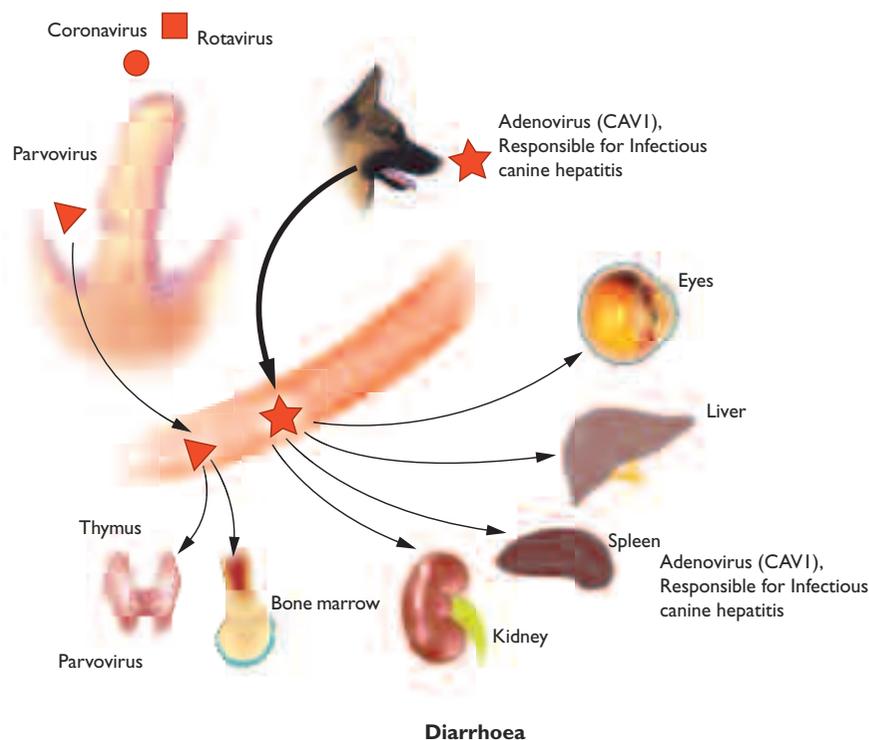
Distemper

Infectious viral disease that may affect dogs of all ages and against which there is a vaccine. The symptoms include fever, depression, respiratory difficulties, gastrointestinal disorders and nerve problems (in the terminal phase). This disease is often fatal.

Distichiasis

Presence of excess eyelashes, which may ulcerate the cornea and cause corneal inflammation.

Tropism of the principal viruses responsible for diarrhoea in the dog



Diuresis

Normal production and emission of urine. Forced diuresis protocols are used in the event of a serious renal pathology.

Drain

Technique that involves drawing liquid or air out of a given area of the body to the outside. In the event of haemoperitoneum for example, a drain can be used to remove the blood from the peritoneal space and out of the body.

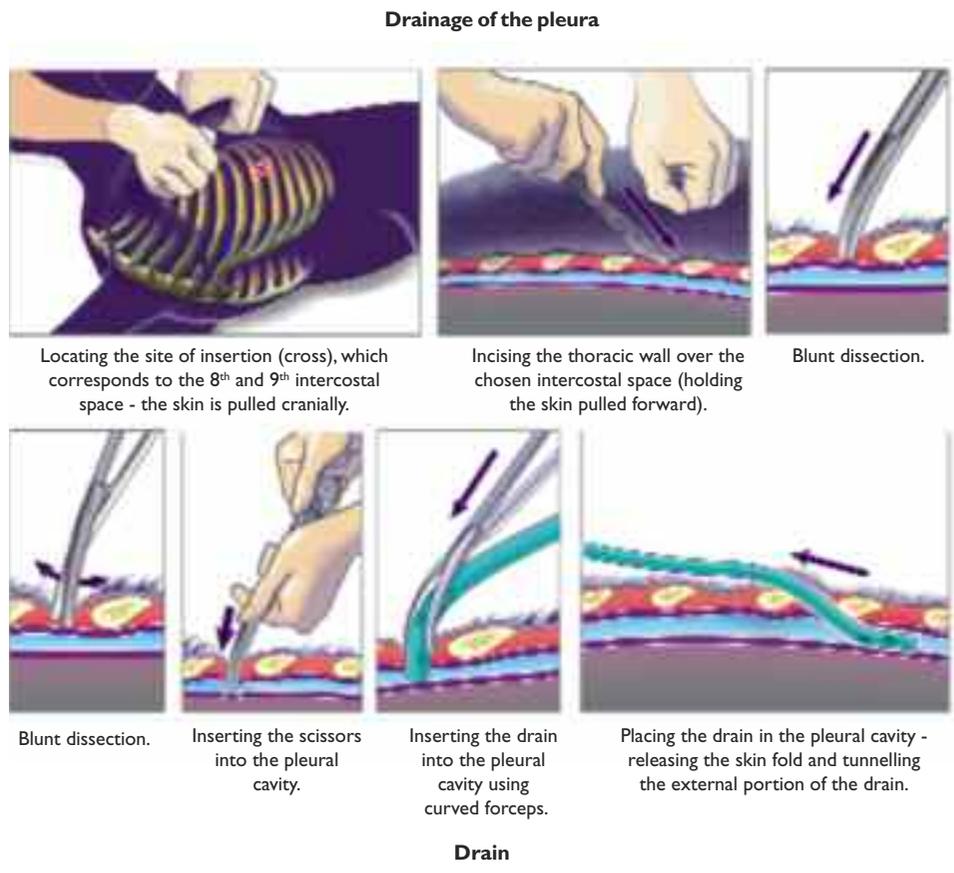
There are various techniques from the most simple (gauze strip used to drain abscesses) to more complex techniques of aspiration under a vacuum.

Dwarfism

Congenital disease, sometimes hereditary, that causes the development of a small individual, with or without the proportions of a normal adult dog.

Dysautonomia

Disease characterised by a degeneration of the autonomic and parasympathetic nervous systems (the autonomic nervous system is responsible for the control of organ functions.) The oesophagus is dilated and so the dog may swallow food the wrong way (i.e. food or saliva enters the lungs provoking bronchopneumonia), it presents with diarrhoea or constipation and ocular disorders.



Dysphagia

Difficulty in swallowing caused by a problem with prehension, mastication or swallowing.

Dysplasia

Growth disorder leading to poor congruence between two surfaces. Several structures are affected by dysplasia:

- joints (hip and elbow dysplasia).
- the mitral and tricuspid atrioventricular valves in the heart, resulting in leakage of blood when they close, which then refluxes back the wrong way.

Dyspnoea

Respiratory difficulties with poorly coordinated respiratory movements and altered amplitude. It is referred to as inspiratory or expiratory, depending on whether the respiratory difficulties concern the entry or exit of the air.

Dystocia

Difficulty during parturition (whelping).

Dysuria

Frequent urination of small quantities, characteristic of pain in the urinary tract.

- 1. Pelvis
- 2. Femoral head
- 3. Femoral neck
- 4. Femur



Hip dysplasia

**I am going to buy a giant breed puppy, but I am afraid of hip dysplasia.
What can I do to prevent this disease in my dog?**

Large and giant dogs are much more prone to develop canine hip dysplasia (CHD) than medium or small dogs. This condition has an important impact on the well-being of the dog.

The word “dysplasia” is formed from the Greek words “dys”, meaning “abnormal” and “plasia”, meaning “to form”. Hip dysplasia thus refers to a malformation of the hip.

CHD is a very complex disease: it is a multifactorial, polygenic, hereditary condition which is also affected by environmental influences such as weight, diet and exercise. In other words, genes and also mistakes during the growth phase of the puppy are responsible for the onset of CHD.

Prevention is difficult but not impossible:

1. To minimise the risk of dysplasia in your puppy, choose a puppy whose parents and grandparents are certified hip dysplasia free.
2. Look at the whole litter and avoid choosing a puppy which rests often, sitting and watching its siblings chasing after each other.
3. During the puppy's growth, avoid over-feeding it in terms of excessive energy intake (this should not exceed 300 kcal/kg^{0.75}). Feed a diet adapted to the age and size of the puppy and follow the feeding guide. It is always best to “give less rather than more”, and never add anything to a balanced diet.
4. During growth, avoid intensive exercise such as jumping obstacles, long walks or running on hard surfaces. Swimming is strongly recommended as it promotes muscle development and avoids excessive strain on joints.

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E

Eclampsia

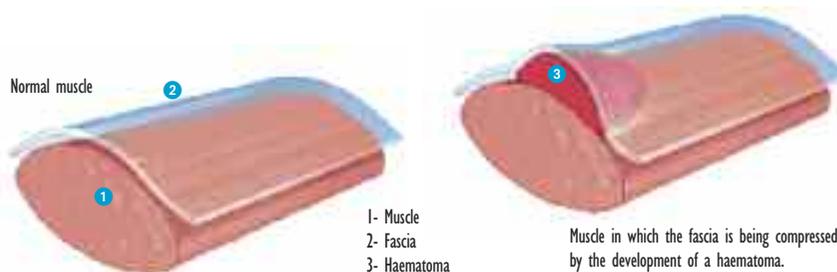
Hypocalcaemia that occurs within a few days of parturition (whelping). Toy breed bitches are predisposed. The main symptoms are anxiety, tremors and then seizures. Hypocalcaemia should be corrected rapidly by the intravenous route. Prevention involves providing correct calcium content in the diet in the period preceding parturition.

Ectopia

Incorrect positioning of an organ or the entrance of a tract in the body. For example ectopic testicle (the testicle(s) is not in the scrotum), ectopic ureters (the ureter(s) does not meet the bladder at the level of the trigone), etc.

Ectopic ureter

Incorrect opening of the ureter. Instead of opening into the trigone area of the bladder, the ureter opens into the urethra, vagina, uterus or bladder neck. Affected individuals present with urinary incontinence from a very young age, with normal or absent urination (if both ureters are ectopic) and signs of urinary infection.



1- Muscle
2- Fascia
3- Haematoma

Muscle in which the fascia is being compressed by the development of a haematoma.

Effusion

Example of haemorrhagic effusion

Ectropion

Congenital defect with eversion (turning outward) of the eyelid. This anomaly is common in Cocker Spaniels and breeds with heavy, droopy jowls. It causes chronic conjunctivitis. Corrective surgery is often necessary.

Effusion

Accumulation of liquid in a body cavity (abdomen, pleural space, pericardium, etc.). This liquid may be of various origins: blood, exudate, chyle, etc.

Ehrlichiosis

Infectious disease in which the infectious agent enters the granulocytes, monocytes and macrophages (white blood cells). If the animal survives the acute phase, the disease becomes chronic with anaemia, hypertrophy of the liver and spleen, clotting disorders, etc.

Electrocardiogram (ECG)

Described in the chapter on further diagnostic tests.

Electromyogram (EMG)

Described in the chapter on further diagnostic tests.

Embolism

A material carried in the blood stream, which blocks a vessel. The most common emboli are fibrocartilaginous (a piece of cartilage obstructs the arterioles that supply the bone marrow), aortic thromboembolism and pulmonary thromboembolism (in both cases a blood clot blocks the artery). The prognosis depends on the site but is usually guarded.

Emphysema

Accumulation of air in a region of the body, such as:

- the pulmonary parenchyma (pulmonary emphysema), generally due to a loss of elasticity of the pulmonary alveoli.
- under the skin (for example after a wound).

Encephalitis

Inflammation of the encephalus (brain). There are numerous causes (vascular, infectious, toxic, congenital malformation, neoplastic, etc.).

Endocardiosis

Disease of the heart valves. Thickening leads to poor closure of the valves and eventually leads to heart failure.

Endocarditis

Inflammation, usually infectious, of the external wall of the heart. Rare in the dog, it is caused by the proliferation of bacteria at

this level. It is often the consequence of another infectious locus and particularly affects large breed dogs.

Endophthalmitis

Inflammation of the eyeball.

Endoscopy

Described in the chapter on further diagnostic tests.

Enophthalmia

The ocular globe sinks back into the orbit, for example following dehydration.

Enteritis

Inflammation of the gastrointestinal tract leading to a variety of gastrointestinal disorders.

There are numerous origins (infection, immune-mediated, foreign-bodies, etc.). A specific diet is prescribed to limit stimulation of the digestive tract.

Enterocolitis

Inflammation of the intestines and colon. There are many origins, and the treatment requires a specific diet.

Entropion

Congenital defect characterised by the rolling inward of an eyelid to the inside surface of the eye. It may cause ulceration if the eyelashes rub against the cornea. It is commonly seen in Chow-Chows and Great Danes. Corrective surgery is often necessary.

Eosinopenia

A deficit in the eosinophil count in the blood, caused by medullary aplasia for example.



Eosinopenia

From left to right: Eosinophil, basophil, and neutrophil

Are some breeds more susceptible than others to heart problems?

Yes, there is a known breed predisposition for many cardiac diseases in dogs, and some of them are proven to be hereditary.

Breed predisposition means that a particular breed has an increased risk for a disease. But this does not mean that every dog that belongs to that particular breed is going to suffer from that disease.

We distinguish two main types of cardiac disease:

- Congenital cardiac disease: the animal is born with the defect. The most frequent in dogs are subaortic stenosis, patent ductus arteriosus and pulmonic stenosis.
- Acquired cardiac disease: the disease develops during the animal's lifetime. The most important are mitral valve insufficiency and dilated cardiomyopathy.

The fact that certain cardiac diseases happen with more frequency in certain breeds raises the suspicion of the genetic origin of these

problems. However, the hereditary aspect is only proven in a limited number of breeds and the mechanism of transmission still needs to be elucidated in many. Most of these diseases are inherited in a complex manner consistent with a polygenic basis.

The knowledge of these breed predispositions allows veterinarians to adequately advise clients wishing to buy a new pet and to adopt preventive measures to reduce the risk of disease, or to monitor closely for the onset of clinical signs that allow early treatment to be instituted.

In addition it may be useful to advise breeders of predisposed breed wishing to institute programmes to select against inherited diseases in their breeding lines.



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Eosinophilia

Excess numbers of eosinophils, caused by a parasitic disease for example.

Epidemiology

Study of the frequency, distribution and risk factors for the occurrence of a disease.

Epididymitis

Inflammation of the epididymis (tube in the spermatic duct system).

Epilepsy

Disease causing seizures. The first seizures occur between 6 months and 5 years of age. Some individuals have partial seizures with no loss of consciousness. Life-long preventative treatment is instigated when the seizures become fairly frequent.

Epiphora

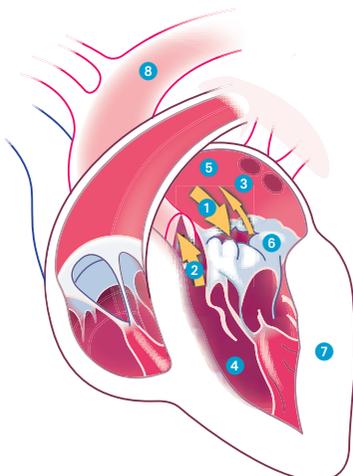
Discharge of tears down the face, often caused by blocked or absent tear ducts.

Epistaxis

Bleeding from the nose, which can be unilateral or bilateral.

Endocardiosis of the mitral valve (left side of the heart)

1. **Step 1:** diastole
Normal filling of the atrium and ventricle.
2. **Step 2:** systole
Ejection of the blood from the left ventricle into the aorta;
3. **Step 3:** Abnormal regurgitation of blood from the left ventricle into the left atrium in a dog with mitral endocardiosis.
4. Left ventricle
5. Left atrium
6. Mitral valve
7. Myocardium
8. Aortic arch

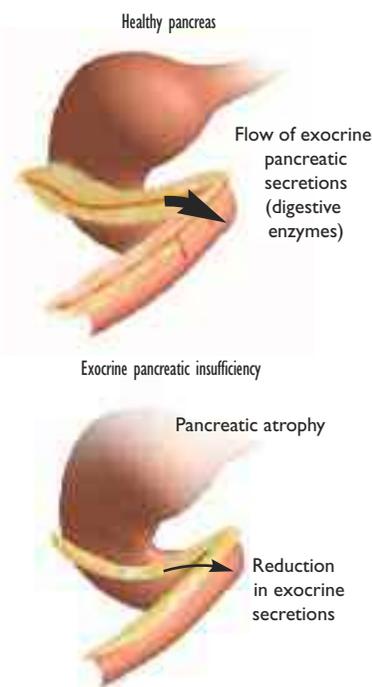


Repeated regurgitation of blood from the ventricle into the atrium eventually causes internal lesions and dilatation of the left side of the heart, visible on x-rays or echocardiographs.

Endocardiosis

Exudate

Discharge of a serous fluid (translucent), rich in proteins, caused by an alteration in the permeability of a membrane following inflammation. It contains white blood cells. It can be found in the abdomen following a tumour of the gastrointestinal tract.



Exocrine pancreatic insufficiency

Epithelioma

Tumours of epithelial cells; the prognosis varies depending on the size, early instigation of treatment, location and whether metastases are present.

Epulis

Small, benign tumour, commonly seen in the mouth. They may need to be removed to prevent trauma from the teeth and secondary infection.

Erythema

Redness of the skin of very variable origin, which disappears transiently when pressed.

Esophagography

Swallowing a radiopaque contrast medium to facilitate radiographic visualisation of the oesophagus.

Excision (resection, ablation)

Surgical removal of a tissue, organ or foreign body.



Epiphora

Exocrine pancreatic insufficiency

A situation in which the pancreas does not secrete enough lipase (enzyme), leading to the poor digestion of fats. This is common in German Shepherds. Affected dogs are thin and have pale coloured, greasy diarrhoea. The treatment, which is very effective, requires a low-fat diet and the use of substitute enzymes.

Exophthalmia

The eyeball protrudes from its socket. The eyeball is larger than normal. It may be caused by trauma, ocular hypertension, etc.

My dog has a painful mouth when he eats!



There are many causes of oral pain in dogs, such as a fractured tooth, loose tooth or small bone fractures. Resorptive lesion of the tooth can also cause pain. Lesions in soft tissue, such as ulceration caused by viruses, bacteria or burning can also create discomfort in the mouth. Muscle or salivary gland disorders can also cause pain when chewing. The best for your dog is to have its mouth examined by a specialist, and all teeth x-rayed.



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F

FAD (flea allergy dermatitis)

Allergic reaction triggered by flea bites. Affected animals must be treated regularly with external anti-parasitic compounds. Their environment should also be treated.

Faecal or urinary incontinence

Lack of control over defaecation or urination. It results in either the very frequent expulsion of faeces or urine including during sleep; or incapacity to pass urine or faeces without manual help. Urinary incontinence often results in bacterial cystitis.

False pregnancy

Condition that affects bitches within two months of a heat, characterised by maternal behaviour and the production of milk in the absence of parturition. Various treatments are available. This problem is often recurrent from one heat to the next and neutering is necessary to prevent recurrence.

Fibroma

Benign connective tissue tumour composed of fibroblasts.

Fibrosarcoma

Malignant tumour of the mesenchymal cells, with a guarded prognosis. The latter depends on the size, location, number of tumours observed and whether metastases are present.

Fine needle aspirate

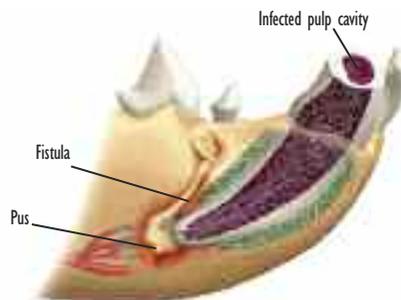
Using a needle to sample a liquid or a few cells for analysis.

Fistula

Abnormal opening between a cavity and another zone. It may be formed by the migration of a foreign body from the skin inside the body. A common case is that of perianal fistulas in elderly German Shepherds, characterised by the presence of several fistulas around the anus.

Fracture

A break in the continuity of a bone.



Fistula

Example of a fistula following the infection of the pulp cavity of a canine tooth.

G

Galactorrhea

Discharge of milk outside of the lactation period in the bitch. It is often caused by a pseudo-gestation (false pregnancy).

Gastrectomy

Ablation of the stomach or a portion thereof.

Gastric dilatation and volvulus (GDV)

Syndrome that primarily affects large breed dogs with a deep thorax. It is characterised by dilatation of the stomach with or without torsion (twisting). Torsion prevents blood from perfusing the stomach and spleen correctly, which leads to gastrointestinal necrosis and destruction of the spleen. The dog tries to vomit but cannot. It is a life-threatening emergency requiring immediate surgical treatment.

Gastric lavage

Can be performed to wash out the stomach if the dog has swallowed a poison. However, this needs to be performed very early (within two hours of ingesting the product) to be effective.

Gastritis

Acute or chronic inflammation of the stomach, characterised by vomiting with the presence of digested blood (which looks like coffee grounds). Acute gastritis (of infectious, toxic or traumatic origin due to a

foreign body) is often easier to treat than chronic gastritis (inflammatory, allergic or metabolic in origin).



Gastritis

"Praying" posture in a case of chronic gastritis

Gastroenteritis

Association of a gastritis and enteritis causing diarrhoea and vomiting, which results in serious, sometimes fatal, metabolic disorders in weaker animals due to loss of fluid and metabolites from the body.

Gastrography

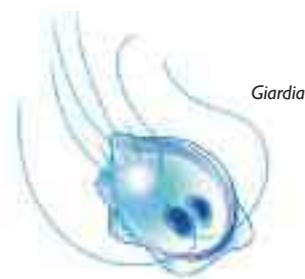
The use of a contrast medium to outline the stomach and visualise the gastric wall on a radiograph. This technique is being progressively superseded by ultrasonography.

Gastrotomy

The surgical opening of the stomach.

Giardiasis

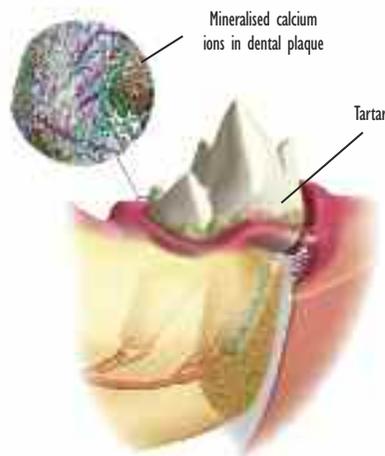
Intestinal disease caused by a gastrointestinal protozoan producing diarrhoea that may be haemorrhagic, and sometimes vomiting.



Giardiasis

Gingivitis

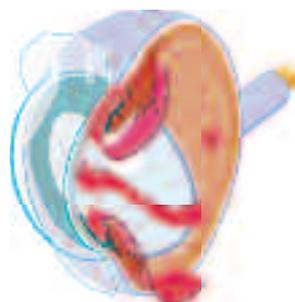
Inflammation of the gums, often caused by the presence of plaque and tartar, and usually accompanied by bacterial proliferation.

**Gingivitis****Glandular cystic hyperplasia**

A prostatic disease leading to an increase in the size of the prostate, accompanied by the formation of cavities. The only effective treatment is castration.

Glaucoma

Increase in the intraocular pressure leading to a risk of blindness, very intense ocular pain and an increase in the volume of the eye. The eye is very red, with abnormally dilated pupils. Glaucoma is a veterinary emergency.

**Open angle glaucoma**

Increased pressure in the anterior chamber of the eye: restricted drainage of aqueous humour (ocular fluid) through a partially blocked trabecular meshwork at the base of the iris.

Glomerulonephritis

Renal disease in which the glomeruli (the functional units of the kidney) are blocked by the deposition of immune complexes. This condition is irreversible and results in

massive protein loss. The dog presents with chronic renal failure if it survives the acute phase.

Glossitis

Inflammation of the tongue, for example following contact with the hairs of processionary caterpillars.

Glycosuria

Presence of glucose in the urine.

H**Haemangioma**

Benign tumour of the cells that line the inside of blood vessels. They can be very large and cause functional disturbances (notably anaemia when the mass is very large).

Haemangiosarcoma

Malignant tumour of the cells that line the blood vessels. The prognosis is guarded as they have often already metastasised before diagnosis.

Haematemesis

Presence of blood in the vomit.

Haematochezia

Discharge of red, undigested blood from the anus.

Haematocrit

Percentage of cells circulating in the blood with respect to the total blood volume in the dog. It gives an approximation of the percentage of red blood cells in the blood. The norm is 38 to 54 per cent in the dog (the haematocrit is physiologically very high in certain breeds such as the Greyhound).

Haematuria

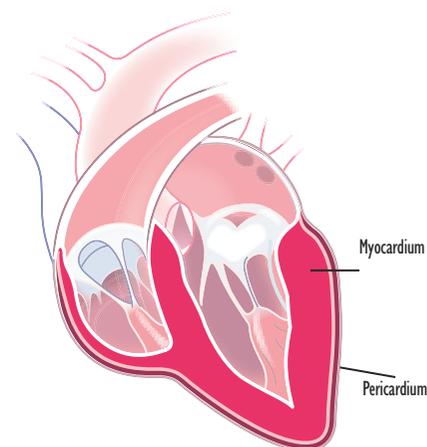
Loss of blood in the urine.

Haemoculture

Culture of the blood (which is normally sterile) to detect the presence of any bacteria if septicaemia is suspected.

Haemopericardium

Accumulation of blood between the endocardium and the pericardium, which compresses the heart and may cause major cardiac disturbances known as tamponade.

**Haemopericardium**

Transverse section of the heart.

Haemoperitoneum

Accumulation of blood in the peritoneal cavity. The cause may be trauma, toxins, neoplasia, etc.

Haemophilia

A hereditary disease, especially common in male German Shepherds, characterised by a blood clotting disorder. It results in abnormally long and intense bleeding due to a deficit in clotting factors in the blood.

Haemorrhage

Loss of blood outside of the blood vessels.

It may be:

- external: the blood can be seen coming out of the wound (after trauma for example).
- internal: the blood or wound cannot be seen (for example following poisoning with anticoagulants such as rat poison, causing pulmonary haemorrhage).
- externalised : the blood can be seen, but not the wound (for example following pulmonary haemorrhage resulting in epistaxis – bleeding from the nose).

Haemostasis

A natural phenomenon that enables the cessation of bleeding from a wound. It in-

volves the contraction of the blood vessels and molecules known as “clotting factors”, which seal the wound.

Haemothorax

Accumulation of blood in the thorax (chest cavity).

Halitosis

Bad breath usually caused by the proliferation of oral bacteria.

Heart failure

Abnormal cardiac function resulting in a discrepancy between the cardiac output and the body’s requirements. It may cause pulmonary oedema. It is related to cardiomyopathy or valvular insufficiency (see endocardiosis).

Hemiplegia

Paralysis of the right or left half of the body.

Hepatic encephalopathy

Neurological disturbances caused by the accumulation of toxins in the body due to hepatic failure.

Hepatic failure

Abnormal hepatic function leading to poor detoxification of the waste produced by the body.



Hepatitis

The liver of the dog (visceral aspect)

Hepatitis

Inflammation of the liver. Acute hepatic failure is associated with gastrointestinal and sometimes nervous disorders and has a varied aetiology.

Hepatomegaly

Increase in the volume of the liver.

Hereditary

A disease transmitted by the genes, i.e. from one generation to the next. Dogs can be carriers of the disease (although they may or may not express symptoms) and transmit the gene responsible for the disease to their descendants.

Hernia

Protrusion of a body structure from its normal position, which leads to the compression of another structure. There are several types of hernia with very variable symptoms depending on their location:

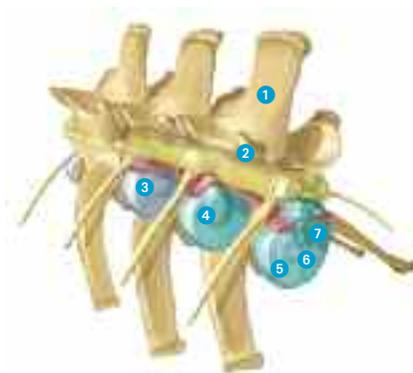
- cerebellar hernia
- diaphragmatic hernia (passage of abdominal viscera into the thoracic cavity following trauma).
- disc herniation (protrusion of a vertebral disc into the spinal canal).
- umbilical hernia, common in puppies (a small outgrowth of tissue, which protrudes from the umbilicus).

Histiocytoma

Very common in young dogs, this benign tumour takes the form of a small, red, hairless nodule, often on the face and extremities.

History

Information collected by questioning the owner about the symptoms of disease and how they started.



- 1. Vertebra
- 2. Spinal cord
- 3. Intervertebral disc
- 4. Disc protrusion (Hansen II)
- 5. Disc extrusion (Hansen I)
- 6. Annulus fibrosus
- 7. Nucleus pulposus

Disc herniation

Hydrocephalus

Increase in the size of the ventricles of the brain due to an excess secretion of or poor evacuation of cerebrospinal fluid. This congenital disease essentially affects toy breeds.

Hydronephrosis

Accumulation of liquid in the cavities of the kidney (the renal pelvis).

Hyperadrenocorticism

See Cushing’s disease.

Hyperaesthesia

Amplified reaction to all external stimulation.

Hypertension

Increase in arterial or intracranial pressure.

Can dogs suffer from chronic liver insufficiency?

Various liver diseases or disorders may lead to chronic hepatic failure in dogs.

The aetiology of chronic hepatic failure is very complex, as is its pathogenesis. Thus clinical and therapeutic approaches are increasingly difficult for the veterinary specialist and unfortunately often less effective in advanced stages of the disease.

In these severe cases, the main objectives of the clinician are to determine the stage of the disease and its origin, in order to achieve remission of the symptoms as quickly as possible. This is possible only by finding the optimum balance between dietary and medical therapies.

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Can dogs suffer from high blood pressure (hypertension)?

Yes, however hypertension (blood pressure above 150/100 mmHg) is much rarer in companion animals than in man, and is always as a consequence of another disease. Hypertension mostly affects the elderly pets. Unfortunately, hypertension develops silently and if not controlled in time, it may lead to blindness, central nervous signs or kidney failure.



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To avoid these severe complications, it is highly recommended to have your ageing pet's blood pressure checked annually by your veterinarian (human home blood pressure monitors are not suitable for measuring an animal's blood pressure).

Blood pressure measurement is indispensable in kidney patients and in certain endocrine diseases.

Iatrogenic

Inadvertently caused by the actions of the veterinarian or the treatment.

Ichthyosis

Hyperkeratosis (thickening of the outer layer of the skin) with desquamation (flaking), often accompanied by systemic symptoms. The oral mucosa and footpads are affected. These lesions are very painful and the prognosis is guarded.

Hyperthermia

Commonly known as a "fever" or pyrexia, this is an increase in the body temperature above normal levels (38°C-39°C).

Hyperthyroidism

Abnormally raised production of thyroid hormones, usually accompanied by goitre (enlargement of the thyroid gland). This disease is very rare in the dog. It is diagnosed by assaying the concentration of thyroid hormones in the blood.

Hyphaema

Accumulation of blood in the anterior chamber of the eye.

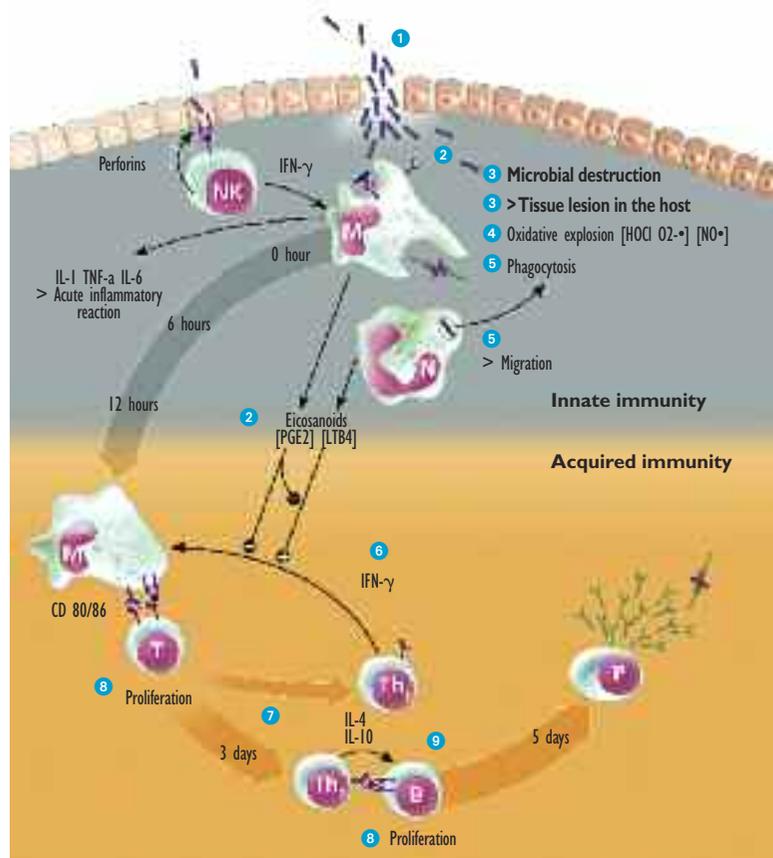
Hypoplasia

Incomplete formation of an organ or tissue. This is often a congenital condition leading to variable disorders depending on the affected organ.

For example, renal hypoplasia results in renal failure; cerebellar hypoplasia (of the cerebellum) is accompanied by neurological disorders, etc.

Hypothermia

Body temperature lower than normal (38°C-39°C).



- | | |
|--|---|
| 1. Vitamin A, protein-energy malnutrition | 5. Glutamine, genistein, iron |
| 2. Polyunsaturated fatty acids (PUFA) | 6. Lutein, genistein |
| 3. Antioxidants, protein-energy malnutrition | 7. Leptin, vitamin E, PUFA |
| 4. Antioxidants, arginine, glutamine, genistein (an isoflavone), carotenoids | 8. Nutrients, lutein, genistein, copper, zinc |
| | 9. Lutein, vitamin A, iron |

The immune system

Icterus

Yellow colouration of the mucous membranes associated with hepatic dysfunction. It is also referred to as “jaundice”.

Idiopathic

Of undetermined origin.

Immunoglobulin

Proteins playing a role in the body’s immune defence. They form the antibodies. There are 5 types of immunoglobulin but the major one is gamma globulin.

Impetigo

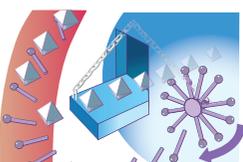
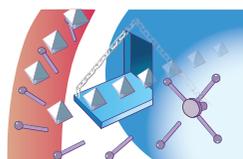
Contagious bacterial skin disease causing vesicles and papules. Treatment requires long term antibiotic therapy.

Infectious canine hepatitis (ICH)

Viral disease causing gastrointestinal disorders, marked depression, hypertrophy of the lymph nodes and pyrexia. This disease is fatal in unvaccinated puppies.

Infertility

Inability to reproduce, in a male or female. There are numerous causes of infertility (bacterial, morphological, behavioural, etc.). Incorrect timing of mating causes apparent infertility.



Insulin resistance

In the event of insulin resistance (lower diagram), a lot more insulin is needed to open the doors of the cell and allow sugar to enter.

Insulin resistance

Lowered response to insulin. One of the main causes of insulin resistance is oestrus

in the bitch, which explains why diabetic bitches often need to be neutered to stabilise their insulin treatment.

Insulinoma

A tumour, often malignant, of the endocrine cells of the pancreas. The main symptom is persistent hypoglycaemia. Treatment is surgical, combined with chemotherapy.

Intertrigo

Inflammation of the spaces between the skin folds and often associated with bacterial complications. It is common in brachycephalic dogs and breeds such as the Shar Pei.

Intestinal malabsorption

Poor absorption of nutrients from the small intestine leading to chronic diarrhoea.

Intestinal obstruction

Obstruction of the intestine.

Intravenous fluid therapy

Introduction of a sterile liquid into the body enabling the correction of fluid loss caused by dehydration or to increase circulating blood volume following haemorrhage.

Ischaemia

Defective tissue oxygenation.

K

Keratitis

Inflammation of the various layers of the cornea, which may be accompanied by ulceration. The cornea becomes opaque, painful, loses its transparency and blood vessels start to appear. The German Shepherd and Long-Haired Dachshund can be affected with two breed-specific types of keratitis.

Keratoconjunctivitis sicca

An ocular condition caused by a chronic lack of tears. The main symptoms are ker-

atitis, blepharitis and commonly the presence of corneal ulcers. Tear production is abnormally low when measured with the Schirmer tear test, which assesses the quantity of tears produced. Treatment involves the administration of artificial tears, combined with medical treatment.

L

Lactation of false pregnancy

See false pregnancy.

Leiomyoma

Benign tumour of the smooth muscles.

Leiomyosarcoma

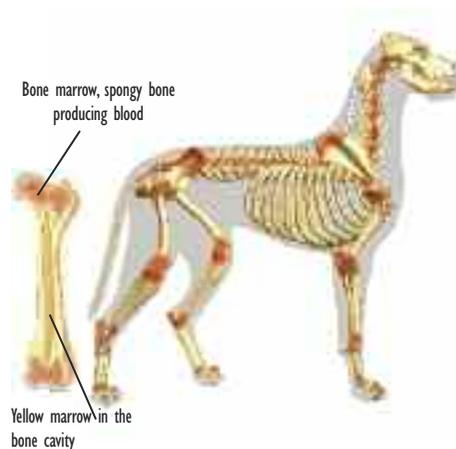
Malignant tumour of the smooth muscles, in particular the uterus and gastrointestinal tract.

Leishmaniasis

A disease caused by a protozoan parasite transmitted by sand flies. The incubation period is very long and the symptoms are highly variable (cutaneous, ocular, hypertrophy of the lymph nodes, anaemia, etc.). Total recovery is very rare and but there is often remission of the symptoms.

Leptospirosis

Bacterial disease transmitted particularly by the urine of infected rodents. It causes de-



Leukaemia

Location of bone marrow

pression, pyrexia, icterus, polyuria-polydipsia due to renal failure and gastrointestinal disorders. Treatment with antibiotics should be started early to prevent the development of irreversible lesions.

Leucocytosis

Increase in the quantity of leucocytes (white blood cells) in the blood.

Leukaemia

Cancer of the bone marrow cells.

Leukopaenia

Decrease in the quantity of leucocytes (white blood cells) in the blood.

Leydig cell tumour

Testicular tumour

Lower urinary tract disease

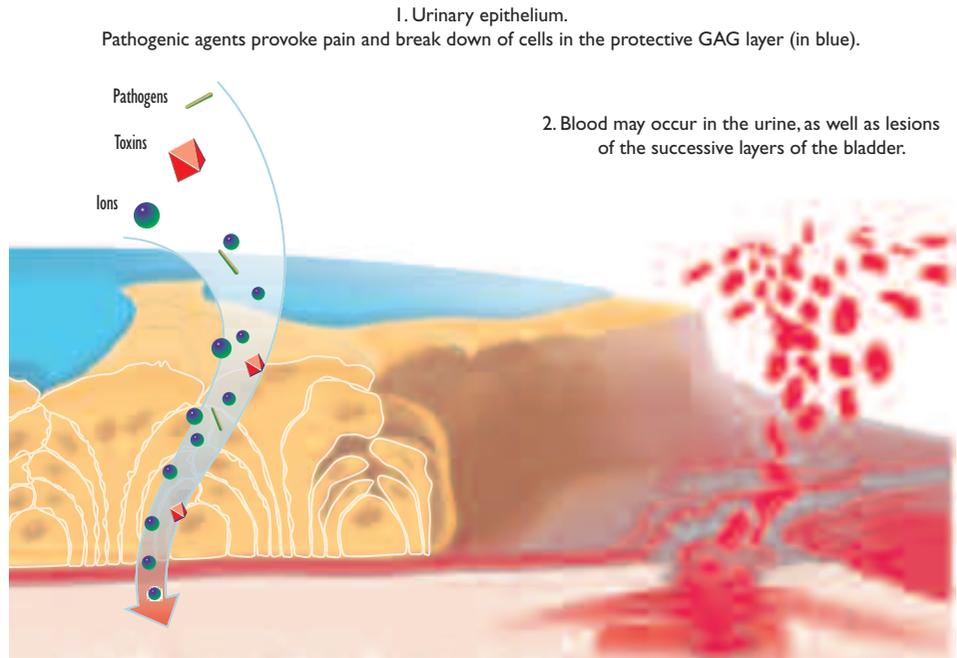
Disease that affects the lower part of the urinary tract, i.e. the bladder or urethra. The cause may be infection, calculi (stones), neoplasia, or impossible to determine (referred to as idiopathic).

Lyme's disease

Zoonosis caused by a tick-borne bacterium (*Borrelia burgdorferi*); the symptoms (which include high fever, intermittent muscle and joint pain) may appear several months after the dog has been bitten. Lyme's disease is treated with antibiotics; a vaccine is available and is useful for dogs living in high risk regions.

Lymphadenomegaly

Increase in the size of the lymph nodes.



Lower Urinary Tract Disease

Idiopathic cystitis

Lymphadenopathy

Enlargement of the lymph nodes, usually associated with disease.

Lymphangiectasia

Intestinal disease characterised by the obstruction of the lymphatic ducts. The loss of proteins leads to the formation of oedema and ascites, associated with chronic small intestinal diarrhoea. The dog should be fed a high quality, low fat, high protein diet.

Lymphocytosis

Increase in the quantity of circulating lymphocytes.

Lymphoma

Tumour of the lymphoid cells characterised by significant hypertrophy of all of the body's lymph nodes.

Lymphopaenia

Deficit in circulating lymphocytes.

M

Malignant histiocytosis

Malignant tumour causing the proliferation of monocyte cells (white blood cells) in various organs (skin, blood, lymph nodes, nervous system, eyes, lungs, etc.). The Bernese Mountain dog is predisposed to this disease. The prognosis is very poor.

Marie's disease (Hypertrophic osteopathy)

Paraneoplastic disease, i.e. related to a tumour (pulmonary, bladder, oesophageal), characterised by the appearance on the bones of the lower legs of swellings and new bone formation. It can cause lameness.



Healthy intestinal villi



Dilated lymphatic ducts (in yellow) in lymphangiectasia

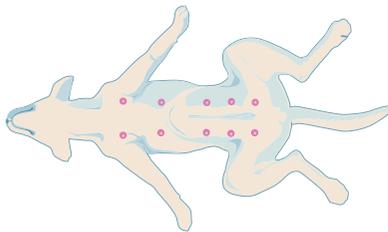


Villous atrophy in chronic inflammatory bowel disease, one of the possible causes of malabsorption.

Lymphangiectasia

Mastitis

Inflammation of the mammary glands during lactation, often bacterial in origin, and leading to the death of the puppies due to the ingestion of “toxic” milk. The glands are hot, dark and painful.



Mastitis
Location of the mammary glands

Mastocytoma

Malignant tumour characterised by the proliferation of mastocytes. It is usually located in the skin or mucous membranes. Boxers are predisposed to this tumour.



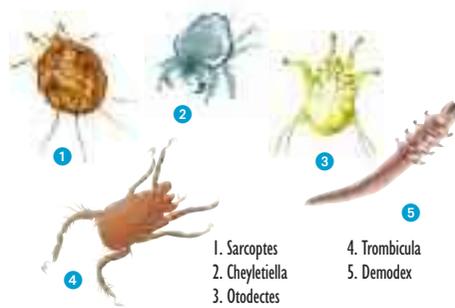
Mastocytoma
Mast cell

Medullary aplasia

Defective function of the bone marrow, which leads to a reduced production of red and white blood cells and platelets. The symptoms are multiple: anaemia, immunodeficiency, clotting disorders, etc. There are numerous causes: infection, neoplasia, immunological, etc.

Megacolon

Accumulation of faeces in the colon leading to constipation and tenesmus (straining to defaecate). It is often caused by a neurological deficit or pain during defaecation.



1. Sarcoptes
2. Cheyletiella
3. Otodectes
4. Trombicula
5. Demodex

Mites

Mites are related to spiders and scorpions

Megaesophagus

Generalised or localised dilation of the oesophagus. The dog regurgitates and has difficulty swallowing.

Melaena

Presence of digested blood in the faeces, giving them a black colouration.

Melanoma

Malignant tumour of the skin that spreads rapidly.

Meningitis

Inflammation of the meninges causing neurological symptoms.

Meningoencephalitis

Inflammation of the meninges and brain causing neurological disorders and an altered state of consciousness.

Mesothelioma

Aggressive tumour of the mesothelial cells, in particular the pleura (surrounding the lungs), peritoneum (surrounding the abdominal cavity) and the pericardium (surrounding the heart).

Methaemoglobinaemia

Abnormally high concentration of methaemoglobin in the red blood cells. This pigment, which is derived from haemoglobin, is incapable of fixing oxygen. The blood turns brown in colour. Some forms of poisoning (cyanide or onions for example) can cause methaemoglobinaemia.

Microhepatica

Small liver.

Mites

External parasites on the skin, in the coat or in the ears.

Monoclonal gammopathy

Presence of abnormally high levels of globulins (proteins playing a role in the immune response) in the blood. This disease is diagnosed using electrophoresis (examination of certain components of the blood) and is often associated with a tumour of the immune cells.

Monocytosis

Increase in the number of monocytes (large leucocytes) in the blood.



Monocytosis
Monocyte

Muscle weakness

The dog tires easily when exercising, finds it hard to stay standing and has muscle tremors.

Myasthenia

Disturbances in the transmission of nerve impulses to muscles, of congenital or acquired origin. It may be generalised or affect specific structures (in particular the oesophagus).

Mydriasis

Increase in pupil size. It may be spontaneous (in dim light), pathological (advanced stage of retinal atrophy for example) or linked to the administration of a medication (atropine for example). It is said to be non-reflective when the pupil does not react to a light stimulus.

Myelogram

Differential count of the types of cells present in a bone marrow biopsy.

Myelography

Injection of a contrast medium into the space around the spinal cord to visualise the latter on a radiograph. This is used to detect compression of the spinal cord.

Myeloma

Neoplastic disease of the plasma cells, leading to the uncontrolled production of antibodies. The main symptoms are anaemia, bone pain, depression and fever. The prognosis is guarded.

Myosis

Decrease in pupil size.

Myositis

Inflammatory disease of the muscles, causing muscle pain. The causes are very diverse and depend on the location of the symptoms.

N

Narcolepsy

Disease in which the animal suddenly falls asleep when excited. The causes of this disease are poorly understood.

Nasal discharge

Secretion of a serous or mucopurulent fluid from the nose. It has many causes, for example bacterial infection of the respiratory tract.

Necrosis

Tissue destruction caused by poor vascularisation.

Neonatal mortality

Mortality in the first few days of life.

Neosporosis

Disease caused by a protozoan parasite that primarily affects puppies (transplacental transfer). It causes an ascending paralysis (which starts with the hind end) plus dysphagia. Treatment is difficult.

Nephritis

Renal inflammation. This causes irreversible lesions, which ultimately result in renal failure.

Nephroblastoma

Malignant tumour of the kidneys.

Neuritis

Inflammation of a nerve, which may be painful and results in neurological disorders and lameness.

Neuropathy

Disease that affects the nerves.

Neutropaenia

Deficit in polynuclear neutrophils indicative of immunodepression for example.



Neutropaenia
Neutrophil

Neutrophilia

Increase in the quantity of polynuclear neutrophils (white blood cells) related to an inflammatory process.

Nodular dermatofibrosis

A paraneoplastic syndrome generally linked to a renal tumour, resulting in multiple cutaneous nodules, often localised on the extremities of the limbs and on the face.

Nutritional dermatosis

Cutaneous disease caused by an inappropriate diet with deficient levels of essential

Why is my dog's coat turning a reddish colour?

A variety of factors may be the cause. Fundamentally, coat colour is genetically determined, But in white dogs particularly, the coat of certain individuals contains pigments which cause a reddish discolouration.

Significant influencing factors include environmental effects, such as UV-light and humidity. Moulting and hormonal causes can result in generalised colour changes.

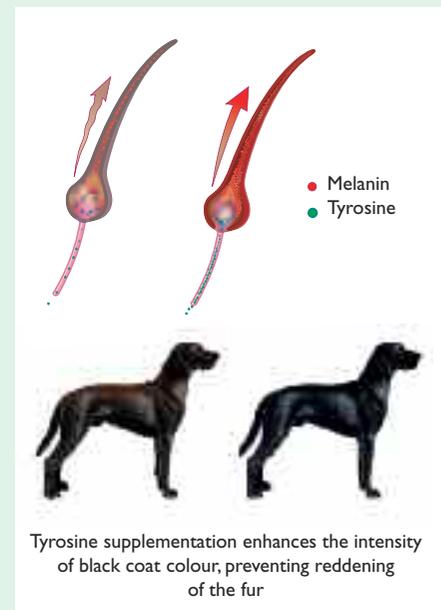
The coat colour can change locally around the muzzle and eyes as a result of porphyrins from saliva and tears. These may also cause colour changes where the dog licks areas of itchy skin (allergies). Shampoos and insecticides may also be implicated.

Nutrition is another influencing factor. Proteins, certain amino acids (especially tyrosine), trace elements (especially copper) and vitamins (especially biotin) all play a role. A deficiency of these nutrients can induce colour changes. Although not scientifically proven, B-carotene may make white dogs reddening.

Studies have shown, however, that in dogs with black fur, a diet with elevated tyrosine increased the intensity of the black.



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Tyrosine supplementation enhances the intensity of black coat colour, preventing reddening of the fur

fatty acids, proteins, minerals, vitamin A, or following the consumption of poorly preserved food. The fur is dry and friable, with visible seborrhoea.



Obesity

A dog is said to be obese when its body-weight exceeds 15 percent of its ideal weight.

Obstruction

Element preventing the normal passage of another element through a structure. It may be gastrointestinal (food is blocked in the intestine, by a foreign body for example), respiratory (the air cannot reach the pulmonary alveoli), urinary (the urinary tract is blocked by a calculus for example), biliary, etc.

Oedema

Increase in the volume of a structure due to the accumulation of liquid in the interstitial tissue. It may be cerebral, pulmonary, subcutaneous, etc. The resulting symptoms depend on the location (respiratory difficul-

ties, neurological disturbances or simple mechanical impedance, etc.).

Oesophageal dilation

Dilation of the oesophagus, which inhibits the correct passage of food, caused by a congenital defect (for example the persistence of the right aortic arch), a foreign body or a tumour.

This dilation results in hypomotility of the oesophagus, which then predisposes the dog to choking on its food, which in turn leads to development of bronchopneumonia.

Oesophagitis

Inflammation of the oesophagus caused by the ingestion of caustic products or acidic gastric reflux. The exact cause must be determined via further diagnostic tests.

Oestrus

Period in the cycle of the bitch during which she attracts males and is receptive to mating. Ovulation occurs during this period.

Oliguria

Reduction in the quantity of urine produced.



Auditory canal in a healthy dog and one with otitis

The "L"-shape of the auditory canal in the dog promotes the accumulation of cutaneous debris that cannot be evacuated naturally.

Osteoarthritis (degenerative joint disease)

Degeneration of the joint characterised by the destruction of the cartilage and the abnormal production of bone (osteophytes). Pain is more marked when the joint is cold, and causes lameness. Once developed, degenerative joint disease cannot be reversed. Hydrotherapy can be used to maintain muscle mass and limit the severity of the symptoms.

Osteochondrosis

Abnormality of the articular and growth cartilages, which may result in formation of cartilage fragments. It is often related to excessively rapid growth of the dog due to an inappropriate diet. The most commonly affected joints are the shoulder, elbow, stifle, and hock.

Osteodystrophy

Painful, fragile abnormal bone growth. Advanced renal failure or a dietary imbalance during growth may result in secondary osteodystrophy.

Osteofibrosis

Fragility of the skeleton caused by demineralisation of the bone.

Osteoma

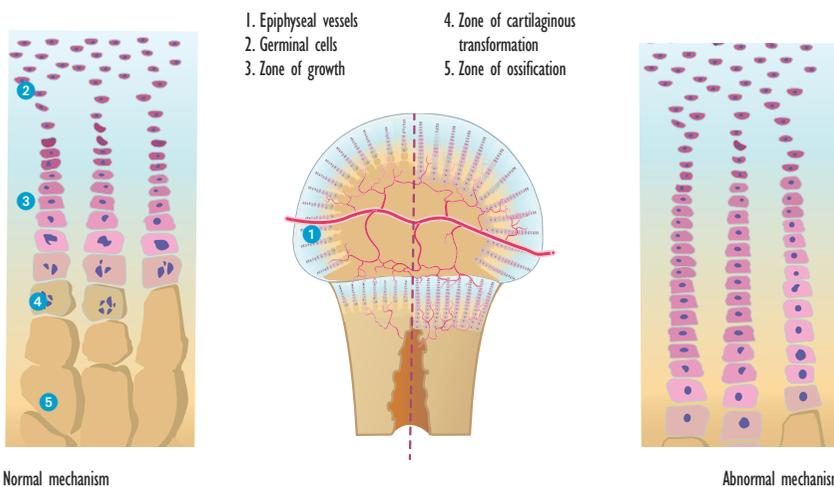
Benign bone tumour that may cause mechanical hindrance.

Osteomyelitis

Infection of the bone.

Osteoporosis

Fragility of the skeleton caused by a reduction in bone mass.



Normal (on the left) and abnormal (on the right) endochondral ossification; this occurs in the growth plates as well as in the articular cartilage during growth.

Osteochondrosis

Osteosarcoma

Very painful malignant bone tumour, often diagnosed late and with a very poor prognosis.

Otitis

Bacterial or fungal inflammation of the outer, middle or inner ear. Dogs with drooping ears are predisposed. It causes ear pain and induces itching, erythema and sometimes the accumulation of secretions.

Oxygen therapy

The administration of oxygen via tracheal intubation or a face mask, or through the use of an oxygen tent to help dogs in respiratory distress.

P**Pancreatitis**

Very painful and severe inflammation of the pancreas, the origin of which is not always clear.

Papillomatosis

Viral disease characterised by the development of small warts on the surface of the skin or mucous membranes (gums, genitals, etc.). These small tumours are benign.

Paracentesis

A procedure during which fluid from the abdomen is withdrawn through a needle. Paracentesis tympani (myringotomy): surgical technique to incise the ear drum to relieve pain caused by otitis media for example. It may cause deafness in the event of serious disease.

Paralysis

Loss of the capacity for movement, generally of neurological origin. It may affect the limbs (following a displaced fracture of the spinal column and section of the spinal cord for example), the organs, etc. Laryngeal paralysis causes poor functioning of the cartilages of the larynx resulting in serious respiratory difficulties, roaring (rattling noise in the throat) and exercise intolerance; surgery is required to repair the cartilages.

Parenteral

Route of administration of a medication other than via the gastrointestinal tract e.g. by injection.

Paresis

Partial loss of the motor capacities of certain muscles.

Parvovirus

Viral disease to which puppies are most susceptible. There is a vaccine available.

The disease causes haemorrhagic diarrhoea and vomiting. It is fatal without early treatment.

Pasteurellosis

Bacterial infection leading to fever, oedema and the formation of abscesses. It is common following bite wounds.

Patent ductus arteriosus (PDA)

Congenital heart problem characterised by the persistence of blood flow between the aorta and the pulmonary artery. There are breed and gender predispositions (the Pyrenean sheepdog represents 50 percent of all known cases and three times as many females are affected than males).

Affected dogs are easily tired, have a heart murmur and sometimes respiratory abnormalities.

Pediculosis

Infestation with lice leading to pruritus and desquamation.

Pericardiocentesis

In the event of pericarditis, the pericardium is incised to sample and analyse the liquid contained therein.

Pericarditis

Inflammation of the pericardium, often infectious in origin. If left untreated, periodontal disease may lead to pericarditis.

Periodontal disease

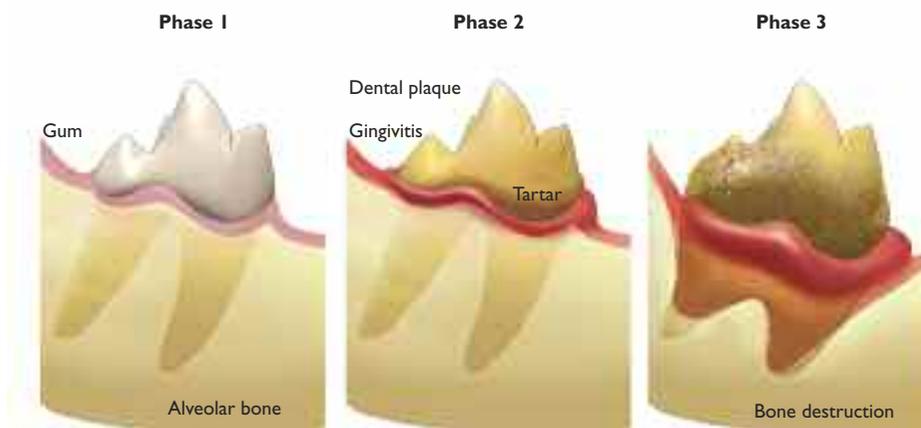
Inflammation and bacterial infection of the gums, linked to the presence of plaque and tartar. The gums are red, painful and the teeth may be loose.

Peritonitis

Septic or aseptic inflammation of the membrane that surrounds the peritoneal cavity. It causes significant abdominal pain, gastrointestinal disturbances, fever and a state of shock.

Persistence of a duct

Failure of certain embryonic structures to regress before birth. The most common are the persistence of the fourth right aortic arch or the urachus (that links the bladder to the umbilicus during gestation). These



The three phases of periodontitis

congenital anomalies require major corrective surgery.

Pexy

Surgical fixation of one structure to another.

During gastropexy for example, the stomach is fixed to the abdominal wall to prevent recurrent gastric torsion.

Phlebitis

Inflammation of a vein.

Piroplasmosis

Blood borne parasitic disease causing anaemia, pyrexia and haemoglobinuria (presence of haemoglobin in the urine).

Plantigrade

Abnormal gait in which the dog walks on the part of its leg from the carpus or tarsus down, whereas the dog is normally digitigrade (walking on its toes).

Plasmacytoma

Neoplastic disease of the plasma cells, leading to the uncontrolled production of antibodies. The main symptoms are anaemia, bone pain, depression and fever. The prognosis is guarded.

Pneumomediastinum

Accumulation of air in the mediastinum, usually of traumatic origin.

Pneumonia

Pulmonary inflammation caused by an infection (usually bacterial and / or viral), or by chemical agents. It causes coughing, pyrexia, mucopurulent nasal discharge and dyspnoea.

Pneumothorax

Presence of air in the pleura. It may be traumatic (most common) or spontaneous and causes respiratory difficulties.

Pododermatitis

Skin infection of the distal extremity of the limbs, more specifically in the interdigital spaces and foot pads.

Poisoning

Consumption of a substance with a deleterious effect on the integrity or function of the body. Many substances, plants and some foodstuffs are poisonous to dogs. The resulting disorders (gastrointestinal, neurological, clotting, etc.) will depend on the substance consumed. It is advisable to contact the vet with details of the product the dog is thought to have ingested.

Pollakiuria

Abnormally frequent urination with small quantities of urine.

Polyarthritis

Inflammation of several joints. These are hot, painful and the dog is intermittently lame.

Polycystic kidneys

Hereditary congenital disease resulting in the presence of cysts in the kidneys and resulting in renal failure.

Polycythaemia

Increase in the quantity of red blood cells in the blood.

Polymyositis

Inflammation of several muscles leading to generalised muscle pain.

Polyneuropathy

Neurological disease affecting several peripheral nerves and resulting in neurological disturbances. All of the nerves in the body (motor nerves of the limbs, cranial nerves, autonomic nervous system) may be affected.

Polyp

Benign tumour that develops on the mucous membranes (mouth, gastrointestinal tract, respiratory tract). It may become infected or cause a functional problem and require excision.

Polyphagia

Increased appetite and food intake.

Polypnoea

Increase in the respiratory rate.

Polyradiculoneuritis

Generalised inflammation of the nerve roots of the motor nerves. It causes generalised paralysis.

Polyuria – Polydipsia

Increase in fluid intake and the quantity of urine produced.

Pressure sore

Necrotic lesion seen especially in paralysed or hospitalised animals resulting from friction between the body and the ground (point of the hip, point of the elbow, etc.).

Prostatic disease

Very common in entire males over 6 years of age, causes an increase in the volume of the prostate, difficulty urinating with the presence of blood in the urine; the dog may

How do I know my dog is in pain ?

Recognizing pain in animals can be difficult. As humans and animals withdraw or vocalize at the same minimum level of a painful stimulus, we conclude that a stimulus/experience causing pain in humans also causes a similar degree of pain in animals. We have all experienced pain of many causes, therefore, anthropomorphism will assist in assessing the existence and level of pain in animals.

Animals with chronic pain exhibit lameness, repetitive abnormal movements, behav-

ioural changes such as reluctance to move or perform usual activities, or loss of appetite.

Animals in acute pain associated with traumatic, surgical or medical origin may tremble, chew at the affected area, may not move or vocalize, or may thrash around and vocalize and most resent touch of the 'injured' area.

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also have difficulty passing faeces or show locomotor disorders of the hind end. Prostatic problems are also a cause of infertility in stud dogs. The origins are multiple (infection, neoplasia, glandular-cystic hyperplasia whose origin is undetermined, etc.).

Prostatic massage

Technique that enables the collection of a few prostatic cells for analysis. It is used to determine the cause of prostatomegaly (enlargement of the prostate gland).

Prostatitis

Inflammation of the prostate of various origins. It causes urinary difficulties, tenesmus and sometimes the presence of blood in the urine.

Proteinuria

The presence of protein in the urine, which is a sign of renal failure.

Pruritus

Severe itching that may cause skin lesions.

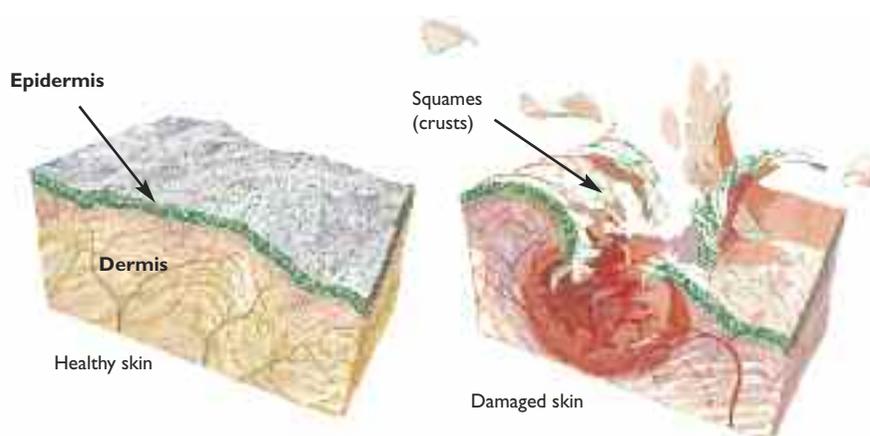
Pseudo-mange

Cheyletiellosis (“walking dandruff”) and trombiculiasis are highly pruritic forms of dermatitis caused by mites.

Ptosia

Displacement of an organ distally (to the lower parts of the body).

Epidermal reaction in severe pruritus.



In pruritus, excoriation leads to epidermal damage, reducing its barrier function. It is therefore less able to limit water loss and the penetration of allergens and infectious agents is facilitated.

Pruritus

Ptyalism

Increase in the production of saliva associated with drooling of saliva outside of the oral cavity.

Pyelonephritis

Presence of pus in the renal pelvis, leading to renal failure and the presence of pus in the urine.

Pyometra

Accumulation of pus in the uterus; it usually occurs within two months of a heat in entire bitches.

Pyothorax

The presence of pus in the thorax.

Pyuria

The presence of pus in the urine.

R

Rabies

Zoonotic viral disease primarily transmitted by bite or scratch wounds. It causes neurological disorders, aggression, ptyalism and death in 100 percent of cases. A vaccine is available.

Radiography

See the chapter on further diagnostic tests.

Regurgitation

Expulsion of food from the stomach or oesophagus with no expulsive effort, i.e. without abdominal contractions.

Renal failure

Abnormal renal function leading to defective filtration of the urine. It may be acute (sudden onset) or chronic (linked to the progressive destruction of the nephrons in the kidney). Renal damage is irreversible,

My dog has kidney failure, what can I do?

Chronic kidney disease is more common than acute disease. In chronic disease the primary cause is often not known, and kidney tissue is replaced by scar tissue.

The aim of treatment is to support kidney function and to reduce further formation of scar tissue.

The most important therapy is a specialised renal diet. Diet will often reduce symptoms and slow disease progression; on average doubling the life expectancy of the dog.

The need for intravenous fluid therapy, treatment for loss of protein in urine and treatment for hypertension will be evaluated by your veterinarian.

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but can be stabilised with the help of dietary changes.

Renomegaly

Increase in the size of the kidney.

Respiratory disease

There are two types of pathology that affect the respiratory tract (nasal cavity, larynx, trachea, bronchi and pulmonary alveoli):

- obstructive: the airways are blocked (e.g. by a foreign body or tumour).
- restrictive: the pulmonary airways cannot inflate properly (e.g. pulmonary haemorrhage) or the airways are compressed by an extra-pulmonary mass.



Respiratory disease

Diagram of the respiratory tract showing the nasal cavities, trachea and lungs.

Retinal atrophy

Congenital defect causing the progressive destruction of the vessels and cells of the retina. It results in blindness, first nocturnal, then permanent (with mydriasis – dilation of the pupil, which does not react to light stimuli).

Retinal detachment

Ocular pathology leading to sudden blindness characterised by the detachment of part of the retina from its underlying layer of support tissue. Information is therefore no longer transmitted via the optical nerve. This can be seen using an ophthalmoscope or with ocular ultrasonography. The cause may be ocular hypertension, inflammation of the retina or ocular trauma.

Which toxins cause most damage to the kidneys?

The single most dangerous toxin for dog's kidneys, based on the frequency of poisoning and the consequences, is probably ethylene glycol, a substance found in antifreeze. Poisoning results in death in two out of three cases. The ingestion of some rat poisons containing cholecalciferol, or of grapes, can also lead to serious kidney failure. Many other substances (plants, venom, herbicides,

fungicides) can have severe repercussions for the kidneys depending on the individual, its state of health and the intensity of exposure. It is essential in all these cases, that the dog is presented to a veterinarian as soon as possible after ingestion, even if it does not exhibit any clinical signs.

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Can dialysis be carried out in dogs?

Although technically it is possible carry out hemodialysis in dog and cats only very few veterinary hospitals offer this service.

Hemodialysis is a method of blood filtration used to eliminate waste products and toxins accumulated in patients with kidney failure. The kidney acts like a "filter"; it removes waste products from the body, regulates the level of water and different minerals needed by the body for good health and produces hormones which control other body functions, such as red blood cell production and bone metabolism.

Kidney failure means that the kidneys have been damaged and are not working as well as they would normally. In acute cases, such as those produced by toxins or infections, total recovery may be possible, but chronic cases tend to worsen over time because the kidney damage is irreversible. In the early stages of chronic kidney diseases, the only treatment needed may be a change in diet and specific medications, but when kidney function is near its terminal phase, either dialysis or transplantation is needed for continued life. It is important to realize that these options are a supportive treatment and not a permanent cure.

The main indication for hemodialysis is the management of acute renal failure because the patient has a good chance of recovery of renal function after a relative short time. In the end stages of chronic renal disease, long-term treatment is necessary with at least two to three weekly sessions indefinitely.

To carry out hemodialysis it is necessary to have, among other things, a specific machine, specially trained staff and 24-hour intensive care. Very few centres can afford the cost of this procedure, both in monetary terms and of staff, and it requires a huge financial and emotional effort by the owner. Nevertheless the increased sophistication of specialist veterinary practice and the increasing demand by pet owners for this kind of treatment promises its further expansion and availability worldwide.



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10 facts about renal insufficiency

1. Chronic Renal Insufficiency is a chronic progressive kidney disease.
2. The onset of the disease is easily missed.
3. Pet owners will identify the symptoms only at a very late stage.
4. Therefore this clearly suggests that the challenge of early diagnosis is the responsibility of the veterinarian.
5. Inclusion criteria for an early-diagnosis program are breed, age and other diseases affecting renal tissue.
6. The measurement of serum creatinine is not a reliable bio-marker in early diagnosis.
7. Unfortunately, a rise in the creatinine level can often be identified only at a very advanced stage.
8. Only the sum of a variety of data derived from case history (breed, age, primary diseases of other organs), clinical examination (weight loss, polyuria/polydipsia), laboratory analysis (creatinine, urea, phosphate, potassium), blood pressure measurement and urine testing (specific gravity, protein / creatinine (UPC), sediment) makes early diagnosis possible.
9. Dietary measures as well as the use of phosphate binders play an essential role in the therapy of chronic renal insufficiency. In a very advanced stage, success may be limited.
10. All therapeutic measures currently available (low phosphorus diets, phosphate binders, ACE inhibitors, calcium channel blockers) increase lifespan only if used sufficiently early.

Summary: Each renal patient needs early diagnosis by a veterinarian for optimal therapy. Otherwise, the patient's quality of life and life expectancy will be considerably reduced.

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What is kidney failure?

The principal role of the kidneys is to maintain a constant balance of water and electrolytes in the blood and to act as a filter for the waste eliminated from the body in urine. So when they no longer function properly, toxin levels within the body rise.

Acute and chronic renal failure are seen in dogs.

Symptoms of acute renal failure are:

- pain around the kidneys
- dehydration
- low urine output and then cessation of urine output.

Treatment consists of intravenous fluid therapy combined with dialysis (peritoneal or haemodialysis).

Symptoms of chronic renal failure are:

- anorexia
- weakness
- vomiting
- weight loss
- progressive anaemia
- depression
- ammonia-smelling breath

There is no actual treatment for this chronic disease but it is possible to slow the progression through symptomatic treatment and specialised nutrition. Renal transplants are also possible in dogs.

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Rhabdomyolysis

Acute destruction of muscle fibres usually occurring after intense effort in hot conditions, leading to the leakage of myoglobin (the red pigment in muscle fibres) into the urine (myoglobinuria). Prevention involves appropriate physical training, a diet with a high content of antioxidant nutrients and an ad lib water supply.

Rhabdomyoma

Benign tumour of the striated muscles.

Rhabdomyosarcoma

Malignant tumour of the striated muscles.

Rhinocopy

Examination of the nasal cavities using a fibre optic cable.

Ringworm

See Dermatophytosis

S

Sarcoma

Malignant tumour of the connective tissue or related tissues (for example osteosarcoma). Tumour staging can be used to aid the prognosis, which is guarded.

Sarcoptic mange

Highly contagious zoonotic parasitic dermatosis causing very intense pruritus and significant lesions (crusts, oozing). Treatment involves the administration of an antiparasitic agent and isolation.

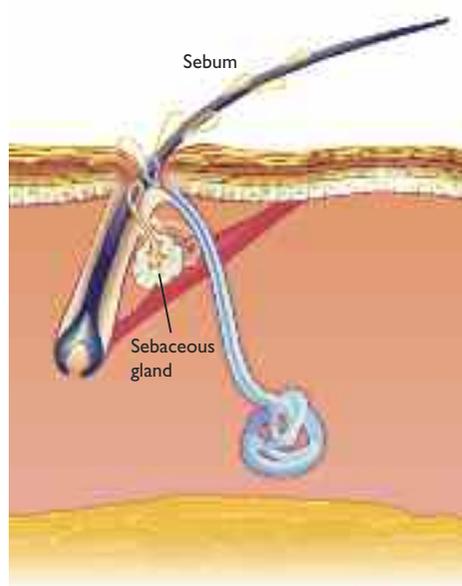
Scintigraphy

Diagnostic test enabling the visualisation of an organ using a radioactive isotope that is injected into the body.

Seborrhoea

Abnormally high production of sebum by the sebaceous glands. The skin is oily, strong-smelling and flakes easily.

It is often secondary to a skin condition except in certain breeds where it may be spontaneous (Cocker Spaniel, Spaniel, German Shepherd, etc.).



Seborrhoea

Normal sebum production

Seminoma

Malignant testicular tumour affecting the seminal cells.

Septicaemia

Generalised bacterial infection of the blood. It causes severe pyrexia and a risk of septic shock.

Serology

Assay of antibodies in the blood.

Sertoli cell tumour

Testicular tumour of the Sertoli cells.

Shunt

Vascular abnormality, which is often congenital and causes a deviation of the blood flow.

Portosystemic hepatic shunts are the most common example. They cause diversion of the blood from the intestinal vessels to the general circulation without passing through the liver.

Sialocele

The presence of a pocket of saliva between the maxillary bone and the cheek, caused by obstruction of the salivary ducts. Surgery is often necessary.

Skin scraping

See the chapter on further diagnostic tests.

Small intestinal bacterial overgrowth

Abnormally rapid bacterial multiplication in the small intestine leading to gastrointestinal disturbances. A highly digestible, low fat diet is fed in addition to medical treatment.

Sphincter incompetence

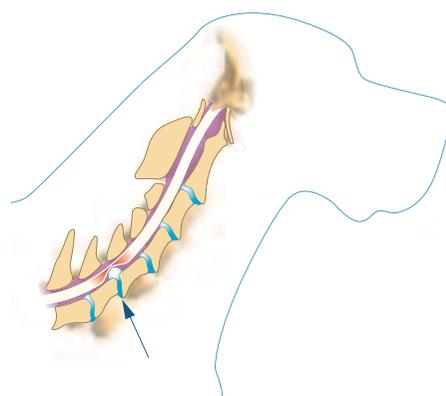
Functional defect of a sphincter, which no longer contracts, and does not relax normally.

Splenomegaly

Hypertrophy of the spleen caused by haemorrhage or neoplasia for example.

Sprain

Traumatic lesion of a joint with stretching and sometimes tearing of the ligaments without displacement of the joint surfaces.



Wobler's syndrome

Compression of the spinal cord may cause locomotor disorders of variable severity from mild ataxia to complete paralysis.

Squamosis (scaling)

Presence of scales on the surface of the skin.

Steatorrhea

Presence of fat in the faeces leading to a yellow colouration.

Stenosis

Narrowing of a natural duct: nostrils, trachea, aorta, etc.

Stomatitis

Inflammation of the oral mucosa.

Stranguria

Pain during urination.

Subconjunctival injection

Injection of a medication, usually underneath the bulbar conjunctiva of the eye.

Supernumerary teeth

Milk teeth that have not fallen out impede mastication and disrupt the eruption of the adult teeth. This problem is common in smaller breeds.

Syncope

Sudden loss of consciousness.

Syndrome

This is a collection of symptoms that make up a clinical entity.

There are many different syndromes in veterinary medicine, for example:

- “toxic milk syndrome”: bacterial contamination of puppies by the consumption of milk from a bitch with mastitis. The puppies lose weight and may die.
- swimmer puppy syndrome: (splay pup / flat puppy); inability of the puppy to stand up. They keep their legs splayed out on the ground. The prognosis is guarded.
- cauda equine syndrome: compression of the nerves of the terminal portion of the spinal cord leading to paresis and posterior ataxia, sometimes accompanied by urinary and faecal incontinence.
- Wobbler syndrome: cervical vertebral instability leading to ataxia, common in Dobermanns.
- paraneoplastic syndrome: collection of symptoms linked to the development of a cancer. Marie’s disease is an example of a paraneoplastic syndrome.
- vestibular syndrome: disorders of the inner ear leading to balance problems.

Synovial fluid

Liquid present in the joints which ensures smooth mechanical function and supplies the cartilage with the nutrients that it requires. Its composition changes in the event of inflammation (synovitis).

Systemic lupus erythematosus

Immune-mediated disease caused by the circulation of abnormally high levels of antigen-antibody complexes and antibodies directed against the body’s own tissues. It usually results in dermatological lesions, polyarthritis, blood dyscrasias and pyrexia.

T

Tachycardia

Increase in the heart rate.

Tachypnoea

Increase in the respiratory rate, which becomes too fast.

What are some common traumatic injuries in dogs which you see on emergency ?

The most common traumatic injuries include dogs being hit by cars, bites from other animals, penetrating wounds, and being shot by an arrow or gun.

First and foremost, these patients should be evaluated by an ER veterinarian and treated for life-threatening blood loss or shock.

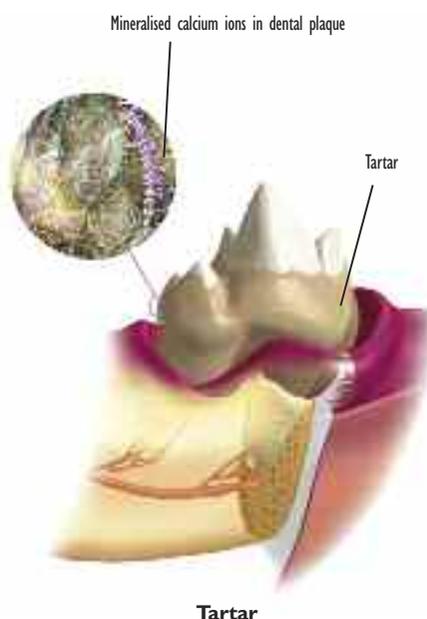
Tests can be performed, such as x-rays, ultrasound, and even CT scans or MRI, to help assess and treat internal bleeding, broken bones and head trauma.



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Tartar

Dental plaque accumulates on the teeth and becomes calcified to form tartar. When bacteria become lodged on the tartar, this leads to halitosis (bad breath).



Tartar

Untreated tartar can lead to gum inflammation and subsequent bone destruction and tooth loss.

Teratogenic

Pertaining to anything that may cause anomalies during embryogenesis, causing congenital malformations.

Tetraplegia

Paralysis of all four limbs.

Thoracocentesis

Sampling of liquid from the thoracic cavity for analysis, or to decrease pulmonary compression following pleural effusion (or pneumothorax).

Thrombocytopenia

Decrease in the blood concentration of circulating platelets.

Thromboembolism

Migration of a blood clot obstructing a vessel.

Thrombosis

Formation of a clot within a vessel or cavity of the heart.

Thymoma

Tumour of the thymus with a good prognosis if the diagnosis is made early enough.

Tissue hypoxia

Lack of oxygen in a tissue, leading to cell death. One example is cerebral hypoxia (lack of oxygenation of the brain).

Tenesmus

Pain during defaecation.

Toxascariasis

Intestinal parasitic disease which can lead to a “pot-belly” appearance in puppies, gastrointestinal upsets and weight loss in heavy infestations.

Toxocariasis

Very common zoonotic intestinal parasitic disease, which is often asymptomatic but can lead to gastrointestinal upsets and weight loss in heavy infestations.

Transfusion

The intravenous perfusion of blood taken from another dog or of blood derivatives from the Pet Blood Bank.

Transudation

Passage of a liquid across a membrane.

Trichiasis

Turning inward of the eyelashes, which rub against the cornea and provoke inflammation.

Trichuria

Gastrointestinal parasitic disease of the dog causing gastrointestinal upsets and tenesmus.



Trichuria

Tube

Tube that enables the passage of air or liquid. There are various types: urinary (usually referred to as a catheter, to allow the passage of urine), naso-oesophageal (to administer food into the oesophagus), gastrostomy (to administer food directly into the stomach), etc.

Tuberculosis

Zoonotic bacterial disease causing respiratory, gastrointestinal and cutaneous problems and lymphadenopathy.

Tumour

New tissue formation with uncontrolled growth.

Tumour staging

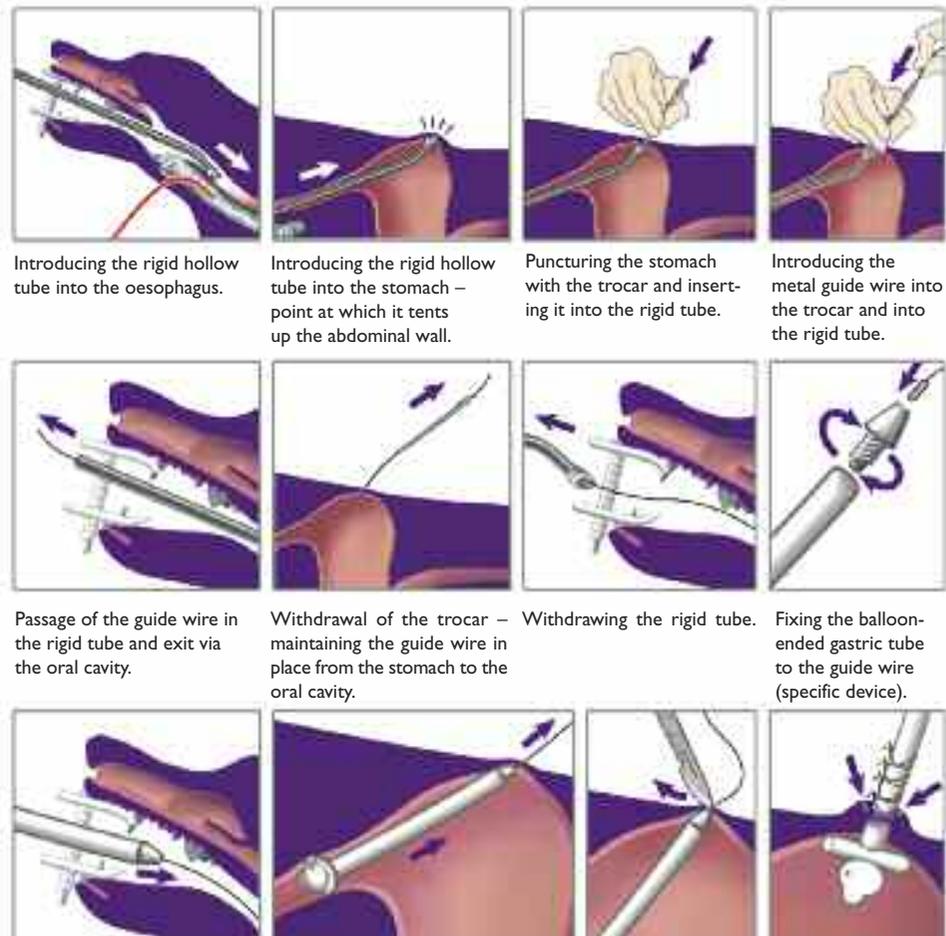
When a tumour is detected, vets look at size, penetration into the affected tissues and for signs of metastases (i.e. of extension of the tumour to the rest of the body by checking the lymph nodes, adjacent organs and sometimes the lungs).

U

Ulcers

Loss of substance from the surface of a body structure. The most common are:

- corneal ulcers: defect in the corneal epithelium, affecting one or several layers of the cornea. The eye is partially closed, painful and a discharge is seen. The cornea loses its smooth, shiny and transparent appearance.
- gastroduodenal ulcers: damage to the wall of the stomach or duodenum. They are as-



Introducing the rigid hollow tube into the oesophagus.

Introducing the rigid hollow tube into the stomach – point at which it tents up the abdominal wall.

Puncturing the stomach with the trocar and inserting it into the rigid tube.

Introducing the metal guide wire into the trocar and into the rigid tube.

Passage of the guide wire in the rigid tube and exit via the oral cavity.

Withdrawal of the trocar – maintaining the guide wire in place from the stomach to the oral cavity.

Withdrawing the rigid tube.

Fixing the balloon-ended gastric tube to the guide wire (specific device).

Inserting the guide wire / stomach tube assembly into the oesophagus and caudal traction towards the stomach – balloon tip last.

Pulling the guide wire / tube out of the stomach.

Coming through the abdominal wall

Fixation of the tube to the abdominal wall using a Chinese finger trap suture – with the balloon up against the inner wall of the stomach.

Technique for blind placement of a gastrostomy tube

There is a growing lump on my pet's skin. Should I watch it or should I act?

Never just watch a lump on your pet grow. Every growing lump is possibly malignant, therefore ask your veterinarian to examine your dog to check the lump is not cancerous.

If the lump results from an inflammation, your veterinarian will recommend the appropriate treatment. But if your vet suspects cancer, he may take a tissue sample (biopsy) to confirm the diagnosis. Immediate action improves the chances that malignant tumours can be treated before they spread within the body.

If detected early enough, they may even be entirely eliminated. Therefore, never just watch a nodule developing on your pet's skin. Early detection of cancer can cure your pet. At the same time, please don't forget that there is always help, even in advanced cancer.

Veterinary oncology has improved tremendously during the last decade and a group of human doctors and veterinarians striving to improve treatment for cancer patients in Europe have united their forces to exchange

ideas, carry out research and develop effective therapies (www.rotepfote.at).

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sociated with haemorrhagic vomiting, abdominal pain and a decline in the general state of health.
 - mouth ulcers, linked to renal failure for example.

Ultrasound

Described in the chapter on further diagnostic tests.

Urate calculi

A type of calculus commonly encountered in Dalmatians.

Ureterocoele

Dilation of the ureters, which occurs when urine cannot be expelled normally.

Ureterography, urography and

Ureterography, urography and urethrocytography

Marking of the ureter, bladder and sometimes the urethra with a contrast medium to enable visualisation on a radiograph.

Urinary infection

Presence of bacteria in the urine, which is normally a sterile fluid.

Urinary lithiasis

See calculi

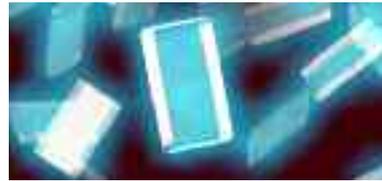
Urine cytology and bacteriology

When bacterial cystitis is suspected, a urine culture can be used to determine the causative bacteria. Cytology is used to look for cells in the urine and detect any crystals or small calculi.

Urate calculi

Purine metabolism is different in the Dalmatian

Other breeds of dog



Dalmatian



Purines from cell metabolism or from food



Purines are transformed in the liver into uric acid.



... then into allantoin (in pink above). The products of degradation are carried by the blood to the kidneys where they are excreted in the urine.



The Dalmatian converts 40% of its uric acid into allantoin, whilst other breeds of dog transform 90%. This peculiarity makes Dalmatians more susceptible to the formation of urinary urate calculi.



Uroperitoneum

Accumulation of urine in the peritoneum, caused by rupture of the urinary tract (ureter, bladder, urethra). Since urine is highly irritant, this is a true surgical emergency.

The peritoneum is a sac which lines the inside of the abdomen and surrounds the abdominal organs.



Uroperitoneum

Anatomy of the peritoneum.

Urticaria

Allergic dermatosis linked to the ingestion or injection of an allergenic substance. The symptoms (pruritus and reddening) are especially apparent in young dogs on the head, neck, legs and back.

Uveitis

Inflammation of the iris and ciliary bodies; accompanies certain viral and infectious diseases (tuberculosis, distemper, infectious canine hepatitis, etc.). It results in ocular pain, conjunctival inflammation, loss of transparency of the anterior chamber of the eye and myosis. It may cause loss of vision in the dog and is an emergency.

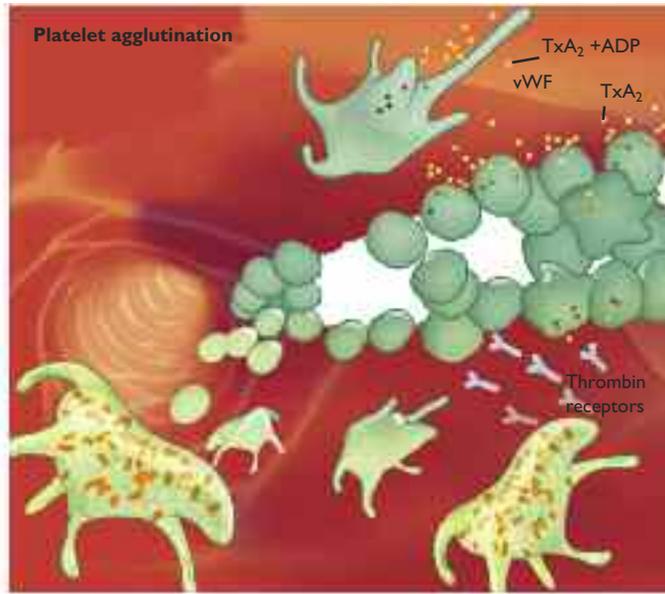
V

Vasoconstriction

Reduction in the diameter of a blood vessel.

Vomiting

Often preceded by nausea and always preceded by abdominal contractions. Vomiting results in the expulsion of digested food via the mouth.



von Willebrand disease

Diagram showing the normal function of von Willebrand factor (vWF): activation of platelets to form a platelet plug.

Von Willebrand disease

Hereditary clotting disorder resulting in the poor adhesion of the platelets to the vascular endothelium following a lesion. Bleeding times are prolonged and spontaneous bleeding may be seen.

W

Weight loss

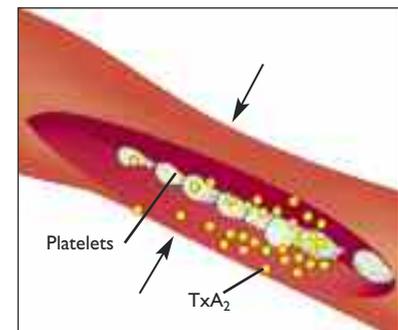
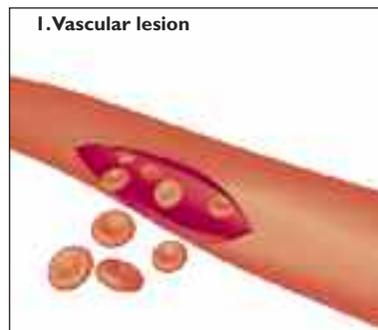
Loss of weight, which when it occurs over a short period of time, is indicative of a

pathological problem, assuming that the diet is correctly adapted to the animal (breed, level of physical exercise, growth stage) and the correct amount fed.

Z

Zoonosis

Disease transmissible from man to animals and vice versa.



Vasoconstriction

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Dominique Grandjean,
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Franck Haymann,
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338 recognised breeds, more than 30 million years on earth, a weight at adult age that ranges from 1 to 100kg (2 lbs to 220 lbs), a coat that ranges from nothing at all to the densest of pelts, an appearance that attracts or (erroneously) instils fear, physiological traits based on size or breed that are not found in any other species, an unsurpassed sense of smell that is harnessed each and every day to make our world a safer place and save human lives, several dozen sports or leisure pursuits that owner and dog can participate in together... and loyalty, tenderness and a look that no one can resist... That is the dog: an unequalled animal and fully fledged member of human cultures and societies, whose noble animal nature we need to respect by increasing our knowledge every single day.

This encyclopaedia – the result of the huge efforts of a whole team – is first and foremost the humble reflection of knowledge acquired throughout the centuries in the discoveries, reflections and creations of hundreds of veterinarians, biologists, breeders, trainers and other professionals. It is also the demonstration that a company with unequalled knowledge and expertise is also aware of the need to constantly make that scientific and technical information available to the widest possible audience.

In this regard, the Royal Canin Group as a whole and all the teams that make it up deserve all the Respect they give to dogs every day.

Regardless of their level of knowledge, readers will find an answer to any question they – or their neighbour – may have about their favourite animal. They will discover a dog that is not a little person but a complex living being – different, understandable, a communicator in its own way and incomparably rewarding.

They will discover, perhaps surprisingly, that a little dog can save people's lives on search and rescue missions in what is nothing but a game for the dog, a way of spending quality time with its handler and getting a wonderful reward – a simple pet!

The dog is just a single species in the animal world, so calling this book *The Dog Encyclopaedia* is totally justified, but the canine species is so rich and diverse that it would perhaps have been better to call it *The Encyclopaedias of the Dogs!*

Be this as it may, we hope that readers enjoy discovering this book, which has been designed to share all the knowledge needed to understand dogs – and to dream of them.

Professor Dominique Grandjean



Franck Haymann,
a dog lover since 1975, wrote the first French-language book on the Briard in 1982 and worked freelance on various magazines (*Chiens de France*, *Chiens 2000*, *Vos Chiens Magazine*). In 1994 Franck published monographs on various breeds, including the Rottweiler, Poodle and Newfoundland. The following year he launched the *Cynomag*, a bimonthly magazine devoted to the breeding of purebred dogs, and was involved in

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