PURINA

RESEARCH REVIEW >

A New Mash Product for Horses, Purina® RepleniMash™ Promotes Optimal Volatile Fatty Acid Production in Horses

A SUMMARY OF RESEARCH CONDUCTED AT THE PURINA ANIMAL NUTRITION CENTER EVALUATING THE *IN VITRO* FERMENTATION OF PURINA® REPLENIMASH® PRODUCT IN A UNIQUE EQUINE CECAL FLUID MODEL.[1]

< INTRODUCTION >

Purina® RepleniMash™ is a unique product designed to be fed intermittently to complement a horse's regular feeding program to support hydration, digestion, and comfort. One aspect of the formulation is the specific ingredient profile intended to support hindgut health via fermentation and interaction with the horse's microbiome for the creation of byproducts that are nutritive to the horse. The hindgut of the horse is a fascinating environment in which bacteria, fungi, yeasts, protozoa, and viruses interact directly with the gastrointestinal tract. These microorganisms, collectively known as the microbiome, are responsible for the breakdown of feedstuffs such as fibers and forage, via a process called fermentation. This process creates large amounts of volatile fatty acids (VFA); compounds used by the horse for energy, tissue repair, and other important physiological functions. The individual diet of a horse directly impacts the VFA profile produced, and as such, it is possible to impact this profile through different feeding strategies. The objective of this trial was to evaluate the fermentation parameters of Purina® RepleniMash™ in a unique equine cecal *in vitro* model.

< MATERIALS AND METHODS >

For this trial, cecal fluid was collected from a group of five cecally cannulated horses and used in an *in vitro* model of equine digestion. Approximately 250 mL of cecal contents was obtained from each horse and combined. The contents were strained to remove particulate and dry matter resulting in approximately 500 mL of remaining cecal fluid. This fluid was immediately processed for *in vitro* fermentation.

The *in vitro* fermentation process was designed to mimic the digestive process that takes place in the horse's gastrointestinal tract. In short, three substrates were utilized for comparison (Purina® RepleniMash™; crude protein=10%, crude fat=5%, NDF=30%, ADF=13%, wheat bran; crude protein=17%, crude fat=4%, NDF=43%, ADF=16%, and a commercially available mash formulated for horses; crude protein= 11%, crude fat= 6.5%, NDF= 14%, ADF= 6%). The individual substrates were prepared and put through an enzymatic digestion process designed to mimic foregut digestion. An HCl/Pepsin solution was used to mimic the digestive processes in the stomach, while a pancreatin solution was utilized to replicate digestion in the small intestine. Following the foregut digestion process, the resultant substrates were transferred to vessels containing the processed equine cecal fluid for *in vitro* fermentation. Substrates were fermented for a period of 24 hours with measurements taken at 7-hr and 24-hr. Measurements included dry matter (DM) disappearance, neutral detergent fiber (NDF) disappearance, total VFA production, total gas production, and individual VFA production. All substrates were analyzed in triplicate and data was analyzed for significance utilizing SAS 9.4.

[1]Jacobs, RD et al., HR. 331. Ahiflower tissue incorporation. Internal research, PANC 2020.

< RESULTS >

Total Volatile Fatty Acids

Volatile fatty acids are important energy sources for the horse that are produced in the hindgut. **Figure 1** below shows that at 24-hr, Purina® RepleniMash™ fermentation results in more total VFA production compared to both the commercially available mash and wheat bran (*P<0.05*).

Acetate

Acetate is the predominant VFA produced by the microbes in the hindgut of the horse. In fact, this important VFA is readily absorbed into the bloodstream of the horse and utilized directly as an energy source. **Figure 2** shows that at 24-hr, Purina® RepleniMash™ fermentation results in more acetate production compared to both the commercially available mash and wheat bran (*P<0.05*).

Propionate

Propionate is an important VFA in horses due to the role that it plays in gluconeogenesis. Increased propionate levels result in improved gluconeogenesis, which may be important to horses recovering from exercise or other glucose utilizing events. **Figure 3** shows that at 24-hr, Purina® RepleniMash™ fermentation results in more propionate production compared to both the commercially available mash and wheat bran (*P<0.05*).

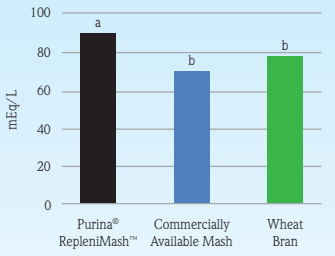
Butyrate

Specific enterocytes (intestinal cells) utilize butyrate almost exclusively as an energy source, and dietary substrates that can increase the *in vivo* production of butyrate in the hindgut of the horse supports optimal VFA production, thereby influencing overall health and performance. In a simulated gastric environment, **Figure 4** shows that at 24-hr, Purina® RepleniMash™ fermentation results in more butyrate production compared to the commercially available mash (*P<0.05*) and similar production to wheat bran.

< IMPLICATIONS >

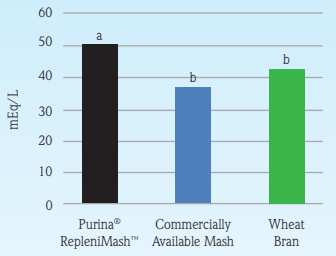
The hindgut of the horse is a perfect example of symbiosis in nature. The microorganisms that reside in the hindgut of the horse produce the essential volatile fatty acids that the horse needs, while the fiber that horses consume provides optimal fermentation substrates for the microbes. This system is in a constantly delicate balance and the diet of the horse is essential in supporting this functionality. Purina® RepleniMash™ has a unique formula which complements common equine rations while providing ingredients specifically selected to optimize hindgut performance.

FIGURE 1 Total volatile fatty acid production at 24-hour of *in vitro* fermentation.



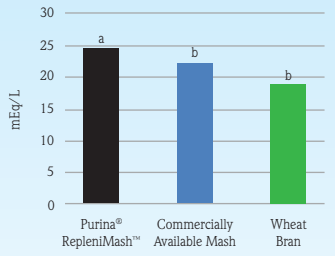
*Differing superscripts indicate significance at P < 0.05

FIGURE 2 Acetate production at 24-hour of *in vitro* fermentation.



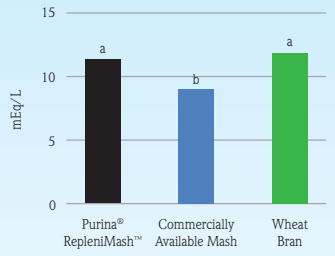
*Differing superscripts indicate significance at P < 0.05

FIGURE 3 Propionate production at 24-hour of *in vitro* fermentation.



*Differing superscripts indicate significance at P < 0.05

FIGURE 4 Butyrate production at 24-hour of *in vitro* fermentation.



*Differing superscripts indicate significance at P < 0.05

< FOR MORE INFORMATION > Contact your local Purina representative if you would like more information about this study.

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