

NUTRACEUTICALS AND SKIN DISEASE: GETTING MORE OUT OF YOUR OTHER TREATMENTS

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Fat and Skin

The use of dietary fats to help improve skin and coat quality has been a staple in dermatological care from the beginnings in veterinary medicine. Overall fat consumption is a “double edged sword” since it is often blamed for obesity its addition to food regardless of form is essential for healthy skin. In general pet foods range from around 17%-60% of energy coming fat. This is a huge range and it has been shown that higher fat diets often lead to a glossier coat and better overall coat quality. (1) In dog studies it has been directly shown that when changing the dietary intake of omega 6 and/or omega 3 fatty acids, you can directly influence the skins composition of these fatty acids making impacts on the skin that are also reflected in the serum allowing for fatty acid supplements utility in altering skin form and function, particularly when inflamed. (1)

Omega 6:

Of course, much of the focus in veterinary medicine revolves around the essential fats in the diet for adult dogs and the only truly essential fatty acid is linoleic acid which is an 18 carbon fatty acid that is necessary to ceramide production in the skin which helps provide the “glue” between each keratinocyte and has been associated with seborrhea (i.e. excessive dander and flaking of the skin) when deficient in the diet. That said, the diet of any dog should contain approximately 1% dry matter of linoleic acid for a typical 4000 kcal/kg diet (16,000 MJ/kg). Other fatty acids like arachidonic acid are not essential since dogs will make this from linoleic acid, however cats have a linoleic and an arachidonic acid requirement since cats cannot make arachidonic acid (20 carbon) from the precursor linoleic acid. Beyond linoleic acid there is potentially a requirement for the omega three fatty acid, alpha-linolenic acid or its elongated counterparts eicosapentaenoic acid (EPA: 20 carbon) and/or docosahexaenoic acid (DHA: 22 carbon) which are largely related to neurological health or inflammation which will be discussed below.(1)

Marine/Fish oil (and maybe Flaxseed oils):

Most marine oils (fish, krill, algae) will contain long chain omega three fatty acids (20 carbons) including EPA and DHA. Most fish/krill oils are between 12-25% EPA and DHA usually containing more EPA than DHA in products. Algae oils are usually about 10-15% EPA and DHA, however it leans more towards DHA than EPA in these products. Hence, choosing a product and understanding the dosing is important. The major tenants that have been proven out in dermatology is that providing EPA/DHA from fish oil at anywhere between 25-100 mg/kg can influence pruritus and inflammation in atopic dogs.(2-4) This is a wide range and allows for a titration upwards. As a sole agent it can have utility and there is also data to suggest that it can allow for dose lowering of things like prednisone and cyclosporine making it a natural part of supplementation during dermatological issues. It must be recognized that since fish oil is usually only around 25% EPA/DHA we cannot go on the total mg quantity of the product when dosing. The average 1 ml dose of fish oil usually only contains around 250 mg of EPA and DHA. Hence to get a dose between the 25-100 mg/kg of EPA/DHA recommended it would be about 500 mg of EPA/DHA in the 10 kg dog. With a typical fish oil one would likely need 2 ml per 10 kg body weight per day as a starting point. To get closer to the 100 mg/kg dose one would likely need about 4 ml per body weight. It should be

recognized that for every 4 ml of fish oil (1 American teaspoon) or any additional oil that there are about 35-40 kcals in grams, and regular diet should be adjusted to prevent weight gain in many cases. It has been shown that this addition to food will help with pruritus and the inflammatory response and it has been suggested that it diminishes the formation of prostaglandins and leukotrienes (PGE₂ and LTB₄ for example) which dampens the cycle of inflammation since EPA becomes PGE₃ and LTB₅ which are inert molecules that cannot activate prostaglandin or leukotriene receptors similarly to the even series eicosanoids.(1)

The use of fish oil appears to have the strongest evidence although there are only 3 studies examining just fish oil – considering many utilize a mix of fatty acids, both omega 3 and 6 which of course may have synergistic activities, since there is some elongation of omega 3 from seed oil into precursors to EPA, namely DPA which is an intermediate between EPA and DHA, where a study has shown that this is the primary fatty acid when supplementing flaxseed oil and may have implications for ameliorating atopic dermatitis clinical signs. Flaxseed and alpha linolenic acid cannot be ignored as it is a component in many over the counter products and successful dietary interventions.(5)

Borage, Primrose and Blackcurrant oils:

In veterinary dermatology, due to the importance of essential fatty acids there are a number of studies using other seed oil sources that differ from the typical ones incorporated into diets which are sunflower, canola, poultry fat as examples of sources of linoleic acid which is certainly essential for proper ceramide production in the skin and is essential for skin barrier integrity.(1)

Some seed oils produce a downstream intermediate called gamma- linolenic acid which is really just linoleic acid with 3 double bonds rather than two. In humans the conversion of linoleic acid to gamma linolenic acid is relatively robust, while in dogs and cats it is not as easily converted. In the body this is rapidly converted to di-homo-gamma linoleic acid which is a 20-carbon precursor to arachidonic acid, however due to limited activity of 5 desaturase and elongase activity this molecule may accumulate and during inflammation may proceed down eicosanoid metabolic pathways to prostaglandin 1 series molecules as a mild anti-inflammatory. (1)

Studies using borage, black current and evening primrose oil have been performed in atopic dogs suggesting that these fatty acids also have influence over pruritus and skin quality. (7-12) As we have yet to mention the cat in these proceedings it should be noted that the two studies in miliary dermatitis in cats that a blend of these oils with or without fish oil have been shown to be successful in ameliorating clinical signs associated with pruritic skin disease in cats, even more so than fish oil. At this juncture firm recommendations in the cat cannot be made however the limited evidence suggests that using a blend of these oils and possibly fish oil may be the most effective route in supplementing at similar amounts used for supplementing straight fish oil. (2-4 ml of oil blend per typical cat) (13,14).

Vitamins and Minerals:

There are a number of vitamins and minerals that are important in regulating the immune system and improving skin integrity that should not be forgotten and have clinical data suggesting that supplementation may be effective in quelling the pruritic in atopic dermatitis in the dog. Zinc is one that is often thought of due to zinc dermatopathy, which effects primarily northern breeds where zinc is often recommended as an organic form to alleviate clinical signs in dogs with this disorder. Dog foods will be appropriately supplemented to prevent zinc issues in nearly all dogs and the evidence is not strong that supplementation is necessary when feeding a dog food with over 120 mg/kg Dry matter, however there is

some evidence that using zinc methionine (1.6 mg/kg) that the dose of prednisone or cyclosporine could be lowered in 50-70% of cases suggesting that it may be worthwhile in the difficult cases.(15)

Vitamin E has been suggested to help improve immune cell function and a study in atopic dogs compared to placebo showed that all dogs improved whether on vitamin E at 8.1 mg/kg over an 8 week period of time while being treated for atopic dermatitis. Although the group treated with vitamin E showed improvement that were slightly better than the placebo group nearly all dogs improved to near clinical resolution of their clinical signs. The clinical benefits may be minimal, yet vitamin E supplementation is very safe and can be given without any real worry.(16)

Vitamin D is known to be a regulator of immune cell function and when dogs are consuming commercial dog food deficiency is not commonly observed. The tenants around using cholecalciferol to allow for homeostasis in the immune system should not be taken lightly as supplementation to help alleviate clinical signs of atopic dermatitis, but often requires very high dosing. In an effective clinical study for atopic dermatitis, it was shown that dosing starting at 300 IU/kg was ineffective and dose escalation was upwards to 1000-1400 IU/kg to get clinical effect, which has the potential to induce hypercalcemia. Although effective in many dogs the risk of hypercalcemia is real, and if used should be done similarly with dose escalation and monitoring for hypercalcemia. This approach should only be reserved for difficult cases not responding to other treatments.(17)

Probiotics and Herbal Remedies:

The use of probiotics to quell atopic dermatitis in dogs is in its infancy with studies suggesting that dermal integrity may be improved with less transepidermal water loss which is poorly understood. There have been two clinical studies suggesting that there may be mild improvements in clinical signs of atopic dermatitis and both were using lactobacillus species at over 1 billion microbes orally with food. In both studies the effects were mild approaching significance compared to placebo in one study and the other being open label, however what was significant in one study was lowering of other drug treatments during a 12 week trial. The effects appear to be mild and recommendations are not firm on how to best utilize probiotics during atopy treatment.(18,19) More interesting is the utilization of Chinese herbal formulas which are often formulated with a range of medicinal plant products. There are studies, one being a placebo blinded study for 8 weeks showing a diminished pruritic score at the 4-8 week mark using an herbal remedy, while the other study examined efficacy compared to oclacitinib. This non-inferiority study showed that the herbal product was similar in efficacy to oclacitinib over two weeks of treatment at 40-60 mg/kg, but not 20 mg/kg dosing. These are encouraging results however more placebo blinded studies are needed as these are complex mixtures of 4 or more herbs. The common herbs across the two studies were the use of *Rhemmania* spp and *Glycyrrhiza* spp in both studies. (20,21)

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