

DTO Smectite for the Intestinal Health and Well-Being of the Horse

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A balance must be maintained between the microflora normally residing in the horse's intestinal tract that support health and pathogenic microbes that release toxins and cause clinical disease. Pathogenic organisms that are commonly of concern in horses include *Salmonella* spp., *Clostridium difficile*, and *Clostridium perfringens*, all of which have been associated with enteric disorders in adult horses.¹⁻⁷

Pathogenic Bacteria

Diarrhea in adult horses is a significant source of morbidity and mortality. The results of a retrospective study conducted in the 1990's indicated that more than 25% of horses admitted to a teaching hospital with acute diarrhea did not survive.⁸ Of these horses, those with a history of antimicrobial drug treatment, a contributing factor to pathogenic bacterial overgrowth, had the lowest rate of survival.⁸ *Salmonella* spp. are non-spore-forming facultative anaerobes that constitute some of the most-frequently cultured pathogenic bacteria in adult horses with diarrhea.⁹ *Salmonella* infection risk significantly increases for horses that have undergone abdominal surgery^{10,11} and is becoming increasingly problematic in the hospital setting. For example, *Salmonella* has been identified as the most common agent implicated in nosocomial infectious outbreaks in veterinary hospitals.¹² Fatality rates may be as high as 44%.¹³ *Clostridium difficile* is an anaerobic, spore-forming bacteria that also plays a prominent role in equine enteric diseases.¹⁴ The primary mode of virulence for *C difficile* is through its ability to produce two major toxins, both of which attack predominantly the cecum and colon of the adult horse and irreversibly alter cell-signaling pathways and disrupt normal physiological function.^{14,15} The resistance of *C difficile* spores to many environmental factors,

including cleaning agents, further adds to the potency of this pathogen. Risk factors for *C difficile*-associated diseases (CDAD) include recent hospitalization, antibiotic therapy, and changes in diet including post-surgical feed with-holding.¹⁴ *Clostridium perfringens* is another anaerobic, spore-forming bacteria commonly associated with intestinal disease in the horse. This pathogen is identified as one of five types based on the toxin produced. The beta toxin is implicated in necrotizing enteritis and enterotoxemia in the horse.^{16,17} Both *Clostridium* species can be identified in healthy horses, although *C perfringens* is reported with much lower frequency.¹⁸

A complex and dangerous condition

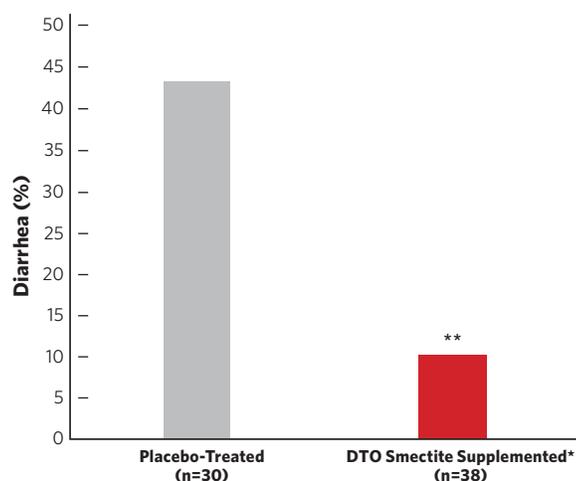
Colitis is a life threatening condition in adult horses and foals, with reported mortality rates of 22% for horses and 18% for foals.¹ Adult horses with colitis that test positive for *C difficile* may be less likely to survive than horses with colitis lacking detectable levels of *C difficile*.¹ Mortality rates in foals with infectious diarrhea may be over 50% and worse depending on the offending pathogen.¹⁹ The use of antimicrobial agents as treatment for pathogenic infections is controversial and often contraindicated. Metronidazole may be effective for certain cases, although resistant *C difficile* strains are now reported.⁶ Smectite, a naturally occurring organomineral, has shown promise as a protectant against the overgrowth

of pathogenic bacteria by reducing the harmful effects of bacterial toxins.^{20,21} *In vitro* work has shown that a commercially-available product containing di-tri-octahedral (DTO) smectite* can bind 99% of *C difficile* toxins A and B as well as *C perfringens* enterotoxin²² and effectively neutralized *C perfringens* alpha, beta, and beta-2 toxins.²³ Furthermore, DTO smectite does not interfere with metronidazole activity.²² DTO smectite's mechanism of action has been suggested being due to its ionic charge that allows it to bind to various toxins.²² Others have suggested DTO smectite may have the ability to create an environment that is not favorable to the growth of clostridial bacteria, or it directly interferes with toxin absorption by coating the intestinal wall.²⁴ Due to its ability to bind and neutralize clostridial toxins, DTO smectite may be particularly useful in horses with colitis and diarrhea caused by clostridial as well as possibly other pathogenic organisms.

Promising results in the Horse with DTO Smectite

Recent studies in adult horses indicate that commercially-available DTO smectite* may be beneficial in horses after colic surgery and in adult horses with antibiotic-induced colitis. For example, researchers at the University of California, Davis reported a significant decrease in the incidence of diarrhea after colic surgery in horses

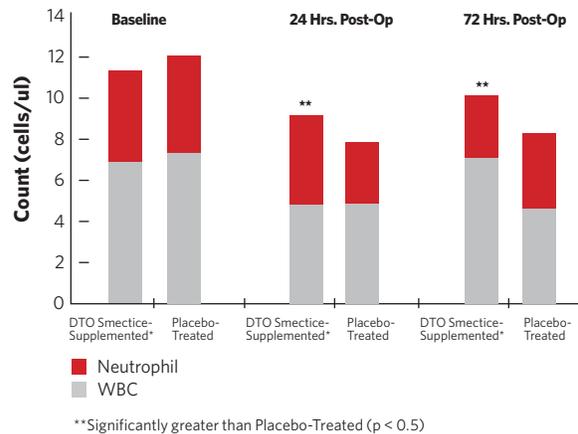
Figure 1. Occurrence Rate of Diarrhea in Horses After Colic Surgery



**Significantly lower than Placebo-Treated value (p<0.05)

*Bio-Sponge®

Figure 2. Total WBC and Neutrophil Count in Horses After Colic Surgery



**Significantly greater than Placebo-Treated (p < 0.05)

administered DTO smectite* when compared with horses receiving a placebo. Whereas only 10% of horses administered the smectite developed diarrhea, 43% of the placebo-treated horses developed diarrhea (Figure 1).²⁵ In addition, total WBC and neutrophil counts remained significantly higher 24 and 72 hours after surgery in the horses administered the smectite when compared to the placebo-treated horses (Figure 2). DTO smectite may also be beneficial in the management of horses with colitis, as the results of a recent pilot study indicated DTO smectite* helped maintain normal gastrointestinal function in horses with antibiotic induced colitis.²⁴

Conclusion

DTO smectite*, an intestinal protectant, may help create an intestinal environment that protects against the harmful effects of microbial overgrowth and toxin production. Additionally, DTO smectite* may be beneficial in horses with endotoxemia, with post-operative diarrhea, and after toxin ingestion.

Putting it into Practice

- To reduce the risk of diet-induced colitis, make all dietary changes slowly, over 10-14 days.
- Include DTO smectite* supplementation in the veterinary care of adult horses with acute colitis.
- Supplement horses affected with diarrhea with DTO smectite* to support gastrointestinal health.
- When undergoing antibiotic treatment as part of medical care, occasional diarrhea is a common side effect associated with gut microflora disturbances

caused by the antibiotic treatment. Consider DTO smectite* to promote normal gut function.

of post-operative diarrhea in equids with surgical disease of the large intestine: results of a randomized clinical trial. *Vet J* 2009;182:210-214.

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