



ACVN NUTRITION NOTES

Nutritional Management of Chronic Enteropathies in Dogs

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The **American College of Veterinary Nutrition (acvn.org)** and **Today's Veterinary Practice** are delighted to bring you the **Nutrition Notes** column, which provides the highest quality, cutting edge information on companion animal nutrition, provided by the ACVN's foremost nutrition specialists.

The primary objectives of the ACVN are to:

- Advance the specialty area of veterinary nutrition
- Increase the competence of those practicing in this field
- Establish requirements for certification in veterinary nutrition
- Encourage continuing education for both specialists and general practitioners
- Promote evidence-based research
- Enhance dissemination of the latest veterinary nutrition knowledge.

The ACVN achieves these objectives in many ways, including designating specialists in animal nutrition, providing continuing education through several media, supporting veterinary nutrition residency programs, and offering a wide array of resources related to veterinary nutrition, such as this column.

DEFINING CHRONIC ENTEROPATHIES

An animal that presents with a minimum 2-week history of vomiting and/or diarrhea may be diagnosed with a chronic enteropathy. By definition, the disorder stems from a primary gastrointestinal disease, and secondary causes of vomiting and diarrhea must be excluded (**Table 1**) before making this diagnosis.

Diarrhea should be characterized as small bowel, large bowel, or mixed bowel in origin, as this may influence diagnostic and therapeutic options (**Table 2**).

For chronic enteropathies, initial diagnostics typically include:

- Minimum database, including complete blood count, serum biochemical profile, and urinalysis
- Fecal examination
- Abdominal imaging, including radiography and ultrasonography.

Depending on these results, additional diagnostics may be warranted, including:

- Cobalamin (vitamin B₁₂)

- Folate
 - Trypsin-like immunoreactivity
 - Resting cortisol +/- adrenocorticotrophic hormone stimulation test
 - Endoscopy and biopsy.
- Laboratory tests for diagnosis of chronic canine and feline enteropathies are described elsewhere.¹

SELECTED CAUSES OF CHRONIC ENTEROPATHIES

Inflammatory Bowel Disease

Inflammatory bowel disease (IBD) is an umbrella term that envelops a few chronic enteropathies, including:

- Food-responsive disease
- Antibiotic-responsive disease
- Immunomodulation-responsive disease.

IBD is characterized by mucosal infiltration of inflammatory cells and is typically classified by the predominant inflammatory cell(s); lymphocytic-plasmacytic inflammation is most commonly diagnosed.

A review of the etiopathogenesis, diagnosis, and therapeutic options of IBD has been recently published.²

Etiology. The etiology of IBD is multifactorial, with genetic, dietary, and immunologic factors all potentially playing a role.

While any canine or feline breed may be affected, certain breeds are prone to developing specific chronic enteropathies, including:

- Irish setters, with gluten enteropathy
- Soft-coated wheaten terriers, with protein-losing enteropathy (PLE).

Diagnosis & Therapy. A histopathologic diagnosis of IBD does not necessarily dictate how an individual animal will respond to therapy. As such, with stable patients, a step-wise management approach is recommended to assess the animal's response to one therapy at a time.

Therapeutic options may include diet trial, antibiotic trial, fiber supplementation, and immunomodulatory medications (eg, corticosteroids, cyclosporine, chlorambucil).

1. Diet Trial: Every animal with IBD may respond a bit differently to dietary therapy; the main dietary options (**Table 3**) include those with novel ingredients (elimination diet), hydrolyzed, highly digestible, or home-prepared diets.

2. Antibiotic Trial: The most common antibiotics used for antibiotic-responsive diarrhea are metronidazole and tylosin. In cases of intestinal dysbiosis, where the animal's immune system may be responding adversely to pathogenic intestinal flora, antibiotics may improve clinical signs either by specifically modifying the intestinal flora or by exerting other less easily defined immunomodulatory effects.

There is likely a role for **probiotics** (live microorganisms that exert a beneficial effect in the intestinal tract, potentially by inhibiting pathogenic bacteria or other immunomodulatory mechanisms) in cases of chronic enteropathies; however, veterinary data are limited. One study evaluating dogs with IBD showed that treatment with a probiotic for 30 days was effective at reducing clinical signs of disease.³ However, caution must be exercised when recommending specific brands of probiotics because there is variable quality control among supplements. One study that evaluated labels and bacterial contents of 25 commercial probiotics marketed for use in animals revealed that only 2 of 25 products had acceptable labels that accurately described their contents.⁴

3. Fiber Supplementation: Fiber supplementation may prove useful, especially for animals that present with a component of large bowel diarrhea.⁵ In some cases, only the addition of soluble fiber (eg, psyllium) is necessary to resolve the diarrhea.

Similar to the effects of fermentable fiber in the intestine, **prebiotics** (eg, inulin, fructooligosaccharides) may be of benefit by increasing short-chain fatty acid production and influencing intestinal flora. Prebiotics are nondigestible food ingredients that can increase

TABLE 1.
Primary & Secondary Causes of Vomiting and/or Diarrhea

PRIMARY GASTROINTESTINAL DISORDERS	SECONDARY GASTROINTESTINAL DISORDERS
<ul style="list-style-type: none"> • Chronic foreign body obstruction • Chronic intussusception • Food allergy • Food intolerance • Infectious diarrhea • Inflammatory bowel disease • Intestinal dysbiosis • Lymphangiectasia • Neoplasia 	<ul style="list-style-type: none"> • Exocrine pancreatic insufficiency • Hepatic disease • Hyperthyroidism • Hypoadrenocorticism (Addison's disease) • Neoplasia • Neurologic disease (eg, vestibular disease) • Pancreatitis • Renal disease

TABLE 2.
Typical Characteristics of Small & Large Bowel Diarrhea

SMALL BOWEL DIARRHEA	LARGE BOWEL DIARRHEA
<ul style="list-style-type: none"> • Large volume stool • Melena • +/- Vomiting • Weight loss 	<ul style="list-style-type: none"> • Hematochezia • Increased frequency and urgency of defecation • Mucus present • Small volume stool • Tenesmus

Note that not all of these properties are present in every case.

TABLE 3.
Dietary Management of Selected Enteropathies

CHRONIC ENTEROPATHY	DIETARY MANAGEMENT OPTIONS
Inflammatory Bowel Disease	<ul style="list-style-type: none"> • Novel ingredient diet • Hydrolyzed diet • Highly digestible diet • Home-prepared diet
Lymphangiectasia	<ul style="list-style-type: none"> • Low-fat or ultra low-fat diet • Novel ingredient diet • Hydrolyzed diet • Home-prepared diet
Food Allergy or Intolerance	<ul style="list-style-type: none"> • Novel ingredient diet • Hydrolyzed diet • Home-prepared diet
Predominantly Large Bowel Disease	<ul style="list-style-type: none"> • Modified fiber diet

the number and/or activity of health-promoting intestinal bacteria. This may reduce the animal's immune response to pathogenic bacteria in the intestinal tract.

Lymphangiectasia

Lymphangiectasia is a common form of PLE, characterized by intestinal villus lacteal dilation and subsequent luminal loss of chylous fluid.

Lymphangiectasia may be classified as:

- Primary idiopathic disease
- Secondary to inflammatory or neoplastic conditions.

Diagnosis. Definitive diagnosis requires intestinal biopsies; however, many cases are diagnosed presumptively based on:

- Classic signalment (eg, Yorkshire terrier)
- Physical examination findings (eg, ascites)
- Clinicopathologic findings, such as panhypoproteinemia, hypocalcemia, hypocholesterolemia, and lymphopenia
- Diagnostic imaging (eg, ultrasonographic intestinal mucosal striations).⁶

Therapy. Animals with primary idiopathic lymphangiectasia may be successfully managed with nutritional modification as a sole therapy (**Table 3**).⁷ The primary nutritional focus is feeding a low-fat diet. The purported benefit of feeding such a diet is to reduce intestinal lymphatic pressure and subsequently reduce lymph leakage into the intestinal lumen. Commercially available veterinary therapeutic low-fat diets, such as Veterinary Diet Gastrointestinal



Comparing Diets

When comparing diets, it is best to assess nutrients per caloric concentration (ie, grams fat per Mcal or 1000 kcal), which eliminates the effects of dry matter content and caloric concentration of the diets.

The **grams fat per Mcal** can be estimated from a diet's guaranteed analysis by dividing the percent crude fat by the metabolizable energy (kcal/kg) and multiplying by 10,000. For example, the guaranteed analysis of a canine adult maintenance dry food might list the minimum fat at 12%. If the caloric concentration of that diet is 3500 kcal/kg, the minimum fat—on a caloric basis—is 12 divided by 3500 x 10,000, or 34.3 grams/Mcal.

Note that guaranteed analyses provide minimum fat concentrations, and a significant difference may be present between the minimum and typical analysis.

For more information, see **Beyond the Guaranteed Analysis: Comparing Pet Foods** at tvjournal.com.

TABLE 4.

Most Commonly Reported Canine & Feline Food Allergens^{8,9}

CANINE	FELINE
<ul style="list-style-type: none"> • Beef • Dairy • Wheat 	<ul style="list-style-type: none"> • Beef • Dairy • Fish

Low Fat (royalcanin.com) and Prescription Diet i/d Low Fat GI Restore (hillspet.com), provide 18 to 23 grams fat per Mcal.

In cases of lymphangiectasia secondary to inflammation or neoplasia *or* with concurrent inflammation, additional dietary and/or medical modifications may be necessary.

Food Intolerance & Food Allergy

A food allergy differs from food intolerance in that a food allergy is an immune-mediated reaction, whereas food intolerance is a nonimmunologic reaction (**Figure**).⁸

Food Allergy. Food allergy (**Table 4**) typically presents with:

- Dermatologic clinical signs, such as nonseasonal pruritus
- Gastrointestinal signs
- Concurrent dermatologic and gastrointestinal clinical signs (10%–15% of animals with food allergies).

Diagnosing a true food allergy is more challenging than diagnosing food intolerance. There is no easy test to perform and, despite their appeal, serologic titers have been shown to have poor positive and negative predictive values.¹⁰

An elimination diet is required for diagnosis of a food allergy. After an elimination diet is fed for a minimum of 2 to 4 weeks, and response is noted, the animal should be challenged with one ingredient at a time to document the food(s) to which the animal reacts adversely with such signs as intense pruritus, vomiting, and diarrhea.

This process can be time-consuming and challenging for an owner. Unless the owner wants to use those results to dictate how the animal will be fed in the future, most owners are quite happy with an improvement in clinical signs due to the elimination diet, and do not wish to pursue additional food challenges.

If there is no response to a diet trial, or only a partial response, a few factors must be considered:

- Animal has skin disease caused by atopic dermatitis or other concurrent allergies

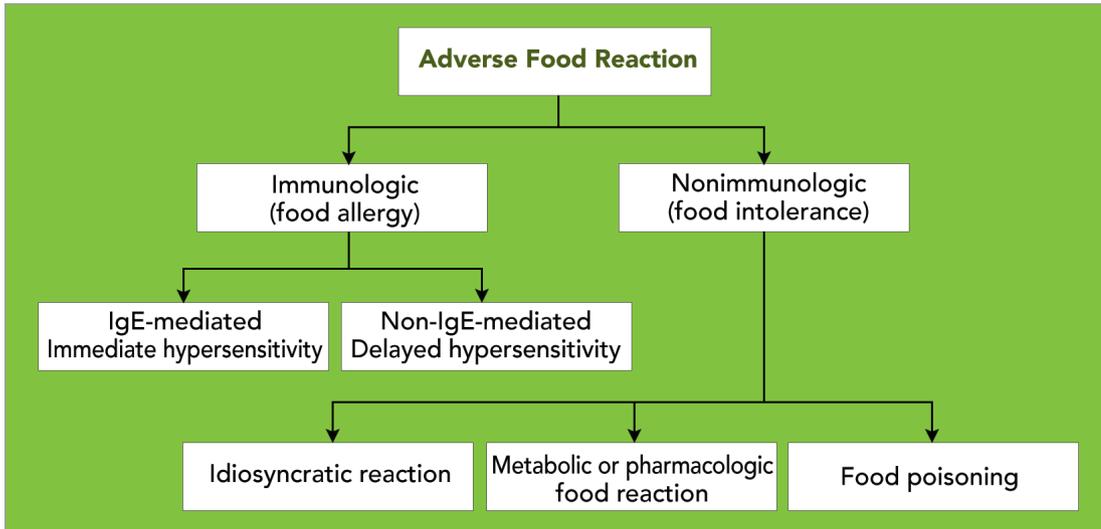


FIGURE. Characterization of adverse food reactions. (Adapted from Roudebush P, Jackson HA. Adverse reactions to food. In Hand MS, Lewis LD (eds): Small Animal Clinical Nutrition, 5th ed. Topeka: Mark Morris Institute, 2010, pp 609-635)

- Lack of owner or pet compliance
- Diet was *not* truly novel
- Diet was contaminated.

Food Intolerance. Food intolerances may be due to a number of factors, including food additives and the Maillard reaction (the chemical interaction between proteins and carbohydrates during cooking that releases various flavor compounds). Often no single, specific dietary component is identified.

A definitive diagnosis requires:

- Feeding an elimination diet (eg, novel ingredient diet, hydrolyzed diet; **Table 3**) for a minimum of 2 to 4 weeks
- Observing good improvement in clinical signs
- Challenging animal with its original diet to determine if relapse of signs takes place.

However, definitive diagnosis of food intolerance may be complicated by a variety of dietary factors that affect the animal’s response. This is particularly true if the elimination diet differs from the original diet with regard to:

- Increased digestibility
- Decreased fat concentration
- Changes in fiber.

NUTRITIONAL MANAGEMENT OF CHRONIC ENTEROPATHIES

Various nutritional approaches may be taken to manage chronic enteropathies. Underlying etiologies may influence which approach is tried first.

Novel Ingredient Diet

As part of a diagnostic trial, a novel ingredient diet

(**Table 5**, page 48) may be fed if suspicion of food allergy or intolerance is present. This type of diet may benefit animals with chronic enteropathies by limiting antigen delivery to the intestinal tract and reducing subsequent enterocyte reactivity and inflammation.

By definition, a novel ingredient diet should provide both novel protein *and* novel carbohydrate food sources. These diets may also be known as *limited ingredient diets*, which means only one protein and one carbohydrate source are in the diet.

Veterinary Therapeutic Versus OTC Diets.

These diets exist in both veterinary therapeutic and over-the-counter (OTC) forms. Studies have revealed that many OTC limited-ingredient canine diets were contaminated with proteins not listed in the ingredients.^{12,13} For this reason, it may be best to feed a veterinary therapeutic diet for the initial diet trial. Pending the response to the diet trial, switching to an OTC diet may be attempted.

Ingredient Selection. Despite several diets having similar ingredients, their nutrient profiles may be quite variable (eg, variable caloric, protein, fat concentrations). Thus, when choosing a novel ingredient diet, the veterinarian should consider the whole nutrient profile to determine which diet best suits the individual animal’s needs.

Before choosing a limited ingredient diet, it is of the utmost importance to get a complete diet history to identify the ingredients (proteins and carbohydrates) an animal has eaten previously.

Other Options. Given the fact that many OTC diets are now routinely using what were previously

Cobalamin

For animals with concurrent hypcobalaminemia, parenteral cobalamin (vitamin B₁₂) supplementation should be provided. Recommendations for cobalamin supplementation can be found elsewhere.¹¹

considered “novel” ingredients (eg, potato, venison, fish) and the reality that many animals have eaten a wide variety of foods by middle-age (when they may present with clinical signs of a chronic enteropathy), a truly novel ingredient commercial diet may not be available. In those cases, another diet option may be preferable (eg, hydrolyzed diet).

Alternatively, reducing antigen delivery to the intestinal tract may provide some benefit even if the diet is not truly novel. This requires considering whether a true food allergy to a specific ingredient is present versus intolerance of an overall diet.

Hydrolyzed Diet

Hydrolyzed diets (**Table 5**) are another option for a diet trial for suspected food allergy or intolerance. Hydrolyzed diets use proteins that have been broken into small polypeptides; disruption of the protein structure prevents immune recognition of proteins

by the intestinal tract, reducing allergenicity and subsequent inflammation.

Fat Concentration. These diets tend to be highly digestible and typically have low–moderate fat concentrations: canine diets range from 26 to 47 grams fat per Mcal and feline diets range from 27 to 48 grams fat per Mcal.

Diet Availability. Currently, hydrolyzed diets are only available as veterinary therapeutic diet options. Some of these diets do provide intact carbohydrate sources (eg, rice, potato); in rare cases, this may incite a reaction.

Hydrolyzed versus Highly Digestible. One randomized, positively controlled study compared the efficacy of a hydrolyzed diet to a highly digestible diet in dogs with chronic small bowel enteropathies. There was no difference in the initial response rate between groups; however, long-term remission was better for dogs fed the hydrolyzed diet.¹⁴

TABLE 5.

Summary of Nutritional Management of Selected Chronic Enteropathies

DIET	INDICATIONS	UNIQUE FORMULATION	EFFECTS
Novel Ingredient	<ul style="list-style-type: none"> Food allergy Food intolerance IBD Lymphangiectasia 	<ul style="list-style-type: none"> Novel protein and novel carbohydrate food sources 	<ul style="list-style-type: none"> Limits antigen delivery to intestinal tract Reduces subsequent enterocyte reactivity and inflammation
Hydrolyzed	<ul style="list-style-type: none"> Food allergy Food intolerance IBD Lymphangiectasia 	<ul style="list-style-type: none"> Dietary proteins broken into small polypeptides Typically low–moderate in fat concentration 	<ul style="list-style-type: none"> Prevents immune recognition of dietary proteins by intestinal tract Reduces allergenicity and subsequent inflammation Tends to be highly digestible
Highly Digestible	<ul style="list-style-type: none"> IBD 	<ul style="list-style-type: none"> Highly digestible ingredients Typically low–moderate fat concentration Typically low total dietary fiber; emphasis on providing more soluble than insoluble fiber 	<ul style="list-style-type: none"> Formulated to be highly digestible, with > 90% digestibility Increased digestibility typically reduces fecal volume
Home-Prepared	<ul style="list-style-type: none"> Fat intolerance Food allergy Food intolerance IBD Lymphangiectasia Severe PLE 	<ul style="list-style-type: none"> Board-certified veterinary nutritionist should be consulted May be formulated as novel ingredient diet Most recipes found online or in books do not provide complete and balanced nutrition 	<ul style="list-style-type: none"> May be required to control clinical signs May be required to maintain serum albumin Most home-prepared diets have excellent digestibility
Modified Fiber	<ul style="list-style-type: none"> Colitis Fiber-responsive intestinal disease IBD of large intestine 	<ul style="list-style-type: none"> Soluble and insoluble fiber sources Prebiotic dietary fiber sources Table 6 	<ul style="list-style-type: none"> Fiber fermentation results in short-chain fatty acids, providing energy to colonocytes Large bowel clinical signs may respond favorably to fermentable soluble fiber supplementation Prebiotics have beneficial effects by modifying intestinal flora

Highly Digestible Diet

Several veterinary therapeutic diets have been specifically formulated to be highly digestible (> 90% digestibility versus approximately ≤ 90% digestibility). These diets (Table 5) are also referred to as *bland diets*. By increasing digestibility, fecal volume is typically reduced.

Highly digestible diets are *not* meant to be novel ingredient or hydrolyzed; however, they may be a reasonable option for owners who cannot feed one diet exclusively. In addition, remember that dry and canned formulations of the same diet may have different nutrient profiles.

Ingredient Concentration. These diets have low to moderate fat concentrations. If fat is the primary nutrient of concern, veterinary therapeutic low fat diets provide 18 to 23 grams fat per Mcal. While these diets provide variable fiber concentrations, they are typically low in total dietary fiber, with more emphasis on provision of soluble fiber than insoluble fiber.

Home-Prepared Diet

While there is no inherent benefit to feeding a home-prepared diet in most cases, some people may prefer to feed such a diet. Most recipes found online or in books do *not* provide complete and balanced nutrition;¹⁵ thus, a board-certified veterinary nutritionist should be consulted if an owner wants to feed a home-prepared diet (Table 5). The importance of consulting with a veterinary nutritionist cannot be overemphasized.

Ingredient Concentration. A home-prepared diet may be formulated as a novel ingredient diet, and most home-prepared diets have excellent digestibility.

In some cases of profound fat intolerance (eg, severe PLE), a home-prepared diet may be required to control the animal’s clinical signs and maintain serum albumin. There is anecdotal evidence that ultra low-fat diets (< 18 grams per Mcal) may normalize blood proteins even when commercial low-fat diets cannot. This effect has not been fully elucidated in the veterinary literature but it may be due to further reduction of intestinal lymphatic pressure.

Modified Fiber Diet

Dietary fiber modification may be beneficial in animals with chronic enteropathies (Table 5). In general, fiber should be considered based on 2 characteristics: solubility and fermentability. Dietary soluble fiber sources are typically more fermentable

TABLE 6.
Examples of Dietary Fiber Sources

SOLUBLE FIBER SOURCES	INSOLUBLE FIBER SOURCES	PREBIOTIC FIBER SOURCES
<ul style="list-style-type: none"> • Beet pulp • Fruit pectins • Psyllium 	<ul style="list-style-type: none"> • Bran • Cellulose • Hemicellulose 	<ul style="list-style-type: none"> • Fructooligosaccharides • Inulin

than insoluble fiber sources (Table 6).

Fiber Concentration. The crude fiber listed on the guaranteed analysis provides an estimate of insoluble fiber concentration but does not take into account the soluble fiber concentration and, overall, is a poor indicator of total dietary fiber.¹⁶ Thus, assessing the ingredient list may provide some additional information regarding fiber types in any given diet.

Effects. Short-chain fatty acids, the result of fiber fermentation, provide energy to colonocytes. As such, animals with predominantly large bowel clinical signs may respond quite favorably to supplementation with fermentable soluble fiber.⁵

Certain forms of dietary fiber may also serve as prebiotics (Table 5) and provide beneficial effects by modifying intestinal flora.¹⁷ It is important to realize, though, that any change in diet may affect the intestinal flora and, ultimately, an animal’s clinical signs.¹⁸

IN SUMMARY

Client and pet preferences should be taken into account to ensure the best compliance with therapeutic recommendations. Nutrient profiles of the various diets should be compared to see which option seems most appropriate, and most patients require some tweaking of both nutritional and medical therapy to achieve the best results.

Good client communication is imperative to prevent owner frustration if they do not see immediate results. Also, sometimes diet alone will simply not have the desired benefits. In those cases, it is not worth repeating a diet trial multiple times—simply reassess the animal and amend its therapy as warranted.

IBD = inflammatory bowel disease; Mcal = megacalorie; OTC = over-the-counter; PLE = protein-losing enteropathy

Resources

A directory of board-certified veterinary nutritionists is available at acvn.org/directory.

 **Learn More**

To learn more about home-prepared diets, see **ACVN Nutrition Notes: Surveying Supplements: Current Trends, Research, & Recommendations** (May/June 2014), available at tvpjournal.com.

 **Client Education**

- It is important to inform clients that management of chronic enteropathies often entails some trial and error as there is no single diet that will be effective for every pet.
- Additionally, while dietary management may completely resolve the clinical signs, many animals will rely upon some combination of dietary and medical therapy.



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Learn More

To learn more about home-prepared diets, see **ACVN Nutrition Notes: Surveying Supplements: Current Trends, Research, & Recommendations** (May/June 2014), available at tvpjournal.com.

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