Chapter 62

Large Bowel Diarrhea: Colitis

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"The physician strengthens nature, and employs food and medicine, for which nature makes use for the intended end."
Thomas Aquinas, Summa Theologica, 1270

CLINICAL IMPORTANCE

Colitis is a common disorder of dogs and cats. A number of infectious, toxic, inflammatory and dietary factors can trigger an episode of large bowel diarrhea (Tables 61-1 and 61-2). This chapter addresses the diagnosis and management of dogs and cats with acute and chronic colitis.

Currently, inflammatory bowel disease (IBD) is thought to be the most common cause of chronic large bowel diarrhea in dogs and cats (Guilford, 1996), although large bowel IBD appears to be more prevalent in dogs (Washabau, 2004). The generic term, IBD, encompasses lymphoplasmacytic enterocolitis, lymphocytic enterocolitis, eosinophilic enterocolitis, segmental granulomatous enterocolitis, suppurative enterocolitis and histiocytic colitis. Specific types are categorized based on the type of inflammatory cells found in the lamina propria. Lymphoplasmacytic colitis is thought to be the most common form of colitis (Leib, 1997, 2005). The severity of the condition varies from relatively mild clinical signs to life-threatening protein-losing enteropathy (PLE), although PLE is seen more commonly with severe small bowel disease. The boxer breed may present with an especially severe variant termed histiocytic or ulcerative colitis (Leib and Matz, 1995).

PATIENT ASSESSMENT

History and Physical Examination

The most common clinical sign in dogs and cats with acute or chronic colitis is large bowel diarrhea characterized by tenesmus, dyschezia, urgency and passage of mucus and blood (Table 55-4). Clinical signs may be intermittent or persistent. The clinical signs tend to increase in frequency and intensity as colitis progresses. The presence of systemic signs is also variable. Some patients present with a history of depression, malaise and inappetence; however, most are alert and active when examined. Hemorrhagic stools indicate a potentially life-threatening disorder (Table 56-1).

When evaluating colitis cases, careful attention should be paid to the dietary history. Food-induced diarrhea is common; a recent change to a moist high-fat or meat-based food may be

the source of the patient's diarrhea.[a,b] Often, it is possible to elicit a history of food change, indiscretion, feeding table foods over a holiday or access to garbage, carrion or abrasive materials, such as bones.

Other husbandry issues are also important; for example, records of anthelmintic treatments should be scrutinized. The likelihood that an infectious organism is involved is increased if other animals or people in the household are similarly affected.

Dogs and cats with acute colitis may act depressed and be dehydrated and may exhibit pain on abdominal palpation. Patients should be carefully evaluated for evidence of septic shock. Those patients with systemic signs of illness (i.e., fever and congested mucous membranes) in addition to gastrointestinal (GI) signs should be treated more aggressively.

Physical examination findings vary in dogs and cats with chronic colitis. Many patients have no abnormalities. Rarely, dogs and cats with colitis present with weight loss and poor body condition. In such cases, serious infiltrative colonic disorders (e.g., histoplasmosis, neoplasia, histiocytic colitis or large intestinal disease complicated by small intestinal disease) should be suspected.

Occasionally, thickened loops of bowel may be palpated, especially in cats. Segmental thickening of bowel is consistent with eosinophilic gastroenterocolitis in cats and granulomatous enteritis in dogs (Moore, 1983; Lecoindre et al, 2007). This finding should also be distinguished from intussusceptions, foreign bodies, histoplasmosis and neoplastic lesions.

Laboratory and Other Clinical Information

Because there are many potential causes of acute colitis, achieving a definitive diagnosis can be difficult. In acute cases, it is most important to determine whether the patient's condition is self-limiting or potentially life-threatening. This determination, based on historical and physical findings is critical. Some factors suggest a potentially life-threatening condition (Table 56-1). Cases of a serious nature should be pursued aggressively with diagnostics (i.e., hematology, serum biochemistry profiles, urinalyses and fecal examinations for parasites and other infectious pathogens such as *Giardia* and *Tritrichomonas foetus*) (Leib, 2002; Washabau, 2004a). An abundance of inflammatory cells in a fecal smear is an important finding and justifies a fecal culture. Self-limiting cases are usually approached more conservatively. Diagnostics are often limited to assessing hydration status (i.e., packed cell volume, total protein concentration and body weight) and a thorough examination of feces for parasites and bacterial pathogens (e.g., spores of *Clostridium* spp. or clostridial enterotoxins).

Laboratory findings in patients with chronic colitis are often nonspecific. Hematologic findings are variable and may include blood loss anemia, anemia of chronic disease, eosinophilia and lymphopenia. Serum biochemistry profiles and urinalyses should be performed on samples from patients with chronic diarrhea to assess the systemic affect of the GI disorder and to rule out concurrent disease. Decreased cholesterol values may be seen in patients with colitis. Electrolyte abnormalities, including hypokalemia and hypochloremia, may be identified. Acid-base derangements may occur with diarrhea, but are more common with small bowel disease. Hypoproteinemia and hypoalbuminemia may be recognized in severe cases of PLE. Dehydrated patients may have prerenal azotemia.

Fecal examinations are very important in the evaluation of patients with chronic large bowel diarrhea. Multiple fecal parasite examinations using concentration techniques are necessary to rule out parasitism and infection with organisms such as *Giardia* and *T. foetus*.

Endoscopic abnormalities in chronic colitis may include mucosal granularity, hyperemia, increased friability and inability to visualize colonic submucosal blood vessels (Jergens et al, 1992). Multiple biopsy specimens should be collected from multiple bowel segments. Even if these areas appear normal endoscopically, histologic changes may still be present (Jergens et al, 1992; Roth et al, 1990; Marks and LaFlamme, 1998). The definitive diagnosis of IBD is based on histopathologic examination of endoscopic or surgical biopsy specimens (Wilcock, 1992).

Risk Factors

The risk factors for acute colitis include age, breed, immune status and environment. Puppies and kittens are more susceptible to a variety of infectious pathogens including parasites (Gookin et al, 2004), viruses and bacteria. Likewise, immunocompromised dogs and cats are at risk for contracting viral and bacterial enteritides. Hospitalization and administration of cancer chemotherapeutic drugs are associated with nosocomial infection with *Clostridium* (Twedt, 1992) and *Campylobacter* (Davenport, 1989) spp.

Environment also plays an important role in exposure to pathogens. Dogs and cats kept in unsanitary or overcrowded conditions are much more likely to develop infectious enteropathies. In addition, pets kept in poorly controlled environments have a higher risk for exposure to high-fat table foods, garbage and toxins. Dogs in particular eat indiscriminately. Consumption of rotten garbage, decomposing carrion and abrasive materials (e.g., hair, bones, rocks, plastic, aluminum foil, etc.) can result in severe colitis. Poor husbandry practices including inadequate parasite control and overcrowding also put pets at risk for acute colitis. Feeding raw foods may predispose dogs and cats to infectious enteropathies (Chapter 11).

There does not appear to be an age or gender predisposition for any of the forms of IBD. Certain breeds appear to be at risk for specific colonic disorders (Table 61-3). For example, the boxer breed is linked to histiocytic colitis (van Kruiningen, 1967). Other breeds at risk for chronic inflammatory colonopathies include German shepherd dogs and French bulldogs (Guilford, 1996).

Etiopathogenesis

Chapter 55 describes four mechanisms of diarrhea. In acute colitis, diarrhea may occur as a result of altered gut permeability or osmotic mechanisms. Many of the bacterial pathogens elaborate enterotoxins that serve as potent secretogogues.

Despite intensive study by veterinary and medical researchers, the pathophysiology of IBD is not completely understood (Fiocchi, 1998; Hanauer, 1996). IBD may have a genetic origin in several animal species. Crohn's disease and ulcerative colitis are more common in certain human genotypes; a mutation leads to the development of colitis in mice (Watanabe et al, 2006). Genetic influences have not yet been identified in canine or feline IBD, but certain breeds (e.g., German shepherd dogs, boxers) appear to be at increased risk for the disease (Washabau, 2004) (Chapter 57).

Histiocytic colitis, also termed ulcerative or boxer colitis, is characterized by infiltration of the lamina propria with PAS-positive histiocytes. Some authors have suggested that the presence of these macrophages indicates an infectious etiology, especially in light of the occasional recognition of intralesional pathogens and the marked improvement many of these cases experience with fluoroquinolone therapy. However, to date no organisms have been consistently identified in tissues from affected canine and feline patients and immunohistochemical examination of samples from affected dogs suggests an immunologically-mediated pathogenesis for the disorder (Leib and Matz, 1995; German et al, 2000; Stokes et al, 2001).

Table 62-1. Key nutritional factors for dogs and cats with colitis.*

Factors	Recommended levels
Protein	Adult dogs: 15 to 30% Growing puppies: 22 to 32% Adult cats: 30 to 45% Growing kittens: 35 to 50% Option: consider elimination foods or protein hydrolysates (Table 31-5 for dogs and Table 31-6 for cats)
Fat	Dogs: 8 to 15% Cats: 9 to 25%
Digestibility	Highly digestible foods: ≥87% for protein and ≥90% for fat and digestible carbohydrate Fiber-enhanced foods: ≥80% for protein and fat and ≥90% for digestible carbohydrate
Fiber	Highly digestible foods: ≤5% Fiber-enhanced foods: ≥7%
Electrolytes	Sodium: 0.3 to 0.5% Chloride: 0.5 to 1.3% Potassium: 0.8 to 1.1%

*All values expressed on a dry matter basis.

Key Nutritional Factors

Key nutritional factors for acute and chronic colitis are listed in **Table 62-1** and discussed in more detail below.

Water

Water is the most important nutrient in patients with acute large bowel diarrhea because of the potential for life-threatening dehydration due to excessive fluid losses and inability of the patient to replace those losses. Moderate to severe dehydration should be corrected with appropriate parenteral fluid therapy rather than using the oral route.

Protein

Protein should be provided at levels sufficient for the appropriate lifestage of colitis patients unless PLE is present. Thus, dry matter (DM) protein levels in foods for adult dogs and cats should be between 15 to 30% and 30 to 45%, respectively (Chapters 13 and 20). Protein levels for growing puppies and kittens should be in the ranges of 22 to 32% and 35 to 50% DM, respectively (Chapters 17 and 24). High biologic value, highly digestible (≥87%) protein sources are preferred.

Some authors recommend the use of elimination foods because of the suspected role of dietary antigens in the pathogenesis of chronic colitis (Nelson et al, 1984; Nelson and Stookey, 1988; Guilford, 1997; German, 2006). In some cases, elimination foods may be used successfully without pharmacologic intervention. Mild to moderate lymphoplasmacytic and eosinophilic colitis are the forms most likely to respond to dietary management (Nelson and Stookey, 1988; Davenport et al, 1987). Chapter 31 discusses elimination foods and protein hydrolysates in more detail. The suspected pathogenesis of IBD involves an increase in gut permeability; therefore, the use of "sacrificial" dietary antigens has been suggested in the treatment of IBD (Box 57-1) (Guilford, 1996).

Fat

Compared with the processes involved with other macronutrients, fat digestion and absorption are relatively complex and may be disrupted in patients with GI disease. The action of bacterial flora on unabsorbed fats in the colon resulting in hydroxy fatty acid production is an important cause of large bowel diarrhea. Thus, foods indicated for patients with colitis and many other GI diseases often contain low to moderate amounts of fat (i.e., 8 to 15% DM for dogs and 9 to 25% DM for cats). However, dogs and cats digest fat very efficiently and the process is rarely disrupted except in malassimilative disorders. Therefore, colitis patients can be fed foods containing higher concentrations of fat when greater caloric density is required.

Digestibility

Feeding highly digestible (fat and digestible [soluble] carbohydrate ≥90% and protein ≥87%) foods provides several advantages for managing dogs and cats with longstanding inflammatory colitis. Nutrients from highly digestible, low-residue foods are more completely absorbed from the proximal gut. Low-residue foods are associated with: 1) reduced osmotic diarrhea due to fat and carbohydrate malabsorption, 2) reduced production of intestinal gas due to carbohydrate malabsorption and 3) decreased antigen loads because smaller amounts of protein are absorbed intact. Fiber-enhanced foods inherently have somewhat lower digestibility values. These foods should have protein and fat digestibilities of at least 80% and carbohydrate digestibility of at least 90%.

Fiber

Dietary fiber predominantly affects the large bowel of dogs and cats. Beneficial effects of dietary fiber include: 1) normalizing colonic motility and transit time, 2) buffering toxins (e.g., bile

acids and bacterial enterotoxins) in the GI lumen, 3) binding or holding excess water, 4) supporting growth of normal GI microflora, 5) providing fuel for colonocytes and 6) altering viscosity of GI luminal contents.

Fibers are often categorized as soluble, insoluble or mixed. Mixed fibers include beet pulp, brans (rice, wheat or oat), pea and soy fibers, soy hulls and mixtures of soluble and insoluble fibers. Insoluble fibers include purified cellulose and peanut hulls. Soluble fiber sources include fruit pectins, guar gums and psyllium.

Various types and levels of dietary fiber have been advocated for use in patients with colitis. Some veterinarians recommend low-fiber foods (≤5% DM crude fiber) to enhance DM digestibility and reduce quantities of ingesta presented to the colon. Other authors have had success using moderate levels (10 to 15% DM crude fiber) to high levels (>15% DM crude fiber) of insoluble fiber (Dennis et al, 1993). If a food with an increased fiber level is being considered, a crude fiber content of at least 7% DM is advisable. All three strategies have been used successfully in managing patients with colitis and each strategy is patient dependent.

Small amounts (1 to 5% DM fiber) of a mixed- (i.e., soluble/insoluble) fiber type can also be added to a highly digestible food. Some authors have suggested that feeding insoluble or slowly fermentable fibers is detrimental to the management of colonopathies; these suggestions are based on the results of a small, uncontrolled feeding trial comparing cellulose-containing foods with foods containing beet pulp (Reinhart et al, 1994). However, larger, controlled trials incorporating pre- and poststudy histopathology and electron microscopic examination of tissues have not identified any negative effects of slowly fermentable fiber on the colon (Campbell, 1993; Leib, 1992).[c] In fact, many clinicians select foods enhanced with insoluble fiber as their first food option in the management of acute and chronic colitis (Leib, 1989, 2000; Leib and Matz, 1995).[d]

Feeding soluble- or mixed-fiber sources in small quantities to human patients with chronic inflammatory colitis has been advocated (Fiocchi, 1998). Short-chain fatty acid and butyrate enemas induce clinical improvement in patients with ulcerative colitis (Harig et al, 1989; Breuer et al, 1991). Several substrates including beet pulp, soy fiber, inulin and fructooligosaccharides have been demonstrated by in vitro fermentation to produce volatile fatty acids that may be beneficial in inflammatory colonopathies (Sundvold et al, 1995, 1995a, 1995b; Jamikorn et al, 1999). Manufacturers of commercial products usually incorporate these fibers at 1 to 5% DM.

Electrolytes

Potassium depletion is a predictable consequence of severe and chronic enteric diseases because the potassium concentration of intestinal secretions is high. Hypokalemia in association with colitis will be particularly profound if losses are not matched by sufficient dietary intake of potassium.

Electrolyte disorders should be corrected initially with appropriate parenteral fluid and electrolyte therapy. Foods for patients with colitis should contain levels of sodium, chloride and potassium above the minimum allowances for normal dogs and cats. Recommended levels of these nutrients are 0.3 to 0.5% DM sodium, 0.5 to 1.3% DM chloride and 0.8 to 1.1% DM potassium.

Other Nutritional Factors

Acid Load

Acidemia (i.e., normal anion gap hyperchloremic acidosis) is common in patients with acute large bowel diarrhea because fluid secreted in the caudal small intestine and large intestine contains bicarbonate concentrations higher than those in plasma and sodium in excess of chloride ions. Hypovolemia (i.e., severe dehydration) compounds the acidosis in some patients. Severe acid-base disorders are best corrected with appropriate parenteral fluid therapy. Foods for patients with acute colitis should normally produce an alkaline urinary pH. These foods preferably contain buffering salts such as potassium gluconate and calcium carbonate.

Omega-3 Fatty Acids

Omega-3 (n-3) fatty acids derived from fish oil or other sources may have a beneficial effect in controlling mucosal inflammation in patients with chronic inflammatory colitis (Simopoulos, 2002; Barbosa et al, 2003). There is some clinical evidence that dietary omega-3 fatty acid supplementation may modulate the generation and biologic activity of inflammatory mediators. Chapter 57 provides more information.

Vitamins

Folic acid supplementation is recommended for patients receiving long-term sulfasalazine therapy (Linn and Peppercorn, 1992).

FEEDING PLAN

Initially, the objectives for managing acute colitis should be to correct dehydration and electrolyte, glucose and acid-base imbalances, if present. Medical therapy may include antibiotics, anthelmintics, motility modifying agents (e.g., loperamide) and immunosuppressant agents (e.g., corticosteroids and azathioprine). Local-acting antiinflammatory drugs such as sulfasalazine and olsalazine/mesalamine may also be used.

The feeding plan goal is to provide a food that meets the patient's nutrient requirements and allows normalization of colonic motility and function, and fecal water balance. In most cases of acute large bowel diarrhea, initial fasting for 24 to 48 hours, with access to water, either reduces or resolves the diarrhea by simply removing the effects of unabsorbed food and offending agents from the colon. Often, the patient's previous food can be gradually reintroduced over several days.

In chronic colitis, dietary intervention should be aimed at controlling clinical signs while providing adequate nutrients to meet requirements and compensate for ongoing losses through the GI tract. Optimal management of some dogs and cats with chronic colitis may require only dietary manipulation. In other cases, dietary therapy is better used in concert with appropriate

Table 62-2. Key nutritional factors in selected fiber-enhanced veterinary therapeutic foods marketed for dogs with acute or chronic colitis compared to recommended levels.* (See Table 31-5 if foods with novel protein sources or protein hydrolysates are desired.)

Dry foods	Protein (%)	Fat (%)	Protein digestibility (%)	Fat digestibility (%)	Carbohydrate digestibility (%)	Fiber (%)	Na (%)	Cl (%)	K (%)
Recommended levels	**15-30**	**8-15**	**≥80**	**≥80**	**≥90**	**≥7**	**0.3-0.5**	**0.5-1.3**	**0.8-1.1**
Hill's Prescription Diet w/d Canine	18.9	8.8	84	92	95	16.4	0.22	0.46	0.70
Medi-Cal Fibre Formula	26.2	10.6	na	na	na	14.3	0.3	na	1.0
Purina Veterinary Diets DCO Dual Fiber Control	25.3	12.4	79.9	80.4	90.6	7.6	0.34	0.82	0.70
Purina Veterinary Diets OM Overweight Management Formula	31.1	7.2	81.9	78.9	72.3	10.3	0.31	0.97	0.83
Royal Canin Veterinary Diet Calorie Control CC 26 High Fiber	30.9	10.4	na	na	na	17.6	0.33	0.77	0.90
Royal Canin Veterinary Diet Diabetic HF 18	22	9.9	na	na	na	12.1	0.27	0.88	0.88
Moist foods	**Protein (%)**	**Fat (%)**	**Protein digestibility (%)**	**Fat digestibility (%)**	**Carbohydrate digestibility (%)**	**Fiber (%)**	**Na (%)**	**Cl (%)**	**K (%)**
Recommended levels	**15-30**	**8-15**	**≥80**	**≥80**	**≥90**	**≥7**	**0.3-0.5**	**0.5-1.3**	**0.8-1.1**
Hill's Prescription Diet w/d Canine	17.9	12.7	88	90	92	12.4	0.24	0.76	0.64
Medi-Cal Fibre Formula	24.8	9.1	na	na	na	15.0	0.5	na	0.7
Purina Veterinary Diets OM Overweight Management Formula	44.1	8.4	80.9	89.8	62.9	19.2	0.28	0.51	1.06

Key: Fiber = crude fiber, Na = sodium, Cl = chloride, K = potassium, na = information not available from manufacturer.
*Nutrients expressed on a dry matter basis.

pharmacologic agents. Antibiotics (e.g., metronidazole, tylosin, fluoroquinolones [for histiocytic colitis]), anthelmintics, antiinflammatory agents (e.g., sulfasalazine) and immunosuppressive agents (e.g., prednisone, budesonide, azathioprine, cyclosporine) have all been used. Lifelong dietary therapy is often required to control clinical signs in longstanding colitis cases.

Assess and Select the Food

Levels of key nutritional factors in foods currently fed to patients with colitis should be evaluated and compared with recommended levels. Information from this aspect of assessment is essential for making any changes to foods currently provided. Changing to a more appropriate food is indicated if the current food does not match recommended levels.

Withholding food for one to two days and then reintroducing either a highly digestible or fiber-enhanced food is often palliative in managing acute colitis. After feeding the highly digestible or fiber-enhanced food for another three to four days, the pet's regular food may be reintroduced over another three-day period. Further workup is recommended if colitis recurs when the regular food is reintroduced.

Three types of food can be used to manage chronic colitis and they may be attempted in any order: 1) fiber-enhanced foods 2) highly digestible, low-residue foods formulated for GI disease and 3) elimination foods. Alternatively, fiber supplementation can be used in conjunction with the patient's original food. The optimal fiber level is determined by trial and error. There is no physical examination finding, laboratory test or historical fact to predict which method will be successful in any one patient. Dietary trials are often needed to determine which food type works best for individual patients. **Tables 62-2** through **62-5** list selected veterinary therapeutic foods for colitis management for dogs and cats, respectively. These tables compare the key nutritional content of selected veterinary therapeutic foods to the key nutritional factor target levels. Alternatively, homemade foods can be prepared. Foods for extended feeding of puppies and kittens with colitis should also meet the nutritional requirements for growth.

Another option in chronic colitis is to use an elimination food with a limited number of highly digestible, novel protein sources or a protein hydrolysate (Tables 31-5 and 31-6 for dogs and cats, respectively). Commercial veterinary therapeutic foods and homemade foods that contain novel protein sources are often formulated from lamb, rabbit, venison, duck or fish and a highly digestible or unusual carbohydrate source or protein hydrolysates. All other possible dietary sources of protein and carbohydrate should be eliminated including treats, snacks, table foods, vitamin-mineral supplements and chewable/flavored medications (Chapter 31).

Assess and Determine the Feeding Method

A thorough assessment should include verification of the feeding method currently being used. Considerations include feeding frequency, amount fed, how the food is offered, access to other

Table 62-3. Key nutritional factors in selected highly digestible veterinary therapeutic foods marketed for dogs with acute or chronic colitis compared to recommended levels.* (See Table 31-5 if foods with novel protein sources or protein hydrolysates are desired.)

Dry foods	Protein (%)	Fat (%)	Protein digestibility (%)	Fat digestibility (%)	Carbohydrate digestibility (%)	Fiber (%)	Na (%)	Cl (%)	K (%)
Recommended levels	**15-30****	**8-15**	**≥87**	**≥90**	**≥90**	**≤5**	**0.3-0.5**	**0.5-1.3**	**0.8-1.1**
Hill's Prescription Diet i/d Canine	26.2	14.1	92	93	94	2.7	0.45	1.04	0.92
Iams Veterinary Formula Intestinal Low-Residue	24.6	10.7	na	na	na	2.1	0.35	0.66	0.90
Medi-Cal Gastro Formula	22.9	13.9	na	na	na	1.9	0.5	na	0.8
Purina Veterinary Diets EN GastroENteric Formula	27.0	12.6	84.5	91.4	94.4	1.5	0.60	0.85	0.66
Royal Canin Veterinary Diet Intestinal HE 28	33.0	22.0	na	na	na	1.6	0.55	0.99	0.88
Moist foods	**Protein (%)**	**Fat (%)**	**Protein digestibility (%)**	**Fat digestibility (%)**	**Carbohydrate digestibility (%)**	**Fiber (%)**	**Na (%)**	**Cl (%)**	**K (%)**
Recommended levels	**15-30****	**8-15**	**≥87**	**≥90**	**≥90**	**≤5**	**0.3-0.5**	**0.5-1.3**	**0.8-1.1**
Hill's Prescription Diet i/d Canine	25.0	14.9	88	94	93	1.0	0.44	1.22	0.95
Iams Veterinary Formula Intestinal Low-Residue	35.9	13.2	na	na	na	3.9	0.53	0.84	0.84
Medi-Cal Gastro Formula	22.1	11.7	na	na	na	1.0	0.6	na	0.6
Purina Veterinary Diets EN GastroENteric Formula	30.5	13.8	85.1	95.6	92.2	0.9	0.37	0.78	0.61
Royal Canin Veterinary Diet Intestinal HE	23.1	11.8	na	na	na	1.4	0.57	0.92	0.80

Key: Fiber = crude fiber, Na = sodium, Cl = chloride, K = potassium, na = information not available from manufacturer.
*Nutrients expressed on a dry matter basis.
**22 to 32% are recommended levels for growing puppies.

Table 62-4. Key nutritional factors in selected fiber-enhanced veterinary therapeutic foods marketed for cats with acute or chronic colitis compared to recommended levels.* (See Table 31-6 if foods with novel protein sources or protein hydrolysates are desired.)

Dry foods	Protein (%)	Fat (%)	Protein digestibility (%)	Fat digestibility (%)	Carbohydrate digestibility (%)	Fiber (%)	Na (%)	Cl (%)	K (%)
Recommended levels	**30-45**	**9-25**	**≥80**	**≥80**	**≥90**	**≥7**	**0.3-0.5**	**0.5-1.3**	**0.8-1.1**
Hill's Prescription Diet w/d Feline	39.0	9.8	90	87	86	7.6	0.30	0.84	0.84
Hill's Prescription Diet w/d Feline with Chicken	39.9	9.9	91	85	94	7.6	0.35	0.82	0.80
Medi-Cal Fibre Formula	34.2	12.2	na	na	na	14.9	0.5	na	0.9
Purina Veterinary Diets OM Overweight Management Formula	56.2	8.5	91.1	87.7	66.8	5.6	0.57	0.84	0.89
Royal Canin Veterinary Diets Calorie Control CC 29 High Fiber	33.5	10.2	na	na	na	14.0	0.51	0.92	0.88
Moist foods	**Protein (%)**	**Fat (%)**	**Protein digestibility (%)**	**Fat digestibility (%)**	**Carbohydrate digestibility (%)**	**Fiber (%)**	**Na (%)**	**Cl (%)**	**K (%)**
Recommended levels	**30-45**	**9-25**	**≥80**	**≥80**	**≥90**	**≥7**	**0.3-0.5**	**0.5-1.3**	**0.8-1.1**
Hill's Prescription Diet w/d Feline with Chicken	39.6	16.6	92	na	na	10.6	0.38	0.89	0.89
Medi-Cal Fibre Formula	40.0	17.1	na	na	na	16.7	0.4	na	0.8
Purina Veterinary Diets OM Overweight Management Formula	44.6	14.6	87.3	88.6	84.0	10.2	0.31	0.93	0.91
Royal Canin Veterinary Diets Calorie Control CC High Fiber	33.5	21.3	na	na	na	7.7	0.38	0.51	0.77

Key: Fiber = crude fiber, Na = sodium, Cl = chloride, K = potassium, na = information not available from manufacturer.
*Nutrients expressed on a dry matter basis.

Table 62-5. Key nutritional factors in selected highly digestible veterinary therapeutic foods marketed for cats with acute or chronic colitis compared to recommended levels.* (See Table 31-6 if foods with novel protein sources or protein hydrolysates are desired.)

Dry foods	Protein (%)	Fat (%)	Protein digestibility (%)	Fat digestibility (%)	Carbohydrate digestibility (%)	Fiber (%)	Na (%)	Cl (%)	K (%)
Recommended levels	**30-45****	**9-25**	**≥87**	**≥90**	**≥90**	**≤5**	**0.3-0.5**	**0.5-1.3**	**0.8-1.1**
Hill's Prescription Diet i/d Feline	40.3	20.2	88	92	90	2.8	0.37	1.11	1.07
Iams Veterinary Formula Intestinal Low-Residue	35.8	13.7	na	na	na	1.8	0.25	0.63	0.66
Medi-Cal Hypoallergenic/Gastro	29.8	11.5	na	na	na	3.1	0.4	na	0.8
Purina Veterinary Diets EN GastroENteric Formula	56.2	18.4	94.0	93.1	79.7	1.3	0.64	0.58	0.99
Royal Canin Veterinary Diets Intestinal HE 30	34.4	23.7	na	na	na	5.8	0.65	0.97	0.97
Moist foods	**Protein (%)**	**Fat (%)**	**Protein digestibility (%)**	**Fat digestibility (%)**	**Carbohydrate digestibility (%)**	**Fiber (%)**	**Na (%)**	**Cl (%)**	**K (%)**
Recommended levels	**30-45****	**9-25**	**≥87**	**≥90**	**≥90**	**≤5**	**0.3-0.5**	**0.5-1.3**	**0.8-1.1**
Hill's Prescription Diet i/d Feline	37.6	24.1	91	89	91	2.4	0.33	1.18	1.06
Iams Veterinary Formula Intestinal Low-Residue	38.4	11.7	na	na	na	3.7	0.40	0.69	0.93
Medi-Cal Hypoallergenic/Gastro	35.5	35.9	na	na	na	1.2	0.7	na	1.1
Medi-Cal Sensitivity CR	34.5	35.1	na	na	na	2.5	1.1	na	1.1

Key: Fiber = crude fiber, Na = sodium, Cl = chloride, K = potassium, na = information not available from manufacturer.
*Nutrients expressed on a dry matter basis.
**35 to 50% are recommended levels for growing kittens.

food and who feeds the pet. In cases in which colitis is caused by exposure to garbage or inappropriate amounts or types of foods, avoiding foods other than the pet's regular food is recommended and will often prevent further occurrences. If the animal has a normal body condition score (2.5/5 to 3.5/5), the amount of food previously fed (energy basis) was probably appropriate.

Initially, patients with acute colitis should have all food withheld for 24 to 48 hours. After this period, patients should be offered small amounts of food several times (i.e., six to eight times) a day. If the pet tolerates food without a recurrence of diarrhea, the amount fed can be increased over three to four days until the animal is receiving its estimated daily energy requirement in two to three meals per day.

Initially, chronic colitis patients should be fed multiple small meals per day as indicated by acceptance and tolerance of the food. Meal size can be increased and meal frequency can be decreased as tolerated by the patient after clinical signs have been successfully managed for several weeks.

REASSESSMENT

The prognosis for recovery in most cases of acute colitis is good. Bouts of acute colitis often resolve within two to four days with conservative medical and nutritional management. Body weight should be recorded daily until recovery is complete. Changes in body weight from day to day usually reflect changes in hydration status rather than loss or gain of lean or adipose tissue. Further diagnostic testing is warranted if severe large bowel diarrhea persists, or if clinical signs indicative of concurrent small bowel disease become apparent, such as vomiting, hypoalbuminemia and melena.

Weekly recordings of body weight and condition and stool evaluations are useful for assessing patients with chronic colitis. Regaining or maintaining optimal body weight and condition, normal level of activity and alertness and absence of clinical signs are measures of successful dietary and medical management. The feeding method and amount fed can be adjusted as needed to maintain body weight and condition. Additional medical therapies should be considered if dietary therapy alone fails to improve stool quality and maintain body weight.

Dogs and cats presenting with multiple or recurrent episodes of large bowel diarrhea require further diagnostic workup and, most probably, a combination of dietary and medical therapies; however, parasitic causes should be ruled out or treated empirically before pursuing further diagnostics.

ENDNOTES

a. Davenport DJ. Unpublished data. 1996.
b. Remillard RL. Unpublished data. Personal observation. 1996.
c. Kappel L. Louisiana State University, Baton Rouge. Personal communication. 1998.
d. Remillard RL. Unpublished data. 1999.

REFERENCES

The references for **Chapter 62** can be found at www.markmorris.org.

CASE 62-1

Chronic Diarrhea in an Irish Setter

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Patient Assessment

A two-and-one-half-year-old neutered female Irish setter was examined for a five-month history of worsening diarrhea. Initially, the dog produced one abnormal stool every four or five days but now had two abnormal stools daily. Diarrhea was accompanied by tenesmus, hematochezia and excess fecal mucus. Hookworm ova were found in a fecal flotation; however, therapy with an appropriate anthelmintic did not improve the clinical signs. No other parasites or ova were identified in three additional fecal flotations. The owner reported no obvious weight loss.

The dog was obtained as a stray after being hit by a car more than a year ago. It sustained an acetabular fracture that was managed conservatively. Three other dogs and four cats housed with this dog were clinically normal. The dog lived inside and was well supervised in a fenced yard.

Physical examination was normal except for the healed pelvic fracture noted on rectal palpation. Rectal mucosa felt normal and there was no evidence of sublumbar lymphadomegaly or intraluminal masses. Body weight was 30 kg with normal body condition (body condition score [BCS] 3/5).

Assess the Food and Feeding Method

A commercial dry grocery brand food (Ken-L-Ration Biskit[a]) and a commercial dry veterinary therapeutic food (Prescription Diet Canine i/d[b]) had been fed during the previous five months. No difference in the diarrhea was noted when the dog ate either food. Table food and other snacks were not offered. Water was available free choice.

Questions

1. Prepare a list of differential diagnoses for this patient.
2. Outline a diagnostic plan for this dog.

Answers and Discussion

1. The following conditions should be strongly considered: lymphoplasmacytic colitis (inflammatory large bowel disease), irritable bowel syndrome, histiocytic ulcerative colitis, neoplasia and whipworm infection. Idiopathic colitis or inflammatory bowel disease involving the colon is a common diagnosis made after biopsy specimens are obtained from dogs with chronic large bowel diarrhea and examined microscopically. The cause is unknown. The causes of irritable bowel syndrome are poorly understood but the disorder may result from psychological influences on the colon resulting in abnormal motility and signs of large bowel diarrhea. This dog was introduced into the household as a stray. Although the dog seemed to interact well with the seven other household pets, group-related social factors may have caused stress that contributed to the diarrhea. Histiocytic ulcerative colitis has been seen most commonly in boxers but can occur in other breeds. It is much less common than lymphoplasmacytic colitis. Neoplasia would be uncommon in a dog of this age although colonic lymphosarcoma may occur in young dogs. Whipworm infection is still possible despite the negative fecal evaluations for parasites. Other causes of chronic large bowel diarrhea include *Giardia* infection, eosinophilic colitis, cecal inversion, bacterial infection (*Yersinia* spp., *Salmonella* spp., others), histoplasmosis, pythiosis and protothecosis. These disorders should only be considered after exclusion of the more likely diagnoses listed above.
2. The diagnostic plan for this dog should include the following: fecal flotation with zinc sulfate, complete blood count, serum biochemistry profile, urinalysis and colonoscopy with collection of multiple mucosal biopsy specimens. The laboratory database will evaluate the dog's anesthetic risk and identify systemic diseases that may produce chronic diarrhea. However, the history and physical examination make systemic disease unlikely. Flexible colonoscopy allows visualization and biopsy of the entire colonic mucosa. Although four routine fecal flotations only identified hookworm ova on one occasion, this procedure is not sensitive for identification of *Giardia* cysts. *Giardia* infection commonly produces small bowel diarrhea but can occasionally cause large bowel signs. Zinc sulfate flotation or formol-ether sedimentation is necessary to identify *Giardia* cysts in feces. Whipworms shed ova intermittently; therefore, infection may be present despite multiple negative fecal examinations.

Progress Notes

Two fecal flotations using zinc sulfate failed to identify *Giardia* cysts or other parasite ova. Results of the complete blood count, serum biochemistry profile and urinalysis were normal except for mild eosinophilia (2,200/μl). The cecum, ascending, transverse and majority of the descending colon were normal during endoscopic examination. A small 0.5-cm bleeding erosion was noted 15

cm from the anus. Biopsy specimens were obtained from the ascending and transverse colon, from three normal appearing areas in the descending colon and from the eroded area 15 cm from the anus. Microscopically, the eroded region had mucosal ulceration and moderate mucosal infiltration with plasma cells and lymphocytes. All other biopsy specimens had moderate lymphoplasmacytic infiltration into the mucosa. Final diagnosis was lymphoplasmacytic colitis.

Further Questions

1. Outline a feeding plan for this dog.
2. What other therapy should be considered for this patient?

Answers and Discussion

1. Several different types of foods can be used in patients with large bowel disease. One strategy involves using a highly digestible, low-residue food to minimize the amount of ingesta entering the colon. Another strategy uses foods with moderate levels of fiber to alter colonic motility, increase production of volatile fatty acids and control pathogen growth by helping maintain normal colonic pH. A third strategy uses an elimination ("hypoallergenic") food (or one containing a protein hydrolysate) to decrease the amount of potential antigens absorbed by the colon. Ideal elimination foods have moderate levels of protein (i.e., avoid protein excess); have reduced numbers of novel, highly digestible protein sources; and avoid excess food additives and biogenic amines. A combination of these dietary strategies can also be tried. Although the etiopathogenesis of lymphoplasmacytic colitis is unknown, limiting exposure of the colonic mucosa to potential antigens is considered an important part of the feeding plan. Use of an elimination food (or one containing a protein hydrolysate) is often the first choice in these cases. Access to table food, snacks and food for other household pets should be avoided. Therapeutic trials with several different food types and careful monitoring are necessary for optimal case management. The food should be fed in an appropriate amount for the animal's body condition and activity level. For this dog, the daily energy requirement was estimated to be 1.6 x resting energy requirement (1,550 kcal [6.49 MJ]).
2. Medical management of chronic colitis also includes antiinflammatory and immunosuppressive drugs (mesalamine, sulfasalazine [sulfapyridine and mesalamine], olsalazine, prednisone, azathioprine) and antimicrobial agents (metronidazole, sulfasalazine, tylosin, other antibiotics). Changing the environment to alleviate stressful situations may also benefit some patients in which irritable bowel syndrome is a complicating factor.

Progress Notes

The dog was fed a commercial dry veterinary therapeutic food, i.e., a novel protein food (Prescription Diet Canine d/d Rice and Duck[b]) for six weeks. The dog was fed two cups twice daily. The owner reported only two bouts of diarrhea during this period. The dog was eating the food readily and maintaining normal body weight and condition.

Flexible colonoscopy was again performed. Friable, granular mucosa was observed around the ileocolic junction and in the descending colon. Erosions were not seen. Histopathologic evaluation of biopsy specimens revealed moderate lymphoplasmacytic colitis with an increased eosinophilic component compared with specimens from previous biopsy sites. The feeding plan was not changed but therapy with sulfasalazine[c] (1 g, t.i.d.) was instituted. Although clinical signs were eliminated, tear production gradually decreased over the next six months. Keratoconjunctivitis sicca is a common side effect of prolonged therapy with sulfa drugs. The dose of sulfasalazine was tapered and increased tear production occurred but intermittent diarrhea also returned. Therapy with oral prednisone was initiated (40 mg every 24 hours) and the dose slowly tapered. Oral administration of 10 mg prednisone every 48 hours in conjunction with the feeding plan controlled most of the clinical signs. Stressful circumstances still caused intermittent diarrhea.

Endnotes

a. Quaker Oats, Chicago, IL, USA.
b. Hill's Pet Nutrition Inc., Topeka, KS, USA. These products are available under different names.
c. Azulfidine. Pharmacia, Dublin, OH, USA.

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