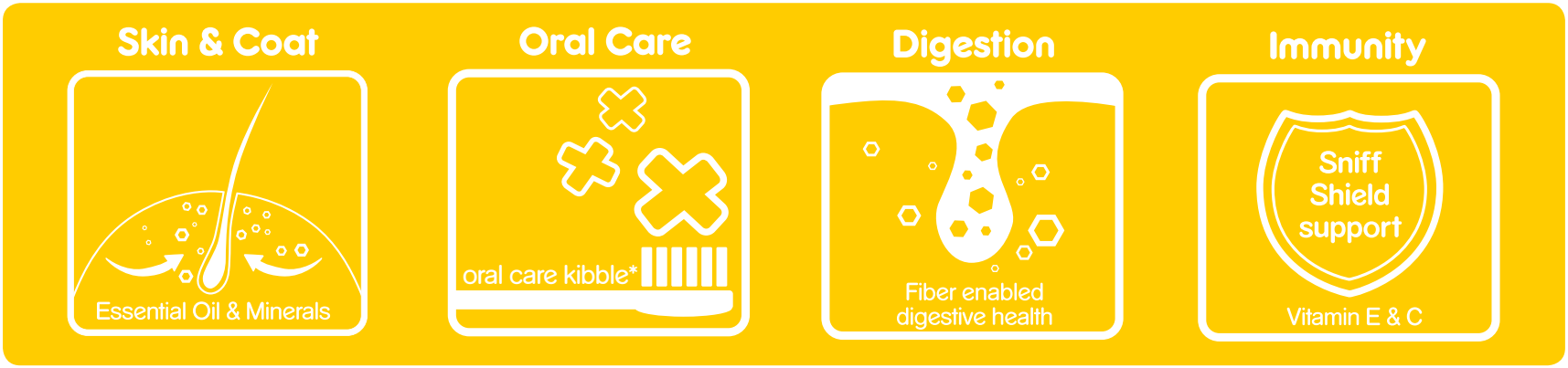
Pedigree®
BRAND

The Four Universal Needs of Dogs.

What Are the Four Universal Needs of Dogs?

The researchers at the WALTHAM® Centre for Pet Nutrition—the world's leading authority on pet care and nutrition—have identified an important breakthrough in canine nutrition, the **Four Universal Needs of Dogs.** These needs are:



These needs were identified through a review of the Centre's robust body of research studies on the requirements of dogs throughout their life stages—puppy, adult, and senior—for overall health and well-being. In addition, WALTHAM® has determined that these 4 needs benefit from additional nutrition that goes beyond that in the established basic canine diet.

WALTHAM®

For almost half a century, the **WALTHAM® Centre for Pet Nutrition** has led the world in advanced pet care research and companion animal nutrition. WALTHAM® has also sponsored research into the nutritional requirements of dogs in conjunction with leading academics and pet experts. The results of those studies have been published in leading periodicals around the world. WALTHAM® also works with major pet food brands, such as PEDIGREE® Food for Dogs, to develop recipes with exceptional nutritional value. The PEDIGREE® Brand has used WALTHAM® research as the basis for its recent dog food reformulation.

*Oral Care Kibble not available in all varieties. See bag for details.

Based on the WALTHAM® research, here's how PEDIGREE® Brand dry dog food has been improved:

DIGESTIBILITY

PEDIGREE® Brand dry food recipes are highly digestible and have been formulated to contain a blend of soluble and insoluble fiber than the brand's previous generation of dry food. This helps support the health of the digestive system, to promote optimum nutrient absorption and stool quality.

SKIN & COAT

The level of linoleic acid has been increased in the PEDIGREE® Brand dry dog food recipes. When compared to other leading dry dog food brands, these reformulated recipes have leading levels of linoleic acid and optimal levels of zinc.

ORAL CARE

PEDIGREE® Brand dry food for dogs provides oral care benefits through its patented X-shaped kibble.* This kibble is included in the brand's adult dog food products. (Puppies have different needs because they are learning to chew and are developing new teeth. The oral health emphasis in PEDIGREE® Puppy is focused on tooth development by optimizing calcium and phosphorus levels.)

IMMUNITY

Our dry recipes contain leading levels of vitamin E and vitamin C, as compared to many other brands.
The PEDIGREE® Food for Dogs dry recipes provide immune support by delivering the right combination and levels of antioxidant nutrients.

*Oral Care Kibble not available in all varieties. See bag for details.

INTRODUCTION

A well-functioning immune system is important for all animals—especially for dogs. Dogs spend much of their time investigating their surroundings, sniffing and licking some potentially questionable items. Dogs require an outstanding immune system to help keep them healthy as they venture out and investigate the world around them.

Function of immunity in the body

The dog's immune system is responsible for keeping the dog healthy. It is an incredibly complex system, and its defenses can be bolstered through the nutrition provided by the dog's diet.

The immune system is comprised of several types of cells, including leukocytes and lymphocytes, working together to fight off the foreign material and pathogens the dog may come into contact with as he roams around his environment. The first line of defense is represented by the skin and gastrointestinal tract. Mucus in the respiratory tract traps microbiota, dirt, and other foreign particles, which are then expelled from the body. Any foreign bodies getting through these systems are dealt with by the immune system, the second line of defense.

In addition to fighting off infections, the immune system deals with the damage created by free radicals. Free radicals are present in the environment (e.g., pollution, UV light) and also are generated in the body during everyday metabolism. Free radicals can damage DNA, the building blocks of life. When free radicals are not controlled, they cause a chain reaction that continues to generate free radicals in the body. This can lead to mutations and the development of diseases such as cancer.

There are two modes of defense against free radicals:

1. Antioxidant enzymes (e.g., superoxide dismutase)
2. Dietary antioxidants (e.g., vitamins E and C), which quench free radicals, preventing them from causing damage.

How can free radicals harm dogs?

Several disease states have been closely linked to the overproduction of free radicals. When free radicals are present in high concentrations, they can damage lipids, proteins, DNA, and carbohydrates.

Cancer

Certain free radicals have been shown to increase the signal cascades involved in cellular growth and regulation. When this pathway is altered, cancerous growth can occur.

Arthritis

Free radicals from oxygen-bearing compounds are often associated with arthritis. These compounds may be able to act directly on joint tissues to destroy them. Additionally, inflammatory cells can accumulate in the joints where they may damage or destroy the cartilage and other tissues that maintain fluid movement.

Diabetes

Free radicals are generated in response to hyperglycemic conditions, making diabetic dogs highly susceptible to oxidative stress. Furthermore, some enzyme systems produce free radicals instead of their normal end products due to altered metabolism.

Cataracts

Cataracts may occur with age, and also as a complication of diabetes due to oxidative stress. The exposure to light on the lens of the eye generates free radicals, creating a condition that causes the lens to cloud—unless there are sufficient antioxidants to protect the eye.

Pancreatitis

This condition is characterized by inflammation of the pancreas, and is associated with the loss of cells and function in this organ. Enzymes and secretions from the pancreas help to regulate digestion and absorption. Recently, pancreatitis has been linked with oxidative stress.

Kidney damage

Since kidney cells are some of the most metabolically active cells in the body, they are constantly exposed to large concentrations of free radicals. Tissue damage or disease may occur over a prolonged period of time if the free radical concentrations are higher in the kidney than its antioxidant capacity.

Nutrients that aid dog immunity

Several nutrients, such as **copper** and **zinc**, have demonstrated the ability to strengthen dog immunity. **Vitamin E** directly influences immunity as it scavenges free radicals as part of an enzyme called glutathione peroxidase. Vitamin E also incorporates into the cell membrane to block free radicals from cascading to generate further free radicals. **Vitamin C** appears to function as a regeneration agent for vitamin E.

Conclusions

Antioxidants allow the immune system to reduce the level of free radical damage that occurs in the body, which helps keep the body systems functioning normally and the dog healthy. By supplementing the diet with the appropriate antioxidant levels, the dog's natural defenses can be strengthened.

INTRODUCTION

Diet digestibility plays a large role in the overall health and well-being of the dog. Without proper digestion of the diet, the dog would be deprived of the nutrients it needs to live a healthy and enriched life. However, optimal digestion does not simply affect the uptake of nutrients into the dog's body, it also impacts the quality and amount of stool that is produced by the dog.

Anatomy of the gastrointestinal tract

The gastrointestinal tract is a hollow tube that begins at the mouth, where the dog has 42 teeth, which include canine teeth for piercing food, carnassial teeth for ripping and tearing, and molars for grinding. The dog's mouth contains no salivary amylase to begin carbohydrate digestion, and so the stomach begins the digestive processes. The dog's stomach is more acidic than that of humans to be able to digest bone fragments and kill any bacteria consumed.

The small intestine is the primary site of digestion in the dog, and contains many types of enzymes to break food particles into molecules, which can be incorporated into the body by specialized absorptive cells. Whatever is not absorbed through this process is transported from the small intestine to the large intestine. This organ contains millions of bacteria, which are capable of fermenting some of the undigested material that survive the other parts of the digestive process. Digestion in the dog is complete within 12–30 hours.

Function of the gastrointestinal tract

The gastrointestinal tract is responsible for several key functions that maintain dog health.

- **To bring food into the dog's body.**
- **To digest food.** Digestion prepares food to be absorbed for use within the body. To do this, the tract contains enzymes that digest food into smaller molecules (mono- and disaccharides from starches, amino acids and smaller peptides from proteins, and fatty acids from lipids).
- **To transport nutrients.** The gastrointestinal tract contains specialized cells that absorb these nutrients so that they can be transported to other cells within the dog's body to be used for growth or maintenance.
- **To eliminate waste products from the body.**
- **To provide a protective boundary between the inside of the body and the outside.** In several places this boundary is only a single cell layer thick, but represents a major barrier to all food particles and foreign matter (e.g., bacteria) consumed by the dog. The gastrointestinal tract samples the contents periodically to determine if the dog has consumed something that it is allergic or otherwise reactive to—like a microbe that is not part of the dog's normal gut microbiota. The gut-associated lymphoid tissue (GALT) and other immune cells respond to ingested allergens rapidly if they are consumed by the dog.

Increased digestibility benefits dog health

Improved nutrient digestibility leads to an increase in the amount of nutrients available for use by the dog. A difference of 2% may seem small, but to increase the digestibility of a dog's diet by 2% increases the amount of energy that is available to turn over proteins to maintain lean muscle mass or to go for a walk.

For puppies, increased digestibility is important so that the puppy can build lean muscle to support healthy growth, and to have extra energy for more playtime. For senior dogs, increased nutrient digestibility is important, especially with regards to protein. Protein digestibility decreases with age, so added protein digestibility can be equated with more efficient turnover of lean mass to prevent muscle wasting.

Increasing nutrient digestibility also can lead to optimal stool quality. Stool quality is an indicator of a healthy gastrointestinal tract. If a dog is unable to digest and absorb a substrate, it will pass into the large intestine where resident microbiota may over-ferment that substrate. This may cause excess water to flow into the intestine and be excreted in the feces, leading to loose stools or diarrhea.

Alternatively, optimal stool quality can indicate that nutrient retention is occurring properly. A firm stool is a sign that the dog is properly digesting and absorbing nutrients (including water) from the gastrointestinal tract.

Beyond this, increased nutrient digestibility optimizes the volume of stool that is produced. When more nutrients are extracted from the diet, there is less matter that needs to be excreted—which means there is less fecal material that a dog's caregiver needs to clean up.

Fiber promotes digestive tract health

Similar to humans, the dog's digestive tract and overall health can benefit from the addition of dietary fiber. There are two types of dietary fiber that benefit the health of the dog's digestive tract: soluble and insoluble fibers.

Insoluble fiber assists transit through the digestive tract and is not fermented as it passes through the tract. It provides bulk to the feces, moving the undigested parts of the diet and waste products of the digestive processes through the dog's intestinal tract.

Soluble fiber serves as a source of energy for the microbiota that reside in the gastrointestinal tract, specifically in the colon. Fermentation by these bacteria generates short-chain fatty acids (SCFA) such as acetate, propionate, and butyrate. These SCFA serve as energy sources for colonocytes, and have been shown to help keep the colon healthy. Soluble fiber also may affect transit rate through the intestine, which affects nutrient digestibility. The SCFA produced by fermentation are absorbed into the bloodstream and affect the neurotransmitter peptide tyrosine-tyrosine (PYY). This action decreases the rate of chyme flow through the intestinal tract and increases nutrient digestibility by allowing the nutrients more time to interact with the intestinal tract for digestion and absorption.

Conclusions

The digestibility of a diet is of great importance to the dog: If a diet is poorly digested, the dog will not be able to efficiently meet its energy needs. Alternatively, a lack of indigestible fiber in the diet may cause poor colonic health. Improvements in diet digestibility has clear benefits to the dog, and the science behind this is constantly improving to provide the maximum benefit to all dogs.

INTRODUCTION

The skin and coat serve as an outward sign of the overall health status of the dog because it is the dog's most metabolically active organ. It is therefore feasible that a change in health status may be observed first in the skin and coat. However, the skin and coat play a much larger role in canine health than simply as an indicator—they are responsible for several critical health functions, including protection from the environment, thermoregulation, and water balance.

Several nutrients impact the health and overall appearance of the skin and coat, including linoleic acid, zinc, biotin, and other B-vitamins. To understand how these nutrients benefit the dog's skin and coat, it is important to first understand the anatomy and functions of these organs.

Skin and coat anatomy

The dog's skin and coat form its largest organ, comprising 12 to 24% of its body weight (adult dogs and puppies, respectively). The dog's skin contains the subcutis, dermis, and epidermis. The dermis is comprised of collagen, and is the largest portion of the skin. The epidermis is the most metabolically active layer of skin, and contains the sebaceous glands and hair follicles. Sebum—the oily secretion of sebaceous glands—functions to keep the skin and hair lubricated, and also coats the hair to prevent friction during movement. Keratin, a waxy substance produced by specialized cells (keratinocytes) within the epidermis, covers the epidermis to help prevent the loss of water through the skin.

The coat consists of thousands of hairs produced in follicles. Since hairs are under constant environmental stress, they are continuously shed and replaced. Seasonal shedding also occurs to replace the coat in relation to temperature and photoperiod.

Functions of the skin and coat

Protection
The skin and coat provide a barrier that protects the dog from the external foreign matter that could cause harm to the internal organs. The dog's skin also contains nerves and nerve endings, which help the dog to sense heat, cold, pressure, and pain. The dog's coat serves to protect the dog from physical and chemical damage, including trauma, exposure to ultraviolet light, and contact with heat.

Immunity
Skin also functions as a part of the immune system, and participates in the daily monitoring of the dog's environment. If the skin's immunity is compromised, infections and potentially life-threatening diseases caused by microbiota could occur.

Thermoregulation
A healthy coat aids in thermoregulation by providing an insulating layer of fur. Healthy skin can efficiently regulate body temperature and move hair follicles more effectively to insulate the body or allow air to enter under the hairs to help cool the dog. The deepest layer of skin can also contract repeatedly, causing the dog to shiver, thereby generating heat for the dog.

Hydration
Water loss through the skin severely impacts canine health. Dogs do not have sweat glands like humans. They lose heat by panting rather than sweating. However, high transepidermal water loss (loss of water through the skin) is not a normal occurrence and heavily impacts the amount of energy the dog needs to maintain its metabolism. It also places additional strain on the dog's health, since nutrients are then diverted to generate heat instead of being used for maintenance of muscle or the immune system.

Nutrient storage
The skin functions as a storage site for several nutrients. Protein and amino acids are present in the skin, as well as collagen fibers and enzymes. Arrector pili muscles, which move the hairs, are also present. Dog hair is mainly comprised of protein. Up to 35% of the dog's daily protein intake is used to maintain its skin and coat. Linoleic acid and other fatty acids are stored in the skin, and are present in the phospholipid bilayer to provide elasticity to the skin. Among other functions, fatty acids participate as intermediaries of inflammation.

Minerals such as zinc, copper, selenium, and manganese are found in higher concentrations in the skin, due to their functions as cofactors and coenzymes in several reactions that occur in the skin. The fat-soluble vitamins A and E may also be stored in the skin. Vitamin A is required for cell differentiation and maintenance, while vitamin E is present as an antioxidant to help protect the skin cells from oxidative damage and to maintain cell membrane stability. B vitamins are present in the skin, but are not stored there, since they are water soluble.

Nutrients that benefit skin and coat health

Linoleic acid is considered an essential fatty acid for dogs, since they cannot synthesize it themselves. It is also important to keratinocyte function, and plays a role in cellular cohesion. In addition, linoleic acid plays a major role in maintaining a proper barrier between the outside and inside of the dog. For example, if a dog consumed a diet with adequate or increased concentrations of linoleic acid, its skin would be supple and more flexible while it chased rabbits through a field. If the lipid concentration of the skin is depleted or unbalanced, dry skin occurs, which can lead to dandruff production. Additionally, imbalanced lipid concentrations in the skin and coat cause thin, discolored hair, increased sebum viscosity, increased epidermal turnover, decreased wound healing, and decreased blood vessel wall thickness.

Zinc is widely used throughout the body for metabolic functions, including cell turnover, DNA and RNA synthesis, biosynthesis of polyunsaturated fatty acids, and vitamin A metabolism. Zinc is especially important in the skin because the skin cells reproduce at a high rate to allow for proper turnover. In addition, zinc reduces water loss through the dog's skin, which prevents strain on the dog's metabolism. Zinc deficiency results in alopecia, scale, and—potentially—to secondary skin infections. Coats of zinc-deficient dogs are typically dull.

Biotin and other **B vitamins** act as cofactors of many metabolic processes, including those for fats—such as polyunsaturated fatty acids like linoleic acid—proteins, and carbohydrates.

Research has demonstrated the benefits of supplementing linoleic acid, zinc, and biotin and other B-vitamins to dogs. These nutrients typically increase coat gloss, improve coat softness, and decrease coat dander and transepidermal water loss from the skin. When added to the diet in combination, zinc and linoleic acid significantly increase coat gloss and reduce coat dandruff.

Conclusions

The dog's skin and coat play a major role as an indicator of overall health and nutrition. This is because the skin and coat require many nutrients and heavily participate in the dog's metabolism. Linoleic acid, zinc, and other nutrients have the capacity to increase the skin and coat health of dogs by maintaining barrier function, participating in healthy cell turnover, and producing a shinier coat.

INTRODUCTION

Healthy, clean gums and teeth aren't just attractive, they're critical to a dog's overall health and well-being. Gum disease is the number one health issue for pet dogs today, with 4 out of 5 of dogs developing some degree of gum disease by the age of three.* When left untreated, the effects of gum disease aren't just limited to a dog's mouth: serious diseases such as kidney, heart, and liver disease have been associated with gum disease.

Periodontal disease

Periodontal disease is a collective term for diseases that affect the tissues that support and anchor the teeth (including the gums and the underlying bone). It is the most common disease reported in dogs, with as many as 4 out of 5 dogs developing some form of gum disease by the age of three.* The beginning stages of periodontal disease (such as gingivitis) are reversible, while later stages (periodontitis) are irreversible, causing permanent damage to the teeth and underlying structures. Advanced gum disease in dogs has been associated with the development of many other diseases such as kidney, lung, and heart disease.

Plaque and tartar

Plaque and tartar buildup on the tooth surface contributes to the development of gum disease. Plaque is composed of a mixture of saliva, food debris, and bacteria. It is the main contributor to the development of gum disease, and appears on the teeth as a clear sticky film with little coloration. Plaque starts to build up very quickly after a meal and needs to be removed daily for the best oral care. Removal can be achieved through a light abrasive action, such as by tooth brushing.

Calcium from the saliva and gingival crevicular fluid (GCF: the fluid found in the gap between the gums and the teeth) can calcify plaque into a hard substance known as calculus or tartar. Tartar itself is inert; however, it is a porous material that attracts more plaque buildup. Tartar is a solid white deposit with a porous structure that allows tartar to pick up stains from foods more easily, which causes tartar to appear as yellow to brown build upon teeth. Tartar buildup is more difficult to remove than plaque. The best way to remove it by scaling during a veterinary dental cleaning. Some tartar buildup is removed during normal chewing of foods and snack/chews where it is chipped off, but this is much less efficient than dental cleanings. Prevention of tartar buildup is a better way of tackling the issue.

*American Veterinary Medical Association

Gingivitis

Gingivitis is inflammation of the gum tissues without any loss of tissue attachment or the bone underneath. It can be seen by the presence of red, swollen gums, especially right at the point where the tooth and gumline meet. In some cases, the gums may spontaneously bleed when touched, or when the dog eats something that contacts the gumline. This is an indication that your dog needs better oral hygiene care.

Gingivitis is irritation of the gums caused by dental plaque and can be reduced or reversed by good, daily oral hygiene routines. If left untreated, gingivitis may development into a more serious form of periodontal disease called periodontitis. This condition involves the destruction of the tissues and bone that attach the tooth in the mouth. Periodontitis is irreversible and can lead to eventual tooth loss. It can also lead to bacteria from the mouth being able to enter the main bloodstream of the body and traveling to other tissues. In fact, advanced gum disease has been associated with the development of other types of disease in the dog, including kidney, heart, and liver disease, as well as some forms of cancer.

Daily tooth brushing is the gold standard for reducing plaque and tartar buildup and helping to prevent gum disease. Because dry dog food has a hard texture, it can help clean teeth while the pet is eating. This is accomplished through the mechanical abrasion of the food on the tooth surface, which helps to wipe off plaque and tartar accumulation.

Cavities (Caries or Tooth Decay)

Although cavities are common in humans, they are relatively uncommon in the dog. This is mainly due to differences in the composition of saliva, different oral bacteria, and the wider spacing between the teeth of the dog as compared to humans.

Maintenance of oral health

The best way to maintain good oral health of your dog is to have a good oral hygiene program that consists of several components:

- **Daily tooth brushing** is the most effective method of keeping teeth clean and gums healthy. The use of either a specially designed toothbrush for dogs or a very soft human toothbrush on the outer surfaces of the teeth will effectively remove plaque and prevent tartar buildup. Specially formulated dog toothpastes are available that may help with the toothbrushing process. Human toothpastes should never be used in dogs, as they tend to contain fluoride and detergents that are not meant to be swallowed and can cause health problems and toxicities in dogs.

- **Routine dental exams and cleanings** by a veterinarian will help to keep a dog's mouth healthy and will also ensure that any dental issues are noticed early. Early detection and treatment can help to prevent disease from progressing and lets vets monitor the effectiveness of the oral hygiene program being utilized.

- **Diet** can also contribute to overall oral health. It is important to feed 100% complete and balanced food to avoid any nutritional deficiencies which may manifest as oral health issues. A well-designed dry food can help reduce plaque and tartar buildup. This is achieved through the mechanical abrasion of the foods along the tooth surface as the pet chews. Research has shown that size, texture, and design of a dry food can all contribute to the efficacy of a food at providing oral health benefits.

The addition of specially designed chews to the daily diet can help to provide further tooth cleaning action. In addition, the stimulation of saliva, which is a natural cleansing agent for the mouth, contributes to helping to clean the tooth surface.

The efficacy of dry foods and oral care chews can be enhanced through the knowledge of oral biometrics of the dog. Oral biometrics is the study of the structure of the jaws, muscles, and teeth of different types of dogs to determine differences in biting patterns. Research completed in this area has determined the bite force capacity (how hard a dog can bite down) and gape (how far a dog can open its mouth) of every area in a dog's mouth. With this knowledge, foods can be designed to better fit within a dog's mouth and can also be matched with a dog's bite force capacity. Raw bones and some extremely hard materials (metal, stone) are often much harder than a dog's natural bite force capacity and can cause broken teeth, root damage, and other issues which are permanent. The use of biometrics produces foods that are not only safe for the dog to chew, but also provide optimal efficacy for oral health. It also allows for products to be produced that address the needs of all sizes and shapes of dogs.

Conclusions

Oral health is the number one health concern in dogs today. Plaque and tartar buildup is the main contributor to the development of further oral health problems, such as gum disease. If left untreated, gum disease can cause irreversible damage to the teeth and underlying tissues, and is associated with the development of other systemic diseases. Proper oral hygiene and care can help to control gum disease in dogs, and includes daily toothbrushing, routine dental cleanings, and exams, as well as specially designed foods and chews.

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