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Chelates in Dog Foods

Some dog foods feature chelated trace elements such as zinc, iron, copper, manganese and selenium. These elements are bound to compounds with multiple carbon atoms and called organic trace elements. The word chelate has become trendy in the marketplace and works as blanket term. Technically, chelate structures consist of a ring of atoms with the trace element as link, and so form a specific class of organically bound trace elements.

Chelated trace elements in pet food are purported to outwork inorganic sources that contain no or only one carbon atom. It is often claimed that chelates are taken up by intestinal cells more efficiently, have prominent regulatory and catalytic activity in the body's metabolism and support the immune system. A few dog foods highlight added organic zinc as booster of a soft and shiny hair coat.

Trace elements are essential nutrients. Most commercially prepared canine foods are supplemented with trace elements and contain higher amounts than dogs' requirements. As additives, either inorganic or organic elements can be used. If a certain organic element is absorbed by the small intestine more efficiently, a smaller element quantity meets the intended absorbable dose. Nevertheless, the use of chelates is more expensive, but this may not discourage application as marketing tool.

Downregulation of absorption protects the body against excess of trace elements. The intestinal uptake routes of chelates might bypass the body's security mechanism. Little is known about the nature of degradation products of intactly absorbed chelates. Research data in the public domain cannot substantiate chelate-mediated health advantages in dogs. All in all, organic trace elements do not appear to be superior to inorganic sources.

Pet food and trace elements

Fear for deficiencies and process simplification explain why commercial pet foods are supplemented with liberal amounts of trace elements. Food-specific supplementation is no easy task. For each element, it involves determining the background concentration in the diet, estimating absorbability, setting the supply of the target animal and judging the need and form of supplementation. The conceptual relationship between intake of an individual trace element and health status of an animal spans amounts ranging from deficiency to adequacy to toxicity. Dietary supplementation appears pointless when supply is in the adequacy range. There is no evidence that higher intakes improve canine health while homeostatic regulation inhibits absorption and/or stimulates excretion. Below the adequacy range, supplementation promotes health. Smaller quantities are needed for trace elements with higher absorbability.

Efficiency of absorption

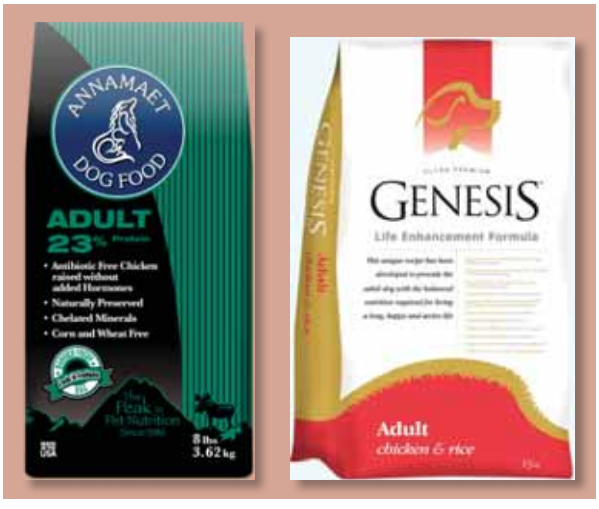
For dogs, there only is published information of the absorption of organic zinc, but it was not quantified. Upon ingestion of equal amounts of zinc in gelatin capsules as either zinc oxide or zinc propionate, the latter induced higher plasma zinc concentrations, indicating more efficient absorption (1). Similar results were obtained when a zinc-amino acid chelate (2) or zinc proteinate (3) was compared with zinc oxide.

The zinc content of a dry food without added zinc was almost doubled by incorporating zinc oxide or zinc-amino acid chelate (4). The chelate lowered faecal zinc excretion. Increasing dietary calcium raised faecal zinc output for the food with zinc oxide, but not for that with zinc chelate (4). When a solution with zinc sulfate or zinc methionylglycinate was administered orally after each meal of extruded food, the apparent absorption percentage of total ingested zinc was 30 and 37 percent (5).

Theoretical considerations

Organic versus inorganic zinc has enhanced absorbability in dogs. Organic trace elements may be more soluble in the intestinal content, which increases availability for absorption. They might easily pass the mucus and unstirred water layer on the intestinal wall. Possibly, chelates cross the mucosa through passive transport or carrier systems for their organic moiety. These routes would bypass homeostatic downregulation of absorption which is undesired from a teleological point of view.

Trace elements that are absorbed as organic molecule must be released prior to utilization as co-factor of enzymes and for other cellular functions. The delivery might be associated with the formation of undesired substances. High intakes of either sodium selenite or selenomethionine induced similar hepatic accumulation of selenium in dogs (6), most likely encased in selenocysteine or selenomethionine along with selenocysteine.



Organic zinc and hair quality

Dogs fed a complete food containing organic instead of inorganic zinc grew more hair of higher zinc content (4, 5, 7, 8). Methionine (4, 5, 7) or a hydroxyl analogue (8) was a constituent of the organic zinc source, but the amount added seems negligible. The increased zinc retention in hair was attributed to higher availability of zinc from the organic sources. However, the observation may reflect zinc accumulation caused by uncontrolled absorption and disturbed zinc homeostasis.

Organic zinc induced smoother and less fragmented hair as based on electron microscopy (5, 9). Veterinarians blinded to treatment modality assigned statistically, significantly higher brightness scores to the hair of supplemented dogs (8). The mean scores were 2.4 and 2.1 on a 1-3 scale which questions practical significance.

Substantiation of claims

There are no research data in the public domain showing that trace elements in either inorganic or organic form improve canine health at intakes higher than the recommended allowances. Pet food manufacturers wishing to use chelates for health claims must rely on the suppliers' data.

List of references is available on request from the author (beynen@freeler.nl)

Dr Anton C Beynen writes this exclusive column on dog and cat nutrition every month. He is affiliated with Vobra Special Petfoods.