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Nutrition

Nutrition and the Immune System

Wholesome nutrition is the key to maintaining a healthy immune system and resistance to disease. Nutritional deficiencies or imbalances as well as exposures to various chemicals, drugs and toxins present an ongoing immunological challenge which can suppress immune function, especially in those animals genetically susceptible to immune dysfunction (immune deficiency, autoimmunity, allergies).

Genetic differences between individuals lead to quantitative variations in dietary requirements to maintain health. Genetic defects also may result in inborn errors of metabolism that affect one or more pathways involving nutrients or their metabolites. While minimal and maximal nutrient requirements have been established for most vitamins and trace mineral elements, optimum amounts for every individual should not be assumed. Examples of important vitamin and mineral requirements in this regard include vitamin C, vitamin E and selenium, vitamin A, copper and vitamin B-12 . Similarly, a wide variation occurs in the energy needs of dogs depending on their breed, age, sex, and size.

Nutritional factors that play an important role in immune function include zinc, selenium and vitamin E, vitamin B-6 (pyridoxine), and linoleic acid. Deficiency of these compounds impairs both humoral as well as cell-mediated immunity. The requirement for essential nutrients increases during periods of rapid growth or reproduction and also may increase in geriatric individuals, because immune function and the bioavailability of these nutrients generally wanes with aging. As with any nutrient, however, excessive supplementation can lead to significant clinical problems, many of which are similar to the respective deficiency states of these ingredients.

Synthetic antioxidants like butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT), propyl gallate, and ethoxyquin have been used as preservatives in human and animal foods for many years, although the safety of these chemicals when chronically fed at permitted amounts in dog and cat foods has been questioned. As a result, naturally occurring antioxidants (vitamins E and C) are also commonly used in animal foods.

Nutrition and Thyroid Metabolism

Nutritional influences can have a deleterious effects on thyroid metabolism. The classical example is the iodine deficiency that occurs in individuals eating cereal grain crops grown on iodine-deficient soil. Iron and zinc also are important minerals in regulating thyroid metabolism. Another link has recently been shown between selenium deficiency and hypothyroidism. Cereal grain crops grown on selenium-deficient soil will contain relatively low levels of selenium. While commercial pet food manufacturers compensate for variations in basal ingredients by adding vitamin and mineral supplements, it may be difficult to determine optimum levels for so many different animal breeds having varying genetic backgrounds and metabolic needs. The selenium-thyroid connection has significant clinical relevance, because blood, but not tissue, levels of thyroid hormones rise in selenium deficiency. Thus, selenium-deficient individuals showing clinical signs of hypothyroidism could be overlooked on the basis that blood levels of thyroid hormones appear normal.

Commercial, Home-Made and Raw Food Diets

Veterinarians treating diseased animals appreciate that nutritional management is an important part of therapy. Many types of premium basic, life-stage, and therapeutic commercial diets are available to address these needs. For example, increasing carbohydrate and reducing protein content, while maintaining high quality protein, may be beneficial, and is also believed to have a positive effect on behavior. Diet and behavior appear to be linked because certain highly nutritious foods may aggravate the condition of dogs with behavioral problems (dominant aggression, hyperactivity, and fear). For allergic animals, elimination diets with restricted or novel antigen source ingredients are given for 6-12 weeks to evaluate their benefit to the patient.

Homemade diets can also be used, either as a sole food source or added to basic cereal diets, provided that the formula is properly balanced. All other food supplements, including treats, are withdrawn. Example ingredients that have been used successfully, include whitefish, rabbit, venison, duck, ostrich, emu, buffalo, and turkey mixed with potato, sweet potato and other vegetables (except onions and cruciferous vegetables). Grains are often avoided, at least initially, although novel grains like quinoa, sorghum, barley or flax usually have been well tolerated.

Commercial or home-made raw food diets have been gaining in popularity as well. One prototype diet [BARF (bones and raw food)] of Dr. Ian Billinghurst recommends feeding a dog 60% raw meaty bones (chicken backs,wings and necks), with the rest of the diet composed of ground vegetables mixed with ground meat, and supplements such as kelp, vitamin E and vitamin C. Nutritional analyses on some commercially available raw diets suggest that the raw meaty bones commonly used provide 40-70% protein, and the meat/vegetable mixtures range from 20-50% protein. The question has arisen about the potential for such high protein diets to affect renal function when fed continuously, as high protein diets are reported to induce renal hypertrophy, and increase renal blood flow and glomerular filtration rate. While this concern may not pertain to healthy dogs, it could play a role in dogs with previously compromised renal function. At present, there are no data to support or refute this issue.

Maintaining the appropriate ratio of trace minerals, vitamins, fatty acids and other nutritive elements is especially important for patients with acute and chronic diseases, as their metabolic demands have increased to sustain cell turnover and tissue repair. Typical supplements include: vitamin-mineral mix, antioxidants (vitamins A, C, D, and E and selenium), digestive enzymes, brewer's yeast, kelp, honey, coat additives, apple cider vinegar, hydrochloric acid (used sparingly), yogurt, liver, eggs, garlic, and plenty of fresh potable water.

Vitamin A and E have been shown to enhance immune function in small animals, as the former can beneficially influence T-helper responses, and the latter is known to improve both cellular and humoral immunity. Dietary carotenoids, especially lutein and beta-carotene, have been reported to modulate both cell-mediated and humoral immunity in dogs but not in cats.

Raw Food Diet Study

Antech Diagnostics recently determined the basic clinical laboratory parameters of 227 healthy adult dogs of varying ages and breed types being fed raw food diets for at least 9 months. From this group, 87 dogs were fed the classical BARF diet, 46 dogs were fed Volhard's NDF diet, and the remaining 94 dogs were fed other types of custom or commercial raw diets.

There were 69 dog breeds represented, including 233 purebreds, 16 crossbreds, 1 mixed breed and 6 of unknown breed type. Dogs from all breed groups were represented. Most of the dogs were neutered males (73) or spayed females (85); and the remainder was divided equally between intact males and females. The mean age of the group was 5.67 ± 3.52 years (mean ± SD); and the mean length of time fed a raw food diet was 2.84 ± 2.54 years. The data from this group of dogs were compared to the same laboratory parameters measured at Antech Diagnostics from 75 healthy adult dogs fed a commercial cereal-based kibbled diet. Statistical comparisons of results for the raw and cereal-based diets found them to be essentially the same with the following notable exceptions:

- Higher packed cell volume (hematocrit) in all raw diet fed groups (range of 51.0 ± 6.6 – 53.5 ± 5.6 %) versus cereal-based kibble (47.6 ± 6.1 %).
- Higher blood urea nitrogen (BUN) in all raw diet fed groups (range of 18.8 ± 6.9 – 22.0 ± 8.7 mg/dL) versus cereal-based kibble (15.5 ± 4.7 mg/dL).
- Higher serum creatinine in the Volhard raw diet group only (1.20 ± 0.34 mg/dL) versus cereal-based kibble (1.07 ± 0.28 mg/dL).

While a more detailed analysis has yet to be completed, these results indicate that dogs fed raw meats (natural carnivores) have higher red blood cell and blood urea nitrogen levels than dogs fed cereal-based food (obligate omnivores). Thus, the normal reference values for dogs fed raw food diets should probably be revised.

References

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