

## Antioxidants Used in Pet Feed

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**Abstract.** The aim of this study is to present a documentation about the antioxidants used in pet feed, and the toxicity exerted on pets. Natural and artificial antioxidants are used in the industry of pet feed to protect oils and fats against lipid peroxidation or oxidative rancidity.

In the present paper 4 brands of moist and dry feed were analysed. In order to determine the toxicity of the antioxidants used in pet feed, some literature studies regarding genotoxicity, teratogenicity, carcinogenicity, allergen potential and fetotoxicity were consulted.

After revising the literature we found that: ADI for BHA was established 100 mg/kg bw/day. The NOAEL for a 90 days study was 62,5 mg/kg bw; In a long term study the NOAEL was 250 mg/kg bw; at reproductive and developmental levels the NOAEL was 0.125 mg/ kg bw and at teratogenic level the NOAEL was 400 mg/kg bw. LD<sub>50</sub> was 2000 mg/kg bw.

Following the studies results we can conclude that: TBHQ (BHA secondary metabolite) has carcinogenic effect; TBHQ has genotoxic effect; BHA has no teratogenic effect; BHA has allergen potential.

**Keywords:** antioxidants, pet feed, carcinogenic effect, genotoxic effect, teratogenic effects.

**Introduction.** Pet feed manufacturers include antioxidants in commercial pet feed to prevent the autooxidation process. The Food and Drug Administration (FDA) defines antioxidants as substances that aid in the preservation of food by retarding deterioration, rancidity, or discoloration as the result of oxidative process. Natural and artificial antioxidants are used in the industry of pet feed to protect oils and fats against lipid peroxidation or oxidative rancidity.

Antioxidant ingredients can be categorized into two basic types – natural – derived products and synthetic products. The mixed tocopherols are probably the most widely distributed natural – derived antioxidants. These are composed of four homologues: alpha, beta, gamma, delta – tocopherols. Physiologically, alpha – tocopherol has the strongest biological function as an antioxidant in the body but has much lower activity as food antioxidant.

Natural antioxidants have multiple purposes: purifies the oxygen from all alimentary systems, maintains redox systems in reduced stage of oxidation, has synergetic action with metal chelates, regenerates primary antioxidants.

In most cases, synthetic antioxidants are included in food because their efficacy, good carry through and cost. In contrast, poor carry through, instability and high levels needed for effective protection make natural derived antioxidants in pet food.

### **Aims and Objectives.**

The aim of this study is to present a documentation about the antioxidants used in pet feed, and the toxicity exerted on pets (NOAEL, LD<sub>50</sub>, carcinogenic studies, teratogenic studies).

The objectives include aspects regarding literature data about utilization and toxicity of antioxidants.

### **Materials and methods.**

For the present study the following materials were used: “ Canine and feline nutrition” - Linda P. Case, “Alimentary additives and interaction with food” - Maria Tofana.

### **Results and discussions.**

In case of etoxiquin the literature studies led to a request of FDA to pet food manufacturers to voluntarily reduce the maximum level of etoxiquine in their foods from 150 mg/kg to 75 mg/kg. the pet food industry has onored this request.

Effective synthetic antioxidants for pet foods include butylated hydroxyanisole (BHA), BHT, tertiary butylhydroquinone (TBHQ) and etoxiquin. BHA and BHT have good carry through and a high efficiency in the protection of animal fats, but they are slightly less effective when used with vegetable oils.

The absorbtion, distribution, metabolism and excretion of BHA have been studied on rats, rabbits, dogs, monkeys. Overall, these studies show that BHA is rapidly absorbed in the gastrointestinal tract, metabolized and excreted. The excretion is made mainly via urine and faeces.

Like BHA and BHT, etoxiquin has good carry through , and it has an especially high efficacy in the protection of fats. Etoxiquin is more efficient as an antioxidant than BHA and BHT, which allows lower levels of the compound to be included in the feed. It is especially effective in the protection of oils that contain high levels of PUFA. And demonstrates synergistic protection when used in combination with BHA.

### **Conclusions.**

Following the studies results we can conclude that: TBHQ (BHA secondary metabolite) has carcinogenic effect; TBHQ has genotoxic effect; BHA has no teratogenic effect; BHA has allergen potential.

BHA and BHT are also mentioned on a list given by the FDA as a prior endocrine disruptor. The European Commission listed these substances as high concern in view of the results of studies on reproduction toxicity and endocrine disrupting properties and regarding its use in feed.

In case of BHA and BHT the following conclusion were extracted: ADI = 100 mg/kg bw/day; LD<sub>50</sub> = > 2000 mg/kg bw, TBHQ has carcinogenic effect; TBHQ has genotoxic effect; No teratogenic effect; Allergen potential;

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