

Improve Digestive Health and Get the Most From Your Feeding Program

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Feeds and supplements given to horses can affect their ability to digest and utilize the energy and nutrients in their diet either positively or negatively. Therefore, it is important to get the most out of your feed choices by feeding to optimize efficiency.

Feeding Too Much Concentrate

Feeding cereal grains and high-starch concentrates can overload the ability of a horse's small intestine to digest and absorb carbohydrates. As a result, the excess starch reaches the hindgut where microbial digestion and the release of volatile fatty acids and lactate occur. This results in acidosis, which can disrupt the normal microflora, damage the lining of the intestines, impair the horse's ability to digest the feed and lead to colic or other intestinal disturbances.¹⁻⁵ Furthermore, disruption of enteric bacteria can increase endotoxin release,^{1,6,7} which may be life-threatening. Grains and sweet feeds also contain high levels of omega-6 fatty acids, which increase the production of inflammatory mediators that aggravate chronic disorders and decrease the intestine's ability to absorb nutrients.^{8,9}

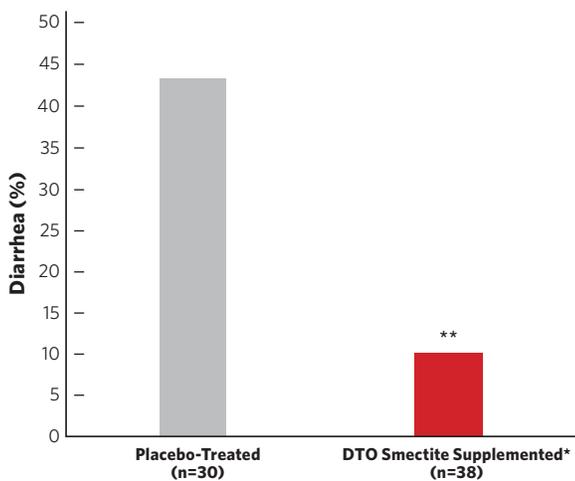
Nutrients That Can Increase Feed Efficiency

Certain nutrients can increase feed efficiency in horses. For example, the addition of healthy fats, such as omega-3 fatty acids, to the diet decreases inflammation in the intestine,^{10,11} which improves its ability to absorb nutrients.⁹ Micronutrient supplementation also can improve feed efficiency. Prebiotics are commonly used to improve digestive health. Mucilage, a soluble fiber, can act as a prebiotic to facilitate the growth and activity of beneficial bacteria in the gut.^{12,13} Mucilage is also an important peristaltic agent and has been used to

treat or prevent sand colic.¹⁴ Vitamins and minerals can also improve the uptake and utilization of various macro- and micronutrients. For example, improvements in growth and feed efficiency have been reported in animals supplemented with various minerals, such as chromium and zinc.¹⁵⁻¹⁷ Antioxidants, such as vitamin E, ascorbic acid, selenium, and L-carnitine, can improve feed efficiency and growth parameters, particularly when animals are under stress.¹⁸⁻²⁰ An intestinal protectant comprised of di-tri-octahedral (DTO) smectite* adsorbs toxins in the gut before they cause harm to the horse or diminish intestinal function. Both *in vitro* and *in vivo* trials with DTO smectite have yielded positive results. In one study, researchers at the University of California, Davis reported a significant decrease in the incidence of diarrhea in DTO smectite-supplemented horses after colic surgery when compared with horses receiving a placebo (Figure 1).²¹ DTO smectite supplementation may also be beneficial in horses with colitis, as evidenced by the maintenance of normal gastrointestinal function in horses with antibiotic-induced colitis supplemented with DTO smectite.²² Various *in vitro* studies have demonstrated that this DTO smectite product effectively adsorbs *Clostridium perfringens* and *difficile* toxins^{23,24} and is significantly more effective at certain physiological concentrations than bismuth subsalicylate (Figure 2),²³ another product commonly used to treat diarrhea.

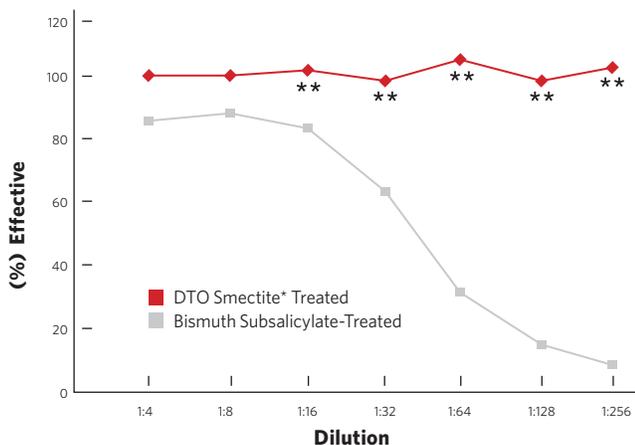
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Figure 1. **Occurrence Rate of Diarrhea in Horses After Colic Surgery**



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

Figure 2. **C Perfringens Beta Toxin Adsorption**



**DTO Smectite significantly more effective than Bismuth Subsalicylate (p<0.05)

Adapted from Lawler et al (2008)¹⁶

The following are tips for ensuring that feed dollars are going as far as possible, while improving the health and performance of horses and preventing costly illnesses, injuries and loss of use.

1. Refine the Horse's Ration

The old adage, "an ounce of prevention is worth a pound of cure" is especially true when a feeding program is being developed. Horses rely on a high-quality, balanced diet to remain healthy and perform at a peak level. Therefore, you need to ensure that your horses are eating a balanced diet, consisting of hay or pasture grasses, and a comprehensive

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supplement. Because hay comprises the largest part of a feed budget, it seems like a great place to reduce costs. However, poor quality hay with a low digestibility may not provide adequate nutrition. As a result, you may find that more hay needs to be fed to enable your horses to get enough calories, protein, and other essential nutrients. Horses also may refuse to eat low-quality hay, which results in hay wastage. Discarding uneaten hay may be even more costly than purchasing good quality hay. If a horse has had problems with colic, it is even more important to ensure that a high-quality forage is available.

2. Eliminate Unnecessary Feeds

Do horses really need all of those extra commercial feeds? Many owners like to add grain or sweet feeds to their horse's ration to provide calories and give their horses a treat. Unfortunately, adding unnecessary feeds to the ration can cause unwanted weight gain and lead to chronic health problems. If a horse requires extra calories, adding fat to the ration instead of grain can improve the total energy digestibility of the ration.²⁵ A flax oil product provides a healthy source of fat that is high in omega-3 fatty acids and antioxidants and is an excellent way to safely increase calories in a horse's diet.

3. Optimize Your Supplement Program

Make sure that your horse's supplement program is designed with a comprehensive nutritional foundation that addresses common nutrient deficiencies and provides anti-inflammatory and antioxidant support. Additional therapeutic and sports nutrition supplements should then be added based on a horse's individual health or performance needs. Many traditional supplement programs are comprised of individual supplements from various manufacturers that are not formulated to be fed together. These programs often miss important areas of equine health that can be improved with proper supplementation.

Putting it into Practice

- For optimal health and cost-effectiveness, feed a high-quality hay or pasture diet.
- To correct fatty acid imbalances, avoid feeds with a high ratio of omega-6 to omega-3 fatty acids.
- To avoid overloading the hindgut with carbohydrates, don't feed large amounts of grain and other sweet feeds.
- To maximize nutrient utilization from feeds, supplement with omega-3 fatty acids, antioxidants, vitamins, minerals and other intestinal protectants.
- During times of intestinal inflammation and/or diarrhea, supplement your horse with therapeutic levels of an intestinal protectant.

Literature Cited

1. Pollitt CC, Visser MB. Carbohydrate Alimentary Overload Laminitis. *Veterinary Clinics of North America: Equine Practice* 2010;26:65-78.
2. Daly K, Proudman C, Duncan S, et al. Alterations in microbiota and fermentation products in equine large intestine in response to dietary variation and intestinal disease. *Br J Nutr* 2012;107:989-995.
3. Hussein H, Vogedes L, Fernandez G, et al. Effects of cereal grain supplementation on apparent digestibility of nutrients and concentrations of fermentation end-products in the feces and serum of horses consuming alfalfa cubes. *J Anim Sci* 2004;82:1986-1996.
4. Reeves M, Salman M, Smith G. Risk factors for equine acute abdominal disease (colic): Results from a multi-centered case-controlled study. *Prev Med* 1996;26:285-301.
5. Milinovich GJ, Trott DJ, Burrell PC, et al. Changes in equine hindgut bacterial populations during oligofructose-induced laminitis. *Environmental Microbiology* 2006;8:885-898.
6. Onishi JC, Park J-W, Prado J, et al. Intestinal bacterial overgrowth includes potential pathogens in the carbohydrate overload models of equine acute laminitis. *Veterinary Microbiology* 2012;159:354-363.
7. Bailey SR, Adair HS, Reinemeyer CR, et al. Plasma concentrations of endotoxin and platelet activation in the developmental stage of oligofructose-induced laminitis. *Veterinary Immunology and Immunopathology* 2009;129:167-173.
8. Sánchez de Medina F, Romero-Calvo I, Mascaraque C, et al. Intestinal Inflammation and Mucosal Barrier Function. *Inflamm Bowel Dis* 2014;[Epub ahead of print].
9. Tappenden K. Inflammation and intestinal function: where does it start and what does it mean? *J Parenter Enteral Nutr* 2008;32:648-650.
10. Matsunaga H, Hokari R, Kurihara C, et al. Omega-3 polyunsaturated fatty acids ameliorate the severity of ileitis in the senescence accelerated mice (SAM)P1/Yit mice model. *Clinical & Experimental Immunology* 2009;158:325-333.
11. Willemsen LM, Koetsier M, Balvers M, et al. Polyunsaturated fatty acids support epithelial barrier integrity and reduce IL-4 mediated permeability in vitro. *European Journal of Nutrition* 2008;47:183-191.
12. HadiNezhad M, Duc C, Han N, et al. Flaxseed Soluble Dietary Fibre Enhances Lactic Acid Bacterial Survival and Growth in Kefir and Possesses High Antioxidant Capacity. *Journal of Food Research* 2013;2:152-163.
13. Alzueta C, Rodriguez M, Cutuli M, et al. Effect of whole and demucilaged linseed in broiler chicken diets on digesta viscosity, nutrient utilisation and intestinal microflora. *Br Poult Sci* 2003;44:67-74.
14. Ferraro G. Diagnosis and treatment of sand colic in the horse. *Vet Med Small Anim Clin* 1973;68:736.
15. Onderci M, Sahin K, Sahin N, et al. Effects of dietary combination of chromium and biotin on growth performance, carcass characteristics, and oxidative stress markers in heat-distressed Japanese quail. *Biol Trace Elem Res* 2005;106:165-176.
16. Sahin K, Onderci M, Sahin N, et al. Effects of dietary combination of chromium and biotin on egg production, serum metabolites, and egg yolk mineral and cholesterol concentrations in heat-distressed laying quails. *Biol Trace Elem Res* 2004;101:181-192.
17. Sahin K, Smith MO, Onderci M, et al. Supplementation of zinc from organic or inorganic source improves performance and antioxidant status of heat-distressed quail. *Poult Sci* 2005;84:882-887.
18. Kumar N, Garg A, Mudgal V, et al. Effect of Different Levels of Selenium Supplementation on Growth Rate, Nutrient Utilization, Blood Metabolic Profile, and Immune Response in Lambs. *Biol Trace Elem Res* 2008;[Epub ahead of print].
19. Celik L, Ozturkcan O. Effects of dietary supplemental L-carnitine and ascorbic acid on performance, carcass composition and plasma L-carnitine concentration of broiler chicks reared under different temperature. *Arch Tierernahr* 2003;57:27-38.
20. Sahin K, Sahin N, Onderci M. Vitamin E supplementation can alleviate negative effects of heat stress on egg production, egg quality, digestibility of nutrients and egg yolk mineral concentrations of Japanese quails. *Res Vet Sci* 2002;73:307-312.
21. Hassel D, Smith P, Nieto J, et al. Di-tri-octahedral smectite for the prevention 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.
22. Neelley K, Herthel D. Preventing and Treating Colitis with DTO Smectite. *J Equine Vet Sci* 2000;20:432.
23. Lawler J, Hassel D, Traub-Dargatz J, et al. Adsorptive effects of di-tri-octahedral smectite on Clostridium perfringens alpha, beta, and beta-2 exotoxins and equine colostrum antibodies. *Am J Vet Res* 2008;69:233-239.
24. 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.
25. McCann JS, Meacham TN, Fontenot JP. Energy Utilization and Blood Traits of Ponies Fed Fat-Supplemented Diets. *J Anim Sci* 1987;65:1019-1026.

