Dr A C Beynen was professor of veterinary nutrition at the Faculty of Veterinary Medicine, Utrecht University, The Netherlands in the period of 1993-2007.

Lecithin in dog food

Lecithin is soaplike, it seeks the interface of fat and water. Within its structure, lecithin has a fatty-acid region that orients to fat and a phosphate-choline group that aligns with water. Many petfoods declare lecithin as ingredient. Actually, blends of true lecithin, fat- and lecithin-like compounds, named lecithins, are used in petfood. Lecithins are legally defined as technological additives and categorized as emulsifiers (1), substances that help fat and water mix together.

Lecithins are diverse oil-seed derivatives containing about 20% lecithin (2, 3). Their use in wet petfood aims at reducing the occurrence of globs of congealed fat. In dry food production, lecithins are deemed to improve the mixing of dry and fatty ingredients, along with water and steam, prior to cooking and kibble forming. Some dry dog foods assert that added lecithin, that is lecithins, enhances digestion of dietary fat, supports healthier haircoat and, less often, that it sharpens brain and lowers cholesterol.

Lecithin is a crucial component of the outer surface of body cells. Bile lecithin contributes to the formation of water-soluble aggregates that carry digested, dietary fat toward intestinal uptake. The dog's liver makes sufficient lecithin so that it is not a required nutrient. Dry food may contain 0.6% lecithin as held by its base ingredients, but creation in the dog's body is equivalent to no less than 3.6%. Added lecithins in dry food normally correspond maximally to 0.2% true lecithin.

The four health claims in lecithin advertising lack scientific evidence. Moreover, they can be considered illogical. The amount of lecithin added is minor compared with basal dietary lecithin plus bile lecithin, rendering enhanced miscibility of digested fat and water unlikely. Similar reasoning erodes the other lecithin-related health claims.

Phosphatidylcholine

Glycerophospholipids are important components of animal and plant membranes. Their basic component is a glycerol molecule to which phosphoric acid is esterified at the alpha carbon. Two long-chain fatty acids are esterified at the remaining two carbon atoms. In phosphatidylcholine (PC), lecithin's chemical name, choline is attached to the phosphate group.

Intake and synthesis

PC concentrations in finished dog foods are unavailable. An estimate can be made for dry food based on 50% corn and 30% poultry by-product meal. Corn meal (4) may contain 0.14% PC. Dry rendered poultry meal with 12% crude fat includes about 1.8% PC (5-8). Thus, the food's PC content would be 0.6%.

In dogs, the liver is the major source of plasma and biliary PC (9). The organ incorporates radioactive phosphate, choline and palmitic acid into PC (10). PC synthesis probably involves phosphocholine transfer to 1,2-diacylglycerol or methylation of phosphatidylethanolamine. Linoleic and arachidonic acid are plentiful in canine plasma and biliary PC (11, 12). Linoleic acid is indispensable, but choline is considered conditionally essential for the dog (13). Feeding a choline-free diet reduced hepatic PC synthesis in dogs (14, 15).

A 20-kg dog may daily secrete about 5 and 7 g PC into blood and bile (16-21). When that dog consumes 333 g dry food/day, total PC synthesis is numerically equivalent to a dietary concentration of 3.6% PC.

Absorption

In dogs given labeled dilinoleoyl PC, more than 90% of radioactivity was absorbed from the intestinal lumen within 24 hours (22). Dietary and biliary PC's are hydrolysed by pancreatic phospholipases (cf. 23) within the duodenum for incorporation into mixed micelles. PC (re)synthesized in the mucosa forms part of chylomicron formation. In dogs, PC ingestion (24) only slightly increased the PC content of lymph, but absorbed fat raised it considerably (25).

Safety

Oral administration of phospholipids from bovine cerebral cortex, at the equivalent of 5.8% in dry food, did not produce adverse effects in dogs within one year (2). Feeding undefined soybean lecithin, at 2.2 or 1.3% of the diet for 5 or more days, clearly reduced erythrocyte numbers in dogs without (26) or with experimental polycythemia (27), but 0.2% for 60 days left the hematological profile unchanged (28).

Health claims

There is no published research indicating that supplemental dietary lecithins and PC affect fat digestion, haircoat condition, brain function or blood cholesterol in dogs. Besides, practical supplementation of dog food with PC is quantitatively negligible (see below). On the other hand, additional lecithins in food might stimulate fat absorption because their ingestion is combined with that of dietary fat. Dogs fed dry food based on regular ingredients without added lecithins show apparent fat digestibilities higher than 90% of intake (29, 30), which makes further increase hard.

Addition of 1% soybean lecithins to the diet equals 0.2% extra PC, which in turn represents 0.03% choline and 0.04% linoleic acid. The supplementary PC is negligible when compared with 0.6% intrinsic dietary PC plus body synthesis equivalent to 3.6% dietary PC. The PC-associated amounts of choline and linoleic acid are insignificant also: commercial dry dog food may contain at least 0.15% choline (31) and more than 1.5% linoleic acid (32).

Technological impact

The value of lecithins in petfood production is not described in the open literature. Type and dose of lecithins that are optimally effective against "greasing out" or "fat capping" should be determined empirically for different wet food formulas. Potential benefits as to motor load, throughput, starch complexing or anti-clumping in the manufacture of dry food may be clarified by suppliers of lecithins.

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.*