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Popular Article

Role of Omega Fatty Acids in Canine Health

Payel Kar¹, J. B. Rajesh^{2*}, Sherry Carelyne Marwein³, Kh. Thanila Rose⁴, A. K. Samanta⁵,
S. K. Behera⁶, H. Prasad⁷, B. Konwar⁸, Lalnuntluangi Hmar⁹

^{1,3,4}MVSc scholar, Department of Veterinary Medicine, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University (I), Selesih, Aizawl, Mizoram: 796015

^{2,6,7} Department of Veterinary Medicine, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University (I), Selesih, Aizawl, Mizoram: 796015

⁵ Department of Animal Nutrition, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University (I), Selesih, Aizawl, Mizoram: 796015

⁸ Department of Veterinary Surgery & Radiology, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University (I), Selesih, Aizawl, Mizoram: 796015

⁹ Dean, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University (I), Selesih, Aizawl, Mizoram: 796015

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Abstract

Essential fatty acid plays a major role in the health of canines. They are required for the functioning of smooth muscles, internal organs, brain, and skin. The deficiency of fatty acids in the body will be exhibited in different clinical signs. Often this will be overlooked and the clinician will follow a conventional approach in diagnosis and therapy. If the condition is improving then further tests will be done and a clinical trial of drugs will be followed. But considering the importance of nutritional medicine, it is imperative to look into the possibilities of nutrition driven disorders in animals. In this article we are emphasizing the importance of proper nutrition especially need of the fatty acids in the diet of canines for their proper health with a scientific detailing of Omega-3, Omega-6.

Key words: Canine, Essential fatty acids, feeding, Omega-3, Omega-6

Introduction

Essential fatty acids (EFA) are necessary for specific metabolic processes and are crucial nutritional components for normal health. The reason why essential fatty acids are called as essential is that a pet's diet needs to include them because they cannot be synthesised from non-fat sources like protein or carbohydrates. EFA are the precursors to two families of polyunsaturated



fatty acids (PUFAs), known as omega-3 fatty acids and omega-6 fatty acids. They are classified into two primary groups: α linolenic acid (ALA) (omega 3), also referred to as the n-3 series, and linoleic acid (LA) (omega 6), also known as the n-6 series. Docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) are members of the n-3 series, while γ -linolenic acid (GLA) and arachidonic acid are members of the n-6 series. EFAs from both series have the ability to control inflammation by assisting in the maintenance of the epidermal barrier, producing anti-inflammatory mediators, and competing with enzymes involved in the synthesis of arachidonic acid. The most advantageous n-6 to n-3 ratios for dogs often falls between 5:1. EFA deficiencies can occur in dogs fed with meals that are overcooked, rancid, improperly kept, or lacks sufficient antioxidants.

There are three important omega-3s for dogs: ALA, EPA and DHA. ALA, comes from plants, such as seeds, nuts, and vegetables. This type of omega is actually a precursor to other types of omega-3, meaning the body converts ALA into EPA and DHA. Dog's body is not able to convert ALA into the other two effectively. EPA and DHA are primarily found in seafood sources, including fish oil as well as phytoplankton and other marine plants. Omega-6 fatty acids are found in animal and plant sources, commonly found in commercial dog foods. They are an important part of cell structure and are necessary to maintain good health in dogs.

Functions of EFA

EFAs are required by all mammals for various functions such as: Maintaining the structure and function of smooth muscle organs (*i.e.*, heart, reproductive system), protection and formation of liver cells, maintenance of healthy skin structure, function, coat and joint tissue. Eicosanoids are signalling molecules originated from essential fatty acids. Precursors of eicosanoids are prostaglandins and leukotrienes. DHA develops the brain and immune system as well as eye (retina) functions in pups and adult dogs. Linoleic acid maintains skin water barrier function. Insufficient amounts of EFAs in the body will disrupt the body's essential functions. EFA deficiency often leads to the development of chronic skin and coat disorders, digestive problems, cardiovascular disease, degenerative eye disease and allergies in dogs and cats Therefore, EFA should not be considered a nutritional supplement but an essential element for good health.

Importance of EFA

Dietary fatty acid supplementation in dogs is most commonly recommended for itchy skin diseases associated with hypersensitivity reactions, such as flea allergic dermatitis, atopic dermatitis, food sensitization and idiopathic pruritis. Dietary EFAs play an important role in normal cellular function by providing fatty acid precursors of eicosanoids and other important



physiological mediators. LA plays an important role in maintaining the epidermal permeability barrier and as a precursor to prostaglandins in dogs. The skin's epidermal water barrier is composed of ceramides found in cell membranes, which are derived from omega-6 fatty acids (LA). The skin cells cohesion is increased by these lipid components providing an effective water barrier to the epidermis. This is why many cases of dry, dull coat and scaly, non-itchy skin disorders in dogs show positive effects after adding vegetable oils to diets rich in these fatty acids.

Fats nourish the brain and DHA and EPA have particularly beneficial effects. In puppies, whose brains are still developing, omega-3 supplements can be very helpful. Omega-3 supplements may also help older dogs with brain disorders, such as canine cognitive dysfunction. Higher levels of DHA have been shown to promote better neurological development in dogs. Puppies fed a DHA-rich diet also had better cognitive and psychomotor performance. However, the diet is also enriched with several other vitamins and antioxidants that may contribute to results.

Failure of reproduction in canine not only attributed to poor sperm concentration but also for not supplementing a certain daily intake of micronutrients. Fish derived omega-3 fatty acids contains beneficial effect on sperm motility and fertility. A diet high in n-3 polyunsaturated fats may improve sperm functions by changing the characteristics of the membrane and lowering spermatozoa lipidic peroxidation.

Deficiency symptoms

Nowadays, heart failure is one of the causes of death in domestic carnivores. Nutrition can best be used as a medicine to treat heart disease in dogs and cats. Proper omega balance is often considered as a treatment for improving heart health. TNF and IL-1 production is directly reduced by omega-3 fatty acids, and their supplementation has been shown to reduce muscle loss in dogs with congestive heart failure (CHF).

Supplementation of Omega-3 fatty acid leads to:

- i. Reducing the production of inflammatory mediators
- ii. Reducing platelet aggregation and inflammation
- iii. Increasing vasodilation
- iv. Decreasing arrhythmogenesis
- v. Reducing plasma triacylglycerols and Very low density lipo protein (VLDL)
- vi. Reducing atherosclerosis.

Infertility, scaly skin, poor coat condition, and poor growth, increased risk of cardiovascular problems, poor wound healing, abnormalities in red blood cell membranes, changes in fatty acid composition in adipose tissues and cell phospholipids are the clinical



indicators linked to an EFA deficiency. Omega-3 fatty acid deficiency is also linked to visual problems as night blindness, photophobia, or visual abnormalities.

Omega-3 fatty acids have beneficial effects in the treatment of rheumatoid arthritis. In addition, omega-3 fatty acid concentrations in tissues and cell membranes are increased by dietary omega-3 fatty acid supplementation, leading to a relative decline in omega-6 fatty acid concentrations, including arachidonic acid. Additionally, high omega-3 fatty acids showed better mobility and better performance in activities of daily living in dogs. EPA and DHA reduce the production of inflammatory molecules such as prostaglandin E3 and leukotriene B5. This reduces the anti-inflammatory environment throughout the body and joints, which may reduce the severity of future joint problems. For this reason, many dog foods aimed at joint health contain higher levels of omega-3 fatty acids than the average dog food.

Dogs with kidney diseases showed changes in urinary vasoactive eicosanoid excretion, which were interpreted as indicating a role for glomerular hyperfiltration in progressive kidney damage in dogs. Eicosanoids produced from (n-3) PUFAs are less vasoactive than those obtained from (n-6) PUFAs. Therefore, dietary supplementation with PUFAs would be expected to alter renal eicosanoid production and possibly also the intrarenal hemodynamic response to disease.

Prevention and Control

Potential side effects of omega-3 fatty acid supplementation include gastrointestinal symptoms (*e.g.*, vomiting or diarrhoea), reduced platelet aggregation, immune system changes, slowed wound healing, and altered glucose and lipid metabolism. Diets high in omega fatty acids, vitamin E can be supplemented or added to prevent or minimize lipid peroxidation and vitamin E deficiency. Additionally, there is a possibility of omega fatty acid-drug interactions.

While many studies have looked at the possible advantages of supplementing with fatty acids, the appropriate type and dosage of the supplement depends on the patient, their medical history, their present conditions, and their clinical symptoms. Remember that supplements, including fatty acid supplements, can also have negative consequences. **Essential Fatty Acids in the Diet**

Dietary Requirements

An optimum pet food contains essential omega-3 and omega-6 fatty acids. Minimum requirements for total fat, LA, ALA, EPA + DHA, and AA are recommended by the National Research Council (NRC) (Table 1).

Table 1. Minimum Requirements of Essential fatty Acids in Grams /1000 kcal

	Dogs (Growth)	Dogs (Adult Maintenance)
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Total fat	21.3	13.8
Linoleic Acid	3.3	2.8
Arachidonic Acid	0.08	ND
Alpha-linoleic acid	0.2	0.11
EPA+DHA	0.13	0.11

Dose of fish oil:

Dogs: 50 to 75 mg EPA + DHA (combined) per kg body weight

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