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Sugar in dog foods

Sugar loosely refers to carbohydrates, but in everyday language it is table or granulated sugar, with sucrose as common chemical name. Sucrose is made up of two simple sugars, glucose and fructose. It is extracted and refined from sugar cane or beet. Added sugar in the diet is generally considered bad: it is seen as a taste enhancer containing a lot of calories, with no essential nutrients.

Unsurprisingly, many owners reject sugary dog foods as being the presumed cause of overweight, tooth decay and other disorders. Various petfood manufacturers have responded by advertising "no added sugar" on their websites. At times, the catchphrase turns up on a dog food label. Added sucrose is declared in the ingredient list as sugar or sucrose, but there may also be beet pulp and/or molasses as sucrose-rich ingredients. The sucrose content of dog food is not disclosed, but the manufacturer may be contacted.

Dental caries in the dog population is rare and unrelated to dietary sucrose (1, 2). There is no specific role for sucrose in the wide-spread canine obesity due to caloric excess; the amount of calories rather than source is crucial. Adding sucrose to dog food makes it more appetizing. It is easy to anticipate that palatable food promotes obesity in dogs, but there is no research-based evidence. Whichever food is dished up, it is always prudent to adjust portion size to dog weight.

The dog digests dietary sucrose efficiently and utilizes the glucose and fructose components. Puppies were maintained with good growth on experimental diets very high in sucrose. A similar diet fed to bitches during pregnancy, parturition and lactation supported general health and satisfactory reproduction. It is reasonable to conclude that the assessed, maximum amount of sucrose in dry, extruded kibbles does not harm dogs.

Palatability

Adult dogs given free access to dry food, a pan with distilled water and another one with 10% sucrose (w/v), showed a strong preference for the sweetened water (3). A study in puppies found that the preference threshold for sucrose was about 0.003%, with maximum liking reached at 3% (4).

In two-choice tests, dogs clearly ate more sucrose-supplemented than unsupplemented diet. The preference results were similar for a dry, vegetarian-protein formula mixed with sucrose at 1% or 20% of the total diet (5). Indirect comparison indicates that sucrose added to a semimoist (4) or semipurified food (6) increased palatability.

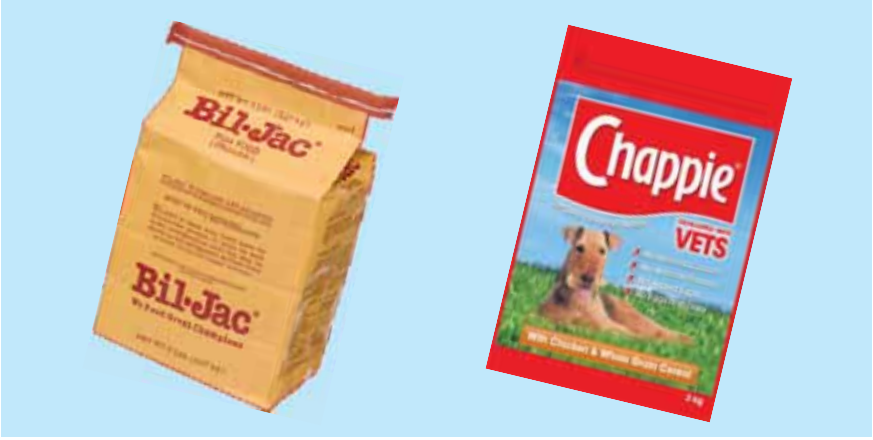
Utilization

Adult dogs fed a carbohydrate-free, meat-based diet had low sucrase activity in small intestinal mucosa, but a diet made with meat meal and 41% sucrose (g/100 g dry matter, throughout this text) substantially increased the activity within 14 days (7). In two dogs given that sucrose diet for 5 days, apparent ileal sucrose digestibility was almost 100% (8).

After 10 days on a semipurified diet with 62% sucrose as only digestible carbohydrate, adult dogs (n=4) showed a considerable postprandial blood glucose response and excreted sucrose and fructose in urine (9). Urinary loss of total sugar equaled 0.3 % of sucrose intake, corroborating another study (10). Apparently, intactly absorbed sucrose and fructose traces ended up in urine.

Safety

There are no long-term, controlled, dose-response studies that addressed the safety of sucrose consumption by dogs. Some insight can be obtained from earlier nutrient-requirement studies employing semipurified, high-sucrose diets.



Different research groups (11-14) reported that nutritionally optimized, semipurified diets containing 49 to 69% sucrose, fed for 6 to 27 weeks, supported good health and satisfactory body-weight gain in weanling dogs. Bitches fed semipurified diets with 69% sucrose showed no evidence of unthriftiness, had normal hair coats and good consistency of stools (15). Their pups had expected body weights at birth and weaning, while mortality was in the upper normal range.

Fructose

Fasted dogs fed diets containing about 66% fructose instead of glucose had lost part of their capacity to dispose of blood glucose after glucose ingestion (16) or after intravenous administration of glucose together with insulin (17, 18). Dietary fructose, displacing 66% glucose or 18% starch, raised fasting blood insulin concentrations, but left glucose unchanged (17, 19). Fasting triglyceride levels were increased by 66% fructose in the diet (17), but not by 18% fructose (19) or 24-50% sucrose (20, 21).

Replacement of 18% dietary starch by fructose, albeit not as only variable, reduced hepatic glucose uptake and glycogensynthase activity in dogs (19). Thus, hepatic metabolism shifted from glycogenesis to lipogenesis, for which is fructose is both activator (22) and excellent substrate (23).

"High intakes of fructose in place of starch may induce insulin resistance." However, the dose-response relationship is unknown, while fructose quantity equals almost twice that of sucrose. Dogs develop obesity-associated insulin resistance, but not type-2 diabetes (24). Nevertheless, chronic adverse effects of insulin resistance cannot be excluded.

Practical implications

The main sucrose sources in dog food are refined sucrose, beet pulp (8-25% sucrose), beet/cane molasses (about 60%) and bakery byproducts (about 20%). Considering regular formulations, extruded dog foods hold considerably less than 10% sucrose. An unspecified dry food had 2% sucrose according to sophisticated analysis (25). Certain semimoist foods, in the form of rings, slices or rolls, contain added sugar. A frozen food features all three sucrose-rich ingredients. It is unknown whether the foods' sucrose contents affect insulin sensitivity.

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

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