Management of Clostridial Enterotoxicosis in Three Dogs

By Robert Gaston, D.V.M., C.V.S.M.T.

*Clostridium perfringens*, an enteric, anaerobic, gram-positive rod bacterium, is a normal part of the intestinal flora of dogs when present in a vegetative form. It is a bacterium that can undergo sporulation. An enterotoxin in the bacterial spore coat produced during sporulation causes fluid accumulation in the intestines and damage to the intestinal lining. This leads to leakage of fluid, ions, and proteins, inhibition of glucose transport, sloughing of epithelial cells, and weakened peristalsis. Clinical signs are typical of large bowel diarrhea, including excess mucus, occasional fresh blood, scant stools, tenesmus, and increased frequency and urgency of bowel movements. These signs can be acute or chronic, with waxing and waning episodes and intermittent bouts of diarrhea for weeks to years. Depression, anorexia, and vomiting may also occur. Vomiting may be the only clinical sign in some cases.

The stimulus for sporulation and enterotoxin production is not precisely known. Alkaline pH in the intestine favors sporulation and it appears that specific strains of bacteria may be more likely to undergo sporulation. The key point is that the enteric environment factors determine the cycle of proliferation and sporulation of the organism. Dietary changes, alterations of bacterial flora, intestinal epithelial injury, and stress all may play roles in *C. perfringens* enterotoxicosis. A current theory is that *C. perfringens* overgrowth may be a marker for small intestinal bacterial overgrowth in general (Twedt, 2002).

A specific diagnosis can be obtained by performing a reverse passive agglutination assay that is highly sensitive and specific for the *C. perfringens* enterotoxin. However, clinical signs typically correlate with enterotoxin and high spore counts in the feces. Thus, a “Diff-Quick” or similarly stained (generic three-part stain obtainable from several sources) fecal smear offers a rapid and simple screening for clostridial enterotoxicosis. The spores are unique and easily identified by their large size and “safety pin” or “tennis racket” appearance. It is important to correlate fecal smear findings with clinical signs since nonenterotoxigenic *C. perfringens* strains are known to exist.

Treatment usually involves antibiotics (typically amoxicillin, metronidazole, or tylosin) and sometimes additional dietary fiber, which is fermented in the intestine to short chain fatty acids (acetate, propionate,
and butyrate) that reduce intestinal fluid pH, protect the colonic epithelium, or alter microbial flora resulting in inhibition of clostridial growth and sporulation.

**Case Study #1**

**Snuggles:** five-year-old, spayed, female, cocker spaniel.

Snuggles presented initially with flatulence, intermittent diarrhea, and occasional vomiting of bilious fluid on an empty stomach, for a duration of approximately one year, and blood in her stool for two weeks. Clinical signs were worsening progressively.

Fecal flotation using ZnSO₄ was negative. Fecal cytology showed rare clostridial spores and moderate amounts of bacteria in the form of large rods with visibly pale staining at one end identified as transitional forms of *C. perfringens* in the process of sporulation.

The clinical signs along with the fecal cytology results provided evidence for a diagnosis of possible enterotoxiscosis from sporulating *C. perfringens*. Initial treatment consisted of metronidazole 250 mg SID for seven days and C-Biotic (Wysong Corp., Midland, MI) 1 tsp. with each feeding for long-term use. C-Biotic contains a variety of whole-food nutrients in addition to *Lactobacillus* spp. and digestive enzymes derived from *Aspergillus* spp. A dietary change from Fit n’ Trim food to Wysong Anergen was recommended for possible adverse food reactions or allergies. However, the owners declined to make the recommended dietary change. Diarrhea resolved within 24 hours of the initiation of therapy.

Similar clinical signs recurred two months later and responded well to the previous dose of metronidazole. Two weeks later, clinical signs recurred and were more severe. Fecal cytology during this episode showed numerous clostridial spores. Immediate relief was achieved with metronidazole again. The recommended dietary change was made by the owners to Wysong Anergen (lamb and rice; no wheat or corn gluten). Wysong Pet Inoculant, a probiotic containing 200 million colony-forming units of four bacterial species (*Lactobacillus lactis*, *L. acidophilus*, *Bifidobacterium bifidum*, and *Streptococcus faecium*) per milliliter was also included in an attempt to restore beneficial intestinal bacterial flora. Dosage was based on product labeling instructions.

Four weeks later, diarrhea recurred. Fecal flotation was negative and fecal cytology showed no spores, but nearly all bacteria present were large rods. A trial course of Panacur (Fenbendazole; Distributed by Intervet, Millsboro, DE) to rule out whipworm infestation was prescribed at a standard dosage of 50 mg/kg SID for three days and cephalxin 250 mg BID (twice daily) for 10 days was prescribed for concurrent *Staphylococcus* pyoderma. Diet continued to consist of Anergen, Pet Inoculant, and C-Biotic. Diarrhea improved, but flatulence and borborygmus continued, with vomiting occurring 3-4 times per week.

As a result of the continued gastrointestinal dysfunction, small intestinal bacterial overgrowth, gut function, liver function, and adverse food reactions were discussed in detail with the owner. In order to obtain a more complete diagnostic work-up, a CBC and chemistry profile were obtained and all values were within reference ranges. Stool was collected and sent to Great Smokies Diagnostic Laboratory (GSDL, Asheville, NC) for a Comprehensive Digestive Stool Analysis (CDSA) (**Note: This test was available for dogs for a brief period of time, but has since been discontinued by GSDL.**). The results of the CDSA showed an increase in short chain fatty acid distribution, suggesting an imbalance in bowel ecology and a reduced stool pH that was possibly due to greater amounts of SCFA produced by bacterial flora, malabsorption of SCFA, pancreatic insufficiency, or a combination of these.

In order to balance the intestinal ecology and improve digestion, one capsule each of Lact-Enz® and Zypan® (Standard Process, Palmrya, WI) were administered with each meal and one capsule of IPS (Biotics Research Corporation, Rosenberg, Texas) was administered one hour prior to each meal. Supplementation of IPS was recommended for 12 weeks, while Lact-Enz® and Zypan® were recommended for 4-6 months. IPS was used to improve intestinal function globally because it contains L-glutamine, *Tillandsia*, lamb intestinal concentrate, glucosamine sulfate, gamma oryzanol, Jerusalem artichoke, L-glutathione, and cellulase. Glutamine is essential for enterocyte metabolism and maintenance of normal intestinal permeability.

Lact-Enz® contains the digestive enzymes amylase, protease, cellulase, and lipase, along with *Lactobacillus acidophilus* and *Bifidobacterium longum*. It is used as a digestive aid and contributes to normalization of intestinal flora. Zypan® contains betaine hydrochloride, pancreatin, and pepsin to aid digestion and promote absorption of proteins. Zypan® was utilized for suspected poor protein digestion leading to recurrent
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Research

vomiting and increased intestinal gas. Pet Inoculant and C-Biotic were discontinued due to their apparent ineffectiveness in this situation.

After one month on this regimen, Snuggles was doing well with much less gas, no diarrhea for four weeks, and a decreasing frequency of vomiting. Lact-Enz® was administered for approximately three more weeks. IPS and Zypan® were administered for approximately six additional weeks. Two-months later, with no refills on supplements necessary, Snuggles continued to do well with no diarrhea, rare vomiting, and no flatulence.

For the next 16 months, there were occasional transient bouts of loose stool. Eighteen months after the last purchase of Lact-Enz®, Zypan®, and IPS, there was a recurrence of bloody mucoid stool with tenesmus and pain. Each supplement was dispensed again:

- Lact-Enz®: one capsule per meal
- Zypan®: one tablet per meal
- IPS: one capsule per meal

Eighteen months following the last episode, there are only occasional episodes of loose stools with mucus and blood. These episodes are rapidly self-correcting, lasting only one day or less. The diet consists of Anergen mixed with Fit-n-Trim with no other supplements. The supplements have produced a long-term beneficial effect in this patient. However, because of the intermittent use of supplements and a failure of the owners to follow dietary recommendations, the beneficial results are not as good as I believe was possible in this case. This illustrates the importance of patient/owner compliance in treating health challenges.

**Case Study #2**

**Cody:** Seven-year-old, neutered, male cocker spaniel

Cody has had a long history of recurrent otitis externa since approximately one year of age. When I first examined Cody, the possible role of adverse food reactions and gut dysfunction in the recurrent otitis and chronic pruritus was discussed with the owner. The patient was also regularly troubled with constipation. The diet was changed from dry lamb and rice to Wysong Maintenance formula with the addition of C-Biotic. One tablespoon of Aloe Vera juice was added to Cody’s water daily and one capsule of Cascara sagrada was administered daily. The frequency and severity of otitis episodes decreased and became manageable.

Despite the improvement in the constipation and diminished severity of the otitis externa, there was apparently on-going intestinal dysfunction or adverse food reaction because of the continued mild otitis externa. This intestinal dysbiosis or inflammation is suspected to have contributed to the subsequent development of clostridial enterotoxicosis.

Eighteen months later, Cody presented with vomiting, diarrhea, and dehydration. Intravenous fluids were administered to correct dehydration. Fecal cytology was inconclusive regarding C. perfringes, however, there was a significant proportion of large rod bacteria. The combination of fecal cytology results and clinical signs leads to a tentative diagnosis of clostridial enterotoxicosis. Amoxicillin was prescribed to treat the suspected clostridial enterotoxicosis. Additional supplementation was initiated as follows:

- Zymex®: one capsule BID
- Lact-Enz®: one capsule BID
- Cyro-Yeast®: two wafers BID

Cody improved rapidly and after two weeks, the administration of Lact-Enz®, Zymex®, and Cyro-Yeast® was decreased to one of each daily for several weeks. During the past 18 months, there have been several episodes of loose stool and Cody has responded immediately to repeating supplementation with Lact-Enz®, Zymex®, and Cyro-Yeast®. Rather than continuing daily administration, Cody’s owner administers supplements intermittently as needed. The owner is very satisfied with this approach. Cody has not needed Cascara sagrada for constipation since starting on the Standard Process supplements.

**Case #3**

**Gomez:** Seven-year-old, neutered, male Dachshund

Gomez presented with acute onset bloody diarrhea and vomiting for 48 hours. The dog had been receiving antibiotics for a tooth root abscess for one week and had undergone a change in diet two weeks prior to the onset of diarrhea and vomiting.

Fecal flotation was negative. Fecal cytology showed only a few spores and the bacteria present on the slide were nearly 100% large rods. Clostridial enterotoxicosis was suspected based on clinical signs and fecal cytology results. Metronidazole 250 mg BID for 5 days was prescribed and yielded immediate improvement.
Diarrhea and vomiting occurred again five months later but were much more severe. Gomez was 5% dehydrated at presentation. Treatment consisted of subcutaneous lactated Ringers solution, penicillin 300,000 units, and dexamethasone 1 mg BID and oral metronidazole 250 mg BID for 5 days. At the time of this episode, Gomez was eating Wysong Anergen with added Prozyme (Prozyme Products Ltd., Lincolnwood, IL) and Missing Link (Designing Health, Valencia, CA).

Response to medical treatment was excellent. A week later, Gomez started on one Zymex® capsule BID and one Lact-Enz® capsule per meal. There has been no further recurrence of diarrhea or vomiting in this dog for 8 months, despite reducing the Zymex® and Lact-Enz® to one daily of each. Gomez continues to eat Wysong Anergen, with added Prozyme and Missing Link.

Final Thoughts

These cases help to demonstrate the effectiveness of specific whole food supplements to alter the intestinal environment and encourage balanced flora that can resist enterotoxicosis. Antibiotics will provide immediate relief from the acute signs of toxicity as a result of their activity against anaerobic bacteria, but they do not address the underlying cause of the imbalance and toxicity. In addition, antibiotics themselves may have a negative impact on intestinal flora.

There are many possible contributing factors in clostridial enterotoxicosis. However, adverse food reactions or allergies were suspected contributors in each of these cases. Food allergy may develop as a result of increased intestinal permeability, poor digestion, and a relative lack of digestive enzyme function with a cooked and/or processed diet. The dietary supplements utilized provided extra digestive enzymes, as well as nutrients to normalize intestinal permeability and enterocyte function. However, to facilitate the return of normal intestinal function, dietary changes were strongly advised to reduce the inflammatory reaction in the intestinal lining associated with exposure to food allergens. As can be seen with the results in these three cases, client compliance is a large determinant of outcome.

In each case, the underlying intestinal dysbiosis and/or adverse food reactions were chronic conditions (duration of weeks to years), with the acute onset of signs associated with the clostridial overgrowth and toxin production. However, if all the precipitating and underlying factors could be completely corrected or brought back into a normal relationship then treatment would only need to be short-term to restore proper flora.

However, it is difficult to eliminate all food substances that may be offensive and reliably correct all digestive abnormalities and dysfunction immediately. Therefore, long-term supplemental support was recommended in each case to encourage normal flora and allow time for improvement in intestinal function. The owner’s compliance in providing supplements is related to their desire to avoid recurrence. For Cody’s owner, recurrence of mild signs and a quick resolution was satisfactory, therefore intermittent use of supplements was acceptable. For Gomez’ owner, recurrence of the pain and discomfort associated with the diarrhea and the mess created in the house were unacceptable. Therefore, supplements have continued daily and long-term.

Length of treatment varies with each individual, according to underlying dysfunction and according to the willingness and ability of the owners to implement recommended changes in nutrition.

References