

ETHOXYQUIN AND OTHER ANTI-OXIDANTS

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Anti-Oxidants:

Anti-oxidants are added to pet foods to protect fats from rancidity. Fat becomes rancid especially when exposed to air, heat and perhaps bacteria. Fat breaks down in two steps. Hydrolysis yields fatty acids that may improve the flavor up to a point (no more than 10%). Oxidation of unsaturated fatty acids yields ketones and free fatty acids that are usually unpalatable and potentially injurious. It takes as little as 0.05% of the fat to react with oxygen to produce rancidity.

All commercial pet foods are preserved by some means. The dryness of dry pet foods provides a hostile environment for most bacteria, fungi and other potential disease causing organisms. Canned products are sterilized by heat, while the metal barrier keeps out pathogens. Frozen dog foods are popular in some countries because low temperatures stop many pathogens. Preservatives include the anti-oxidants BHT, ethoxyquin, forms of vitamin E (tocopherols) and vitamin C. Pet foods devoid of anti-oxidants added at the time of processing often contain ingredients (such as animal tallow and fish meal) that are preserved with anti-oxidants.

Ethoxyquin:

Many pet food manufacturers use ethoxyquin because of its excellent anti-oxidant qualities, high stability and reputed safety. However, an ongoing controversy surrounds issues related to its safety when repeatedly fed at permitted amounts in dog foods, particularly when fed to genetically susceptible breeds of inbred or closely linebred dogs. Toy breeds may be particularly at risk because they ingest proportionately more food and preservative for their size in order to sustain their energy needs.

For human consumption, ethoxyquin is permitted in certain spices to prevent loss of color. Ethoxyquin is permitted in pet foods, fats and oils at levels not exceeding 0.915% in the finished product (e.g. 0.015% as fed basis). It is readily absorbed, metabolized and excreted in urine and feces, with residual levels in liver, gastrointestinal tract and adipose liver.

Ethoxyquin is assigned a toxicity rating of 3 or "moderately toxic", indicating the probable oral lethal human dose is 0.5-5 g/kg, 3- to 33-times the maximum allowed in pet foods. This toxicity rating is slightly greater than ratings for tetracycline and penicillin, lower than for aspirin and caffeine. Susceptibility of laboratory animals to anti-oxidant toxicity increases with the nutritional stress of variable dietary constituents. Increased dietary fat, for example, increases susceptibility to toxicity of ethoxyquin fed to chickens and BHT (as well as DDT) fed to rats. The response in chickens to increased dietary fat appeared to be due to the resultant lowered protein. Chickens fed 17 vs. 23% protein showed increased susceptibility to ethoxyquin toxicity. Ethoxyquin levels fed to chickens were, however, almost 17 times the maximum allowable level for pet foods.

In laboratory animals, ethoxyquin increased hepatic vitamin A levels 2 to 5 fold, and at levels 3

times that found in pet foods, increased blood vitamin E levels 2 fold. These data suggest that ethoxyquin assumes some in vivo anti-oxidant activities and thus spares natural anti-oxidants such as vitamin E.

Since the late 1980's, the incidence of chronic disorders in purebred dogs appears to have increased. These disorders include dysfunction of liver, kidney and thyroid, reproductive problems, autoimmune diseases and other immune dysfunction, birth defects in pups, increased stillbirths and neonatal mortalities, neoplasia, allergies and problems with skin and coat condition. Most concerns have focused on inbred or closely linebred dog families.

Suspicious about the safety of ethoxyquin and any association with these disorders would be difficult to corroborate because the affected animals may have received drugs or other medications to treat their symptoms and other diseases may be present. Furthermore, ethoxyquin has been used in some animal feeds since 1959, some years before the controversy arose. Nevertheless, the additive or cumulative effects of several environmental insults, could explain the increasing frequency of debilitating illnesses in these dogs. Cumulative effects of metabolites and their interactions may place inbred or closely linebred dogs exposed to other inducing agents at significantly increased risk. The Food and Drug Administration of the USA Center for Veterinary Medicine states, however, that there is insufficient scientific evidence to show that ethoxyquin is unsafe when used at approved levels or to warrant action against its use in pet foods. Future studies incorporating modern toxicological techniques, appropriate medical and epidemiological assessment of cases and consideration of multifactorial interactions in inbred or closely linebred dogs, should help to clarify the issue. Indeed, for the majority of dogs, health risks from the ingestion of inadequately preserved rancid fats might be more harmful than risks from the potential adverse effects of ethoxyquin.