



■ REVIEW >

RESEARCH  
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## Purina® Systemiq™ Probiotic Supplement Supports an Optimal Response to an Inflammatory Challenge

A SUMMARY OF RESEARCH CONDUCTED AT THE PURINA ANIMAL NUTRITION CENTER EVALUATING THE EFFECTS OF FEEDING SYSTEMIQ™ PROBIOTIC SUPPLEMENT TO HORSES UNDERGOING A GASTROINTESTINAL STRESS CHALLENGE.<sup>1</sup>

### < BACKGROUND >

Inflammation is a natural response by the horse's immune system to challenges such as infection, exercise, and various disease states. While inflammation is necessary to maintain optimal health, excess or inappropriate inflammation can lead to a reduction in performance, health, and overall well-being. Previous research evaluating the effects of a novel probiotic on exercise-induced inflammation was integral in the development of Purina® Systemiq™ Probiotic Supplement.<sup>2</sup> The *Bacillus coagulans* (GBI-30, 6086) that is the live and active probiotic strain in Systemiq™ Probiotic Supplement was able to support optimal recovery following an exercise-induced inflammatory challenge. The objectives of this trial were to evaluate the effects of Purina® Systemiq™ Probiotic Supplement on inflammation induced via a gastrointestinal health challenge. It was hypothesized that similarly to the effects on exercise-induced inflammation, Purina® Systemiq™ Probiotic Supplement would reduce markers of inflammation (serum amyloid A, prostaglandin E<sub>2</sub>, etc.) in response to a gastrointestinal stress challenge.

### < MATERIALS AND METHODS >

A group of nineteen (n = 19; average age = 6.3 years; average BCS = 6.25) horses of mixed breed (Quarter Horse = 12; Thoroughbred = 7) and gender (gelding = 11; mare = 8) were split into two groups (Treatment = 10; Control = 9) so that each group contained similar numbers of horses of different breeds, ages, and genders. Before the trial, all horses were maintained on the same concentrate (Purina Strategy GX; CP = 14.7%, Fat = 7.2%, ADF = 14.2%, NDF = 31.5%) and grass hay (CP = 9.5%, Fat = 2.9%, ADF = 39.0%, NDF = 61.7%) fed to maintain a BCS of at least 5/9. On day 0 of the trial, all horses were housed in stalls overnight and fasted for 12 hours to allow for gastric endoscopy on the following day.

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<sup>1</sup>HR 374. The effects of feeding a specific probiotic strain to horses undergoing a gastric ulcer induction challenge. Jacobs, R.D. et al. 2023. Internal research, PANC.

<sup>2</sup>Oral probiotic administration attenuates post-exercise inflammation in horses. Jacobs R.D. et al. Translational Animal Science. In preparation.

At the onset of the trial, all horses underwent a gastric endoscopy to visualize their stomachs. A scoring system was used by a veterinarian blinded to treatment to assess the health of each horse's gastric environment.<sup>3</sup> This score considered the number and severity of ulcers in both the glandular and non-glandular regions of the stomach as well as the presence and severity of ulcers on the pylorus. Severity of ulcers was scored on a scale of 0-5 and an overall Equine Gastric Ulcer Score was scored on a scale of 0-4 with a score of 0 indicating no ulceration and a score of 4 indicative of extensive lesions with areas of deep ulceration.

Following the endoscopy, all horses were enrolled into an IACUC approved gastric ulcer induction (GUI) protocol. During the GUI phase of the trial, horses were housed in individual stalls (12' x 12') for 24 hours daily with free-choice access to clean water and a plain white salt block. The GUI phase of the trial lasted for 17 days during which horses were exercised for 46 min for 5 days/week (M-F) in an equine exerciser. During this phase, horses received no long-stem forage and dietary needs were met by a complete feed (CP = 12.2%, Fat = 6.3%, ADF = 23/6%, NDF = 38.9%) offered at 2.0% BW split into three meals (AM= Approx. 15 min post exercise, Lunch = 1500, and PM = 2000). Horses in the treatment group received one quarter of the daily recommended feeding of Purina® Systemiq™ Probiotic Supplement at four feedings (PreEx, AM, Lunch, and PM). The total amount of probiotic was split into four equal feedings for research consistency. During the GUI phase, blood samples were obtained daily, immediately following exercise. Stalls were cleaned and bedded twice daily to remove manure, urine, and dirty shavings.

On day 18 all horses underwent a second gastric endoscopy, during which the same veterinarian assessed gastric health. Following the second endoscopy, horses entered into the recovery (REC) phase of the trial. During this phase, the horses were transitioned to a diet of Purina® Strategy GX® (2.72 kg) and grass hay (1.5% BW) split into two meals daily. Horses in the treatment group were offered one half of the daily recommended feeding rate of Purina® Systemiq™ Probiotic with their concentrate at AM (0700) and PM (1500) feedings. During the REC phase, horses were allowed access to drylots by treatment group from approximately 0800 to 1300 daily.

Horses remained in the REC phase for 56 days and on day 57 all horses underwent a final gastric endoscopy to assess gastric health and ensure that all active ulceration was resolved. During the REC phase, blood samples were obtained weekly immediately prior to AM feeding. Horses were evaluated and observed constantly through the course of the trial for any signs or symptoms requiring veterinary care. Blood samples were analyzed for serum amyloid A (SAA), interleukin-6 (IL-6), and prostaglandin E<sub>2</sub> (PGE<sub>2</sub>), and data were analyzed via SAS 9.4 (Cary, NC) utilizing a MIXED procedure ANOVA.

## < RESULTS >

The objective of this trial was to evaluate the effects of Purina® Systemiq™ Probiotic Supplement on inflammation induced via a gastrointestinal stress challenge. The gastric ulcer induction was successful in inducing inflammation in all horses regardless of treatment as indicated by the increase in the measured markers of inflammation. Prostaglandin E<sub>2</sub> is a lipid molecule that is produced during an inflammatory response and is known to cause an increase in pain in horses. Prostaglandin E<sub>2</sub> levels were increased in all horses during the GUI phase of the trial. However, horses supplemented with Purina® Systemiq™ Probiotic Supplement had a reduced PGE<sub>2</sub> expression compared to those in the negative control group (**Figure 1**; P < 0.001).

Serum Amyloid A is an acute phase protein that is a non-specific marker of inflammation. Elevated SAA is indicative of the presence of a pro-inflammatory condition. In this trial, all horses had increased levels of SAA during the GUI phase of the trial, but horses in the Purina® Systemiq™ Probiotic supplemented group had lower levels compared to those in the negative control (**Figure 2**; P < 0.001). No significant differences were observed in IL-6 expression between treatment groups.

## < CONCLUSIONS AND IMPLICATIONS >

Excessive gastrointestinal inflammation can cause significant health risks for horses including but not limited to colic, inflammatory bowel syndrome, prolonged gastric ulceration, and an overall decrease in gastrointestinal functionality. Purina® Systemiq™ Probiotic Supplement contains a unique *Bacillus cogulans* (GBI-30, 6086) strain of bacteria that remains live and active through the manufacturing process and as it passes through the gastrointestinal tract of the horse. It functions to promote an optimal gut microflora, modulate inflammation, and improve enterocyte health and function.<sup>4</sup> The data gathered in this trial demonstrate that horses consuming Purina® Systemiq™ Probiotic Supplement had a more appropriate response to a gastrointestinal health challenge.

<sup>3</sup>Sykes BW, Hewetson M, Hepburn RJ, Luthersson N, Tamzali Y. European College of Equine Internal Medicine Consensus Statement-Equine Gastric Ulcer Syndrome in Adult Horses. *J Vet Intern Med.* 2015;29:1288-99.

<sup>4</sup>HR367. The effects of feeding probiotics on exercise-induced inflammation. Jacobs, R.D. et al., 2023. Internal research, PANC.

FIGURE 1 Prostaglandin E<sub>2</sub> levels in horses experiencing a gastrointestinal health challenge.

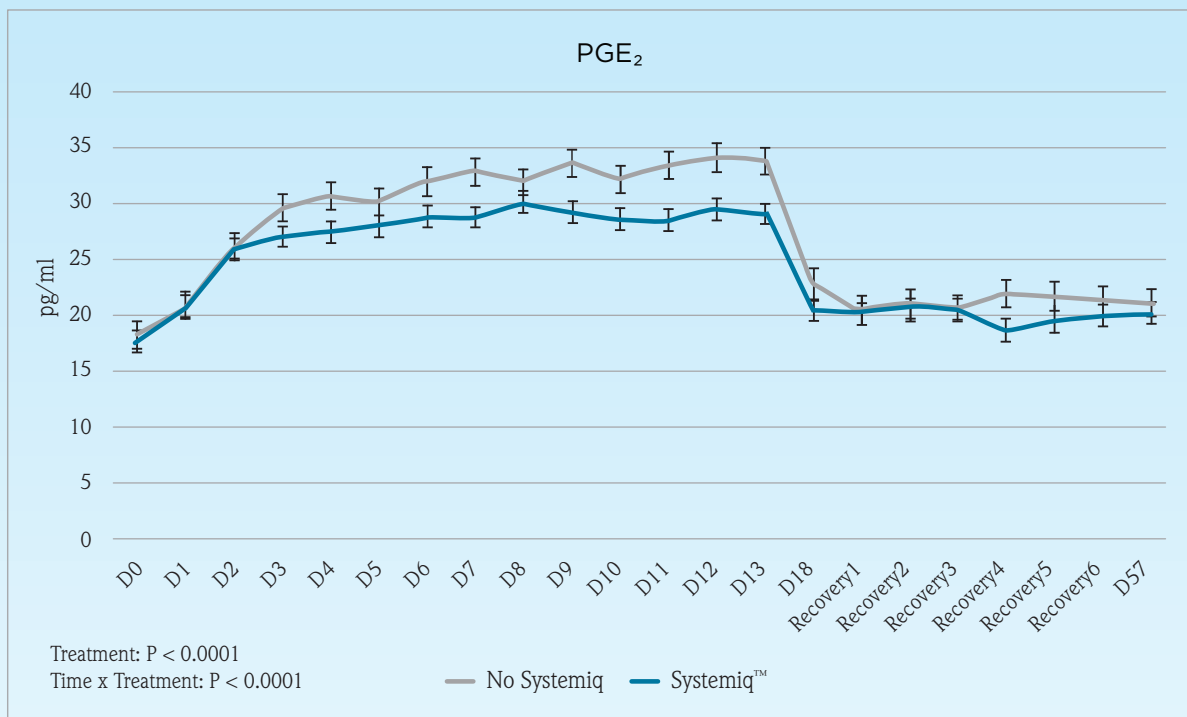
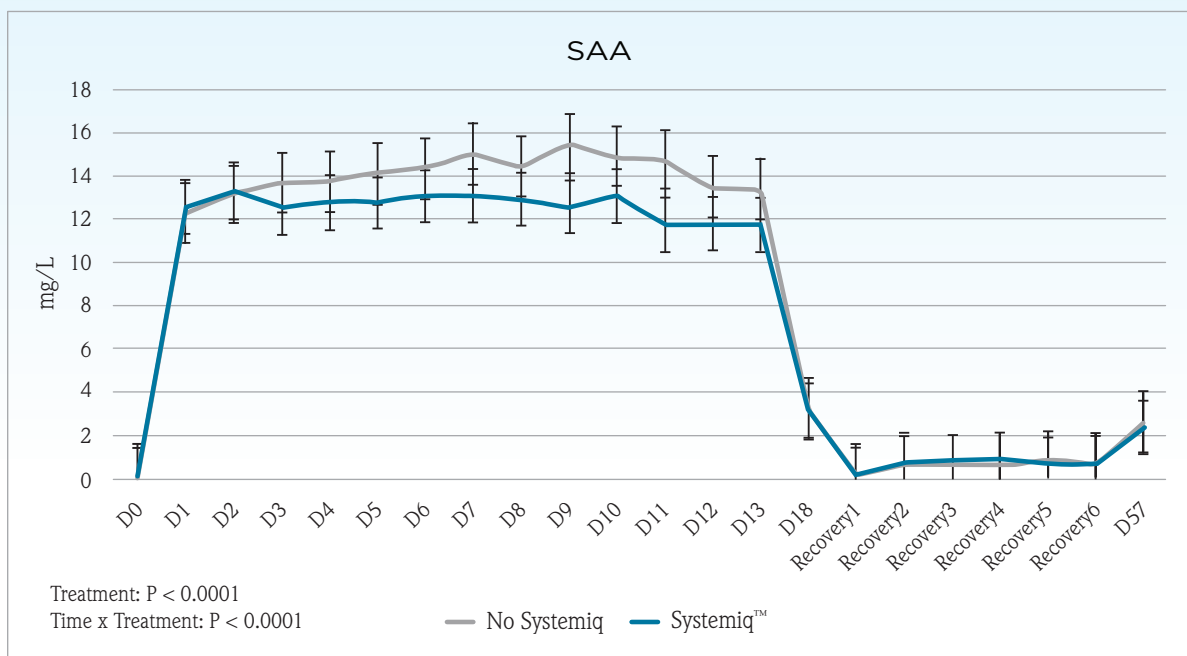


FIGURE 2 Serum amyloid A levels in horses experiencing a gastrointestinal health challenge.



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