

GI INTERVENTION

Approach to Diagnosis and Therapy of the Patient with Acute Diarrhea

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Diarrhea can be defined as increased fecal fluidity, usually accompanied by increased defecation frequency and volume of feces. Most cases of diarrhea are mild and self-limiting, requiring minimal diagnostics and therapy. Life-threatening cases can occur, however, that require greater diagnostic efforts and intensive care.

ACUTE VERSUS CHRONIC

Diarrhea is considered:¹

- **Acute** if it lasts for less than 14 days
- **Chronic** if it persists for longer than 14 days.

Historical and clinical findings and appearance of the feces are used to differentiate whether the diarrhea is of small bowel or large bowel origin (**Table 1**). This differentiation is most important in cases of chronic diarrhea, when selection of diagnostic tests is influenced by the presumed location of enteric pathology. Additionally, many pets with acute diarrhea display signs of enterocolitis (mixed small and large bowel signs).

PREVALENCE & INCIDENCE

While diarrhea is a very common presenting problem in companion animal practice, it is either more common in dogs than cats, or dogs with diarrhea are more likely to be examined by a veterinarian. A report of diagnoses from over 2 million dogs and almost 430,000 cats in 2011 indicated that “gastroenteritis (GI upset)” and “colitis” both ranked in the top 19 diagnoses for dogs, but were not among the most common diagnoses in cats.²

Incidence of diarrhea and vomiting was investigated prospectively in a Norwegian study of 585 large-breed dogs followed from birth to 2 years of age.³

- Most dogs had only one episode of diarrhea and/or vomiting during the study period; those suffering from several episodes demonstrated relatively long periods between episodes.

- There was a positive association between occurrence of diarrhea and vomiting in the same dog, but episodes of diarrhea and vomiting did not usually occur at the same time.
- Diarrhea and vomiting had a much higher frequency in young puppies despite complete vaccination and deworming protocols.
- Risk for diarrhea decreased from 16% in 7-to-12-week-old puppies to 5.4% in 12-to-18-month-old dogs.

An early study showed that frequency of both vomiting and diarrhea were highest in puppies and declined with increasing age⁴; this is supported by Banfield data demonstrating that “gastroenteritis (GI upset)” was common in dogs up to 3 years but much less common in dogs above that age.²

OWNER IDENTIFICATION

Diarrhea is generally recognized by owners, as long as the feces are observed. Most owners realize that diarrhea is usually self-limiting and may be more prone to “wait and see” when pets develop gastrointestinal (GI) signs, compared to clinical signs that are not as familiar.

In a study of 772 pet dogs in England, 70% of the reports of diarrhea involved only 1 or 2 episodes, and 78% lasted 2 days or less. Veterinary attention was sought for only 10% of dogs with diarrhea (and 5% of vomiting dogs).⁵ All dogs with diarrhea persisting for 7 days or longer were presented to a veterinarian.

PATHOPHYSIOLOGY

Four major pathophysiologic mechanisms can cause diarrhea. Osmotic forces and changes in mucosal permeability are the most important mechanisms in dogs and cats. In most small animal diseases, multiple mechanisms contribute to diarrhea, and it can be difficult to determine the predominant mechanism.

1. **Osmotic diarrhea:** The number of osmotically active particles in feces determines water content, and pres-

Table 1. Findings Used to Differentiate Small Bowel From Large Bowel Diarrhea

FINDING	SMALL BOWEL	LARGE BOWEL
Frequency of defecation	Normal to mildly increased	Markedly increased
Fecal volume	Normal to increased	Decreased
Fecal mucus	Absent	Often present
Fecal blood	Melena	Hematochezia
Tenesmus	Absent	Often present
Urgency	Absent	Often present
Dyschezia	Absent	Often present
Vomiting	May be present	Infrequently present
Weight loss	Often present	Infrequently present
Steatorrhea	May be present	Often present

ence of increased numbers of these particles within the intestinal lumen leads to osmotic diarrhea.

Osmotic diarrhea occurs with many malabsorptive disorders, such as exocrine pancreatic insufficiency, in which poorly digested nutrients are malabsorbed, remain within the GI lumen, and attract water. It can also occur with overeating and dietary indiscretion if poorly absorbed nutrients are ingested.

Retention of nutrients in the GI tract can also lead to dysbiosis (see below) and fermentation of carbohydrates, which further increases the number of osmotically active particles. A hallmark of osmotic diarrhea is that it resolves when the patient stops ingesting poorly absorbable solute.

- 2. Secretory diarrhea:** Stimulation of crypt enterocytes results in secretion of large volumes of fluid that exceeds the absorptive ability of the intestine. This occurs most commonly with infectious diseases, such as enteropathogenic *Escherichia coli* and salmonellosis, but is also a mechanism of diarrhea related to inflammatory bowel disease (IBD). By-products of dysbiosis can also stimulate intestinal secretion. One distinguishing feature of secretory diarrhea is its persistence despite fasting, which is due to abnormalities in ion transport not related to food.
- 3. Increased mucosal permeability:** Increased permeability of the intestinal mucosa causes loss of fluids, electrolytes, proteins, and blood into the intestinal lumen. It commonly accompanies erosive, ulcerative, neoplastic (intestinal lymphoma), and inflammatory processes, such as IBD and hookworm infection.
- 4. Abnormal motility:** Deranged motility is often secondary to disorders that cause diarrhea. Decreased segmental contractions result in transport of ingesta at a rate too fast for normal digestion and absorption. Platelet-activating factor, synthesized and released from several immunocytes, may be one of the inflammatory response mediators that stimulates giant aboral contractions, the powerful contractions that propagate—uninterrupted—from the small intestine to the ileum or colon.

Tremendous fluid loss can occur when the small and/or large intestine are not functioning normally. Mild diarrhea causes few metabolic consequences; however, moderate or severe diarrhea can lead to profound dehydration, hypovolemic shock, electrolyte abnormalities (hypokalemia, hypochloremia, and hyponatremia), and acid–base disturbances.

Metabolic acidosis typically develops secondary to loss of intestinal bicarbonate and dehydration leading to hypovolemia, anaerobic metabolism by tissues, and production of lactic acid.

ACUTE DIARRHEA: CAUSES

There are many causes of acute diarrhea in dogs and cats (Table 2, page 22). In many cases of acute diarrhea, signs resolve spontaneously or with symptomatic therapy without a specific cause being discovered.

In animals with chronic diarrhea, a thorough diagnostic evaluation and appropriate dietary and therapeutic trials for diagnostic purposes are much more important. It is beyond the scope of this review to discuss causes and diagnostic approach to pets with chronic diarrhea; however, watch for evidence of chronicity even at first presentation of a pet with diarrhea.

Endoparasites

It is well documented that endoparasitism is primarily a concern in young animals.^{2,6-8} Batchelor, et al, documented that dogs with GI signs had a higher prevalence of intestinal parasites, including *Giardia* and *Toxocara*.⁶ In a referral population, however, dogs with GI signs had no greater odds of endoparasitism than healthy animals; instead, age and median household income were the strongest predictors of endoparasitism, and dogs from heavily populated ZIP codes had the greatest risk for endoparasitism.⁹

Dietary Indiscretion

Dietary indiscretion is a common cause of acute diarrhea. One study reported that feeding a home-cooked diet, recent history of scavenging, or change of diet all increased the risk for diarrhea in dogs.¹⁰ Another study found a positive correlation between development of diarrhea and/or vomiting and reports of scavenging behavior (stealing food; eating trash; or eating feces from horses, farm animals, or cats).⁵ No correlation was found between GI signs and eating table food.

Bacterial Enteritis

A variety of bacteria are known or suspected to cause enteritis in dogs and cats (Table 2). Establishing a diagnosis of bacterial enteritis creates a significant challenge due to:

- Limitations in understanding the complex intestinal microflora
- Inadequate investigation of many potential pathogens.

The fact that the microorganisms responsible for enteritis can be found in healthy individuals, and may not be found at a higher prevalence in animals with diarrhea,

Table 2. Differential Diagnosis of Acute Diarrhea

SELF-LIMITING	LIFE-THREATENING
<p>Dietary Indiscretion</p> <ul style="list-style-type: none"> • Chemicals and toxins • Diet change • Foreign material • Garbage or table scraps • Plants 	<p>Bacteria</p> <ul style="list-style-type: none"> • <i>Campylobacter</i> species • <i>Clostridium difficile</i> toxins A/B • <i>Clostridium perfringens</i> enterotoxin • Enteropathogenic <i>E coli</i> • <i>Salmonella</i> species • <i>Yersinia</i> species
<p>Drugs</p> <ul style="list-style-type: none"> • Antibiotics • Cancer chemotherapeutics • Copper chelators • Corticosteroids • Digoxin • Magnesium antacids • Nonsteroidal anti-inflammatory drugs 	<p>Systemic Diseases</p> <ul style="list-style-type: none"> • Acute liver disease • Acute pancreatitis • Acute renal failure (leptospirosis) • Canine distemper • Hypoadrenocorticism • Salmon poisoning
<p>Parasites</p> <ul style="list-style-type: none"> • Coccidia, including <i>Cryptosporidium</i> species • <i>Giardia</i> • Hookworms, roundworms, and whipworms 	<p>Intestinal Obstruction</p> <ul style="list-style-type: none"> • Foreign body • Intestinal accident • Intussusception
<p>Other</p> <ul style="list-style-type: none"> • Acute colitis • <i>Clostridium perfringens</i> enterotoxin • Coronavirus • Idiopathic 	<p>Other</p> <ul style="list-style-type: none"> • Hemorrhagic gastroenteritis (see Box) • Canine parvovirus and feline panleukopenia • Severe dietary indiscretion • Severe parasitism (hookworms and whipworms)

Adapted, with permission, from Leib MS, Munroe WE (eds): *Practical Small Animal Internal Medicine*. Philadelphia: WB Saunders, 1997, p 692.

Hemorrhagic gastroenteritis (HGE) is a diarrheal syndrome of unknown etiology that has a predilection for small breed dogs; it has not been reported in cats. Speculation regarding pathogenesis includes type-1 hypersensitivity reaction to food components, CPE, and *C difficile* toxins A/B.

HGE is distinctively characterized by peracute onset of bloody diarrhea and vomiting accompanied by marked hemoconcentration. Packed cell volume of an affected dog can reach 75% or higher within hours of onset of signs, yet total plasma protein often remains within reference range.

Symptomatic therapy, primarily aggressive IV fluid therapy and gastroprotectants, results in marked clinical improvement within 24 to 48 hours. Antimicrobial therapy is usually administered, although in a recent study, clinical response was not improved in dogs that received antibiotics (amoxicillin/clavulanic acid).¹⁴ With appropriate therapy, mortality is low despite severity of signs.

confounds diagnosis, treatment decisions, and assessment of infection control and zoonotic risk (Table 3, page 25).

Cytology. Microscopic examination of fresh feces has been used by some clinicians for presumptive diagnosis of disease by evaluating pathogen appearance. However, fecal cytology is now considered of no diagnostic utility for bacterial enteropathogen identification because:

- These bacteria can be present in normal animals
- Appearance does not differentiate between pathogenic strains and harmless commensal species
- In the case of *Clostridium perfringens*, no studies have reported a correlation between presence or number of spores and signs of disease.

Enterotoxin has received the most attention in relation to *C perfringens*, and some association has been found between the presence of *C perfringens* enterotoxin (CPE) and diarrhea in dogs.¹¹

Intestinal Microbes. Intestinal microbes play a crucial role in maintenance of host health. They:

- Act as a defending barrier against transient pathogens
- Support the host in digestion and energy harvest from the diet
- Stimulate the immune system
- Provide nutritional support for enterocytes.

The total microbial load in the intestine is estimated at 10¹² to 10¹⁴ organisms, about 10× the number of host cells in the entire body.

New technologies have enhanced our understanding of the microorganisms harbored by mammalian GI tracts. Massive parallel 16S rRNA gene pyrosequencing has provided the tool for molecular-phylogenetic characterization of the GI tract's complex microbial community.¹² The gene content of these microbes is defined as the *intestinal microbiome*.

There is mounting evidence that changes in microbial populations play an important role in pathogenesis of acute and chronic enteropathies of dogs. In a recent study, dogs with acute diarrhea, especially those with acute hemorrhagic diarrhea, had the most profound alterations in their fecal microbiome compared to healthy dogs, and observed changes differed between acute and chronic disease states.¹³

Recognition of fecal biome alterations (dysbiosis) in pets with various GI disorders opens the door to future studies that evaluate the ability of probiotics, prebiotics, antibiotics, and other therapies to restore the balance of bacterial flora.

ACUTE DIARRHEA: HISTORY & PHYSICAL EXAMINATION

Signalment and history often contain the information necessary to make a tentative diagnosis or help rank differential diagnoses (Tables 1 and 2).

Puppies and kittens, especially from shelters, are prone to viral diseases and GI parasites.

Physical examination may detect:

- Abdominal masses
- Dilated loops of bowel
- Foreign bodies
- Intussusception
- Abdominal pain.

When patient size permits, routinely performing digital rectal palpation aids recovery of feces for observation of the presence of blood (digested [melen] or fresh) and/or mucus.

Dehydration (at least 5% to be clinically noted) may be evident by dry mucous membranes, loss of skin turgor, prolonged capillary refill time, or enophthalmos. More pronounced alterations in these parameters indicate moderate dehydration (7%–9%); extreme alterations denote severe dehydration (10%–12%) approaching hypovolemic shock (tachycardia with poor peripheral perfusion and weak peripheral pulses).

ACUTE DIARRHEA: DIAGNOSTICS

The most important initial step in evaluating animals with acute diarrhea is to determine if they have a self-limiting or potentially life-threatening problem (Table 2). This distinction is crucial as it guides the level of diagnostics and therapy indicated, and should be based on a thorough history, careful physical examination, clinical experience and judgment, and a sound understanding of the differential diagnoses for acute diarrhea.

Initial Diagnostics

Fecal Flotation. Animals with suspected self-limiting diarrhea should always be tested for GI parasites by centrifugation fecal flotation using zinc sulfate, paired with indirect fluorescent antibody testing for *Giardia* cysts and *Cryptosporidium* oocysts.

Cytology. Fecal cytology, a low-yield diagnostic test, is not useful for detection of potential bacterial enteropathogens (Figure). In contrast, exfoliative rectal cytology can be useful in dogs and cats with signs of colitis, especially when chronic, to identify fungal organisms or colonic neoplasia.

A patient may have a potentially LIFE-THREATENING PROBLEM if some of the following are present:

- Moderate to severe dehydration
- Abdominal pain
- Depression
- Melena or hematochezia
- Presence of an abdominal mass or dilated loop of bowel
- Frequent vomiting
- Signs of systemic illness, such as:
 - Ascites
 - Lymphadenopathy
 - Coughing
 - Ocular and nasal discharge
 - Hepatomegaly
 - Oliguria/anuria
 - Icterus
 - Pyrexia

If the distinction is not clear cut, it is better to be cautious and initially manage the patient as if it has a life-threatening problem.

Laboratory Analysis. Measuring total plasma protein and hematocrit will help assess hydration and provide a baseline for reference if clinical signs persist or progress.

Symptomatic Therapy

- If dietary indiscretion has occurred, removal of the incriminating factors and/or feeding a highly digestible diet for 3 to 5 days usually helps resolve diarrhea.
- If parasites are detected, diarrhea should improve 2 to 3 days after appropriate treatment
- If an etiology is not found, a presumptive diagnosis of acute idiopathic self-limiting diarrhea may be made. Symptomatic therapy usually relieves clinical signs in 1 to 3 days. If diarrhea persists or other clinical signs develop or intensify, a more serious problem may exist, requiring thorough evaluation and more intensive therapy.

Additional Diagnostics

Laboratory Analysis. Laboratory evaluation helps rank differential diagnoses as well as assess severity of dehydration and electrolyte disorders; it may include:

- Complete blood count
- Serum biochemistry profile
- Urinalysis
- Baseline cortisol (to exclude hypoadrenocorticism)
- SNAP Parvo Test (idexx.com).

In chronic or recurrent cases of diarrhea, serum concentrations of cobalamin and folate and canine or feline trypsin-like immunoreactivity (cTLI or fTLI) can be measured. Depending on clinical signs, patients may be evaluated for hyperthyroidism (cats) and pancreatitis.

Radiography. Survey abdominal radiographs may demonstrate an abdominal mass, dilated loop of bowel, ileocolic intussusception, foreign body obstruction, or linear foreign body requiring surgical intervention.

Specific Identification. Additional diagnostic tests may be indicated to definitively diagnose a specific organism or disease or to pursue diagnosis if a cause is not yet evident (eg, abdominal ultrasound).

- Identification of *Trichostrongylus axei*; several diagnostic tests are available
- Serologic testing for feline leukemia and immunodeficiency viruses may be warranted in diarrheic cats based on housing and origin
- Partial analysis for enteric pathogens, usually reserved for diarrheic pets that are systemically ill or in contact with an immunosuppressed person:
 - » Fecal enteric panel: Gram-stained fecal smear, CPE enterotoxin enzyme-linked immunosorbent assay

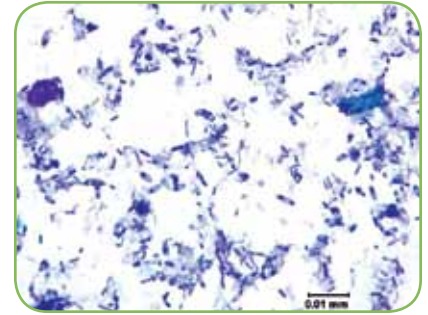


Figure. Photomicrograph of fecal cytology showing sporulated organisms compatible with *Clostridium perfringens*. Fecal cytology, however, is not considered to be diagnostically useful for bacterial enteropathogen identification.

Table 3. Potential Enteric Bacterial Pathogens in Dogs & Cats

ORGANISM	PREVALENCE	ANTIBIOTIC CHOICE IF THERAPY APPEARS INDICATED
<i>Campylobacter</i>	Healthy: Dogs, 21%–76% Cats, 16%–58% Diarrheic: Dogs, 60%–97% Cats, 16%–31%	Enrofloxacin: Dogs, 5 mg/kg PO Q 12 H Cats, 2.5 mg/kg PO Q 12 H (or marbofloxacin to avoid risk of retinal damage) Alternatives: Tylosin, tetracycline, or erythromycin
<i>C perfringens</i>	Healthy: Dogs, 11%–100% Diarrheic: Dogs, 27%–86%	Usefulness of treatment unknown for mild cases; consider treatment of severe (HGE) or chronic diarrhea with metronidazole or tylosin ; alternatives are ampicillin or amoxicillin-clavulanic acid
<i>C difficile</i> *	Healthy: Dogs and cats, 0%–10% Diarrheic: Data not available	Metronidazole: See Table 4, page 55
<i>Salmonella</i>	Healthy: Dogs, 0%–2.9% Cats, 0.4%–1.7% Diarrheic: Data not available	No indication to treat healthy carriers. Use of antimicrobials is controversial except in cases of systemic illness (bacterial translocation); treat based on <i>in vitro</i> susceptibility testing.

*Infections in pets appear to be community-acquired, not hospital- or antibiotic-associated, as in human patients.

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Marks SL, Rankin SC, Byrne BA, Weese JS. Enteropathogenic bacteria in dogs and cats: Diagnosis, epidemiology, treatment, and control. *J Vet Intern Med* 2011; 25:1195-1208.

(ELISA), *C difficile* toxin A/B ELISA

» Fecal culture or polymerase chain reaction (PCR): For potential bacterial pathogens, such as *Salmonella* and *Campylobacter*

It is very difficult to establish evidence for a causal association between the presence of a specific bacterium in the feces and occurrence of diarrhea (Table 3).

ACUTE DIARRHEA: MEDICAL THERAPY

Most cases of self-limiting diarrhea resolve within 1 to 5 days, following correction of the underlying cause and/or symptomatic treatment.

Nonspecific symptomatic therapy may include one or more of the following:

- Nutritional management
- Therapeutic deworming
- Antidiarrheal
- Antiemetic and/or gastroprotectant
- Probiotic
- Antimicrobial (selected cases)
- Fluid therapy.

Nutritional Management

Administration. Animals with acute diarrhea often benefit from withholding food for 6 to 12 hours followed by frequent (3–6 small meals/day) feeding of small amounts of a highly digestible, so-called “bland,” diet; amount fed per meal can be slowly increased.

- Such diets for dogs should have a low or modest fat content; fat restriction is not required for cats.
- Useful choices include boiled rice with lean chicken, low-fat cottage cheese, or tofu; Prescription Diet i/d Low Fat GI Restore (hillsvet.com); Purina Veterinary Diets EN Gastroenteric (nestlepurina.com); and Veterinary Diet Intestinal Low Fat (royalcanin.us).

When diarrhea resolves, the animal’s usual diet can be slowly reintroduced over a 2- to 3-day period by adding 25%, 50%, 75%, and finally 100% of the usual diet. If vomiting is concurrently present, an antiemetic can be administered.

High-fiber diets. For pets with signs of acute large bowel diarrhea (Table 1), a high-fiber diet is often used instead of a bland diet as fiber may be beneficial in reducing tenesmus and facilitating colonic epithelial repair. Commercial

A recent British study documented the prescribing habits of veterinarians for dogs with acute diarrhea seen in general practice.¹⁵ A total of 371 dogs of various breeds, ages, and sexes were represented. See Box for study results.

THERAPY	USE IN CASES
Antibacterials	71%
Probiotics/antidiarrheal	26%
Steroids	19%
Antiemetics (vomiting present concurrently)	13%
Gastric protectants (primarily if vomiting/melena present)	10%
Sulfasalazine (use associated with presence of fecal mucus)	7%

The frequent use of antibacterials for acute diarrhea is surprising and somewhat alarming. There is evidence that resistance to antimicrobials is increasing among bacteria isolated from pets.¹⁶ Nutritional management, therapeutic deworming, and probiotic therapy, accompanied in some cases by an antidiarrheal agent, should be considered first-line therapies (Table 4, page 55).

(continued on page 54)

(GI Intervention continued from page 24)

products with increased mixed (soluble and insoluble) fiber are ideal. Soluble fiber (psyllium mucilloid, 1 tsp/10 kg body weight) may be added to a bland diet.

Therapeutic Deworming

Parasite Identification. If a GI parasite is identified on fecal examination, the appropriate antiparasiticide should be prescribed.

In many dogs and cats with acute diarrhea, parasitic infection remains a possibility despite negative test results because:

- Testing is not 100% sensitive
- Not all parasites shed ova continuously.

Antiparasiticide Selection. For these reasons, a good therapeutic strategy to consider is administration of a broad-spectrum dewormer, such as fenbendazole, which is also an excellent choice for treating giardiasis, showing better efficacy and a greater safety margin than metronidazole. If a response to therapeutic deworming is seen, a second course of fenbendazole in 3 months is needed for some parasites, such as whipworms.

Antidiarrheals

Indications. If diarrhea is frequent enough to interfere with the animal's (or sometimes the owner's) ability to rest, causes apparent pain or discomfort, or results in large fluid losses, an opioid may be given to alter intestinal motility.

Mechanism of Action. Opioids prolong intestinal transit time, allowing increased fluid absorption and reduction in the frequency of diarrhea. They act by:

- Increasing colonic segmentation, fluid absorption, and anal tone
- Decreasing propulsive peristaltic contractions and secretion

These drugs are particularly effective in patients with large bowel diarrhea (colitis).

Specific Drugs. Diphenoxylate or loperamide is very effective in reducing frequency of diarrhea.

- Both are available as elixirs, making dosing convenient for small dogs and cats.
- Loperamide is more potent and has faster onset and longer duration of action than diphenoxylate.
- In dogs, both drugs—at recommended doses—are safe and have few side effects.
- In cats, excitatory behavior can occur, but appears to be rare; for this reason, though, these drugs should be used with caution in cats.

If a toxin or possibly pathogenic bacteria are the suspected cause of acute diarrhea, opioids are contraindicated because they may increase toxin absorption or time for bacterial proliferation.

Probiotics

Definition. Probiotics are live microorganisms that, when administered in adequate amounts, confer a health benefit on the host (World Health Organization definition). Probiotics include a wide variety of organisms, such as vari-

ous species of *Lactobacillus*, *Bifidobacter*, *Bacillus*, *E coli*, *Streptococcus*, and *Saccharomyces*.

Mechanism of Action. Both live and dead cells in probiotic products can generate beneficial biological responses.

- Live probiotic cells influence both GI microbiome and the immune response.
- Components of dead cells may have anti-inflammatory effects in the GI tract.

In the case of live probiotic organisms, bacterial levels in feces disappear within days when supplementation ceases.

Clinical Evidence. To date, limited clinical trials with probiotics have been performed in dogs and cats with GI disorders (see **Probiotic Studies in Companion Animals**, page 56).

Antimicrobial Therapy

Nonspecific Use. Routine use of antibiotics in cases of acute uncomplicated diarrhea is strongly discouraged. If an antibiotic is selected for nonspecific use in such cases, metronidazole or tylosin is an appropriate choice.

Specific Use. In acute intestinal diseases, antimicrobials are specifically indicated only in animals with:¹⁹

- Confirmed bacterial infection (eg, positive blood culture and/or presence of enteropathogenic bacteria on fecal culture, along with signs of sepsis)
- Predisposition for bacterial translocation (eg, disruption of intestinal epithelial barrier)
- Increased risk for sepsis (eg, immunosuppression, portosystemic shunting).

Pets with acute bloody diarrhea of unknown cause are usually treated with an antibiotic, such as amoxicillin/clavulanic acid, or monitored very closely because:

- Ruling out enteric bacterial infection is challenging
- Bacterial translocation is a potentially life-threatening complication.

Markedly hemorrhagic diarrhea is often interpreted as evidence of a breach of intestinal integrity, justifying use of antimicrobials, although no studies document an increased risk for bacterial translocation or sepsis in these patients.

Fluid Therapy

Administration. An animal's deficit due to dehydration can be calculated by multiplying the percent of estimated dehydration (from physical examination) times body weight (kg). Maintenance fluids (44–66 mL/kg/day) should be added to this deficit. Continued losses from diarrhea should be estimated and added to the fluid volume administered.

If mild dehydration is present, a balanced isotonic polyionic fluid (lactated Ringer's) can be administered subcutaneously, but animals with severe dehydration caused by life-threatening acute diarrhea require intravenous fluid therapy.²⁰

Further Diagnostics. If diarrhea worsens or other clinical signs develop, the animal should be re-evaluated and further diagnostics considered. Any underlying conditions should be specifically treated. If further diagnostic testing

Table 4. Medications for Acute Diarrhea: Dogs and Cats

MEDICATION NAME	DOSAGE
Antidiarrheals	
Diphenoxylate (Lomotil, pfizer.com)	Dogs: 0.05–0.2 mg/kg PO Q 6–8 H *Cats: 0.08–0.1 mg/kg PO Q 12 H
Loperamide (Imodium, jnj.com)	Dogs: 0.08–0.2 mg/kg PO Q 6–12 H *Cats: 0.04 mg/kg PO Q 12–24 H
Antimicrobials for Nonspecific Diarrhea	
Metronidazole	Dogs: 10–15 mg/kg PO Q 12 H Cats: 62.5 mg PO Q 12 H
Tylosin	10–15 mg/kg PO Q 12–24 H
Antimicrobials for Dogs or Cats at Risk for Bacterial Translocation	
Amoxicillin-clavulanic acid	12.5–22 mg/kg PO Q 12 H
Ampicillin	22 mg/kg PO Q 8–12 H
Broad-Spectrum Parasiticide	
Fenbendazole	50 mg/kg PO Q 24 H for 3–5 days
Probiotics: Fortiflora (nestlepurina.com) & Prostora (iams.com)	

*Use with caution in cats.

For dosages of antiemetics and gastroprotectants (for diarrhea cases with concurrent vomiting, hematemesis, and/or melena), see **Medications for Acute Vomiting: Dogs and Cats**, available at todaysveterinarypractice.com/resources.asp#resources.

is needed, fluid therapy consisting of crystalloids and possible addition of colloids should be instituted *prior* to obtaining a definitive diagnosis.

Feeding. Food should be withheld for no more than 12 hours and an antiemetic administered if vomiting occurs to allow feeding as soon as possible. Puppies with parvoviral diarrhea treated by early enteral feeding showed more rapid clinical improvement than puppies held off food.²¹

Monitoring. Careful monitoring is required during fluid therapy.

- Physical examination findings that indicated dehydration should gradually improve as the patient is rehydrated during the first 24 hours of therapy.
- Hematocrit and total protein should decrease.
- Body weight should be measured frequently, as changes accurately reflect hydration.
 - » After hydration has been reestablished, body weight should remain relatively stable throughout the treatment.

» Falling weight suggests dehydration while increasing weight supports overhydration.

- Serum electrolytes should be monitored daily for several days in animals with profuse diarrhea or severe electrolyte abnormalities.

SUMMARY

- Dogs and cats frequently develop diarrhea that starts abruptly and lasts for less than 7 days.
- Most cases are mild and self-limiting, and likely associated with changes to the intestinal microbiota.
- In mild cases, in which there is no indication for antimicrobial therapy, nutritional management, therapeutic deworming, and probiotic therapy, sometimes in conjunction with an antidiarrheal agent, should be considered.
- In cases with more severe, sometimes life-threatening, signs, a thorough and logical diagnostic plan must be followed to obtain an accurate diagnosis and guide appropriate therapy. ■



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Probiotic Studies in Companion Animals Dogs with Acute Diarrhea

Kelley, et al. In one study, 31 young adult dogs with acute, uncomplicated, nonspecific diarrhea were enrolled in an unblinded, randomized prospective study, receiving either *Bifidobacterium animalis* strain AHC7 (Prostora, iams.com) or placebo for 2 weeks.¹⁷ Mean time to diarrhea resolution was significantly less for the probiotic group (3.9 ± 2.3 vs 6.6 ± 2.7 days).

Hersted, et al. In a double-blinded, placebo-controlled study, 36 dogs with acute diarrhea or acute gastroenteritis were randomized to receive a probiotic cocktail (2 *Lactobacilli* species and 2 *Bacillus* species) or placebo.¹⁸ Duration of abnormal stools was shorter for dogs receiving probiotics (1.3 vs 2.2 days). There was no difference in duration of vomiting between groups.

These study results suggest that probiotic therapy is a rational approach for shortening the duration of diarrhea, improving patient comfort in dogs assessed to have acute, self-limiting diarrhea. Similar studies in cats have yet to be published.

Prevention of Diarrhea

Probiotics likely have a role in diarrhea prevention, such as for pets in stressful conditions. Cats and dogs housed in an animal shelter were studied to determine whether feeding *Enterococcus faecium* SF-68 (FortiFlora, nestlepurina.com) would decrease episodes of diarrhea and improve fecal scores.¹⁹

Animals in one room were supplemented daily with FortiFlora while controls received a placebo. The percentage of cats with diarrhea ≥ 2 days was significantly lower in the probiotic group (7.7% vs 20.7%), suggesting that probiotics may lessen how long cats have diarrhea. Diarrhea prevalence rates were low for all dogs so statistical differences were not detected.

CPE = *Clostridium perfringens* enterotoxin; ELISA = enzyme-linked immunosorbent assay; GI = gastrointestinal; HGE = hemorrhagic gastroenteritis; IBD = inflammatory bowel disease; PCR = polymerase chain reaction

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