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Diet and grass eating in dogs

Do dogs eat grass because they have a dietary deficiency? Based on three arguments, the answer to that commonly asked question (1) is no. For one, a deficiency of any nutrient is highly unlikely in grass-eating dogs fed on commercial, complete diets. Secondly, if a nutrient deficiency would inspire grass eating, the low bodily status of the nutrient in question somehow connects with grass as replenisher and directs its selection and consumption. So far, these capabilities have not been shown in dogs. Thirdly, dogs fed a fiber-deficient diet did not engage in eating fresh grass more frequently than did their counterparts fed the same diet, but with alfalfa meal as fiber source.

In a questionnaire-based study, 71 (11%) out of 626 owners stated that their dogs never ate grass or other green plants (2). A web-based survey showed that 1068 (68%) out of 1571 plant-eating dogs ingested plants on a daily or weekly basis (3, Note 1). In 79% of those 1571 dogs, grass was the most frequently eaten plant. Plant-eating frequency (< 1 or ≥ 1/week) was unassociated with diet type: the frequencies were similar in dogs fed either commercial kibbled and/or canned food (n =1245) or home-cooked or raw food (n =326). As mentioned, fiber deficiency may not increase grass eating. Contrarily, an experimental diet did affect grass eating: excessive intake of a non-digestible carbohydrate had a diminishing effect.

For the 1571 plant-eating dogs, 8% of their owners frequently noticed signs of illness before plant eating, while 23% frequently saw their pets vomit afterward (3). These outcomes indicate that overt illness is a minor correlate of grass eating and that vomiting is not a fixed consequence (Note 2). Another question that dog owners may put to veterinarians (1) – Do dogs eat grass to induce vomiting because they are sick? – cannot be answered, but grass eating mostly is not followed by vomiting (Note 3). Plant eating likely serves a biological purpose, but so far the interpretation is subject of speculation (1).

Canine grass eaters may ingest 0 to 30 blades of grass per day, or 0 to 2 g of grass (= 0.32 g of dehydrated grass, Note 4). Multiple, commercial dry dog foods contain alfalfa meal derived from the green, leguminous alfalfa plant. The meal consists of dried, chopped, short-stem and leaf-rich alfalfa. A 20-kg dog may consume 12 g dried alfalfa (about 60 g fresh stems with leaves) per day when fed on a dry food containing 4% alfalfa meal (Note 5). That level of alfalfa inclusion is safe and contributes significantly to the amount of crude fiber in the diet. Diverging health benefits are attributed to alfalfa in dog food (Note 6), but the assertions remain unproven.

Grass-eating pattern

In healthy, adult kennel dogs (n =12), known to eat grass, grass-eating behavior was studied in a research facility (4). Compatible groups (n =3) were presented with two pots of both kikuyu (*P. clandestinum*) and couch grass (*C. dactylon*), and observed during 10-min sessions around 9 and 12 am and 3 pm for six days. Water was freely available. On two consecutive days, during one and the same of the three daily sessions, the dogs received a meal of commercial dry food. In conformity with a Latin square, two groups were observed before the meal and two groups afterwards.

All dogs readily ate grass as they did in their home-kennel environment. There was no clear difference in preference between couch and kikuyu grass. Before their kibble meal, the dogs spent more time eating grass and had more grass eating events than after the meal: on average 2.7 versus 0.5 min and 6.7 versus 2.0 events per dog. The authors (4) suggested that satiety may diminish grass

eating. Across all 12 dogs and all 18 testing sessions, there were five vomiting events, involving three dogs, for a total of 709 grass-eating events.

Case report

An 11-year-old dog displayed problematic plant-eating behavior for 7 years (5). Every day, the dog ate grass during its outside walk or plants grown in house. Before or after, behavior was normal, except for invariable vomiting afterwards. Dog's feces was somewhat soft. Physical and clinical-chemical examinations did not reveal abnormalities.

The feeding of a hypoallergenic, hydrolysed-protein-based diet for 8 weeks left plant-eating behavior unchanged. Then, the dog was put on a high-fiber diet: a dry prescription food containing 15.3% crude fiber plus added cooked or raw grains and vegetables. Within three days, plant eating and vomiting had stopped. As expected, both fecal firmness and bulk were increased. Thirteen months later, the dog was still off plant eating.

Alfalfa study

A study has tested the hypothesis that shortage of fiber stimulates grass eating (2). According to an incompletely-balanced Latin square design (Note 7), 11 adult dogs were fed a fiber-free diet without or with alfalfa meal. The feeding periods lasted 21 days. Dogs were housed individually in a shared room, had water ad libitum and were administered their meal at 5 pm. Each day, from 6 to 7.30 am, the dogs were brought together in a courtyard and had free access to fresh grass sods. From a position invisible to the dogs, grass-eating behavior of the dogs was watched and recorded.

The control diet was based on whole-egg powder and cooking oil (Note 8). The test diet was composed of 90% control diet and 10% alfalfa meal. The proximate composition of the control/test diet was 96.9/96.1% dry matter, 23.5/23.0% protein, 63.2/58.0% fat, 0/2.1% fiber and 9.0/8.9% ash. All dogs engaged in grass eating, but not daily. The average number of sessions during which grass was eaten (out of 21 sessions per diet) was almost identical for both diets: 13.0 and 13.8 sessions per dog (Note 9). Thus, adding alfalfa fiber to a fiber-free diet did not reduce grass eating.

FOS study

The hypothesis that gastrointestinal stress promotes grass eating, was put to the test through feeding dogs a diet with a very-high level of fructooligosaccharides (FOS, Note 10). In a study (6) with A₁-B₁-A₂-B₂ design and periods of 7-2-5-2 days, 12 adult dogs were fed diets A (control) and B (test). The control diet consisted of an extruded and canned diet in a 97:3 energy ratio. To make the test diet, FOS (inulin) was mixed with the wet-food portion so that the inclusion was 10% of total dietary dry matter.

For 10 minutes per day, as from 10 am, during the B periods and during the last two days of the A periods, pairs of dogs were presented with one pot each of couch (*C. dactylon*) and kikuyu (*P. clandestinum*) grasses. Grass-eating behavior was recorded. The dogs were given their meal once daily, between 3 and 5 pm.

Feces consistency was normal for the control diet, but FOS feeding caused loose, watery feces. The dogs showed a strong preference for kikuyu versus couch grass. Average grass-eating events and duration were higher for the control diet compared with the FOS diet: 4.6 versus 3.1 events and 2.7 versus 1.7 min. The results indicate that mild, FOS-induced diarrhea did not coexist with enhanced grass eating. Stated differently, in some way the FOS preparation discouraged grass eating.

Alfalfa in dog food

Alfalfa (*Medicago sativa*), also called lucerne, may be used for grazing, pelleting, hay and silage, and hence for feeding cattle and horses. Young plants are typified by trifoliate leaves. In maturity, the leaves become elongated and clusters of small purple flowers appear. Fresh, young alfalfa contains about 20% dry matter. Artificially- or sun-dried alfalfa holds about 90% dry matter, 10-19% crude protein, 2-3% crude fat, 23-30% crude fiber, 9-12% ash, 0.9-1.6% calcium and 0.2-0.3% phosphorus.

In 1935 (7) and 1942 (8), the Alabama Agricultural Experiment Station released bulletins on practical dog feeding. The so-called Auburn Ration I (Note 11), which was corn-based and contained 2% alfalfa-leaf meal, was “especially recommended for brood bitches where reproduction and raising pups is the main consideration” (8). In 1965 (9), it was reported that a corn-based diet containing 5% alfalfa meal (Note 12) was adequate for growth, maintenance, reproduction and lactation in dogs.

Note 1

The inclusion criteria of the survey responses were as follows (3): only those surveys in which dog owners stated that they spent at least 6 h per day in the company of their dogs and had observed plant eating on at least 10 occasions during the time they owned their dog were included. Of 3340 surveys returned, 1571 (47%) met the inclusion criteria.

Note 2

In a questionnaire-based study (2), owners (n =555) of grass-eating dogs were asked about remarkable observations before grass eating. The responses were none (n =472), hungriness (n =45), consumption of spoiled food (n =20) and overeating (n =18). With regard to vomiting after grass eating, the responses were no (n =230), yes (n =200) and sometimes (n =125).

Note 3

An article is entitled “*Cynodon dactylon* (L.) Pers.: a self-treatment grass for dogs” (10). That article is at odds with the observations (2, 3) that grass eating mostly is not followed by vomiting. However, the authors observed in India that the grass parts in dogs’ vomitus matched with *Cynodon dactylon*, also called couch grass or dog grass. The paper speculates how couch grass may uniquely induce vomiting in dogs. In two studies on grass-eating behavior (4, 6), dogs were given access to both couch and kikuyu grass (*P. clandestinum*) grass.

Note 4

Some owners of grass-eating dogs reported that their dogs repeatedly had episodes with a strikingly great desire for grass eating (2). During those circumstances, the dogs were said to ingest 20 to 30 blades of grass per day. Blades of perennial ryegrass (*Lolium perenne* L.) with average length of 10.8 cm had an oven-dry weight of 12.4 mg (11). The dry weight of 30 blades is 372 mg, which corresponds with 2325 mg fresh weight, or over 2 g. Fresh grass contains about 16% dry matter.

Note 5

According to the manufacturer of Canine Caviar dog foods, the amount of sun-cured alfalfa is less than 5% in each diet (a).

The ingredient list of the dry food Canine Caviar Open Meadow reads as follows (b): Dehydrated Lamb, Pearl Millet, Lamb Fat (preserved with mixed tocopherols), Coconut, Sun-Cured Alfalfa, Coconut Oil, Sun-Cured Kelp, Dried Lactobacillus Acidophilus Fermentation Product, Sodium Chloride, Lecithin, Choline Chloride, FOS or Fructooligosaccharide (prebiotic), Fenugreek, Peppermint, Taurine, Zinc Proteinate, Papaya, Rose Hips, Yucca Schidigera Extract, Anise Oil, Thyme Oil, Manganese Proteinate, Beta-Carotene, Vitamin D3 Supplement, Biotin, Selenium, Riboflavin, Thiamine Mononitrate, Pyridoxine Hydrochloride, Vitamin B12 Supplement, Folic Acid.

a. <https://blog.caninecaviar.com/2019/09/benefits-of-alfalfa-for-dogs>

b. <https://www.caninecaviar.com/product/open-meadow/>

Note 6

The benefits of alfalfa for dogs have been described as nutrient dense/nutritional powerhouse (a, c, e, f, g), promoting oral and kidney health (a, g), improving appetite (a), supplying complex carbohydrates (d), relieving arthritis pain (e, g) and preventing cancer (g). Alfalfa in dog food has been called a controversial ingredient as it is commonly associated with horse feed (h).

c. <https://www.natureslogic.com/2016/07/06/alfalfa-natures-logic-foods/>

d. <https://krisers.com/products/zignature-limited-ingredient-lamb-formula-dry-dog-food>

e. <https://woofwhiskers.com/crave-dog-food-review>

f. <http://slimdoggy.com/dog-food-ingredients-a-to-z-alfalfa/>

g. <https://www.dogsnaturallymagazine.com/alfalfa-for-dogs/>

h. <https://puplore.com/canidae-dog-food-reviews/>

Note 7

The study was designed as Latin square with six dogs and two feeding periods (2). During grass-eating sessions in the second period, two dogs proved to be unsuitable due to pack-order fights and were removed. One dog was replaced. Data for the control and test diet are based on 5 and 6 dogs (Note 9).

Note 8

The control diet (2) consisted of 49.26% whole-egg powder, 44.50% cooking oil, 2.77% dicalcium phosphate dehydrate, 0.54% calcium carbonate, 1.21% sodium chloride and 1.72% potassium sulfate.

Note 9

The number of sessions during which the individual dogs ate grass were 17-11-10-21-6 (n = 5) for the control diet and 18-12-13-20-10-10 (n =6) for the test diet (2). The total number of sessions was 21.

Note 10

FOS (fructo-oligosaccharides) refers to a group of carbohydrates consisting of bonded fructose units (12). Inulins, which are extracted from chicory root, have an $\alpha(1-2)$ -linked glucose end unit.

McKenzie et al. (6) used inulin. It has been shown earlier that mixing inulin into dogs' food, at 7% of dietary dry matter, increased wet feces quantity by 46% and reduced apparent protein digestibility by 2.6% units (13). The extra feces contained 89% moisture, pointing to an osmotic effect of colonic solutes generated by enhanced bacterial activity. Inulin acts as microbial substrate, thereby expanding fecal, bacterial mass, including protein.

Note 11

The Auburn I dog ration (7) consisted of 35% yellow corn meal, 10% wheat bran, 20% wheat middlings, 10% meat scraps (55-60% protein), 10% fish meal (55-60% protein), 10% skim milk powder or dried butter milk, 2% alfalfa meal or alfalfa leaf meal, 2% bone meal, 1% salt.

Note 12

The diet consisted of 58% ground yellow corn, 32% soybean oil meal, 5% alfalfa meal, 2% salt mixture and 3% cottonseed oil. One g of irradiated yeast, 2.0 g niacin and 20 µg crystalline vitamin B12 were added per kg diet (9). Each animal was given 10 drops of halibut liver oil weekly. The salt mixture was composed of 50% CaCO₃, 24% NaCl, 24% CaHPO₄, 1% MgO, 0.95% MnSO₄ and 0.05% KI.

Note 13

Estrogenic activity in alfalfa meal may be about 15 times higher than that in soybean meal (14). The estrogenic activity in soy-containing petfoods appears to be safe, but it can influence hormonal systems in dogs and cats (15).

Note 14

MFiber is advertised as a petfood ingredient (i, j). MFiber is a fiber ingredient made from *Miscanthus giganteus*, a C4 grass grown for its fiber content. In a dog digestibility trial, *Miscanthus* grass (presumably being the same as MFiber) has been compared with cellulose and beet pulp (16). MFiber is a processed product using the lignified plant as starting material (i, j). If the terms MFiber and *Miscanthus* grass are used interchangeably, then the word grass is somewhat misleading.

i. <https://mfiber.net/>

j. <https://mfiber.net/renew-biomass-acquires-mfa-oil-biomass-assets/>

Note 15

A research paper advances the judgment that dogs are widely exposed to commonly used lawn chemicals and that these chemicals are present in their urine, possibly having negative health effects (17).

Note 16

Based on an experiment, it has been suggested that grass-eating behavior in domestic dogs is innate and that the mother's eating habits further facilitate the puppies' grass eating (18).

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