



The *German Shepherd*

*Best balance of
nutrients for
German Shepherds*



***Royal Canin Scientific Research:
Innovation in Health Nutrition***

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The German Shepherd:

No other breed has been such a part of the story of our company as the German Shepherd and every one of us feels an enduring rapport with this dog, the emblem of our brand from the very first day of our existence.

How could we forget that Royal Canin owes its birth in 1967 to Dr. Jean Cathary, who decided to perfect dry food to treat German Shepherds suffering from eczema?

Royal Canin was born.

A little later in 1980, thanks to the work on the articular specifics of German Shepherds led by Royal Canin Research Center Director Dr. Cloche, Royal Canin perfected the first food specially formulated for large-breed puppies.

AGR would be the big bang in nutrition, addressing for the first time ever the size parameter in the formulation of food. An advance that redefined the rules of nutritional science on a global scale.

So the perfection of our German Shepherd 24 food is much more than a simple launch or just another leg in the journey of our brand.

German Shepherd 24 is primarily a tribute to the German Shepherd, a breed of exceptional versatility and a personality, whose bravery and loyalty can never be adequately saluted.

at the heart of the Royal Canin story

We have once again pushed back the limits of knowledge of this exceptional dog, a wonderful companion and a lifesaver at one and the same time, in our quest to better understand its digestive, articular and immunology needs and then fulfill them.

As supreme homage to the German Shepherd, we have dedicated an encyclopedia to it, compiled under the authority of Umes (Unité de Médecine de l'Élevage and Sport de l'École Nationale Vétérinaire de Maisons-Alfort) and its founder, Professor Dominique Grandjean, expert and an eternal lover of German Shepherds.

For the first time this encyclopedia, already published in four languages and counting over 450 pages, brings together the wealth of knowledge on this fascinating breed.



1967: the German Shepherd was already present in this sketch of the Royal Canin logo.

Pascal Jouannet
Chief Executive Officer
Royal Canin Group

THE GERMAN SHEPHERD...

A dog of unequalled versatility

1 AN ESTABLISHED DIGESTIVE SENSITIVITY

**2 AN IMMUNE SYSTEM
PUT TO THE TEST EVERY DAY**

3 A SENSITIVE SKIN TO PROTECT

4 A BONE STRUCTURE UNDER GREAT STRESS

5 EATING BEHAVIOR
Higher requirements and distinct morphological traits

GERMAN SHEPHERD 24...

The nutritional response



1 Promoting maximum digestive security

- Improves digestion and absorption
 - Limits fermentative activity
 - Protects and nourishes the digestive mucus
 - Improves the consistency of stools
-



2 Reinforcing the natural defenses and combating oxidative stress

- Stimulates immune cells, thanks to the action of MOS
 - Reduces oxidative stress, thanks to an oxidative synergistic complex
-



3 Reinforcing the integrity of the skin barrier and nourishing the hair and the skin

- Protects the skin and nourishes the hair, thanks to an association of vitamins and amino acids
-



4 Protects articular capital

- Protects joints and slows down the gradual appearance of osteoarthritis, thanks to the synergistic action of chondroitin sulfate and glucosamine hydrochloride
 - Combats inflammatory mechanisms and oxidative injuries, thanks to omega 3 fatty acids (EPA and DHA)
-



5 A made-to-measure kibble

- Optimizes appetite
- Improves oral hygiene
- Helps prevent stomach torsion-distension

The history of the German Shepherd

More than a hundred years of loyalty and passion in millions of living rooms on the five continents. A few words in summary of the passionate history of the world's most popular utility dog: the German Shepherd.

At the end of the nineteenth century, sheepdogs, in the literal sense of the word, were used to shepherd flocks in various regions of Germany. They often had different colored hair, a different appearance and coat texture, but they did have some distinctive traits in common: robustness, rusticity and intelligence, which were favored in the selection of the future German Shepherd. As in the majority of European countries that needed one or several indigenous sheepdog breeds, some German amateur breeders were very interested in the situation of sheepdog breeds in their countries. This was the basis on which they selected the stock of the future German Shepherd. The empirical selection of the era was essentially based on the breeding stock's working aptitude; the other traits were considered to be of secondary importance.

The spark called Hector

The notion of genealogical selection did start to become accepted practice among breeders however. The first studbook saw the day in 1878, on the initiative of the Phylax Association. The aim of this association was to improve the morphological characteristics of the various shepherd dogs used in Germany. Unfortunately, this initiative broke down a few years later, as the selection criteria favored aesthetics rather than aptitude.

The torch was taken up by a military man, cavalry captain Max Emile Frederic Von Stephanitz, who launched a passionate mission, the selection of the German Shepherd dog. This man was a reputable breeder who is now considered to be the father of the breed, to which he dedicated 35 years of his life. He surrounded himself with such pioneers as Arthur Meyer, Otto Weber and Arnold Männer.

On a visit to a dog show in April 1899, he fell in love with a sheepdog that would inaugurate the German Shepherd studbook. The dog was called Hector Von Linksrheim and according to Stephanitz, it displayed all the qualities he was looking for.

A little while after the show he bought the dog, renaming it Horand Von Grafrath (this affix was the name of Stephanitz's kennel) and on April 22, 1899 he formed Verein für Deutsche Schäferhunde, the German Shepherd breeder's association better known by its initials, SV. The club quickly became the most powerful breeders association not only in Germany, but also the world.



1899:
*Hector Von Linksrheim
renamed Horand
Von Grafrath.*

Heading for utility

The definition of a German Shepherd dog in this era was clear. The German Shepherd is every sheepdog in Germany that, thanks to a constant exercise of its sheepdog qualities, achieves perfection in its body and its psyche, as part of its utilitarian function.

100 years later, more than two million German Shepherds are duly recorded in the SV's studbook, in Germany alone.

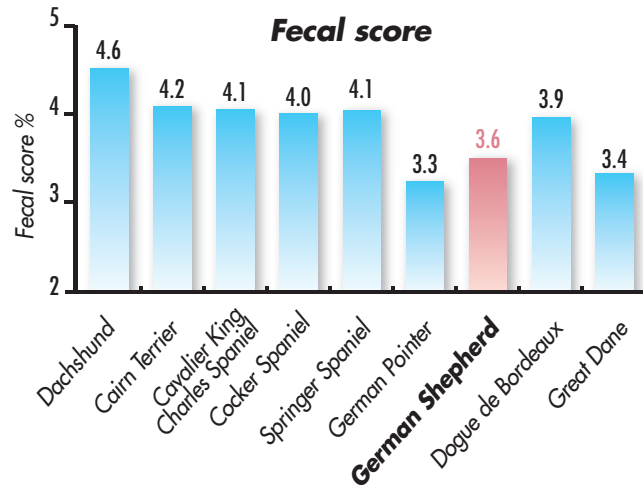
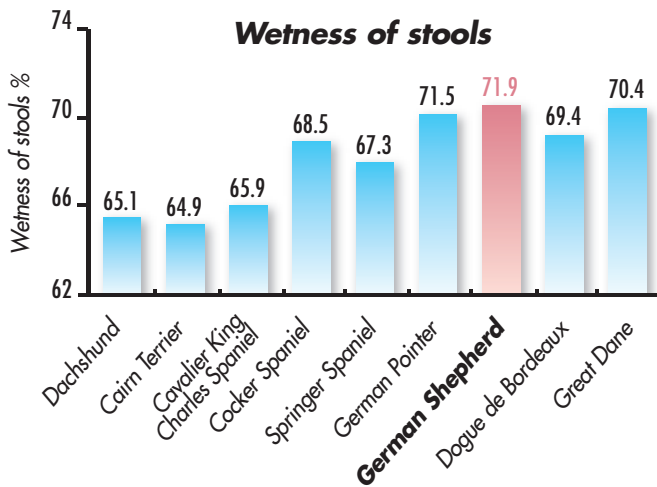


While the function and the premier vocation of the German Shepherd were guarding and shepherding the flocks, the reduction in the sheep population provoked the leading German breeders to find new openings for their sheepdogs. The potential was already present in the breed's principal stock, because from 1901, participation in police competitions permitted the development of these dogs' utilitarian potential. They rapidly established themselves in the various state services, including the army, the police and the fire service and built a reputation as the utilitarian breed.

Nowadays, the German Shepherd is the most prevalent breed in numerous countries, thanks in part to the selection realized by the pioneers of German breeding, who understood from the start that the future of the shepherd breed hung on the diversification of its utility. Nor should it be forgotten that a morphological and psychological evolution allowed these German Shepherds, which live on all five continents, to confer their "joie de vivre" on millions of homes each and every day.

1 An established digestive sensitivity

Empirical observations reported in recent scientific studies (Zentek and Meyer, 1995; Meyer et al, 1999; Weber et al, 2002 and 2003a) show a predisposition in large dogs to lower digestive tolerance (soft and solid stools) compared to small dogs on the same diet.



Average wetness values and scores for stools obtained during the past three years. The stools are graded on a scale from 1 (liquid stool) to 5 (dry and hard stool) according to their consistency. A fecal score of 4.0 is considered optimal (firm and solid stool). (Royal Canin Research Center 2000-2003).

The reason for this weak digestive tolerance in large dogs may be of an anatomic nature as suggested by the relative low weight of their digestive tract (2.7%) in comparison with that of small dogs (7%) (Meyer et al, 1993). An as yet undiscovered physiological reason may also exist.

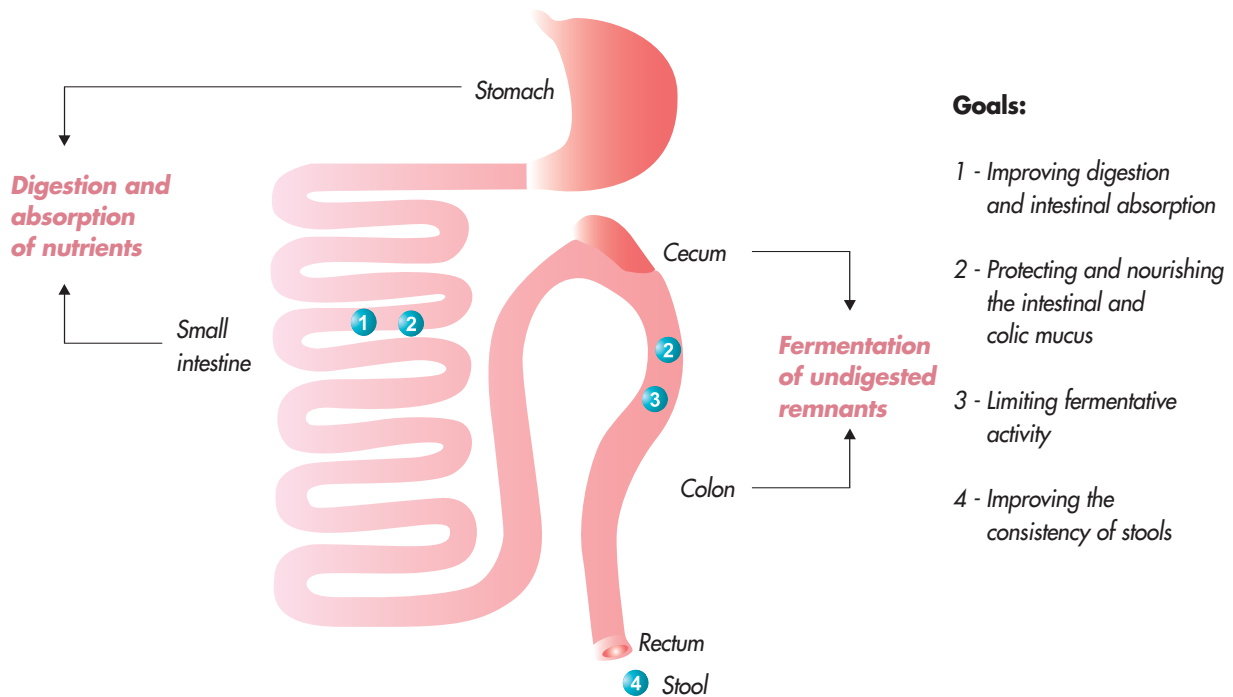
A higher intestinal permeability (Hall and Batt, 1990; Weber and al, 2002), a weaker digestive capacity (Zentek and Meyer, 1995) and greater fermentative activity among large dogs (Weber et al, 2003a and 2003b) are many factors that may explain their weaker digestive tolerance.

In addition to the undeniable “size” effect, the results also appear to be affected by breed.

In comparison with other breeds of similar size, the German Shepherd is among the breeds that display more significant digestive sensitivity – wetter stools and weaker fecal score (see opposite).

So it is important to ensure maximum digestive security among German Shepherds through nutrition.

Promoting maximum digestive security



PROMOTING MAXIMUM DIGESTIVE SECURITY

Objective 1: Improve digestion and absorption through hyper-digestible ingredients

The German Shepherd's digestive sensibility makes the incorporation of hyper-digestible ingredients in the formulation of the food absolutely vital to optimal digestion and absorption.

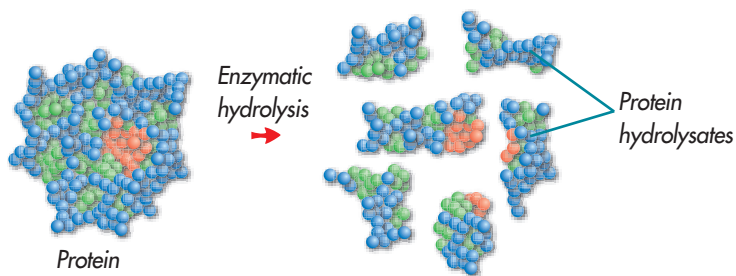
Utilizing highly digestible proteins

German Shepherd 24 contains very highly digestible proteins (>95%), generating less metabolic waste, as almost all of the proteins are digested. That means that the 24% hyper-digestible protein content helps cover the German Shepherd's nutritional needs optimally.

● Soy and poultry protein isolate

- very high organic value
- very high digestibility (96%)
- limits the flow of indigestible protein to the colon, reducing undesirable putrefaction and helping to maintain flora equilibrium

How to obtain protein hydrolysates



Protein isolate hydrolysates are achieved by enzymatic hydrolysis of the isolate. This operation is aimed at reducing the size of proteins (hydrolysates), thus improving their digestion. The digestibility of soy and poultry isolate hydrolysates is over 96%.

Utilizing highly absorbable energy

The high-energy concentration of **German Shepherd 24** means servings can be moderated, significantly reducing the load on stomach and intestine.



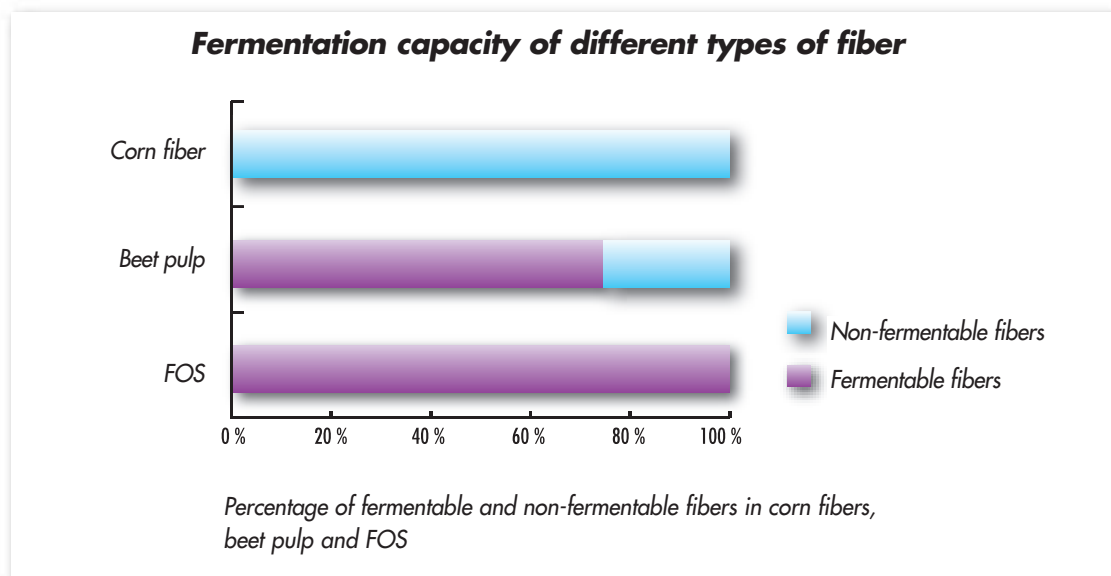
● Rice as a major source of starch

- highly digestible starch
- improves the digestibility of proteins, of fat and dry matter and limits the quantity of feces (Belay, 1997).

Objective 2: Limit fermentative activity

Strong fermentative activity can trigger an in-rush of water into the colon and a marked proliferation of microbes; two factors that lead to the excretion of watery feces. So it is essential to limit fermentative activity among German Shepherds.

- Hyper-digestible food reduces the quantity of non-digested remnants that enter the large intestine.
- Beet pulp, a fiber that is degraded by bacteria in the colon (75%), limits colic fermentation.

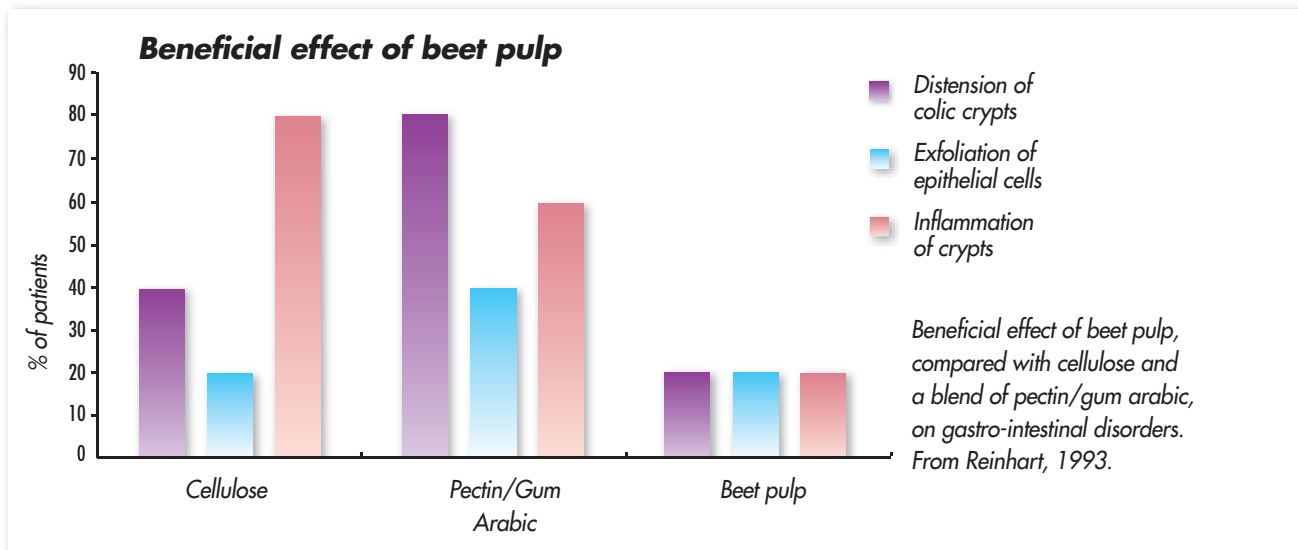


Source : Royal Canin, 2003

Objective 3: Protect and nourish the digestive mucus

● Incorporation of beet pulp

Beet pulp helps maintain healthy gastro-intestinal mucus (Reinhart, 1993).



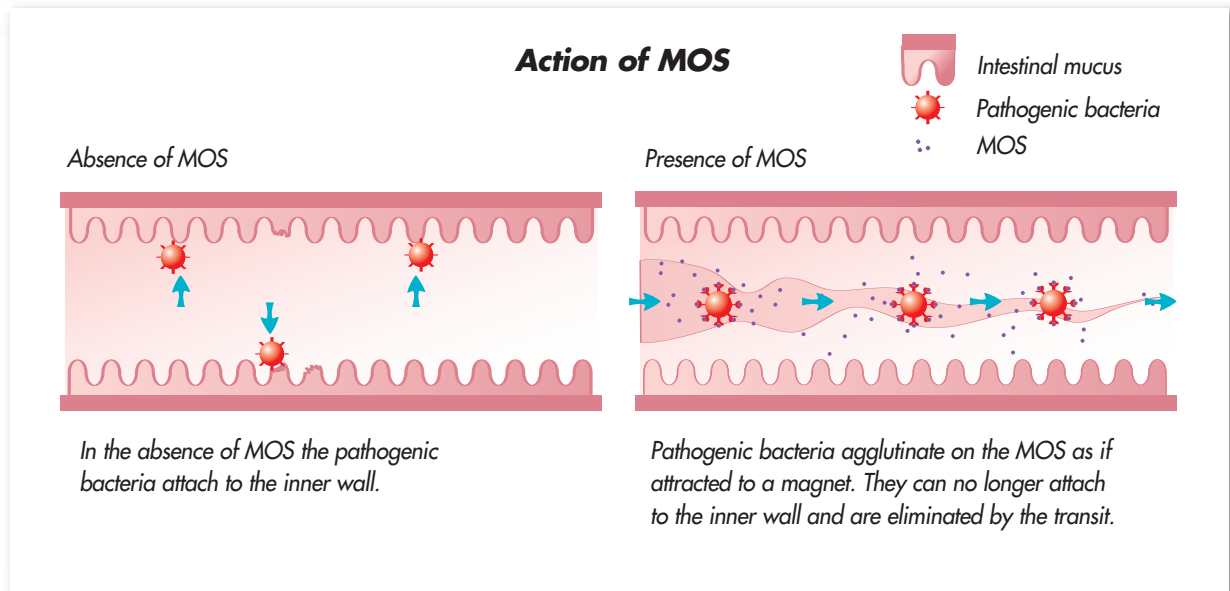
Beet pulp is also a substrate of choice for colic micro-flora, which degrades it into short-chain fatty acids (SCFA) (acetate, propionate and butyrate in the main).

- These SCFA, especially butyrate, are an important energy source for the colic cell (Roediger, 1980). They also have a beneficial effect on the digestive mucus (Sakata et al, 1987).
- SCFA reduce the colic pH (acidification of the contents of the intestine) to stimulate the growth of beneficial bacterial flora and inhibit the growth of pathogen strains (Kumemura et al, 1992).

● Incorporation of MOS (Mannan-oligosaccharides)

MOS belong to the category of non-fermentable fibers that, in their natural state, form the inner wall of yeast cells. They are composed of two sugars; glucose and mannose.

MOS help limit the development of potentially pathogenic bacteria by preventing them from attaching themselves to the intestinal mucus (Harmon, 1999). So pathogenic bacteria cannot physically reach or adhere to the intestinal cells and are evacuated in the stools.



- **Extra source of omega 3 fatty acids (EPA and DHA)**

The fatty acids EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) prevent excessive inflammatory reactions by the intestinal mucus (Reinhart and Davenport, 1995).

Objective 4: Improve stool consistency

The improvement of the consistency of stools is realized primarily by enhancing the water retaining capacity of the cecum and colon. It is important to incorporate indigestible compounds with a high water retaining capacity into the German Shepherd's food.

- **Incorporation of insoluble mineral salts**

Due to their porosity and their large exchange surface area, insoluble mineral salts enable the reduction of excess water present in the digestive tract and deal with certain toxins responsible for increased secretion of water.

- **Incorporation of purified cellulose**

Its high hygroscopic capacity enables it to retain up to 6 times its own weight in water. Additionally, this fiber, which is not degraded by the colic microflora, is absorbed intact in the stools to help improve the consistency of the feces (Wichert et al, 2002).



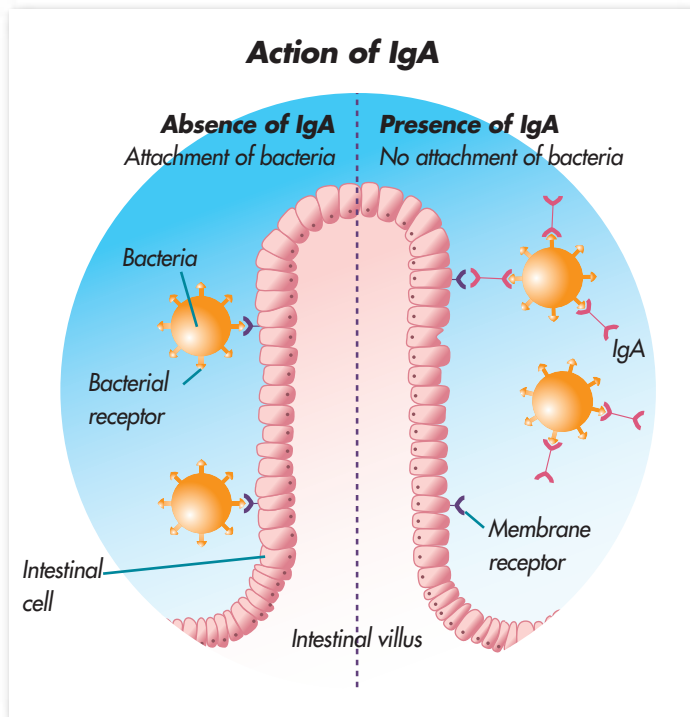
2 An immune system put to the test every day

The firm musculature of the German Shepherd makes him a utility dog par excellence, as a guide dog, rescue dog, police dog or defense dog, to name but a few. These varied chores put the immune system under severe pressure every day.

The German Shepherd is among the breeds showing a weak plasmatic concentration of immunoglobulin A (IgA) (Whitebread et al, 1984, Griot-Wenk et al, 1999), which increases the risk of infection.

IgA is an antibody specialized in the defense of mucus and the skin against infectious agents and is an essential ingredient of such secretions as saliva, tears and intestinal juices.

Taking account of the distinct immune characteristics of the German Shepherd, it is essential to utilize nutritional factors that help strengthen its natural defenses.



The essential role of IgA is to prevent pathogen agents from attaching themselves to cells, and specifically covering cells like digestive mucus (opposite) and the epidermis (outer layer of the skin).

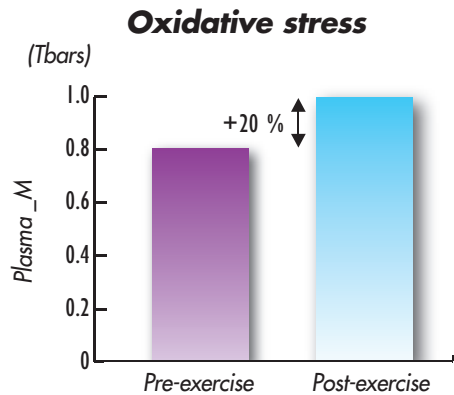
REINFORCING THE NATURAL DEFENSES

Incorporation of MOS (Mannan-oligosaccharides)

MOS stimulate the local defenses by increasing the antibody count, especially IgA, and the production of the white blood cells (neutrophils) responsible for general defense tasks (O'Carra, 1997).

● Oxidative stress and antioxidants

Additionally, when working for protracted periods, the German Shepherd builds up an antioxidant deficit, which makes it more vulnerable to damage caused by free radicals (oxidative stress) (Obra et al, 1999). It is essential to combat oxidative stress, in addition to stimulating the dog's immune system.



Effect of the exercise (20 min) on the peroxidation of lipids (oxidative stress indicator) in dogs. Obra et al, 1999



COMBATING OXIDATIVE STRESS

Antioxidant synergistic complex (vitamins E, C, taurine and lutein)

- **An extra source of Vitamin E**

which plays a major role in the protection of cellular membranes and strengthens immune defenses.

- **A source of Vitamin C**

which advances the regeneration of vitamin E and helps combat oxidative stress.

- **An extra source of Taurine**

a major constituent of immune cells, particularly cells producing antibodies (lymphocytes). Taurine also plays a significant role in the prevention of cardiac diseases (especially cardiomyopathy).

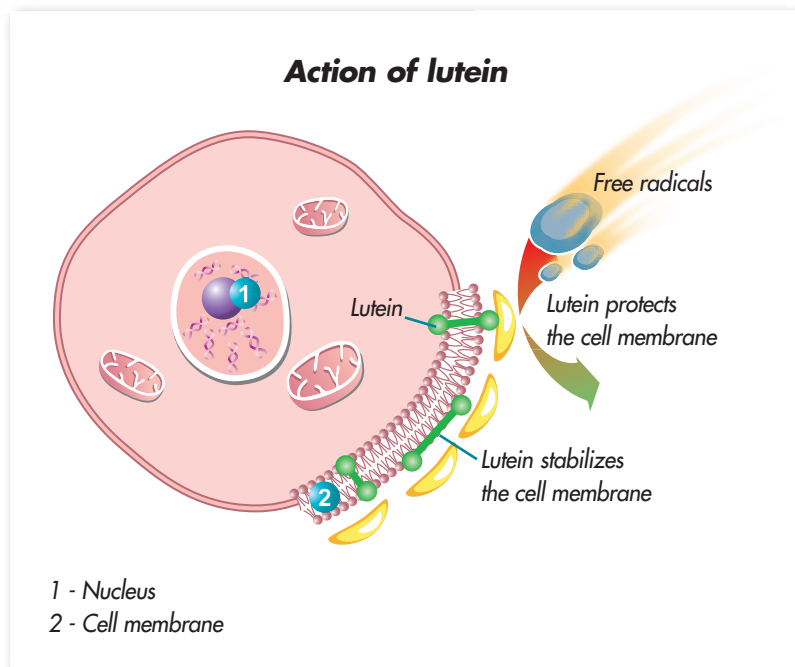
- **A source of Lutein**



Lutein is a vegetable extract derived from the petals of the African marigold (Tagetes Erecta)

Lutein fulfills two essential functions:

- It protects against free radicals. Lutein protects the lipids of the cell membrane, thus combating lipid peroxidation.
- It stabilizes cell membranes into which it incorporates and modulates the immune response by driving up the production of antibodies (Reinhart, 2000).



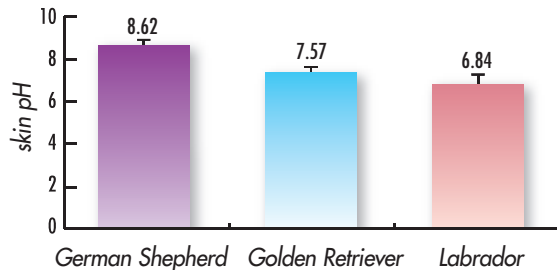
3 Protecting sensitive skin

The dog's skin pH is one of the highest among mammals (an average of 7.4).

Species of mammal	Average skin pH
Man	4.8
Guinea-pig	5.5
Pig	6.3
Horse	6.3
Cat	6.4
Rat	6.5
Dog	7.4
Goat	8.1

Average skin pH values reported for various species of mammal. (Matousek and Campbell, 2002).

Effect of the breed on skin pH



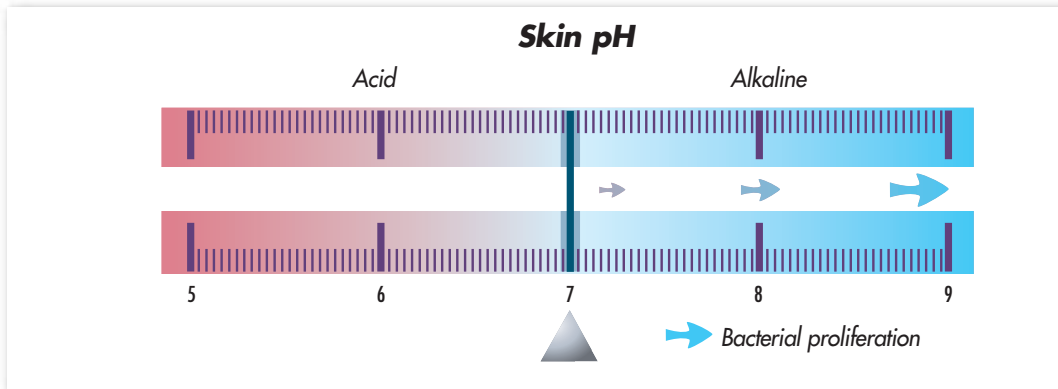
Measures taken on 18 German Shepherds, 6 Golden Retrievers and 15 Labradors. From Weber M, 2003, Royal Canin Research Center and breeder network.

Among the canine race, the skin pH varies according to breed.

A protocol was perfected by the Royal Canin Research Center to measure the alkaline pH of the German Shepherd and compare it with other breeds.

These results show that the German Shepherd possesses a much more alkaline skin than the Golden Retriever or the Labrador.

Many researchers agree that an alkaline skin is more conducive to bacterial proliferation than an acidic skin (Chikakane and Takahashi, 1995; Matousek and Campbell, 2002).



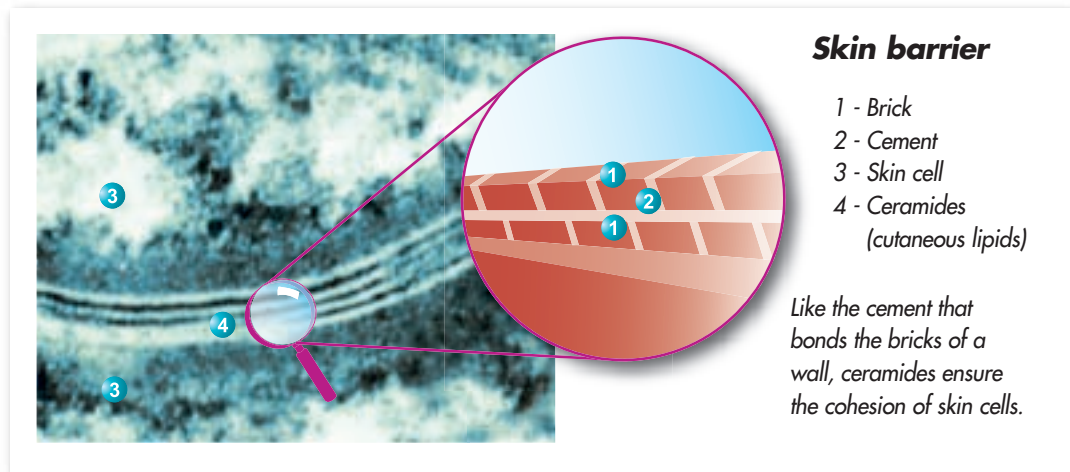
The relative deficiency in IgA (Immunoglobulin A) and the high alkalinity of its skin can explain the German Shepherd's sensitivity to bacterial skin diseases, such as pyoderma (Denerolle et al, 1998).

So it is essential to reinforce the integrity of the skin barrier, while nourishing the hair and preserving its natural beauty through nutrition.



REINFORCING THE INTEGRITY OF THE SKIN BARRIER

The epidermis forms a barrier that limits water loss by the body and prevents penetration by allergens. This barrier role is made possible by ceramides, which are lipids that form “cement” that bonds the epidermis cells.

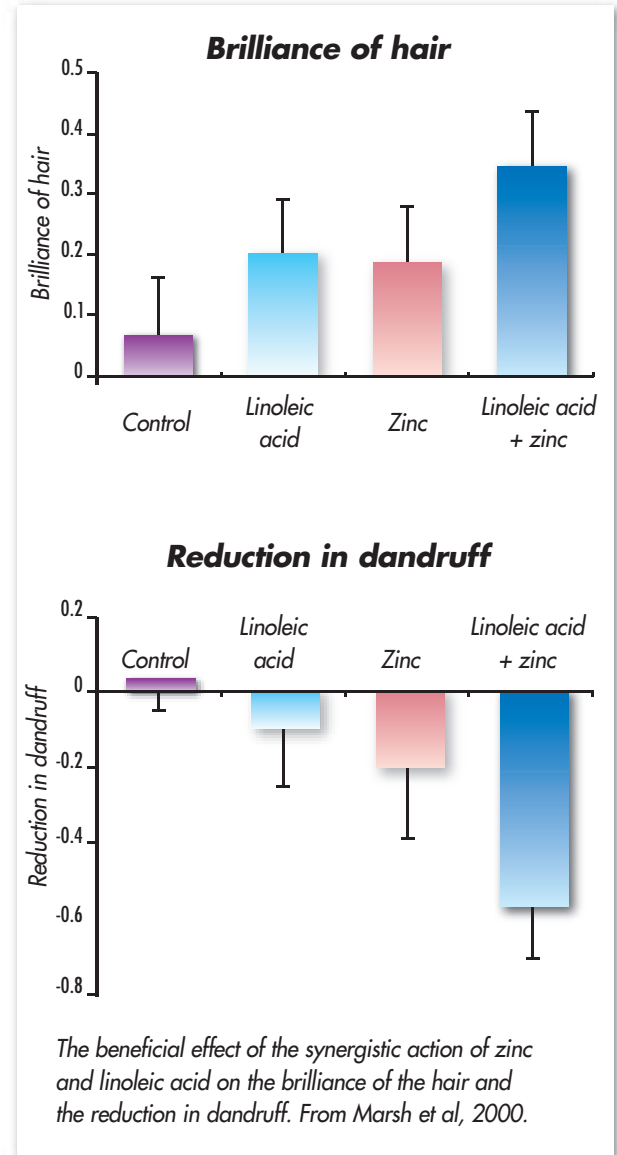


● Vitamins/amino acid synergistic association

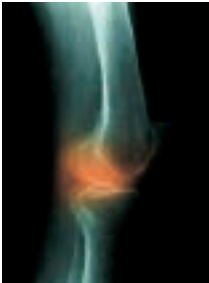
The synergistic action of a supply of various vitamins (pyridoxine and pantothenic acid, inositol, nicotinamide, choline) and amino acids (proline and histidine) augments the synthesis of ceramides, which helps limit water loss and prevent the penetration by bacteria or any allergens (pollen, dust mites) (Tim Fray, 2002, Waltham Center for Pet Nutrition).

NOURISHING THE HAIR AND SKIN

- **German Shepherd 24 is a source of γ -Linolenic acid**, an Omega-6 fatty acid provided by borage oil that improves the health of the hair and the quality of the skin.
- **German Shepherd 24 is a source of Zinc** (250 mg/kg), a crucial element in the synthesis of collagen and of keratin, which are essential for epidermal regeneration and cicatrisation. In the event of a deficiency, hair becomes dull and greyish.
- **German Shepherd 24 is a source of Linoleic acid.** The synergistic action of this acid and zinc assures a brilliant coat of hair and less dandruff (Marsh, 2000) (see opposite).
- **An extra source of vitamin A (vitamin for the epithelium)** (22000 IU/kg)
Vitamin A helps combat seborrhea and plays a key role in the regeneration of the skin (growth and proliferation of epidermal cells) (Miller, 1986; Scott, 1986).
- **An extra source of Biotin (vitamin H)** (3 mg/kg)
The extra source of Biotin, often called vitamin H (from the German word "Haut" for skin), helps combat dehydration of the skin, hair loss and the formation of dandruff (Marsh and Watson, 1999).
- **Incorporation of selenium**
An essential mineral for maintaining and growing tissue that helps protect cell membranes in interaction with vitamin E.



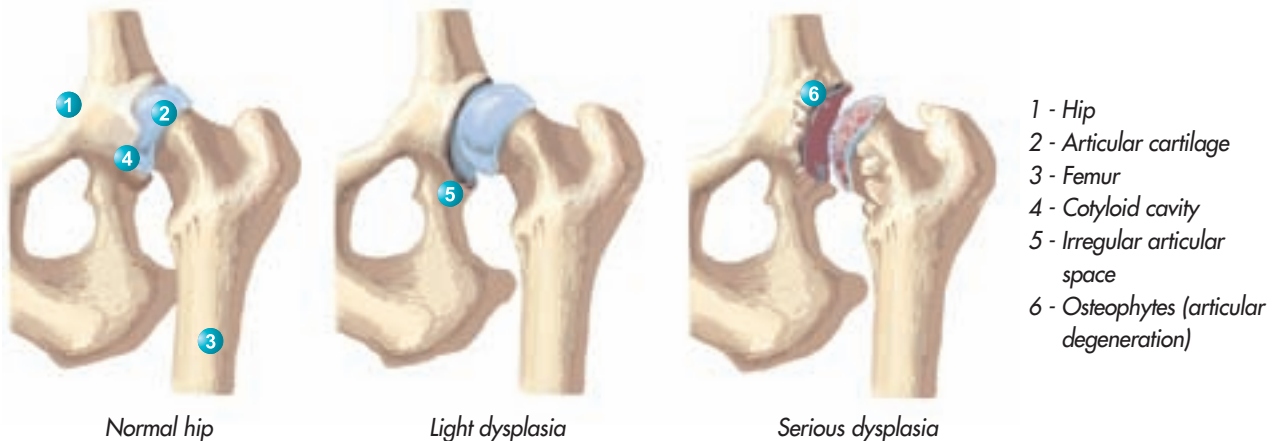
4 A bone structure under great daily stress



The German Shepherd's exceptional morphology enables it to perform as well in its work or walking with its master, as in the most diverse and most demanding of sporting disciplines: ring, Mondioring, drug and bomb detection, protection, and search & rescue. That means that the joints of this versatile dog are put under great stress.

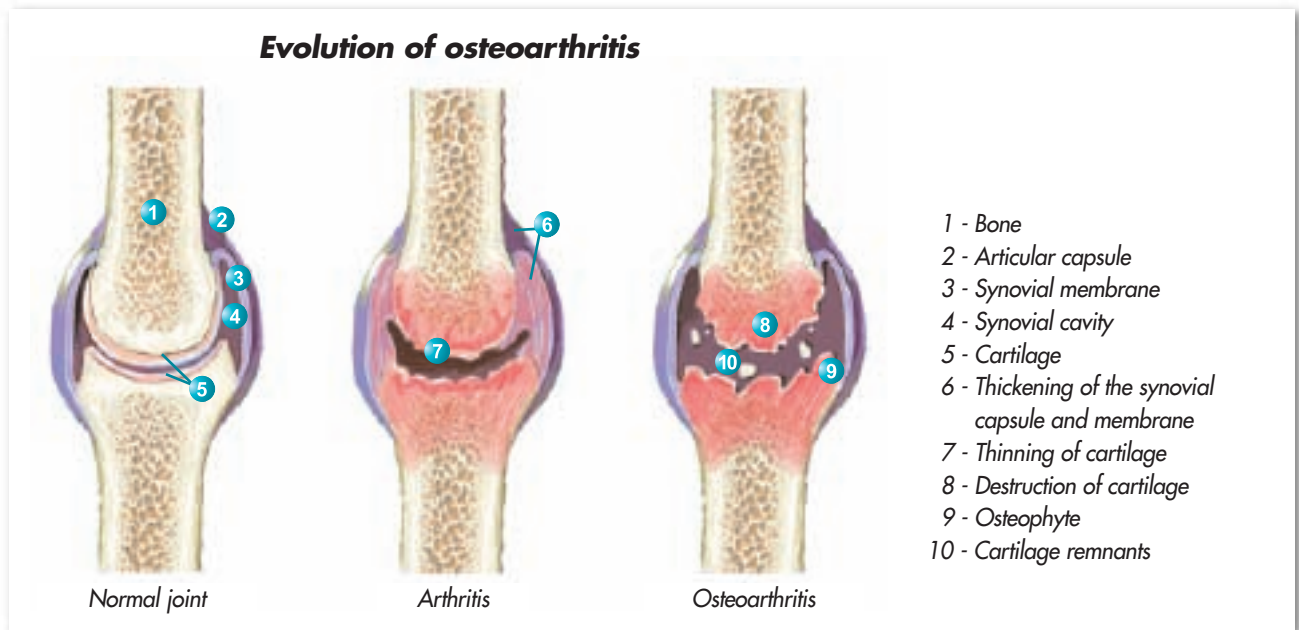
Hip, elbow and knee dysplasia, cauda equina and articular osteochondroses are unfortunately not rare in this sporting dog (Lafond et al, 2002).

Evolution of hip dysplasia



Dysplasia is characterized by the abnormal development of the coxofemoral joint, which leads to poor imbrication of the head of the femur in the hip's cotyloid cavity as well as the appearance of osteoarthritis.

In time, the dog's cartilage will be damaged and this wear and tear may gradually give way to osteoarthritis as the dog grows older.



It is essential to help prevent joint complaints and associated inflammatory mechanisms through nutrition.

PROTECTS ARTICULAR CAPITAL

Objective 1: Protect joints and prevent or slow down osteoarthritis

- **An extra source of chondroitin sulfate and glucosamine hydrochloride**
(1000 mg/kg combined)

The combined action of these two nutrients helps stimulate the regeneration of articular cartilage and slow down cartilage degeneration (Lipiello et al, 1998).

- **Chondroitin sulfate** inhibits the action of enzymes that cause the destruction of cartilage. It also possesses a high water retaining capacity, enabling proper hydration of the cartilage.
- **Glucosamine hydrochloride** (precursor of glycosaminoglycans, the principal constituents of articular cartilage) stimulates the regeneration of cartilage (especially promoting the synthesis of collagen).

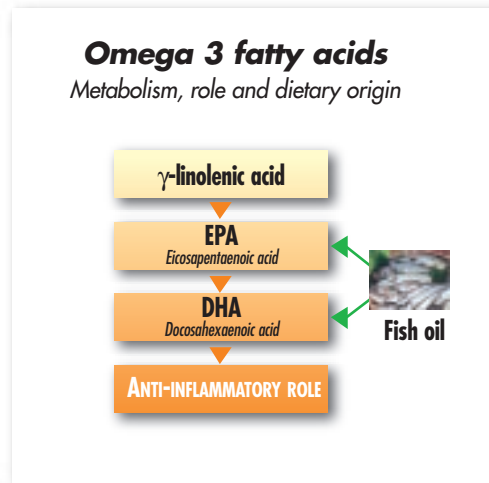
- **Incorporation of manganese**

- **Manganese**, a trace mineral element, contributes to the synthesis of procollagen, a precursor of collagen, which makes up the cartilage fibers.

Objective 2: Combat inflammatory mechanisms

- An extra source of Omega 3 fatty acids (EPA and DHA) (0.4%)

The fatty acids EPA and DHA, essentially found in fish oils, possess anti-inflammatory properties. They activate the production of anti-inflammatory mediators and inhibit the synthesis of some inflammation mediators (Freeman, 1999).



5 A tailor-made kibble

Objective 1: Guarantee optimal appetite



Whether a search & rescue dog, an explosive or drug sniffer dog, an avalanche dog or a dog that works to find people in collapsed buildings, the German Shepherd has little competition when it comes to olfaction sensitivity. Born with an exceptional olfactory acuity, this supreme tracker is able to detect up to 500,000 different odors, compared with the mere 4,000 that humans can distinguish.

This faculty may be clarified by the difference in the nasal mucus surface area. It is 200 cm² in the German Shepherd with 200 million olfactory cells, while it stretches only 125 cm² in the Fox Terrier and 67 cm² in the Cocker Spaniel (Vadurel, 1997).

The dog's exceptional nose makes guaranteed optimal appetite of the food essential to satisfy the dog's very high demands as well as possible.

Influence of the breed on olfaction sensitivity among dogs

Number of receptor cells (in millions) among Dachshunds, Fox Terriers, Bulldogs and German Shepherds. From Lecomte, 1979.








● Appetence without equal

German Shepherd 24 is formulated with premium quality ingredients and exclusive aromas, based on a secret recipe. In many trials conducted at the Royal Canin kennel, **German Shepherd 24** has been tested by a wide panel of expert breeders.

More than 1,100 trials have been conducted based on a sliding scale of approval and criteria perfected in association with the breeders. **German Shepherd 24** attained the top mark (5/5).

Appetence scores

- 1  **very poor:** the dog refuses the food
- 2  **poor:** the dog circles the bowl and eats
- 3  **average:** the dog eats, but absent-mindedly
- 4  **good:** the dog eats normally
- 5  **very good:** the dog eats with gusto without turning away from its bowl

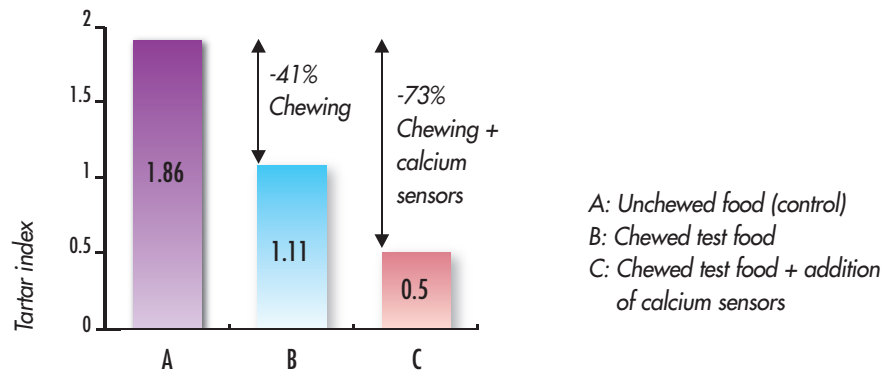
● Royal Canin Innovation: Nitrogen-Flushed packaging

All bags up to 20 pounds of **German Shepherd 24** are conditioned under a controlled atmosphere using a technology used widely to pack human food, which replaces oxygen with an inert gas that thoroughly combats the natural oxidation of food, thus preserving all of its organoleptic qualities and all its aromas.

Objective 2: Improve oral hygiene

The dog's teeth are brushed mechanically as it chews **German Shepherd 24**, which helps limit the accumulation of tartar. This effect is reinforced by the presence of chelating agents of calcium, sensors which render calcium unavailable for the mineralization of dental plaque and so the formation of tartar (Soulard and Servet, Royal Canin Research Center, 2002).

The effect of chewing the kibble and the addition of calcium sensors on the tartar index

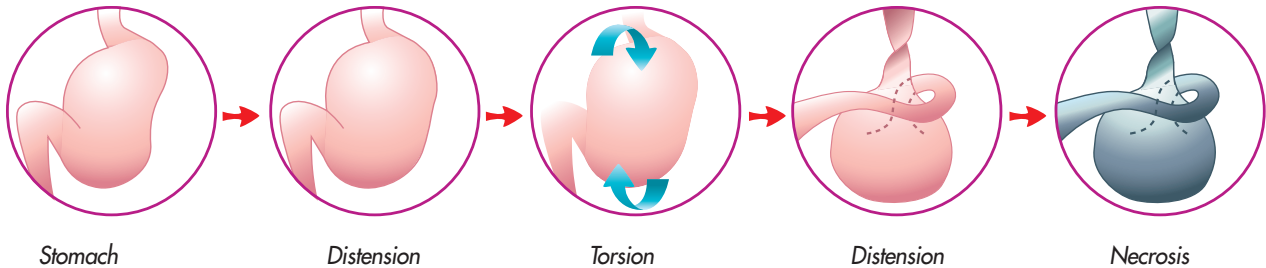


Encouraging the dog to chew its food reduces the tartar index by 41%. Extra incorporation of calcium sensors reduces the index by 73%. From Soulard Y and Servet E, 2002. Royal Canin Research Center, 28-day trial.

Objective 3: Help to prevent distension and/or torsion

After a meal, the stomach can achieve a volume of 1 gallon in a 33 lb. dog and up to about 2 gallons in a large breed dog. This predisposition to distension, associated to a relative laxity of the stomach's means of attachment to the abdomen, means that the dog is predisposed to bloat, or gastric dilatation volvulus syndrome. This complaint is fatal in 30% of cases.

Evolution of stomach torsion/distension

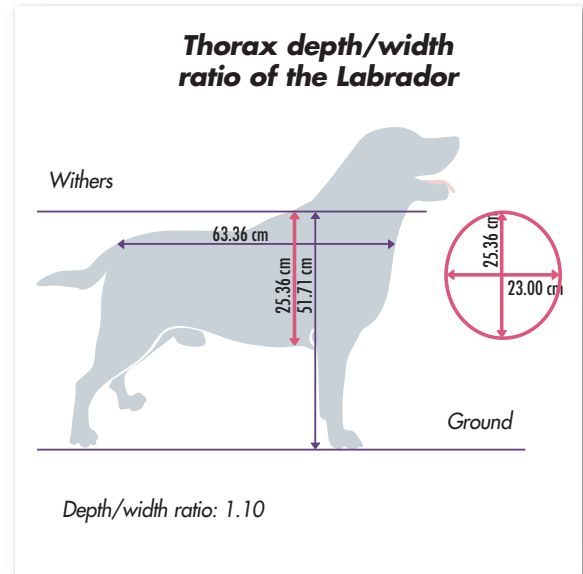
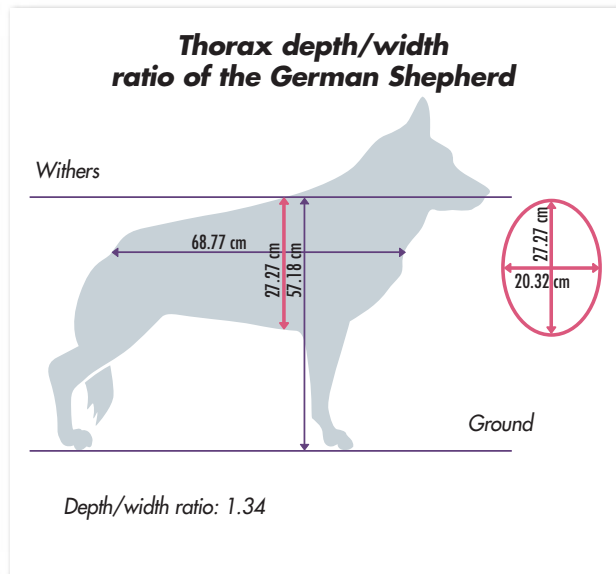


● **There are several factors that heighten the risk of stomach torsion/distension:**

- **Size:** heightened risk in large and giant-breed dogs (Glickman, 1994)
- **Age:** heightened risk in animals over two years old (Glickman, 1994)
- **Sex:** heightened risk in males (Glickman, 1997; Bright, 2003)
- **Quantity of food ingested:** heightened risk in the event of ingestion of a large quantity of food (Glickman, 1997)
- **Speed of ingestion:** heightened risk in the event of fast ingestion (Glickman, 1997)
- **Stress:** heightened risk in the event of stress (Glickman, 1997)

Another significant risk factor that also needs to be considered is **the breed**.

Breeds with a higher ribcage depth/width ratio, like the Great Dane or, to a lesser degree, the German Shepherd, appear to be more at risk of developing this complaint than other dogs.



Owing to its conformation the German Shepherd displays a much greater ribcage depth/width ratio than the Labrador or the Golden Retriever, which puts it at greater risk of developing stomach distension.

Measurements from 11 German Shepherds and 7 Labradors. From Mercier L, 2002, Royal Canin Research Center.

The elaboration of the **German Shepherd 24** kibble is the result of a great many trials at kennels.

Ten prototypes were tested. The animals' physical and physiological reactions, the time they took to eat and the effects on digestion were recorded in true-to-life conditions.

The cross-shaped **German Shepherd 24** kibble came through the various stages of development with success. Its shape and dimension encourage the animal to chew.



Actual size: 15x15 mm

A NUTRITIONAL PROGRAM FOR EVERY STAGE OF THE GERMAN SHEPHERD'S LIFE

5-15*
months

GROWTH PHASE

MAXI puppy



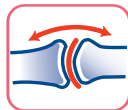
Health nutrition for large-breed puppies.



Your large breed puppy's immune system requires firm support during the first year of life, as it gradually loses the immunity transmitted by its mother. Nutrients such as mannan-oligosaccharides and antioxidants such as Vitamins E & C, taurine and lutein help stimulate the production of antibodies and build the immune system of your puppy.



Proper development of the brain and other vital functions are critical in the puppy. EPA and DHA from fish oil continue to promote healthy development of your puppy's brain and nervous system as well as motor skills and sensory perception.



Even at an early age, it is important to consider the joint health of your large breed puppy. The addition of glucosamine (780 mg/kg) and Chondroitin (220 mg/kg) contributes to healthy joints in the puppy. Omega 3 essential fatty acids from anchovy oil help to limit inflammation of the joints.



The digestive abilities of the puppy develop with age. But even as their system matures, digestive capacity is still not fully developed. MAXI Large Breed Puppy 32 incorporates LIP (Low Indigestible Protein) from egg powder, prebiotics and psyllium, contributing to an extremely digestible product for the still sensitive digestive system of your large breed puppy.



A perfect source of everything they need while they are growing.

*Royal Canin recommends starting your German Shepherd puppy on **MAXI Puppy 32** at five months of age.

from
15
months

ADULT AND MATURE PHASE

GERMAN SHEPHERD 24

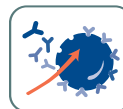
Health nutrition exclusively formulated for the German Shepherd, taking into account its digestive sensitivity, reinforcement of natural defenses, protection of the skin and articular capital.



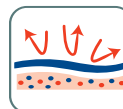
L.I.P.s (limited indigestible proteins) are exclusive to Royal Canin. LIP are proteins with a digestibility of at least 95%, which translates to easier nutrient assimilation in the body, promoting greatly improved digestion for the German Shepherd. The German Shepherd has a notably fragile digestive system, which often leads to soft stools and frequent digestive upset. MAXI German Shepherd 24 contains Soy Protein Isolate (L.I.P.), Egg Powder (L.I.P.), Sodium Silico Aluminate and Beet Pulp to promote optimal digestion.



The unique shape, and size of the MAXI German Shepherd 24 kibble helps to slow down ingestion and encourages your German Shepherd to chew, promoting better digestion with less gas and diarrhea. Slower ingestion may also help to prevent bloat.



The German Shepherd's activity level and athletic temperament put their immune system under daily stress. MOS (mannan-oligosaccharides) help to build the German Shepherd's natural defenses by stimulating the production of antibodies. High levels of antioxidants such as Vitamins E (600 IU/kg) & C (300 mg/kg), lutein and taurine help to reinforce the German Shepherd's immune system.



German Shepherds have one of the most alkaline skin of all breeds, leaving them very susceptible to outside pathogens. A synergistic complex of vitamins and amino acids, Folic Acid, chelated Zinc and chelated Copper helps to build and protect the skin barrier. The addition of L-tyrosine helps enhance the natural beauty of your German Shepherd's coat.

From the tips of its toes ...

First accepted in 1899, the official German Shepherd standard has just turned 100, with a few modifications down the years.

General Appearance

The first impression of a good German Shepherd Dog is that of a strong, agile, well muscled animal, alert and full of life. It is well balanced, with harmonious development of the forequarter and hindquarter. The dog is longer than tall, deep-bodied, and presents an outline of smooth curves rather than angles. It looks substantial and not spindly, giving the impression, both at rest and in motion, of muscular fitness and nimbleness without any look of clumsiness or soft living. The ideal dog is stamped with a look of quality and nobility--difficult to define, but unmistakable when present. Secondary sex characteristics are strongly marked, and every animal gives a definite impression of masculinity or femininity, according to its sex.

Temperament

The breed has a distinct personality marked by direct and fearless, but not hostile, expression, self-confidence and a certain aloofness that does not lend itself to immediate and indiscriminate friendships. The dog must be approachable, quietly standing its ground and showing confidence and willingness to meet overtures without itself making them. It is poised, but when the occasion demands, eager and alert; both fit and willing to serve in its capacity as companion, watchdog, blind leader, herding dog, or guardian, whichever the circumstances may demand. The dog must not be timid, shrinking behind its master or handler; it should not be nervous, looking about or upward with anxious expression or showing nervous reactions, such as tucking of tail, to strange sounds or sights. Lack of confidence under any surroundings is not typical of good character. Any of the above deficiencies in character which indicate shyness must be penalized as very serious faults and any dog exhibiting pronounced indications of these must be excused from the ring. It must be possible for the judge to observe the teeth and to determine that both testicles are descended. Any dog that attempts to bite the judge must be disqualified. The ideal dog is a working animal with an incorruptible character combined with body and gait suitable for the arduous work that constitutes its primary purpose.

Size, Proportion, Substance

The desired height for males at the top of the highest point of the shoulder blade is 24 to 26 inches; and for bitches, 22 to 24 inches.

The German Shepherd Dog is longer than tall, with the most desirable proportion as 10 to 8. The length is measured from the point of the prosternum or breastbone to the rear edge of the pelvis, the ischial tuberosity. The desirable long proportion is not derived from a long back, but from overall length with relation to height, which is achieved by length of forequarter and length of withers and hindquarter, viewed from the side.

Head

The head is noble, cleanly chiseled, strong without coarseness, but above all not fine, and in proportion to the body. The head of the male is distinctly masculine, and that of the bitch distinctly feminine.

The expression keen, intelligent and composed. Eyes of medium size, almond shaped, set a little obliquely and not protruding. The color is as dark as possible. Ears are moderately pointed, in proportion to the skull, open toward the front, and carried erect when at attention, the ideal carriage being one in which the center lines of the ears, viewed from the front, are parallel to each other and perpendicular to the ground. A dog with cropped or hanging ears must be disqualified.

Seen from the front the forehead is only moderately arched, and the skull slopes into the long, wedge-shaped muzzle without abrupt stop. The muzzle is long and strong, and its topline is parallel to the topline of the skull. Nose black. A dog with a nose that is not predominantly black must be disqualified. The lips are firmly fitted. Jaws are strongly developed. Teeth -- 42 in number--20 upper and 22 lower--are strongly developed and meet in a scissors bite in which part of the inner surface of the upper incisors meet and engage part of the outer surface of the lower incisors. An overshot jaw or a level bite is undesirable. An undershot jaw is a disqualifying fault. Complete dentition is to be preferred. Any missing teeth other than first premolars is a serious fault.

Neck, Topline, Body

The neck is strong and muscular, clean-cut and relatively long, proportionate in size to the head and without loose folds of skin. When the dog is at attention or excited, the head is raised and the neck carried high; otherwise typical carriage of the head is forward rather than up and but little higher than the top of the shoulders, particularly in motion.

Topline-- The withers are higher than and sloping into the level back. The back is straight, very strongly developed without sag or roach, and relatively short.

The whole structure of the body gives an impression of depth and solidity without bulkiness.

Chest--Commencing at the prosternum, it is well filled and carried well down between the legs. It is deep and capacious, never shallow, with ample room for lungs and heart, carried well forward, with the prosternum showing ahead of the shoulder in profile. Ribs well sprung and long, neither barrel-shaped nor too flat, and carried down to a sternum which reaches to the elbows. Correct ribbing allows the elbows to move back freely when the dog is at a trot. Too round causes interference and throws the elbows out; too flat or short causes pinched elbows. Ribbing is carried well back so that the loin is relatively short. Abdomen firmly held and not paunchy. The bottom line is only moderately tucked up in the loin.

Loin Viewed from the top, broad and strong. Undue length between the last rib and the thigh, when viewed from the side, is undesirable. Croup long and gradually sloping.

Tail bushy, with the last vertebra extended at least to the hock joint. It is set

... to the tip of its nose

smoothly into the croup and low rather than high. At rest, the tail hangs in a slight curve like a saber. A slight hook- sometimes carried to one side- is faulty only to the extent that it mars general appearance. When the dog is excited or in motion, the curve is accentuated and the tail raised, but it should never be curled forward beyond a vertical line. Tails too short, or with clumpy ends due to ankylosis, are serious faults. A dog with a docked tail must be disqualified.

Forequarters

The shoulder blades are long and obliquely angled, laid on flat and not placed forward. The upper arm joins the shoulder blade at about a right angle. Both the upper arm and the shoulder blade are well muscled. The forelegs, viewed from all sides, are straight and the bone oval rather than round. The pasterns are strong and springy and angulated at approximately a 25-degree angle from the vertical. Dewclaws on the forelegs may be removed, but are normally left on.

The feet are short, compact with toes well arched, pads thick and firm, nails short and dark.

Hindquarters

The whole assembly of the thigh, viewed from the side, is broad, with both upper and lower thigh well muscled, forming as nearly as possible a right angle. The upper thigh bone parallels the shoulder blade while the lower thigh bone parallels the upper arm. The metatarsus (the unit between the hock joint and the foot) is short, strong and tightly articulated. The dewclaws, if any, should be removed from the hind legs. Feet as in front.

Coat

The ideal dog has a double coat of medium length. The outer coat should be as dense as possible, hair straight, harsh and lying close to the body. A slightly wavy outer coat, often of wiry texture, is permissible. The head, including the inner ear and foreface, and the legs and paws are covered with short hair, and the neck with longer and thicker hair. The rear of the forelegs and hind legs has somewhat longer hair extending to the pastern and hock, respectively. Faults in coat include soft, silky, too long outer coat, woolly, curly, and open coat.

Color

The German Shepherd Dog varies in color, and most colors are permissible. Strong rich colors are preferred. Pale, washed-out colors and blues or livers are serious faults. A white dog must be disqualified.

Gait

A German Shepherd Dog is a trotting dog, and its structure has been developed to meet the requirements of its work. General Impression-- The gait is outreaching, elastic, seemingly without effort, smooth and rhythmic, covering the maximum amount of ground with the minimum number of steps. At a walk it covers a great deal of ground, with long stride of both

hind legs and forelegs. At a trot the dog covers still more ground with even longer stride, and moves powerfully but easily, with coordination and balance so that the gait appears to be the steady motion of a well-lubricated machine. The feet travel close to the ground on both forward reach and backward push. In order to achieve ideal movement of this kind, there must be good muscular development and ligamentation. The hindquarters deliver, through the back, a powerful forward thrust which slightly lifts the whole animal and drives the body forward. Reaching far under, and passing the imprint left by the front foot, the hind foot takes hold of the ground; then hock, stifle and upper thigh come into play and sweep back, the stroke of the hind leg finishing with the foot still close to the ground in a smooth follow-through. The overreach of the hindquarter usually necessitates one hind foot passing outside and the other hind foot passing inside the track of the forefeet, and such action is not faulty unless the locomotion is crabwise with the dog's body sideways out of the normal straight line.

Transmission - The typical smooth, flowing gait is maintained with great strength and firmness of back. The whole effort of the hindquarter is transmitted to the forequarter through the loin, back and withers. At full trot, the back must remain firm and level without sway, roll, whip or roach. Unlevel topline with withers lower than the hip is a fault. To compensate for the forward motion imparted by the hindquarters, the shoulder should open to its full extent. The forelegs should reach out close to the ground in a long stride in harmony with that of the hindquarters. The dog does not track on widely separated parallel lines, but brings the feet inward toward the middle line of the body when trotting, in order to maintain balance. The feet track closely but do not strike or cross over. Viewed from the front, the front legs function from the shoulder joint to the pad in a straight line. Viewed from the rear, the hind legs function from the hip joint to the pad in a straight line. Faults of gait, whether from front, rear or side, are to be considered very serious faults.

Disqualifications

Cropped or hanging ears.

Docked tail.

Dogs with noses not predominantly black.

White dogs.

Undershot jaw.

Any dog that attempts to bite the judge.

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www.akc.org/breeds/german_shepherd_dog/

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Scientific references

Digestion

1. **Belay T, Shields RG, et al.** Evaluation of nutrient digestibility and stool quality of rice (*Oriza sativa*) based canine diets. *Vet Clin Nutr* 1997; 4:122-129.
2. **Bright RM.** New perspectives on gastric dilatation volvulus. *BSAVA* 2003; 413-415
3. **Glickman LT, Glickman NW, et al.** Analysis of risk factors for gastric dilatation and dilatation-volvulus in dogs. *J Am Vet Med Assoc.* 1994 May 1; 204(9): 1465-71.
4. **Glickman LT, Glickman NW, et al.** Multiple risk factors for the gastric dilatation-volvulus syndrome in dogs: a practitioner/owner case-control study. *J Am Anim Hosp Assoc* 1997; 33: 197-204.
5. **Hall EJ et Batt RM.** Enhanced intestinal permeability to ⁵¹Cr-labeled EDTA in dogs with small intestinal disease. *J Am Vet Med Assoc* 1990; 196: 91-95.
6. **Harmon D.** Incidence of dietary inclusion of Mannanligosaccharide on diet component digestibility and intestinal bacteria. University of Kentucky, Lexington, USA, 1999.
7. **Kumemura M, Hashimoto F et al.** Effects of administration of 4G-b-D-galactosylsucrose on fecal microflora putrefactive products, short chain fatty acids, weight, moisture and pH, and subjective sensation of defecation in the elderly with constipation. *J Clin Bioch Nutr* 1992; 13: 199-210.
8. **Meyer H, Kienzle E, et al.** Body size and relative weights of gastrointestinal tract and liver in dogs. *J Vet Nutr* 1993; 2: 31-35.
9. **Meyer H, Zentek J, et al.** Digestibility and compatibility of mixed diets and faecal consistency in different breeds of dog. *Zentralbl Veterinarmed* 1999; 46: 155-165.

Immunity

10. **Reinhart GA, Davenport GM.** Omega 3 fatty acids and inflammation management. North American Veterinary Conference, Orlando, Florida 1995.
11. **Reinhart GA.** Dietary fiber source and its effects on colonic microstructure and histopathology of Beagle dogs. *Waltham international symposium* 1993; 79.
12. **Roediger WE.** Role of anaerobic bacteria in the metabolic welfare of the colonic mucosa in man. *Gut* 1980; 21: 793-8.
13. **Sakata T.** Stimulatory effect of short-chain fatty acids on epithelial cell proliferation in the rat intestine: a possible explanation for trophic effects of fermentable fiber, gut microbes and luminal trophic factors. *Br J Nutr* 1987; 58: 95-103.
14. **Weber M, Martin L, et al.** Influence of age and body size on intestinal permeability and absorption in healthy dogs. *Am J Vet Res* 2002; 63:1323-1328.
15. **Weber M, Martin L, et al.** Influence of age and body size on faecal concentration in electrolytes and fermentative products in adult dog. 2003a sous presse.
16. **Weber M, Martin L, et al.** Influence of age and body size on the digestibility of a dry expanded diet in dogs. *J Anim Physiol Anim Nutr* 2003b; 87:21-31.
17. **Wichert B, Scuster S, et al.** Influence of different cellulose types on feces quality of dogs. *Waltham international symposium* 2002;1728S.
18. **Zentek J et Meyer H.** Normal handling of diets - are all dogs created equal? *J Small An Pract* 1995;36:354-359.

19. **Griot-Wenk ME, Busato A, et al.** Total serum IgE and IgA antibody levels in healthy dogs of different breeds and exposed to different environments. *Res Vet Sci* 1999;67:239-43.
20. **Obra R, Harper EJ et al.** Exercise in healthy adult dogs increases plasma TBARS- an indicator of oxidative stress. *The FASEB Journal* 1999;13:446.18
21. **O'Carra R.** Effects of dietary inclusion of a Mannanligosaccharide preparation on the immune system of rats and dogs. Poster presentation at 13th symposium of Biotechnology, Feed industry, 1997.
22. **Reinhart GA.** Modulation of humoral and cell-mediated immune. Responses by dietary lutein in cats. *Vet immunol immunopathol* 2000; 73:331-341.
23. **Whitbread TJ, Batt RM, et al.** Relative deficiency of serum IgA in the german shepherd dog: a breed abnormality. *Res Vet Sci* 1984;37:350-2.

Dermatology

24. **Chikakane K, Takahashi H.** Measurement of skin pH and its significance in cutaneous diseases. *Clinicals in Dermatology* 1995;13:299-306.
25. **Denerolle P, Bourdoiseau G, et al.** German Shepherd dog pyoderma: a prospective study of 23 cases. *Vet Dermatol.* 1999;9:243-248.
26. **Marsh KA, Ruedisueli FL et al.** Effects of zinc and linoleic supplementation on the skin and coat quality of dogs receiving a complete and balanced diet. *Vet Dermatol* 2000;11:277-284.
27. **Marsh KA, Watson TD.** Food containing biotin and other B vitamins. International application published under PCT:A23L 1/00; WO99/48384. 1999.
28. **Matousek JL, Campbell KL.** A comparative review of cutaneous pH. *Vet Dermatol* 2002;13:293-300.
29. **Miller WH.** Antiseborrheic agents in dermatology. In: *Current Veterinary Therapy IX, Small Animal Practice*, Kirk RW ed, WB Saunders Colon, Philadelphia, 496-501, 1986.
30. **Scott DW.** -Vitamin A- responsive dermatosis in the cocker spaniel. *J Am Anim Hosp Assoc* 1986;22:125-129.
31. **Tim Fray.** Waltham Center for Pet Nutrition 2002.

Osteoarthritis

32. **Freeman LM, Brown DJ, et al.** Assessment of degree of oxidative stress and antioxidant concentrations in dogs with idiopathic dilated cardiomyopathy. *J Am Vet Med Assoc* 1999 1;215:644-6.
33. **LaFond E, Breur GJ, et al.** Breed susceptibility for developmental orthopedic diseases in dogs. *J Am Anim Hosp Assoc* 2002;38:467-77.
34. **Lipiello L.** Cartilage stimulatory and anti-proteolytic activity is present in serum of dogs treated with a chondroprotective agent. *Canine practice* 1998; 23:10-12.

Appetence - Dental Hygiene

35. **Lecomte A.** L'olfaction chez le chien. Recherche des stupéfiants. *Th Méd Vét Alfort* 1979
36. **Vadurel A.** Physiologie et pathologie de l'odorat du chien. *Th Méd Vét Nantes* 1995, 64-71

Glossary

- Omega 3 fatty acid:** Fatty acid possessing an anti-inflammatory capacity widely used in dermatology. It assures the maintenance of healthy skin and a brilliant coat.
- Omega 6 fatty acid:** Unsaturated fatty acid that impacts the quality of the coat and the health of the skin. The best known are linoleic acid and γ -linolenic acid.
- Antioxidant:** Substance protecting the body's cells from harmful impact of free radicals.
- Appetence:** Capacity of a food to be consumed spontaneously and with relish.
- Osteoarthritis:** Degenerative disease of the joints.
- Chondroitin and Glucosamine:** Substances that are naturally present in articulate cartilage that act to prevent osteoarthritis.
- Digestibility:** Capacity of a food to be digested and assimilated into the digestive tract.
- EPA/DHA:** Unsaturated fatty acids of the omega 3 family that reduce the inflammatory response. Used to treat chronic inflammatory diseases, they are found in fish oil.
- Beneficial flora:** Flora present in the intestine that plays a role in the digestion of food and in the maintenance of intestinal mucus.
- Protein isolate hydrolysate:** Small protein fragments of very high organic value and very high digestibility (96%).
- Immunity (or immune system):** A body's defense structure against foreign substances.
- Immunoglobuline A (IgA):** Antibodies specialized in the defense of mucus and of the skin against infectious agents.
- Lutein:** Natural antioxidant that acts in synergy with other nutrients like vitamins C and E to combat oxidative injuries.
- MOS, mannan-oligosaccharides:** Food fibers that have a beneficial effect on intestinal flora and a stimulating effect on intestinal immunity.
- Nutrient:** Food substance that can be assimilated by the body.
- pH (power of hydrogen):** Measure of the acidity ($0 < \text{pH} < 7$) or alkalinity ($7 < \text{pH} < 14$) of a medium (the skin, say). A medium is said to be neutral when its pH is equal to 7
- Pyoderma:** Inflammation of the skin caused by bacteria.
- Free radicals:** Molecules responsible for oxidization.
- Selenium:** Trace element that acts in synergy with vitamin E on cellular exchanges and combats oxidative stress.
- Torsion/Distension syndrome** A veterinary emergency characterized by an accumulation of liquid, food and gas in the stomach. This accumulation displaces the stomach, which turns then twists.
- Synergy:** Action of various nutrients whose association has an effect greater than the sum of their individual efforts.
- Taurine:** Sulphur amino acid, a major constituent of muscle and immune cells. It also possesses an antioxidant capability.
- Vitamin A:** Vitamin that promotes growth and healthy skin and stimulates the immune system.
- Vitamin C:** Vitamin that acts in synergy with vitamin E to limit cell oxidation phenomena.
- Vitamin E:** Antioxidant vitamin used by the body to trap free radicals and limit cell oxidation phenomena.
- Zinc:** Trace element contributing to the regeneration of the skin.

A history of innovation at Royal Canin

A history of commitment to developing knowledge and respect for the needs of small, medium and large breeds.

1967: Launch of ROYAL CANIN by a veterinarian

1980: Launch of the first growth food for large breed puppies (AGR)

1988: Launch of the veterinary ranges

1990: Launch of the first diets to respond to the diversity of dog size (RCCI)

1997: Launch of the Size Nutrition program based on the dog's age, activity, and size

1999: Launch of:

- Starter, a unique kibble based weaning diet for dogs
- A sporting dog diet (Energy 4800)
- A veterinary diet for the nutritional management of osteoarthritis in dogs (Mobility Support JS 21)

2000: Launch of a diet for giant breed dogs (Giant Adult)

2001: Launch of a range of 13 veterinary diets (V Diet) including 2 hypoallergenic diets in Europe

2003: Launch of:

- Foods just for small breed dogs (MINI Canine Health Nutrition) and Yorkshire Terriers (MINI Yorkshire Terrier 28)
- Foods just for large breed dogs (MAXI Canine Health Nutrition) and breed specific foods (MAXI Labrador Retriever 30 and MAXI German Shepherd 24)
- Eight formulas dedicated for Professional Canine Breeders (Canine PRO)

2004: Launch of:

- Foods for medium breed dogs (MEDIUM Canine Health Nutrition) including Bulldogs (MEDIUM Bulldog 24)
- Small breed specific foods (MINI Chihuahua 28 and MINI Poodle 30)
- Food for very young large breed puppies (MAXI Babydog 30)
- The first full line of therapeutic diets to help manage allergic skin disease including canine atopy (Limited Ingredient Diets, Hypoallergenic and Skin Support formulas)

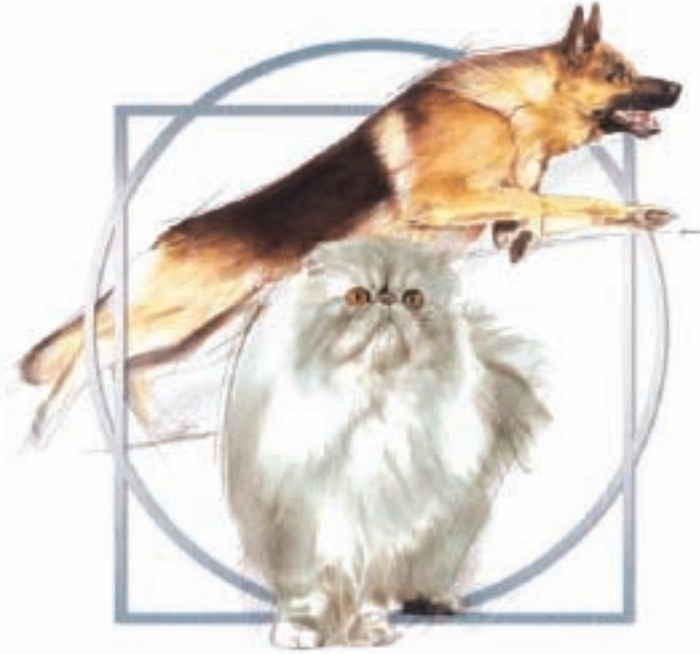
2005: Launch of:

- Small breed specific foods (MINI Dachshund 28 and MINI Shih Tzu 24)
- Food for Boxers (MAXI Boxer 26)
- A specialized formula, HT42d, for the reproductive bitch
- The first veterinary diet for the nutritional management of osteoarthritis specifically for large breed dogs (Mobility Support JS 21 Large Breed)

2006: Launch of small breed foods (MINI Beauty 26, MINI Indoor Adult 21 and MINI Dental Hygiene 24)

2007: Launch of:

- MINI Toy Indoor Adult 25
- MINI Indoor Puppy 27
- MINI Miniature Schnauzer 25



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