

# Evaluation of marketing claims, ingredients, and nutrient profiles of over-the-counter diets marketed for skin and coat health of dogs

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**Objective**—To evaluate marketing claims, ingredients, and nutrient profiles of over-the-counter diets marketed for skin and coat health of dogs.

**Design**—Cross-sectional study.

**Sample**—24 over-the-counter dry and canned diets marketed for skin and coat health of dogs.

**Procedures**—Data on marketing claims and ingredients were collected from diet packaging and manufacturer websites. Concentrations of selected nutrients were obtained by contacting the manufacturers and were compared against minimum values for Association of American Feed Control Officials Dog Food Nutrient Profiles for adult dog maintenance based on calorie content.

**Results**—Most diets incorporated marketing terms such as digestive health, sensitive, or premium that are poorly defined and may have limited relevance to skin, coat, or general health. The types and numbers of major ingredients (ie, potential to contribute protein to the diet) differed. The total number of unique major ingredients in each diet ranged from 3 to 8 (median, 5.5), but the total number of unique ingredients in each diet ranged from 28 to 68 (median, 38). Concentrations of nutrients associated with skin and coat condition also differed widely.

**Conclusions and Clinical Relevance**—Results indicated that the large variation among over-the-counter diets marketed for skin and coat health may cause confusion for owners during diet selection. Owners of a dog with dermatologic problems should consult their veterinarian to select a good-quality diet that meets specific nutrient goals. (*J Am Vet Med Assoc* 2015;246:1334–1338)

Dermatologic problems are among the most common reasons pet owners take their dogs to a veterinarian.<sup>1</sup> Many factors, including diet, infectious disease, parasites, environment, genetics, and metabolic disease, can impact skin and coat quality; however, dog owners frequently blame diet as the cause of dermatologic problems or turn to dietary modification in an effort to address these issues. Anecdotally, many owners appear to be concerned that food allergies commonly contribute to dermatologic conditions; the large number of veterinary and OTC diets that are marketed as novel or hypoallergenic may contribute to this misperception. Cutaneous adverse food reactions, which encompass true allergies and food intolerances, are not commonly diagnosed. The exact prevalence of CAFRs in the general canine population is unknown, but dogs with CAFRs comprised 19 of 251 (7.6%) dogs evaluated at one referral dermatology clinic<sup>2</sup> and 16 of 130 (12%) dogs with dermatologic signs at another referral dermatology clinic.<sup>3</sup>

Similar to the situation for CAFRs, nutrient deficiencies and toxicoses are unlikely causes of dermatologic disease of dogs fed good-quality, complete and balanced commercial foods. Nonetheless, many nutri-

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## ABBREVIATIONS

AAFCO	Association of American Feed Control Officials
CAFR	Cutaneous adverse food reaction
DHA	Docosahexaenoic acid
EPA	Eicosapentaenoic acid
OTC	Over-the-counter

ents can impact skin and coat condition of dogs. Essential fatty acids play a role in membrane fluidity, metabolic regulation, maintenance of the transepidermal water barrier, and eicosanoid synthesis.<sup>4</sup> Dogs with deficiencies of essential fatty acids have clinical signs that include a thin, discolored coat; scaly skin; sebaceous gland hypertrophy; and increased transepidermal water loss.<sup>4</sup> Supplemental dietary linoleic acid may be helpful for improving skin and coat quality,<sup>5</sup> and supplemental omega-3 fatty acids may be helpful for dogs with pruritus and inflammatory skin disease.<sup>6,7</sup> Increased total dietary fat (rather than specific fatty acids) can contribute to coat gloss and softness, even if there is no fatty acid deficiency.<sup>8</sup>

Deficiencies of certain amino acids, vitamins, and minerals can also result in dermatologic signs. For example, vitamin A deficiency can lead to dermatitis, alopecia, and other skin lesions of dogs.<sup>9</sup> Although there are many diets marketed for skin and coat health of

dogs, it is not known whether these diets have concentrations of nutrients, such as fatty acids, total fat, vitamins, or minerals, that would make them effective for this purpose or more effective than a complete and balanced diet not marketed for skin and coat health.

Although there is evidence that preventing deficiencies (eg, essential fatty acid or vitamin A deficiency) or providing higher intake of certain specific nutrients (eg, anti-inflammatory effects of supplemental omega-3 fatty acids) can have beneficial effects for skin and coat health, there appears to be much confusion among pet owners about the role of nutrition in skin and coat health. These misconceptions could be influenced by marketing claims for OTC diets. In accordance with the Federal Food, Drug, and Cosmetic Act, expressed or implied claims that a diet is intended to cure, treat, or prevent disease may subject the diet to regulation as a drug, rather than as a pet food.<sup>10</sup> However, the name or marketing information of numerous OTC diets implies or directly states that the diets improve skin and coat quality; these marketing strategies (both on pet food labels and in advertisements) can be ambiguous and may lead owners to infer specific health benefits. Confusion over marketing can make it challenging for dog owners and veterinarians to make informed decisions about diet choices. Therefore, the purpose of the study reported here was to evaluate marketing terms, ingredients, and nutrient profiles of OTC diets marketed for skin and coat health of dogs to gain a better understanding of common marketing strategies and identify patterns of ingredients and nutrient concentrations.

## Materials and Methods

**Sample**—Over-the-counter dry and canned diets marketed for skin and coat health of dogs were included in the study. The authors included diets from various retail sources, including specialty pet stores, mass market retailers, and supermarkets, at which consumers could purchase OTC diets marketed for skin and coat health of dogs. Diets also were included from online retailers (both Internet-exclusive retailers and websites for retailers with brick-and-mortar locations). Only diets specifically marketed for skin and coat health were included.

**Procedures**—For the purposes of this study, diets that had the terms skin or coat or other specific descriptors of skin and coat appearance (eg, shine and beauty) in the diet name were considered as marketed for skin and coat health. Diets with names that alluded to food sensitivities (ie, use of the term sensitive, as in the phrase “sensitive dogs”) were not included unless they met the criteria, even if other label information implied benefits for skin and coat health. Diets with labeling that advertised a secondary benefit for skin or coat health (eg, a diet with packaging that advertised omega-6 fatty acids for a healthy coat but without a name mentioning skin or coat health) were excluded. Diets marketed as limited-ingredient diets were not included unless they also met the criterion of having skin or coat health in the diet name. Diets with a reference to skin or coat in the manufacturer’s name, but not in the diet name, were excluded. Veterinary diets were not included.

Marketing terms and ingredient lists were obtained from diet packaging and manufacturer websites. Website claims were examined along with diet packaging, given that marketing claims posted on the Internet or provided in other promotional material can also be included under Federal Food, Drug, and Cosmetic Act regulations.<sup>10</sup>

Although most diets were not marketed as limited-ingredient or novel-ingredient diets, it was the authors’ clinical impression that owners often selected these diets if they believed their dog had a food allergy. Therefore, the number of ingredients containing potential allergens in each diet was assessed; added water was not considered an ingredient. Ingredients were considered to be major ingredients if they had the potential to contribute protein to the diet. Although there was a small potential for other ingredients to cause allergies, oils, fruits, herbs, and spices were not classified as major ingredients because they contributed negligible amounts of protein to the diet. The number of both plant- and animal-based (including egg and dairy) major ingredients on diet ingredient lists was counted, given that both contained proteins that may contribute to CAFRs. Only unique major ingredients (ie, ingredients not repeated within each individual ingredient list) were counted, with the assumption that multiple ingredients from the same protein source would not impact allergenicity (eg, chicken and chicken meal were counted as one unique meat-based ingredient). When multiple species of fish (eg, salmon and trout) were named in an ingredient list, they were counted as separate unique ingredients; however, oceanfish and fish were counted as 1 unique ingredient.

Calorie density (reported as kcal/kg of diet) and average (or typical) nutrient concentrations on an as-fed basis were obtained from diet manufacturers via telephone or email. Nutrient concentrations were converted into units/1,000 kcal of metabolizable energy (to facilitate comparison between diets with differing moisture content and energy density), on the basis of the reported value for the nutrient of interest (eg, protein) and reported number of kcal/kg of diet, and compared against minimum values of the AAFCO Dog Food Nutrient Profiles for adult dog maintenance based on calorie content.<sup>11</sup> The method (eg, physiologic fuel values; calculated vs measured) that had been used for calculation of the kcal/kg content reported by the manufacturer was not determined.

**Data analysis**—Data distributions were evaluated by use of Kolmogorov-Smirnov tests. All data were skewed and thus were reported as median and range. Commercial statistical software<sup>a</sup> was used for descriptive statistics.

## Results

Twenty-four OTC dry and canned diets marketed for skin and coat health of dogs were included in the study. This included 15 dry and 9 canned diets of 11 brands. Although all 24 diets had the term skin, coat, or other descriptors of skin and coat appearance in the diet name, a variety of other marketing terms were also

included on the diet packaging and websites (Table 1). Terms that could lead consumers to infer a health benefit (eg, digestive health or sensitive) were extremely common; lack of certain ingredients (eg, corn, wheat, artificial ingredients, and soy) was also frequently used as a marketing claim. Marketing of specific fatty acids (ie, omega-3 or omega-6) was included on labels of 13 diets, but vague terms were almost as commonly used (ie, omega fatty acids or omega oils was included on labels of 10 diets).

Table 1—Number of 24 OTC diets marketed for skin and coat health of dogs that had package labeling or information on a website that included specific marketing terms.

Marketing term or claim	No. of diets
Fatty acids	22
Omega-6	11
Nonspecific omega	10
Omega-3	5
Digestive health	17
Sensitivities	17
No artificial colors, flavors, or preservatives	15
No corn	14
No wheat	14
Antioxidants	13
Premium	13
Natural	12
No soy	11
Limited or unique ingredients	8
Zinc	8

All diets had the words skin or coat or specific descriptors of skin and coat appearance in the diet name.

Median number of unique major ingredients in each diet was 5.5 (range, 3 to 8), with a median of 2 animal-based ingredients (range, 0 to 5) and 3 plant-based ingredients (range, 1 to 5). Median total number of unique ingredients in each diet was 38 (range, 28 to 68). The most common animal-based ingredients were fish (n = 11), egg (7), and chicken (6), with smaller numbers of other animal-based ingredients (venison [4], dairy [3], animal digest [2], duck [2], lamb [2], turkey [2], beef [1], and pork [1]). The most common plant-based ingredients were rice (n = 17), potato (12), oat (11), pea (10), and barley (9), with smaller numbers of other plant-based ingredients (sorghum [4], soy [4], millet [3], corn [2], quinoa [2], sweet potato [2], canola [1], lentil [1], tapioca [1], and wheat [1]).

Not all manufacturers were able to provide average or typical nutrient concentrations for their diets. All manufacturers were able to provide concentrations of protein, fat, zinc, vitamin A, and vitamin E, but concentrations of each of the B vitamins were available from only 20 to 23 manufacturers (Table 2). There were 22 diets that promoted inclusion of omega-6 or omega-3 fatty acids or that promoted inclusion of omega fatty acids but without further specification; however, information was available for a minority of these diets with regard to concentrations of EPA (n = 7), DHA (9), total omega-3 fatty acids (7), or total omega-6 fatty acids (6).

Overall, there was wide variation in nutrient concentrations of the 24 diets. All diets, except for 3, met the minimum values of AAFCO Dog Food Nutrient Profiles for adult dog maintenance based on calo-

Table 2—Nutrient concentrations for 24 OTC diets (15 dry and 9 canned) marketed for skin and coat health of dogs compared against minimum values for AAFCO Dog Food Nutrient Profiles for adult dog maintenance (based on calorie content).

Nutrient	No. of diets*	Median (range)	AAFCO minimum
Metabolizable energy			
Dry (kcal/cup, as-fed basis)†	15	377 (299–453)	NA
Dry (kcal/kg, as-fed basis)	15	3,591 (3,353–4,120)	NA
Canned (kcal/can, as-fed basis)	9	376 (168–528)	NA
Canned (kcal/oz, as-fed basis)‡	9	30 (26–40)	NA
Canned (kcal/kg, as-fed basis)	9	1,144 (900–1,410)	NA
Protein (g/1,000 kcal)	24	70.0 (55.0–104.3)	51.4
Fat (g/1,000 kcal)	24	40.1 (26.2–74.9)	14.3
Linoleic acid (g/1,000 kcal)	19	7.7 (2.7–19.0)	2.9
Total omega-6 (g/1,000 kcal)	6	9.45 (7.00–11.40)	NA
Total omega-3 (g/1,000 kcal)	7	1.40 (0.47–2.92)	NA
EPA (g/1,000 kcal)	7	0.53 (0.01–2.34)	NA
DHA (g/1,000 kcal)	9	0.34 (0.01–1.37)	NA
EPA and DHA (g/1,000 kcal)	8	1.08 (0.01–3.71)	NA
Zinc (mg/1,000 kcal)	24	55 (41–130)	34
Vitamin A (U/1,000 kcal)	24	4,350 (1,060–19,000)	1,429
Vitamin E (U/1,000 kcal)	24	62.8 (11.0–152.7)	14
Riboflavin (mg/1,000 kcal)	23	3.10 (0.86–21.80)	0.63
Pyridoxine (mg/1,000 kcal)	23	2.50 (0.36–19.00)	0.29
Niacin (mg/1,000 kcal)	22	21.3 (6.4–219.0)	3.3
Biotin (mg/1,000 kcal)	20	0.14 (0.02–1.40)	NA

\*Represents the number of diets for which manufacturers were able to provide information on average or typical nutrient concentrations. †One cup = 236.6 mL. ‡Caloric content reported on a kcal/oz basis because can size ranged from 5.8 to 13.2 oz; 1 oz = 28.4 g.  
NA = Not applicable.

rie content for all nutrients evaluated in the study. The AAFCO minimum value for vitamin A was not met by the first diet (concentration of 1,060 U/1,000 kcal and energy density > 4,000 kcal/kg on a dry-matter basis; thus, the diet's vitamin A concentration was compared against the AAFCO minimum value based on calorie content); however, this diet had been tested in AAFCO feeding trials for adult maintenance. The AAFCO minimum value for vitamin E was not met by the second diet (concentration of 11.03 U/1,000 kcal and energy density > 4,000 kcal/kg on a dry-matter basis). The AAFCO minimum value for linoleic acid was not met by the third diet (concentration of 2.7 g/1,000 kcal and energy density between 3,500 and 4,000 kcal/kg on a dry-matter basis; thus, the diet's linoleic acid concentration was compared against the AAFCO minimum value on a dry-matter basis). On a dry-matter basis, this third diet had slightly more linolenic acid (1.045%) than the AAFCO minimum value (1.0%). The latter 2 diets had been formulated to meet AAFCO Dog Food Nutrient Profiles for all life stages. Calorie density also ranged widely among the diets for both dry and canned formulations.

## Discussion

Analysis of results of the present study suggested that owners seeking a diet to help with the skin and coat condition of their dog could be confronted with a confusing array of at least 24 OTC diets with various marketing claims and nutrient profiles. There likely were many more such diets, given the inclusion and exclusion criteria used for the study. The diets evaluated in this study, as for many commercial diets, included marketing terms without technical definitions (eg, premium), which can be a potential source of confusion to pet owners. Although these qualitative terms do not have regulatory definitions and are used on an arbitrary basis, they could suggest superior quality of the diet or health benefits. Consequently, consumers may be led to make decisions about their pets' diets on the basis of marketing, rather than judging diets on the basis of nutrient profiles or other objective methods for evaluating pet foods.<sup>12</sup> Although phrases such as "promotes healthy skin" are permitted on pet food labels, the FDA Center for Veterinary Medicine states that "any healthy animal that gets adequate nutrition should have these qualities anyway without eating a special food."<sup>13</sup> It is not clear whether pet owners understand these distinctions.

Marketing terms regarding ingredient exclusion or appropriateness for a dog with a food sensitivity (eg, the description "sensitive dog") may also reinforce owner misinformation about the prevalence and management of CAFRs. Although food allergies are uncommon, owners may select diets marketed in this manner because of misperceptions about allergies to corn, soy, and other ingredients that are indicated as excluded from these diets. Examination of the ingredients in the 24 diets of the present study clearly indicated that few would be appropriate for an elimination diet trial because of the number of ingredients (3

to 8 major ingredients) and the types of ingredients included in the diets. The most commonly identified food allergens in dogs are beef, dairy, wheat, egg, and chicken.<sup>14</sup> The common use of these ingredients in pet foods, rather than an increased inherent allergenic potential, is the likely reason for their greater prevalence in diagnosed food allergies. However, egg and chicken were among the most common ingredients included in diets evaluated in the present study. Similarly, many of the carbohydrate sources (eg, rice, potato, and oat) in the diets are common ingredients in pet foods and unlikely to be novel ingredients. The use of common ingredients in diets suggested that manufacturers may be more focused on avoiding ingredients purported to cause allergies (eg, corn), rather than avoiding ingredients that have been identified more commonly as allergens. The large number and type of ingredients included in these diets also may make it difficult to identify appropriate novel-ingredient diets if an elimination diet trial is desired to test a dog for a CAFR. If an owner has fed even one of these diets marketed for skin and coat health, then the dog could have already been exposed to many of the ingredients (eg, fish, venison, duck, lamb, potato, oat, barley, and pea) commonly included in novel-ingredient diets. This underscores the importance for veterinarians to obtain a complete diet history and evaluate all exposures to ingredients included in dog foods, treats, table foods, rawhides, dental products, dietary supplement-type products, and foods used for administering medications before recommending a specific diet for use in an elimination diet trial. In addition, OTC diets can be contaminated with potential allergens even if those allergens are not included in the ingredient list, which further complicates selection of novel-ingredient diets.<sup>15-17</sup> Some consumers may seek diets marketed for skin and coat health in an effort to provide their pets with higher concentrations of nutrients, such as omega-3 or omega-6 fatty acids, than are found in typical diets. The wide variation in the nutrient profiles for diets evaluated in the study reported here suggested that these diets may have high concentrations of a certain nutrient of interest or may contain less than AAFCO minimum values. Finally, in addition to the wide variation in nutrient concentrations, the caloric density of both dry and canned diets differed considerably.

The present study had a number of limitations. Inclusion criteria limited the sample size, and some diets that may have been purchased by pet owners because of marketing language that implied benefits for skin and coat health (despite lack of an overt reference to skin or coat health in the diet name) were excluded. The present study also excluded diets advertised as having limited ingredients if the diet name did not explicitly have the required wording. Although owners concerned about food allergies of their dogs may have fed diets labeled as containing limited ingredients (despite the fact that the ingredients were not necessarily novel or even particularly limited in number), these diets did not meet the inclusion criteria for the study. Expanding the inclusion criteria would have more than doubled the sample size; however, evaluation of marketing claims and nutrient profiles in this market niche



would have been less specific. Therefore, we elected to use more limited criteria for the purposes of this study. Some ingredients, such as fish meal or animal digest, may include protein from several species but were only counted as single major ingredients because of limited available data; actual species ingredients for these diets may have been higher than the number obtained from the ingredient list. Nutrient evaluations were made on the basis of information provided by diet manufacturers. Not all manufacturers were able to provide information for all nutrients, and it is not likely that all values were measured on the same basis (eg, number of analyses comprising a typical analysis; calculation vs measurement of energy density). Without laboratory analysis, actual concentrations of nutrients in a diet cannot be assessed. Furthermore, the efficacy of these diets for dogs with dermatologic issues is currently unknown and must be determined through well-designed clinical trials.

Despite the fact the study had limitations, results indicated a potentially confusing array of diets available for purchase by dog owners, which makes it important for veterinarians to obtain a diet history at every visit to ensure owners are feeding a good-quality, nutritionally complete and balanced diet that has an appropriate nutrient profile for that specific animal.<sup>18,19</sup> Veterinarians also need to make specific recommendations regarding the diet at every visit, whether to confirm that the animal's current diet is optimal for its age, activity, body condition, and health, or to recommend modifications as needed.<sup>18,19</sup> This may be particularly important for dogs with skin and coat issues, considering that the marketing claims of OTC diet options can be confusing and the nutrient profiles are highly variable. Consultation with a veterinary dermatologist or veterinary nutritionist is recommended for conditions that do not respond to initial medical or dietary management.

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