

# Small Intestinal Dysbiosis

## (Alteration in Small Intestinal Microorganism Populations)

### Basics

#### OVERVIEW

- “Dysbiosis” is an alteration in the normal make-up of the small intestinal microorganism populations; “microorganisms” are microscopic living things, such as bacteria or protozoa
- “Entero-” refers to the intestines
- “Small intestinal dysbiosis” (SID) is a clinical syndrome caused by an alteration of the small intestinal microorganisms
- Previously, a variety of terms have been used to describe small intestinal dysbiosis, such as “small intestinal bacterial overgrowth” (SIBO); “antibiotic-responsive diarrhea” (ARD); and “tylosin-responsive diarrhea” (TRD)
- Currently, no consensus has been reached on the quantitative makeup of the gastrointestinal microorganisms in healthy dogs or cats
- Small intestinal dysbiosis differs from infection of the intestinal tract by known disease-causing bacteria (such as *Salmonella*, *Campylobacter jejuni*, enterotoxigenic *Clostridium perfringens*, enterotoxic *E. coli*, or others)



#### GENETICS

- No genetic basis for small intestinal dysbiosis has been established; however, recent studies suggest that histiocytic ulcerative colitis should be considered a type of dysbiosis of the large intestine; histiocytic ulcerative colitis has been diagnosed most commonly in the boxer, suggesting that genetic factors are likely; “histiocytic ulcerative colitis” is inflammation characterized by a thickened lining of the colon with varying degrees of loss of the superficial lining (known as “ulceration”); the thickening is due to infiltration of various cells (histiocytes, plasma cells, and lymphocytes) in the layers under the lining
- Some breeds (such as the German shepherd dog, Chinese shar-pei, and beagle) appear to be at an increased risk of developing SID, compared to other breeds

#### SIGNALMENT/DESCRIPTION OF PET

##### Species

- Dogs
- Cats—unknown; little is known about the normal microorganisms of the small intestines in cats and the effects of alterations in the microorganism population are poorly understood; however, certain cats with long-term (chronic) diarrhea respond to antibiotic treatment, suggesting that small intestinal dysbiosis may occur in cats

### **Breed Predispositions**

- Subjectively, German shepherd dogs, Chinese shar-peis, and beagles appear to have an increased incidence of small intestinal dysbiosis compared to other breeds

### **Mean Age and Range**

- Unknown
- Can be diagnosed in dogs of any age (age range, less than 1 year of age to greater than 8 years of age)

## **SIGNS/OBSERVED CHANGES IN THE PET**

- Signs of small intestinal disease
- Long-term (chronic) loose stools or diarrhea—common
- Weight loss, despite a reasonable appetite—common
- Rumbling or gurgling sounds caused by movement of gas in the intestinal tract (known as “borborygmus”) and excessive gas formation in the stomach or intestines (known as “flatulence”)—common
- Vomiting—occasional/variable
- Poor body condition
- Clinical signs of the underlying disease process may be seen in pets with secondary small intestinal dysbiosis
- Clinical signs may vary in intensity (they may increase and decrease over time [known as a “waxing and waning” course]) or be continuous
- Generalized (systemic) signs of infection (such as fever and depression) usually do not occur

## **CAUSES**

- Unknown cause (so-called “idiopathic disease”) or primary small intestinal dysbiosis—primary SID probably is uncommon
- “Secondary small intestinal dysbiosis,” in which the alteration in small intestinal microorganisms occurs due to an underlying intestinal problem—more common; examples of underlying intestinal problems included the following:
  - Abnormal small intestinal anatomy—may be an inherited abnormality or an acquired (condition that develops sometime later in life/after birth) abnormality; examples of abnormal small intestinal anatomy include partial blockages or obstructions of the small intestines; cancer; foreign body; folding of one segment of the intestine into another segment (known as “intussusception”); abnormal narrowing of the small intestine (known as a “stricture”); presence of scar tissue that binds areas of the small intestines together (known as “adhesions”) and presence of a pouch or sac-like opening from the intestines (known as a “diverticulum”)
  - Altered intestinal motility (such as occurs with inadequate levels of thyroid hormone [known as “hypothyroidism”] and with disorders of the autonomic nervous system [known as “autonomic neuropathies”]); the “autonomic nervous system” is involved in the control of muscles in the heart, blood vessels, gastrointestinal tract, and other organs
  - Exocrine pancreatic insufficiency (EPI; a syndrome caused by inadequate production and secretion of digestive enzymes by the pancreas)—approximately 70% of dogs with EPI have co-existent SID
  - Abnormally low levels of hydrochloric acid in the stomach (known as “hypochlorhydria”) or lack of hydrochloric acid in the stomach (known as “achlorhydria”)—may occur spontaneously or may be related to medical treatment (such as treatment using H<sub>2</sub>-blockers to decrease stomach acid)
  - Altered immune system—inability to develop a normal immune response (known as “immunodeficiency”)
  - Preexisting intestinal disease

## **RISK FACTORS**

- Intestinal diseases (such as inflammatory bowel disease [IBD], adverse food reactions, parasite infestation) that affect local intestinal defense mechanisms

## **Treatment**

## HEALTH CARE

- Outpatient medical management using antibiotics, prebiotics, probiotics, or a combination, as recommended by your pet's veterinarian
- Improvement may take a few days to several weeks
- Supportive care for emaciated pets or pets with low levels of albumin, a type of protein, in their blood (condition known as “hypoalbuminemia”)

## ACTIVITY

- Unrestricted

## DIET

- Highly digestible diet
- A diet containing fructo-oligosaccharides has been shown to be beneficial in dogs with small intestinal dysbiosis

## SURGERY

- Only indicated for some underlying causes of small intestinal dysbiosis, such as partial blockages or obstructions of the intestines, tumors, or the presence of a pouch or sac-like opening from the intestines (diverticulum)

## Medications

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive

- Broad-spectrum antibiotics administered by mouth; antibiotics effective against both bacteria that can live and grow in the presence of oxygen (known as “aerobic bacteria”) and bacteria that can live and grow in the absence of oxygen (known as “anaerobic bacteria”) are preferred
- Tylosin—primary antibiotic choice; usually a powder administered in the food; can be used long-term; for small dogs and cats, the drug should be reformulated into capsules; for larger dogs the dose can be approximated by using a teaspoon and administering the drug in food, as directed by your pet's veterinarian
- Oxytetracycline—antibiotic with limited availability in the United States and Europe; do not administer with food (calcium in the diet binds with oxytetracycline and makes it ineffective)
- Metronidazole—antibiotic and antiprotozoal drug used commonly in small animal practice to treat small intestinal dysbiosis because of its activity against anaerobic bacteria; also may have effects to modify the immune response (known as “immunomodulatory effects”)
- Dogs with small intestinal dysbiosis may be cobalamin (vitamin B12) deficient; therefore, supplementation of vitamin B12 by injection is indicated; blood tests to evaluate serum cobalamin concentrations should be performed a month after the last dose of vitamin B12
- Dogs with co-existent exocrine pancreatic insufficiency (a syndrome caused by inadequate production and secretion of digestive enzymes by the pancreas) and SID—treatment for SID is indicated only if pancreatic enzyme replacement therapy (for EPI) alone does not resolve the diarrhea and/or lead to weight gain

## Follow-Up Care

### PATIENT MONITORING

- Body weight
- In pets with low levels of albumin (a type of protein) in their blood (condition is hypoalbuminemia), bloodwork to evaluate serum albumin concentration
- Diarrhea also should resolve
- If diarrhea persists despite improved body weight and/or increased serum albumin concentration, diagnostic investigation for other intestinal disease is indicated

### EXPECTED COURSE AND PROGNOSIS

- Primary small intestinal dysbiosis without complicating factors (such as inflammatory bowel disease, intestinal cancer [lymphoma])—prognosis with appropriate therapy is usually good
- Prognosis for secondary SID depends on underlying disease

## Key Points

- Some pets show clinical improvement within days
- Some pets require weeks of therapy before demonstrating improvement—treat for 2–3 weeks before concluding that therapy is ineffective
- Any co-existent or predisposing diseases (such as partial blockage or obstruction of the intestines, intestinal cancer, exocrine pancreatic insufficiency, inflammatory bowel disease, or dietary intolerance/allergy) also must be treated
- Continual or repeated treatment often is required

## Notes

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