Conclusion

Bio-Sponge™, an intestinal protectant composed of DTO smectite, may help create an intestinal environment that protects against the harmful effects of microbial overgrowth and toxin production. Additionally, Bio-Sponge™ may be beneficial in horses with endotoxemia, 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 Bio-Sponge™ supplementation in the veterinary care of adult horses with acute colitis.
- Supplement foals and adult horses affected with diarrhea with Bio-Sponge™ to support gastrointestinal health.
- After an adequate volume of high quality colostrum has been ingested, supplement with Bio-Sponge™ to support the gastrointestinal health of foals on farms with a history of endemic Rotavirus or *Clostridium difficile*.

Literature Cited

1. Baverud V, Gustafsson A, Franklin A, et al. Clostridium difficile associated with acute colitis in mature horses treated with antiobiotics. Equine Vet J 1997;29:279-284.
2. Weese J, Staempfli H, Prescott J. A prospective study of the roles of clostridium difficile and enterotoxigenic Clostridium perfringens in equine diarrhoea. Equine Vet J 2001;33:403-409.
3. Donaldson M, Palmer J. Prevalence of Clostridium perfringens entertoxin and Clostridium difficile toxin A in feces of horses with diarrhea and colic. J Am Vet Med Assoc 1999;215:358-361.
4. Arroyo L, Weese JS, Staempfli H. Experimental Clostridium difficile entercolitis in foals. J Vet Intern Med 2004;18:734-738.
5. Larson J. Acute colitis in adult horses. A review with emphasis on aetiology and pathogenesis. Vet Q 1997;19:72-80.
6. Walker R, Madigan J, Hird D, et al. An outbreak of equine neonatal salmonellosis. J Vet Diagn Invest 1991;3:223-227.
7. Jones R. Clostridial enterocolitis. Vet Clin North Am Equine Pract 2000;16:471-485.
8. Lewis L. Chapter 16. Sick Neonatal Foal Care In: Cann C, ed. Equine Clinical Nutrition: Feeding and Care. Media: Williams and Wilkins, 1995;353-388.
9. Wilson W, Madigan J. Comparison of bacteriologic culture of blood and necropsy specimens for determining the cause of foal septicemia: 47 cases (1978 - 1987). J Am Vet Med Assoc 1989;195:1759--1763.
10. Magdesian. Neonatal Foal Diarrhea. Veterinary Clinics of North America: Equine Practice 2005;21:295-312.
11. Cohen N, Woods A. Characteristics and risk factors for failure of horses with acute diarrhea to survive: 122 cases (1990-1996). J Am Vet Med Assoc 1999;214:382-390.
12. Baverud V, Gustafsson A, Franklin A, et al. Clostridium difficile: prevalence in horses and environment, and antimicrobial susceptibility. Equine Vet J 2003;35:465-471.
13. Baverud V. Clostridium difficile diarrhea: infection control in horses. Vet Clin North Am Equine Pract 2004;20:615-630.
14. Gustafsson A, Baverud V, Gunnarsson A, et al. Study of faecal shedding of Clostridium difficile in horses treated with penicillin. Equine Vet J 2004;36:180-182.
15. Spier S. Salmonellosis. Vet Clin North Am Equine Pract 1993;9:385-397.
16. Puotunen-Reinert A, Huskamp B. Acute postoperative diarrhoea in colic horses. J S Afr Vet Assoc 1986;57:5-11.
17. Raisis A, Hodgson J, Hodgson D. Equine neonatal septicaemia: 24 cases. Aust Vet J 1996;73:137-140.
18. Cohen N. Causes of and farm management factors associated with disease and death in foals. J Am Vet Med Assoc 1994;204:1644-1651.
19. Haas S, Bristol F, Card C. Risk factors associated with the incidence of foal mortality in an extensively managed mare herd. Can Vet J 1996;37:91-95.
20. Schott H, Ewart S, Walker R, et al. An outbreak of salmonellosis among horses at a veterinary teaching hospital. J Am Vet Med Assoc 2001;218:1152-1159.
21. Ward MP, Brady TH, Couetil LL, et al. Investigation and control of an outbreak of salmonellosis caused by multidrug-resistant Salmonella typhimurium in a population of hospitalized horses. Veterinary Microbiology 2005;107:233-240.
22. Tillotson K, Savage C, Salman M, et al. Outbreak of Salmonella infantis infection in a large animal veterinary teaching hospital. J Am Vet Med Assoc 1997;211:1554-1557.
23. Madwell B, Tang Y, Jang S, et al. Apparent outbreaks of Clostridium difficile-associated diarrhea in horses in a veterinary medical teaching hospital. J Vet Diagn Invest 1995;7:343-346.
24. Weese J, Toxopeus L, Arroyo L. Clostridium difficile associated diarrhoea in horses within the community: preditors, clinical presentation and outcome. Equine Vet J 2006;38:185-188.
25. Palmer J. Gastrointestinal diseases of foals. Vet Clin North Am Equine Pract 1985;1:151-168.
26. Feary, Hassel. Enteritis and Colitis in Horses. Veterinary Clinics of North America: Equine Practice 2006;22:437-479.
27. East LM, Savage CJ, Traub-Dargatz JL, et al. Entercolitis associated with Clostridium perfringens infection in neonatal foals: 54 cases (1988-1997). J Am Vet Med Assoc 1998;212:1751-1756.
28. Rateau J, Morgant G, Droy-Priot M, et al. A histological, enzymatic and water-electrolyte study of the action of smectite, a mucoprotective clay, on experimental infectious diarrhoea in the rabbit. Curr Med Res Opin 1982;8:233-241.
29. Martirosian G, Rouyan G, Zalewski T, et al. Dioctahedral smectite neutralization activity of Clostridium difficile and Bacteriodes fragilis toxins in vitro. Acta Microbiol Pol 1998;47:177-183.
30. Weese J, Cote N, deGannes R. Evaluation of in vitro properties of di-tri-octahedral smectite on clostridial toxins and growth. Equine Vet J 2003;35:638-641.
31. Lawler J, Hassel D, Traub-Dargatz J, et al. Evaluation of di-tri-octahedral smectite neutralization of alpha, beta and beta-2 toxins of Clostridium perfringens [Research Abstract]. 24th Annual American College of Veterinary Internal Medicine 2006.
32. Neelley K, Herthel D. Preventing and Treating Colitis with DTO Smectite. J Equine Vet Sci 2000;20:432.
33. Hassel D, Smith P, Nieto J, et al. Di-tri-octahedral smectite for the prevention of post-operative diarrhea in equine colic patients: results of a randomized clinical trial [Research Abstract]. The Fourteenth Annual American College of Veterinary Surgeons Symposium 2004.

Bio-Sponge™ for the Intestinal Health and Well-Being of the Horse

Tara Hembrooke, Ph.D., M.S., and Sina Wallace, Ph.D., University of California, Davis

A balance must be maintained between the microflora that normally reside in the horse's intestinal tract and pathogenic microbes that release toxins and cause clinical disease. The pathogenic organisms that are of concern in horses include *Salmonella* spp., *Clostridium difficile*, and *Clostridium perfringens*, which have been associated with diarrhea and colitis in adult horses and diarrhea and septicemia in foals.[1-9]

Pathogenic Bacteria

Diarrhea in adult horses and foals is a significant source of morbidity and mortality.[10] The results of a retrospective study conducted in the late 1990's indicated that more than 25% of horses admitted to a teaching hospital with acute diarrhea did not survive.[11] Of these horses, those treated with antimicrobial drugs, a contributing factor to bacterial overgrowth,[1,12-14] had the highest risk of not surviving.[11] Currently, *Salmonella* spp. are the most frequently cultured pathogenic bacteria in adult horses with diarrhea.[15] *Salmonella* organisms also have been implicated in post-surgical diarrhea[16] and neonatal septicemia,[17] which is significant because septicemia remains one of the leading causes of illness and death in young foals.[18,19] In addition, *Salmonella* spp. are increasingly problematic in the hospital setting[20-22] with fatality rates as high as 38%.[21] *Clostridium difficile* has also been isolated from and associated with diarrhea in adult horses.[13,23,24] Foal heat diarrhea, which develops in foals 9 to 14 days old, is considered to be a manifestation of normal changes in the microbial ecology of the intestinal tract. However, neonatal diarrhea develops at an earlier age and is often due to gram-negative bacteria, including Salmonella, and gram positive *Clostridium* species.[6,8,10,25]

PLATINUM PERFORMANCE®

Where good nutrition meets good medicine™

1-866-553-2400 www.platinumvet.com

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.[26] The results of one study indicated that adult horses with colitis that test positive for *Clostridium difficile* are less likely to survive than horses with colitis lacking detectable levels of *Clostridium difficile*.[2] Additionally, one university teaching hospital reported a mortality rate of 54% for foals with *Clostridium perfringens*-associated colitis over a 10-year period.[27] During one particular year, the mortality rate of foals with *Clostridium perfringens* type C was 83%.[27]

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.[28,29] Bio-Sponge™, the commercially available Di-Tri-Octahedral smectite product from Platinum Performance Inc., bound 99% of *Clostridium difficile* toxins A and B and *Clostridium perfringens* enterotoxins in one *in vitro* study[30] and effectively neutralized Clostridium perfringens alpha, beta, and beta-2 toxins in another study.[31] Bio-Sponge™ is suggested to work because it has an ionic charge that allows it to bind to various toxins,[30] creates an environment that is not favorable to the growth of clostridial bacteria,[32] or directly prevents the absorption of toxins by coating the intestinal wall.[32] Due to its ability to bind and neutralize clostridial toxins, Bio-Sponge™ may be particularly useful in horses with colitis and diarrhea caused by clostridial organisms.

Promising results using Bio-Sponge™

Recent studies in adult horses indicate that Bio-Sponge™ 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 administered Bio-Sponge™ when compared with horses receiving a placebo (Figure 1). Whereas only 10% of horses administered Bio-Sponge™ developed diarrhea, 43% of the placebo-treated horses developed diarrhea.[33] In addition, total WBC and neutrophil counts remained significantly higher 24 and 72 hours after surgery in the horses administered Bio-Sponge™ when compared to the placebo-treated horses (Figure 2). Bio-Sponge™ may also be beneficial in the management of horses with colitis, as the results of a recent pilot study indicated that Bio-Sponge™ helped maintain normal gastrointestinal function in horses with antibiotic-induced colitis.[32]

Figure 1. **Occurence Rate of Diarrhea In Horses After Colic Surgery**

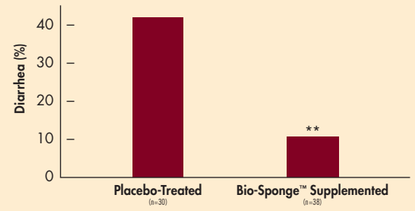

Figure 2. **Total WBC and Neutrophil Count In Horses After Colic Surgery**