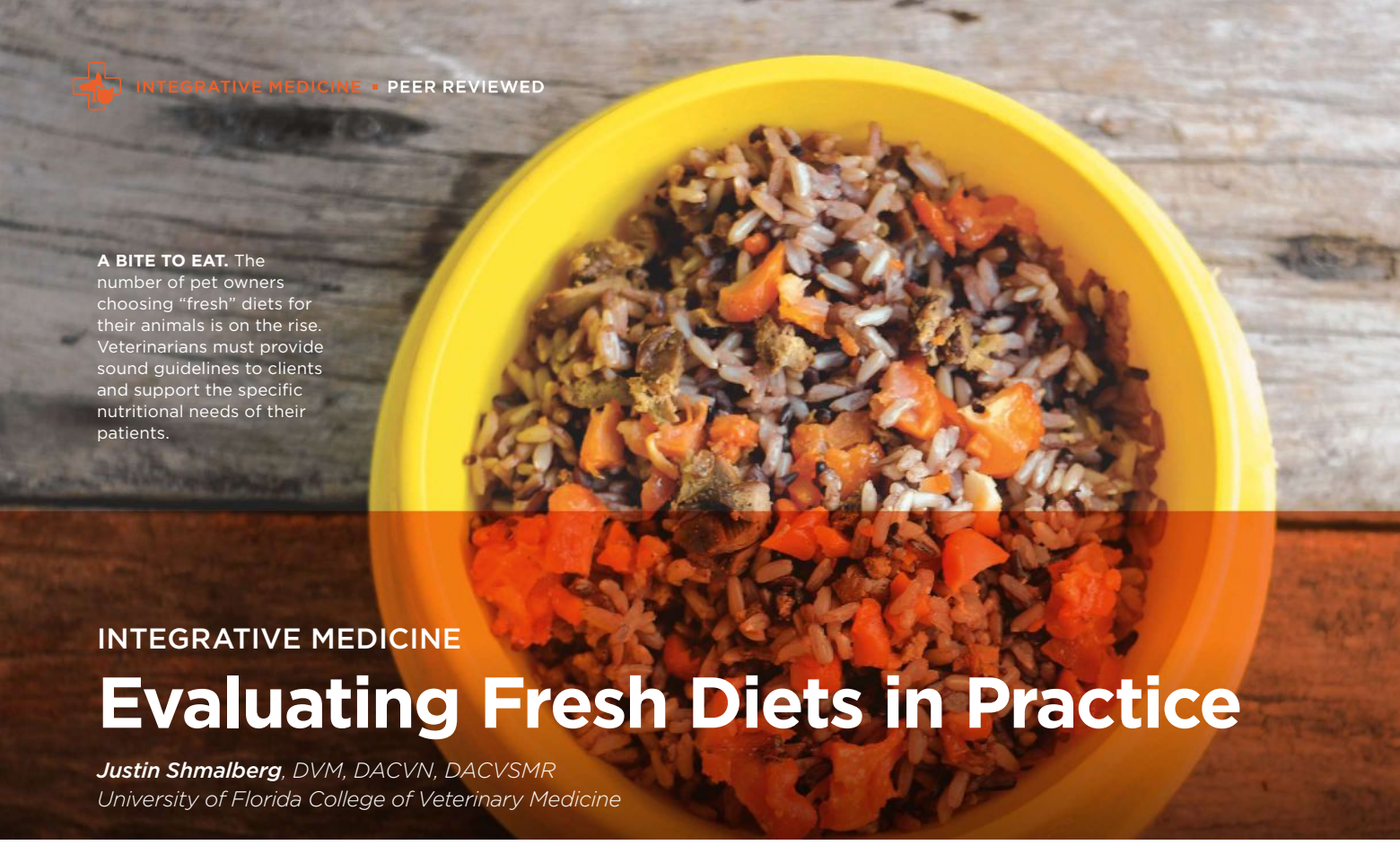

A BITE TO EAT. The number of pet owners choosing "fresh" diets for their animals is on the rise. Veterinarians must provide sound guidelines to clients and support the specific nutritional needs of their patients.

INTEGRATIVE MEDICINE

Evaluating Fresh Diets in Practice

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Dietary trends for dogs and cats closely mirror those of their owners, and it is no surprise that home-prepared meals and their commercialized derivatives are now encountered in practice. These diets pose potential benefits as well as challenges, and clients increasingly expect veterinarians to demonstrate knowledge of them.

WHAT IS A FRESH DIET?

Fresh diets are broadly defined as diets that are not shelf-stable at room temperature, such as:

- Home-prepared cooked diets
- Home-prepared raw diets
- Commercial made-to-order diets (generally cooked and provided refrigerated)

Some owners consider fresh diets to be only those prepared in a certain window of time before feeding. The following diets therefore may or may not be considered "fresh":

- Commercial premixes (cooked or raw ingredients are added by the owner)
- Commercial refrigerated diets (raw or cooked)
- Commercial frozen diets (raw or cooked)

WHY DO OWNERS FEED FRESH DIETS?

Pet owners increasingly select diets based on an assessment of ingredient quality and sourcing, safety and transparency, and customization and variety.[1,2] Fresh diets, especially home-prepared diets, are uniquely positioned to allow this assessment and permit owner choice. Other motivations for feeding these diets are diverse, including the factors below.[3-8]

Distrust of Commercial Pet Foods

Consumer distrust is primarily driven by recalls, of which there were more than 40 in 2018[9] for issues such as elevated vitamin D levels, low thiamine (vitamin B1), and contamination with *Salmonella* or *Listeria* bacteria. Many owners cite the melamine recalls after significant numbers of dogs and cats developed acute kidney injury.[10,11] This distrust in commercial options was identified in 51% of dog owners in an oncology service, and 67% of raw-feeding owners displayed similar sentiment.[12,13]

Ingredient Quality

Owners now evaluate ingredients on a number of potential metrics, such as sustainability, animal welfare, organic standards, and growing region. Visual

assessment of ingredients remains important to consumers, and extruded kibble or homogenized canned food does not readily permit this. Some owners cite reports of unlabeled ingredients.[14] Others distrust synthetically derived vitamins and minerals, which are exempted from Association of American Feed Control Officials (AAFCO) regulations for natural foods and may be sourced from outside the United States.[15]

Skepticism Regarding Current Nutritional Guidelines

The basis for "complete and balanced" pet foods is the available nutritional literature, which is limited for some nutrients and was often gathered under experimental conditions with extruded or purified diets.[15,16] Owners feel that dogs fed unbalanced fresh diets—that is, diets not conforming to current recommendations—show no outward signs of disease and that present knowledge is incomplete to set thresholds for some nutrients. It is true that some nutrient minima may be inaccurate and some deficiencies or excesses affect health more than others.[16,17]

Palatability

Many owners report that their dogs only eat (or strongly prefer) fresh foods. This anecdotally appears more prevalent in small dogs. Improved palatability is likely influenced by a combination of factors, such as increased moisture, protein, fat, aroma, and even the owner's perception.[18,19]

Preservative Avoidance

Synthetic preservatives such as ethoxyquin, BHA, BHT, and TBHQ were historically used in commercial pet foods given their effectiveness, but controversies still surround their safety.[7,20] Natural preservatives, such as tocopherols, rosemary extract, and citric acid, are now commonly used, but fresh diets may reduce or eliminate the need for preservatives.

Customization or Rotation

Home-prepared diets allow owners to change protein and carbohydrate sources readily. Many commercial fresh diets provide diets with similar nutrient composition but different ingredients. Dietary rotation of any type certainly allows for greater nutrient variability, which may confer health benefits and may mitigate suboptimal nutrient levels for a particular animal.

Specific Health Conditions or Concerns

Fresh diets are commonly used in the management of hyporexic pets with renal disease, gastrointestinal disease, or cancer.[12,21-23] Home-prepared fresh diets have been recommended for the diagnosis and management of adverse food reactions.[24] Such diets may also be used by owners of sporting or working dogs with the thought of improving performance or providing supplemental protein, fat, or calories; sled dogs are commonly fed a hybrid diet of commercial foods and raw meat, and racing greyhounds may be fed raw foods.[25,26] Fresh diets may affect the microbiome differently than extruded diets, which could influence gastrointestinal or overall health, and they are often highly digestible.[27,28] Clients may choose fresh diets in the hopes of preventing disease by promoting health.[2]

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Raw Food Claims

A number of specific claims about raw food are discussed in greater detail elsewhere.[28,29] There is insufficient evidence that a raw diet is superior to the same diet when cooked.

HOW COMMON ARE HOME-PREPARED AND COMMERCIAL FRESH DIETS?

The overall prevalence of home-prepared diet use among pet owners remains unclear, but 3 studies have provided limited data:

- In one study, home-prepared diets were fed as the sole source of nutrition to 2% to 3% of dogs and 0% of cats in the general population, but noncommercial foods provided at least 25% of the diet for 17% of dogs and 6% of cats.[30]
- In another study, breeders fed home-prepared diets to 11% of dogs across all life stages, and the practice was more common in giant-breed dogs.[31]

- In the third study, 7% percent of owners with dogs presenting to an oncology service fed home-prepared cooked diets, 4% fed prepared raw diets, and 18% fed a combination of diets, including a home-prepared diet.[12]

Commercial fresh diets represent millions in annual sales, with most companies targeting healthy animals.[32] Some fresh food companies now offer therapeutic diet lines (both cooked and raw) intended for veterinary supervision and sold through established retail channels or, increasingly, shipped directly to the owner.[2] The market share of fresh diets is expected to increase.

PROBLEMS WITH HOME-PREPARED DIETS?

When severely unbalanced, home-prepared diets have been implicated in clinically significant pathology, including:

- Nutritional secondary hyperparathyroidism. The absence of calcium in the diet of growing puppies has caused fibrous osteodystrophy and other skeletal abnormalities.[33-35] Low dietary vitamin D is often concurrently identified. The condition is rare in adult dogs but has been documented.[36,37]
- Thiamine deficiency[38]
- Electrolyte abnormalities[34]
- Taurine deficiency, a cause of dilated cardiomyopathy[34,36,39]

Adverse effects are likely underreported, as dietary change frequently corrects discovered abnormalities.

Owners appear to infrequently consult recipes for their home-prepared diets, but recipes are available on the internet and in print from veterinary and non-veterinary sources.[30,40,41] Such recipes often lack specificity, which could affect nutrient composition, and owners often change recipes without guidance.[21,22,41] A few evaluations have compared recipes to nutritional recommendations, with the following findings:

- 95% of maintenance diets did not meet recommendations for at least one essential nutrient, diets from non-veterinary sources were more deficient, and rotational strategies were unlikely to balance diets.[41]
- 90% of tested home-prepared diet recipes provided by veterinarians for food allergy did not meet nutrient recommendations.[24]
- 100% of renal diets and diets suggested for cancer failed to meet recommendations.[21,42]

The impact of the deficiencies identified in the above studies would be expected to range in severity. Nutrients that were commonly identified as being below established recommendations included:

- Amino acids, specifically methionine, tryptophan, and phenylalanine[21,42]
- Calcium[21,41,43]
- Zinc[21,41]
- Vitamin D[41-43]
- Choline[21,41,42]

Insufficient amino acids could adversely affect muscle mass, produce taurine deficiency, or contribute to poor coat quality. Inadequate vitamin D and calcium could influence bone development in growing animals, and zinc plays a role in skin and immune function. Choline may be spared by other nutrients in the diet but plays a role in lipid handling and methyl group donation.[16] Clinical signs of nutrient deficiency are often present only when severe, making assessment in the clinic difficult. Some deficiencies require special screening laboratory tests (ionized calcium, parathyroid hormone levels, vitamin D testing, amino acid levels).

HOW CAN HOME-PREPARED FRESH DIETS BE IMPROVED?

Two important recommendations should be made to owners committed to preparing their own diets:

1. Offer referral to a board-certified veterinary nutritionist for evaluation and reformulation of the diet. A list of diplomates available for consultation is available at **acvn.org**, and the estimated cost of diet formulation ranges from $150 to $500. An alternative is a computer-generated recipe conforming to nutrient guidelines (e.g., **balanceit.com**).
2. Advise the owner to consider a commercially available fresh diet with an AAFCO statement for the appropriate life stage.

If an owner declines the above options, the following questions can help screen diets for the most commonly encountered sources of dietary deficiencies. Owners should be counseled that most diets from internet sources and other recipes fail to meet established nutrient recommendations, and puppies and kittens should always have a referral or be fed a commercial food given their more critical nutrient tolerances.

1. **Is the diet composed primarily of meat (50% or**

more by weight)? Dogs and cats have no requirement for dietary carbohydrate but do have requirements for amino acids and fatty acids that are often lower in vegetable sources. Contraindications to such a diet should be considered (e.g., renal disease, canine pancreatitis).

2. **Is supplemental calcium added to the food?** Most meats are high in dietary phosphorus but low in calcium. The following doses can be used as general guidelines:
   - **Adult cats:** 0.4 g calcium daily = ⅓ teaspoon of calcium carbonate
   - **Adult dogs:** 2 g calcium per 1000 calories (the amount of food consumed by an average 50-pound pet dog) = 1⅔ teaspoon of calcium carbonate

   Diets containing bones or bone meal likely contain both calcium and phosphorus, but the amounts may be excessive, especially for large-breed puppies. These minerals and other macronutrients can be measured in a sample of the food by a commercial feed laboratory.
3. **Is there a multivitamin product in the recipe?** Once-daily human multivitamins are preferred over pet multivitamins, unless the latter is specifically designed, evaluated, or endorsed by a nutritionist for use in balancing home-prepared diets. Many common pet vitamins contain minimal quantities of essential nutrients. Once-daily human multivitamins are typically dosed at about ¼ tablet per 25 pounds of patient body weight.

   Organ meats are used in some diets to provide trace vitamins and minerals, but their adequacy in fulfilling the nutrient needs of a dog or cat can be difficult to evaluate based on weight of inclusion or percentage of the recipe without specific analysis.
4. **Are there supplemental fatty acids in the diet?** Most diets benefit from supplemental EPA and DHA (omega-3 fatty acids) unless the diet contains large amounts of fish (e.g., tuna, salmon). A dose of 300 mg of EPA and DHA combined (1 standard fish oil capsule) per 25 pounds of body weight is generally sufficient for maintenance purposes. Most prepared diets naturally contain adequate amounts of linoleic acid, an essential omega-6 fatty acid.

The above recommendations do not ensure nutritional adequacy for every condition or every animal, but do help to prevent the most significant deficiencies identified in diets. If owners elect to use a commercial premix, the product should be evaluated for sources of vitamins and minerals, such as calcium or bone meal, individually named vitamins and trace minerals, and/or dried organ meats.

HOW SHOULD COMMERCIAL FRESH DIETS BE EVALUATED?

Fresh diets should be evaluated similarly to all commercial pet foods.[3,28,44] Suggested metrics for evaluation include:

- **Does the product provide an AAFCO statement for the appropriate life stage of the patient?** Products labeled for intermittent or supplemental feeding should not be fed long-term without veterinary guidance, nor should products without an AAFCO statement.
- **Has the diet been analyzed to confirm the nutrient levels provided, and is a detailed nutrient profile on a caloric basis available?** Ideally, foods that are formulated to meet requirements are also tested for confirmation of expected values, which is not a statutory requirement. Feeding trials may be performed, but such trials typically only identify major deficiencies. Foods should always be compared on a caloric basis.[45]
- **Who formulated the diet, and what are their qualifications?** Ideally, diets would be formulated or reviewed by a nutritionist (PhD or board-certified DVM) with experience in the type of food being produced.
- **Does the company operate its own manufacturing facility?** Companies producing their own food are expected to maintain more control over the process, but this has not been objectively evaluated.

Fresh foods, by nature, are more perishable than extruded or canned diets. Therefore, owners should be encouraged to ask additional questions regarding food quality and safety:

- **How is the food best stored, and how is temperature controlled during storage and shipping?** Fresh foods are susceptible to increased bacterial growth and oxidation if exposed to temperature fluctuations.
- **How are the ingredients sourced?** Owners may have additional questions relating to their preferred evaluation rubric for ingredients.
- **What safety and quality measures are present in the manufacturing facility?** A comprehensive food safety protocol should be followed to reduce the potential for contamination. This should include routine testing for pathogens such as *Salmonella* and *Listeria*, the latter of which can reproduce under

refrigerated conditions.[46]

- **What strategies are used to control bacterial growth and pathogens?** Raw foods contain higher bacterial concentrations than extruded diets if untreated, but so do many fresh cooked products. Pasteurization and pH-adjusting inclusions (such as acetic and citric acids) can reduce bacterial numbers.[28,47] Bacteriophages appear to be in use by at least one company, but there is controversy over the regulatory status of this approach.[48]

FRESH DIETS ARE THE NEW REALITY

Current recommendations are that all patients should receive a screening nutritional assessment.[49] Consumer demand and market forces indicate that home-prepared and commercial fresh diets will be increasingly encountered during this assessment. Knowledge of the diversity of options in this group of diets, as well as their merits, will help practitioners provide the best evidence-based guidelines to clients, match recommendations to the motivations of the owner, and support the specific nutritional needs of the patient. TVP

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