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Metoclopramide is a commonly used antiemetic drug. It can be given by intermittent subcutaneous injection (0.2-0.4 mg/kg every 6 hours, subcutaneously [SQ] or intramuscularly [IM]) or as a constant intravenous infusion (1-2 mg/kg/day). The latter mode of administration appears to be more efficacious. This medication predominantly affects the D₂ dopaminergic receptors in the CRTZ and gut. It also affects the 5-HT₃ serotonergic receptors in the CRTZ.

Phenothiazine drugs such as chlorpromazine (0.2–0.5 mg/kg every 8 hours SQ) or prochlorperazine (0.1-0.5 mg/kg every 8 hours SQ or IM) are broad spectrum antiemetics (they have activity at the α_2 -adrenergic, D₂-dopaminergic, histaminergic, and cholinergic receptors). However, use can cause hypotension, so blood pressure should be monitored. Sedation is also usually quite pronounced with use of these agents. These medications are a good choice for dogs that fail to respond to metoclopramide. It is possible to use both agents concurrently.

A limited number of medications are specific to the 5-HT₃ serotonergic receptors. Ondansetron (0.5-1.0 mg/kg every 12 to 24 hours, by mouth [PO]) can be helpful in some cases of vomiting associated with stimulation of the CRTZ.

H₁-histaminergic receptor antagonists include diphenhydramine (2-4 mg/kg every 8 hours PO) and dimenhydrinate (4-8 mg/kg every 8 hours PO). These can be used for the treatment of motion sickness or vestibular disease.

Erythromycin at low dosages (0.5-1.0 mg/kg every 8 hours) can also act as an antiemetic by stimulation of the motilin receptors that increase GI motility and promote gastric emptying.

35. The Approach to Diarrhea

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1. How can large-bowel diarrhea be differentiated from small-bowel diarrhea?

Certain criteria help to differentiate the source of diarrhea; they are listed in Table 35-1. Not every case will have every sign. It is also important to remember that mixed forms can occur. This is especially true if small-bowel diarrhea has been present for some time. The dysfunction/malabsorption in the small intestine leads to secondary changes in the large bowel.

2. When considering differentials for diarrhea what are the two primary differential groups?

Diarrhea has many causes. Many times it is due to primary gastrointestinal (GI) tract disease. At times, however, diarrhea can be due to non-GI tract disease such as uremia, liver disease, or hypoadrenocorticism.

3. What pathophysiologic mechanisms lead to diarrhea?

Diarrhea can have various causes such as infections, dietary indiscretions, food allergy and non-GI disease (uremia). The mechanisms by which diarrhea develops can be grouped into secretory mechanisms, osmotic mechanisms, permeability changes, and motility disorders.

Secretory diarrhea usually develops with various infectious agents (*Escherichia coli*, *Salmonella* spp., etc.) and toxins. This form of diarrhea will not resolve with fasting. The predominant clinical problem with this form of diarrhea is significant fluid and electrolyte loss.

Osmotic diarrhea occurs when increased concentrations of hyperosmolar particles are present in the small and large intestine, overwhelming the ability of the GI tract to resorb water. Common causes include dietary indiscretion and maldigestion. This form of diarrhea is responsive to fasting. The predominant clinical problem is fluid loss.

Table 35-1 *Small Bowel versus Large Bowel Diarrhea*

CLINICAL SIGN	SMALL BOWEL	LARGE BOWEL
Tenesmus	No	Yes
Frank blood in feces (hematochezia)	No	Yes
Melena	Yes	No
Frequency of defecation	Normal to increased	Markedly increased
Urge	No	Yes
Mucoid feces	No	Yes
Weight loss	Yes	Rarely
Fecal volume	Large	Small

Changes in permeability can result in more severe clinical signs. The increased permeability leads not only to loss of fluids and electrolytes but can also lead to the loss of proteins, blood, and mucus. Generally, changes in permeability are associated with GI tract inflammation.

Although in theory motility disorders can lead to diarrhea, this has been poorly documented in dogs. Hypomotility disorders, which are more common than hypermotility disorders, can be caused by many diseases or other conditions.

4. What basic laboratory studies are indicated to evaluate diarrhea?

There is no easy answer to this question. A fecal float test is indicated in all cases of diarrhea. This may be the only test needed in uncomplicated cases of acute diarrhea when the dog is not visibly ill. In chronic cases or cases where symptoms are more severe, a complete blood count, serum chemistry profile, urinalysis, and fecal culture are advisable. Imaging studies may be indicated as well. Especially with chronic disease, other diagnostic laboratory studies such as determination of trypsin-like immunoreactivity (TLI), an adrenocorticotropic hormone (ACTH) stimulation test (to rule out hypoadrenocorticism), measurement of serum folate and cobalamin concentrations, and intestinal biopsies may be indicated.

5. How can biopsies be collected from the GI tract and what are the advantages and disadvantages of each method?

GI tract biopsies are often necessary with chronic disease to establish a more definitive diagnosis. Either full-thickness biopsies or pinch biopsies can be taken. Full-thickness biopsies are usually obtained during exploratory surgery, although they can also be obtained laparoscopically. Pinch biopsies are obtained with endoscopy.

Surgical exploration has certain advantages and disadvantages. Biopsy specimens obtained by this method can be more helpful in diagnosis because they may include all layers of the GI tract. It is also possible to biopsy areas that cannot be reached by endoscopy. Another advantage is that other organs can be examined and biopsied at the same time. The predominant disadvantages of exploratory surgery are that it is more invasive and there is the risk of biopsy site dehiscence. This risk increases considerably when the colon is biopsied or the dog has hypoproteinemia.

Endoscopy often leads to a diagnosis in cases of GI tract disease. The procedure is less invasive than exploratory surgery and there is no risk of wound dehiscence. Endoscopy is preferable for biopsy of the large bowel and in dogs with significant hypoproteinemia. Endoscopy also has the advantage that it allows visualization of the lumen of the GI tract and any abnormal appearing areas. Endoscopy is, however, limited to certain areas of the GI tract (esophagus, stomach, duodenum, proximal jejunum, distal ileum, large intestine) and the biopsy specimens obtained are smaller. Additionally, endoscopy does require the use of special instruments and skill is required to perform a complete endoscopic exam.

ACUTE DIARRHEA

6. What are the clinically significant differences between acute and chronic diarrhea?

Acute diarrhea is a common complaint in small animal practice. Many cases of acute diarrhea are self-limiting, even if mucosal damage is severe, because intestinal epithelial cell turnover is rapid and new, normal epithelial cells will quickly restore normal intestinal function. Treatment need only be supportive and symptomatic, since most animals that die from diarrhea do so not as a result of the underlying cause of diarrhea but from the loss of water and electrolyte imbalance, with subsequent dehydration, acidosis, and shock. In many cases, extensive diagnostic workups are not needed.

In contrast, chronic diarrhea is rarely self-limiting and a diagnosis is needed for optimal treatment. In many cases, biopsy of the GI tract is indicated. Supportive care is less likely to be needed in cases of chronic diarrhea.

7. What are the principles of symptomatic management of acute diarrhea in the dog?

Many dogs with acute diarrhea do not require symptomatic therapy. In those cases, however, when the dog is visibly ill or dehydration is present, it is advisable to initiate more aggressive supportive care.

8. What dietary modification is indicated with acute diarrhea?

Food should be withheld in most cases for 24 to 48 hours; this will be especially effective in dogs with osmotic diarrhea. After this time, a bland diet fed frequently in small quantities is recommended. Then the normal diet is gradually added to the bland diet to allow return to a normal diet.

9. Is fluid therapy indicated with acute diarrhea?

Maintaining fluid balance is vital because diarrhea causes dehydration and the resultant changes in electrolyte and acid-base balance can cause death, especially in puppies. In dogs that are drinking, adequate fluid balance can be maintained by providing them with water. Oral rehydrating solutions can also be used; these combine water with glucose or glycine. The glucose or glycine helps to increase sodium absorption, which in turn increases water absorption.

In dogs that are debilitated, are dehydrated, are vomiting, or have major electrolyte disturbance, intravenous fluid therapy is preferable. In many dogs the subcutaneous route will not provide adequate amounts of fluid. If intravenous fluids are to be used, a minimum laboratory database is indicated to help tailor fluid therapy optimally.

10. When do I use motility modifiers for managing diarrhea? What drugs do I use?

Motility-modifying agents are most appropriate for cases of large-bowel disease, when the dog is not ill and the diarrhea is more of a hygiene problem (e.g., leads to accidents in the house). Narcotic analgesics (loperamide, 0.1 mg/kg every 8-12 hours, diphenoxylate, 0.1-0.2 mg/kg every 8-12 hours) can be effective in treating diarrhea. These medications delay bowel transit time by increasing nonpropulsive contractions and muscular tone of the gut while decreasing propulsive activity. Opiates also influence the transport of water and electrolytes through the intestine and reduce intestinal fluid accumulation, stool frequency, and stool weight (volume). Anticholinergic agents generally are not indicated for the treatment of diarrhea, because they induce ileus.

11. Are locally acting protectants and absorbents indicated for diarrhea therapy?

Bismuth-subsalicylate, kaolin, and activated charcoal are some of the medications that have been recommended for treatment of diarrhea. Salicylate-containing products can be useful in managing secretory diarrhea. Other agents are generally thought not to be efficacious.

12. What should I look for to support the use of antimicrobials in a case of acute diarrhea?

The use of antibiotics with diarrhea is not routinely indicated. However, when extensive damage to intestinal mucosal is suspected, an antibiotic should be used. Mucosal damage is thought to allow penetration of the intestinal wall by bacteria, which are subsequently released into the systemic circulation. Antibiotics are also justified in cases of symptomatic bacterial infection when a known pathogen is diagnosed.

Evidence of extensive mucosal damage includes the following:

- Fever
- Leukocytosis/leukopenia
- Hemorrhagic diarrhea
- Very sick animal
- Positive blood culture

13. What are the clinical signs of hemorrhagic gastroenteritis (HGE)?

The term hemorrhagic gastroenteritis (HGE) refers to a collection of clinical signs. The cause of HGE is variable; often the syndrome is idiopathic. In some cases *Clostridium perfringens* enterotoxin is suspected to be the underlying cause. The dogs show hemorrhagic diarrhea and frequently hematemesis. Marked hemoconcentration may also occur. The onset is acute and dramatic. Hypovolemia is often seen.

14. How is HGE diagnosed?

The appropriate clinical signs, together with a PCV greater than 60%, are consistent with HGE, although this is not an etiologic diagnosis. In most cases when the PCV is elevated, total protein will be normal.

15. How is HGE treated?

Aggressive fluid therapy is vital in these animals; many require initial resuscitation with high dose fluids. After fluid therapy hypoproteinemia may develop, and colloid therapy may be needed. Antibiotics are often used because of the compromised intestinal barrier.

VIRAL DIARRHEA**16. What causes parvovirus infection in dogs?**

The inciting virus is canine parvovirus type 2. The virus is highly contagious and resistant to inactivation. The virus is related to feline panleukopenia and mink enteritis virus. The virus attacks host cells that are rapidly dividing.

17. What clinical signs are associated with parvovirus infection?

Clinical signs are variable, and in some cases, none are apparent. In most cases vomiting, profuse diarrhea, pyrexia, anorexia, and depression are noted. This disease can progress to shock and sepsis. The diarrhea is often hemorrhagic, because the intestinal crypts are destroyed, which leads to the villi being denuded of epithelial cells. Marked hypoproteinemia can occur, as can neutropenia due to the virus attacking rapidly dividing cells in the bone marrow. In the past, myocarditis leading to sudden death was seen in puppies after in utero infections, although this phenomenon is no longer seen.

18. How is parvovirus infection diagnosed?

Appropriate clinical signs in a young dog with inadequate vaccination should always raise concern about parvovirus infection. Neutropenia is a highly suggestive sign; not uncommonly, the neutrophil count is less than 1000/ μ l. In many cases this infection can be definitively diagnosed by an enzyme-linked immunosorbent assay (ELISA) performed in-house on feces.

Usually this assay will demonstrate viral antigen. A weak positive reaction is possible in recently vaccinated dogs. Electron microscopy is an alternative diagnostic tool.

19. How is parvovirus infection treated?

Given the severe fluid losses in these animals, aggressive fluid therapy is required. Hypoglycemia develops frequently and when present, is an indication to add glucose to the intravenous fluids. Antibiotic therapy (ampicillin or cephalosporin in uncomplicated cases, ampicillin with an aminoglycoside in cases with sepsis or severe neutropenia) is indicated in all dogs. If vomiting is persistent, use of an antiemetic would be of benefit. Some studies have shown that early enteral alimentation may be a consideration as well. In severely hypoproteinemic dogs, plasma administration can be helpful.

20. What sequelae can occur with parvovirus infection in dogs?

With the marked disruption of the GI barrier, sepsis or endotoxemia can develop. Damage to the intestine can also lead to intussusception.

21. What is the prognosis with parvovirus infection?

If aggressive supportive care is provided, the prognosis is generally good. Concurrent GI tract disease (corona virus infections, GI parasites) leads to a worse prognosis.

22. What clinical signs are seen with corona virus infection in dogs?

The diarrhea with this disease is variable and usually self-limiting.

BACTERIAL DIARRHEA

23. What role do bacteria play in canine diarrhea?

Bacteria are known to be a common cause of diarrhea in all species. There are, however, difficulties determining if a given bacterial species is causing diarrhea in a dog. Many of the pathogenic bacteria are also found in dogs that do not have diarrhea. In some cases there is genetic variability in the bacterial species that can lead to virulence, for instance, the presence of enterotoxigenic *Clostridia*. This genetic variability usually cannot be determined by simple cultures.

24. What role do *Campylobacter* species play in canine diarrhea?

Campylobacter spp. can be pathogens in dogs, predominantly *Campylobacter jejuni*, *Campylobacter coli*, *Campylobacter helveticus*, and *Campylobacter upsaliensis*. These species are considered to have zoonotic potential in dogs, even though most human cases of *Campylobacter* infection are contracted from contaminated food, especially poultry. Diarrheic and nondiarrheic dogs can harbor these bacteria, and in many studies isolation rates were similar (up to 50% positive, especially in young kennel dogs).

25. What are the clinical signs of *Campylobacter* spp. infection?

Signs are variable. Watery to mucoid to hemorrhagic diarrhea can occur, as can an asymptomatic carrier state.

26. How is a *Campylobacter* infection treated?

Either macrolide antibiotics or fluoroquinolones can be used, though most cases would resolve without resorting to antibiotics. Antibiotic therapy is indicated given the zoonotic potential, however. Erythromycin is considered the drug of choice, though it can cause GI upset. Fluoroquinolones can be used, but resistance can develop rapidly.

27. What role do *Salmonella* spp. play in canine diarrhea?

Salmonella is a potential pathogen, although inapparent carrier states commonly occur. This

is a potential zoonotic infection. Prevalence rates vary, but in the typical dog population about 1% of dogs will have the bacteria. Higher rates are seen in kennel populations, racing Greyhounds, racing sled dogs, and dogs fed raw-meat diets.

28. What clinical signs are associated with salmonellosis?

Signs are variable, from inapparent carrier state to severe diarrhea/septicemia. Diarrhea can be watery, mucoid, or hemorrhagic. In more severely affected animals, fever, abdominal pain, and sepsis can occur. These animals will often also show changes on CBC such as a neutrophilia with a left shift and evidence of toxic change.

29. How is salmonellosis treated?

For sick animals, supportive care is indicated. Antibiotics should be reserved for more severely affected animals. Antibiotics should probably be given to all dogs that have hemorrhagic diarrhea. Fluoroquinolones are the drugs of choice for this infection.

30. What role does *E. coli* play in canine diarrhea?

It is difficult to ascertain the role that *E. coli* plays in diarrhea, because this organism is often cultured from dogs without diarrhea. Some strains of *E. coli* have virulence factors that can lead to disease developing. Some strains thought to cause diarrhea include enterotoxigenic *E. coli* (ETEC) and enteropathogenic *E. coli* (EPEC).

31. What role does *C. perfringens* play in canine diarrhea?

As with other bacteria, *C. perfringens* is commonly isolated from dogs with or without diarrhea. It is thought that the production of enterotoxin by some strains leads to diarrhea, although nondiarrheic dogs can also have enterotoxin-producing strains of *C. perfringens*. The enterotoxin is released during sporulation of the bacterium.

32. How is *C. perfringens* diarrhea diagnosed?

It is not possible to definitively determine if *C. perfringens* is causing diarrhea. Neither detection of enterotoxin nor large numbers of spores are limited to dogs with diarrhea.

33. What is meant by small-intestine bacterial overgrowth (SIBO)?

Bacteria can be found in the small intestine, and under certain conditions they can begin to proliferate. The abnormal proliferation results in malabsorption and diarrhea. However, there is no universally accepted upper limit for the number of bacteria normally found in the small intestine, and therefore it is impossible to determine the level that represents SIBO.

34. How is SIBO diagnosed?

Quantitative bacterial cultures are necessary to establish a diagnosis, although this is controversial. Elevations in serum folate concentration and decreased serum cobalamin concentration are also suggestive. Response to antibiotic therapy may also allow a presumptive diagnosis, although its diagnostic value is tentative at best.

35. How is SIBO treated?

A variety of antibiotics are used, including amoxicillin, metronidazole, and tylosin.

FUNGAL DISEASE

36. What causes pythiosis?

This disease is caused by infection with *Pythium insidiosum*.

37. Where is pythiosis commonly found?

The geographic distribution of this infection is generally limited to areas near the Gulf of Mexico.

38. What are the clinical signs of this infection and how is it treated?

This infection results in chronic diarrhea. With time, vomiting, anorexia, and progressive weight loss occur. The bowel walls become markedly thickened and obstruction can result.

When possible, surgical excision of affected tissue should be undertaken. Medical management with itraconazole or amphotericin B can be successful, although response rates are low.

39. What is the prognosis with pythiosis?

The prognosis is generally guarded to poor unless affected tissues can be surgically excised with good margins.

40. What GI signs are seen with histoplasmosis?

Histoplasmosis can affect many organs; GI tract involvement is common. The disease results in weight loss, lethargy, and anorexia. Diarrhea is often seen; usually its characteristics indicate large-bowel involvement. Other clinical signs will depend on what other organs are affected.

41. How is GI histoplasmosis diagnosed?

Clinical signs, together with cytologic evidence of *Histoplasma capsulatum* organisms, are diagnostic. A rectal scrape can often be diagnostic in those cases of large-bowel diarrhea. Serologic results are considered unreliable.

PARASITES**42. How are helminth infections diagnosed?**

Fecal float tests can be helpful, especially if centrifugation is used. It is, however, important to remember that a negative fecal float test result does not rule out an infection and should never be a reason to not treat with a deworming agent.

43. What roundworms are commonly found in dogs and how are they acquired?

The most commonly found roundworm is *Toxocara canis*. This can be acquired through the fecal-oral or transmammary route or in utero. *Toxascaris leonina* can also be found. It is acquired through the fecal-oral or transmammary route.

44. What clinical signs are seen with roundworms?

Clinical signs are seen almost exclusively in puppies. Severe infestations can result in diarrhea, vomiting, poor nutritional status, and a potbelly. Obstruction can occur.

45. Are roundworms a zoonotic concern?

The ingestion of roundworm eggs by humans can result in visceral larva migrans. This often does not lead to clinical signs, although in some cases blindness can occur.

46. What hookworms are commonly found in dogs and how are they acquired?

The most common hookworm is *Ancylostoma caninum*. Additionally, *Uncinaria stenocephala* can be found. Hookworms are acquired either by the fecal-oral route or the transmammary route.

47. What clinical signs are seen with hookworms?

Diarrhea can occur with this disease. Significant blood and protein loss can also occur, resulting in weight loss, anemia, and hypoproteinemia.

48. Are hookworms a zoonotic concern?

Hookworms can penetrate skin, resulting in dermal larva migrans. There also have been sporadic reports of intestinal disease in humans infected with canine hookworms.

49. What role does *Giardia* play in canine diarrhea?

This parasite can be seen in dogs, though it occurs in dogs with and without diarrhea. Most infections are subclinical. In some cases severe diarrhea can develop.

50. How is *Giardia* diagnosed?

The *Giardia* cysts can be identified on a fecal float test. Motile trophozoites can be seen on fresh fecal smears. There are also highly sensitive fecal ELISA tests available that detect *Giardia* antigen.

51. How is *Giardia* treated?

Metronidazole can be used to treat *Giardia* (25 mg/kg every 12 hours for 5 days). Prolonged use of the drug can result in central nervous system (CNS) disturbances. Fenbendazole is also highly effective in treating this parasite (50 mg/kg every 12 hours for 3 days). Albendazole is also effective; however, bone marrow toxicity has been seen with this drug. Bathing the dog is also recommended to help prevent reinfection.

ADVERSE REACTIONS TO FOOD**52. What is the difference between food allergy and food intolerance?**

With food allergy, a true allergic reaction (usually a mix of types I, II, and IV hypersensitivity reactions) occurs. Food intolerance is based on a nonimmunologic reaction.

53. What clinical signs are seen with adverse reactions to food?

The most common sign, especially with food intolerance, is vomiting or diarrhea. Food allergies can result in non-GI-tract signs such as pruritus and urticaria.

54. How is a food allergy diagnosed?

To diagnose a food allergy, an allergic reaction needs to be documented. This is generally clinically not possible.

55. How is an adverse reaction to food diagnosed?

An adverse reaction to food (allergy or intolerance) is diagnosed by means of an elimination diet and challenge. A diet is fed that does not contain elements that the dog has been previously exposed to. This is fed for a period of at least 12 weeks to see if symptoms subside. If the diet is successful, the dog is challenged with the previous diet to see if signs recur. If they do, the elimination diet is started again.

INFLAMMATORY BOWEL DISEASE**56. What is inflammatory bowel disease (IBD)?**

IBD refers to variable inflammatory infiltrates in the GI tract and associated clinical signs. The distribution can be focal or generalized. Many diseases can cause GI tract inflammation; however, with IBD, the inflammation is considered idiopathic.

57. What clinical signs are seen with IBD?

Signs will vary with the severity of inflammation. Diarrhea is the most common sign with intestinal IBD. Depending on where there is inflammation, the characteristics may be those of small-bowel, large-bowel, or mixed diarrhea. In severe cases anorexia and weight loss can occur, as well as excessive protein loss.

58. How do you diagnose IBD?

IBD is diagnosed by means of intestinal biopsy.

59. How do you treat IBD?

Treatment will vary somewhat depending on the type of inflammatory cells that predominate and the severity of clinical signs. Dietary modification is commonly used. In some cases food allergy is suspected, and in such cases it is common practice to use antigen limited diets. Alternatively, hydrolyzed diets can be used.

Antibiotics such as metronidazole and tylosin are often used. This can help to treat SIBO (a common condition seen with IBD), which may be partly responsible for the clinical signs. Antibiotics may also change the flora of the GI tract, which might be beneficial if bacterial antigens are responsible for the inflammation.

With IBD it is also common to give antiinflammatory or immune suppressive medications. Corticosteroids are among the most common therapies for IBD. In severe cases azathioprine or cyclosporine can also be considered. In cases of colitis, 5-aminosalicylic acid (5-ASA) can be given. When combined with sulfapyridine, it is called sulfasalazine. In the colon bacteria split the sulfa from the 5-ASA, which can then have a local antiinflammatory effect in the colon.

60. What is meant by eosinophilic enteritis?

This form of IBD is associated with an eosinophilic infiltrate or occasionally with peripheral eosinophilia. This form of IBD is generally more severe and its treatment is more difficult. Given the participation of eosinophils, parasites or allergies could be underlying causes.

61. What is lymphocytic/plasmacytic IBD?

This is the most common form of IBD, with lymphocytes and plasma cells being the predominant intestinal infiltrate. In many cases it can be difficult to determine if a pathologic infiltrate is present because this type of change can be seen in many dogs without clinical signs of IBD. Severity of signs does not have to correlate with how marked the infiltrate is.

62. What is histiocytic ulcerative colitis?

This is a form of IBD in which histiocytes predominate in the intestinal infiltrate. This form of colitis is especially severe and can result in significant weight loss. Ulcers are common, both macroscopically and microscopically.

63. How is histiocytic ulcerative colitis treated?

Previously, immune-suppressive drugs and sulfasalazine were used in treating this disease, although results were not consistently good. Recently treatment with enrofloxacin has resulted in a good response and long-term resolution of clinical signs.

PROTEIN-LOSING ENTEROPATHY**64. What is a protein-losing enteropathy (PLE)?**

Protein-losing enteropathies are a diverse group of chronic intestinal disorders characterized by excessive loss of proteins into the GI tract. The most common causes are inflammatory bowel disease and lymphangiectasia, although protein loss can be seen with other GI tract diseases as well, such as neoplasia, parasitism in juvenile animals, and histoplasmosis. Protein loss can also occur acutely with severe exudative enteritis, for instance, with parvovirus infection. The loss of proteins is nonselective; so that both albumin and globulins will be decreased. Other differentials for hypoalbuminemia, such as protein-losing nephropathy or liver disease, usually are not associated with a dramatic decrease in globulins.

65. What is lymphangiectasia?

With lymphangiectasia the lacteals and lymphatic vessels in the mucosa and or submucosa are dilated and can rupture. Proteins and other lymph components are then lost into the GI tract rather than being resorbed. Breeds with predispositions to lymphangiectasia include the Yorkshire

Terrier, Norwegian Lundehund, and Soft-Coated Wheaten Terriers. The cause of this dilation is not always known; rare congenital cases do occur. In most cases the changes are acquired as a result of inflammation, which leads to obstruction of lymph flow. More severe cases will also have dilation of the mesenteric lymph vessels. Lymphangiitis, lymphadenitis, and lipogranulomas are often seen in more advanced cases.

66. What laboratory abnormalities are seen with PLE?

Many changes are nonspecific. Panhypoproteinemia (low globulin and low albumin concentrations) are often present. Decreased serum cholesterol concentrations and lymphopenia are also seen. Fecal concentrations of alpha₁-protease can be helpful in documenting PLE.

67. How is a PLE treated?

In those cases where an underlying cause is found, this should be treated. Often if the cause of a PLE is inflammatory bowel disease, the response to glucocorticoids and other immunosuppressive medications is good. If lymphangiectasia is present, treatment centers on dietary intervention. A highly digestible, low-fat, high-calorie diet is optimal. Reducing fat content decreases lymph flow. At one time supplementation with medium-chain triglycerides (MCTs) was recommended because it was thought that MCTs bypassed the lymphatics. Some recent work suggests that this is not the case. In addition, MCT oil generally is poorly palatable.

NEOPLASIA

68. What are common tumors of the canine GI tract?

Unlike cats, lymphoma limited to the GI tract is a relatively rare finding. The most common tumor in dogs is adenocarcinoma. These can occur in the stomach, small intestine, and large intestine. Smooth-muscle tumors (leiomyosarcomas and leiomyomas) are the next most common tumors; they usually are located in the intestine.

69. What is the prognosis for intestinal tumors?

The prognosis for adenocarcinomas is generally poor because surgical resection is rarely curative. On average, survival time is 6 months, though some dogs live longer. With smooth muscle cell tumors, the prognosis is better. Leiomyosarcomas are slow growing, so even if the tumor metastasizes, the survival time may be close to 2 years.

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