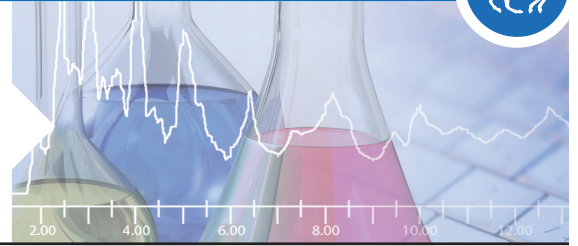




FOCUS ON RESEARCH



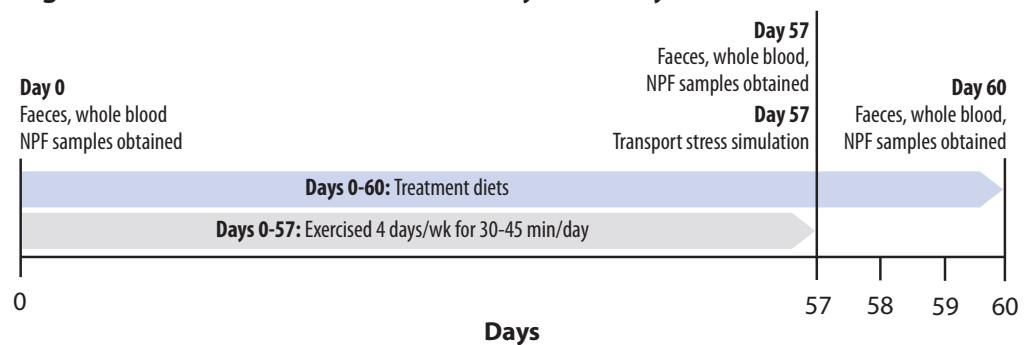
Effect of TruEquine™ C *Saccharomyces cerevisiae* fermentation-based postbiotic (SCFP) on immune cell function and mucosal immunity in young, stress-challenged horses

A simulated prolonged transport stress model was used to evaluate immune system responses in young horses supplemented with TruEquine C postbiotic. This study was conducted at the University of Florida Institute of Food and Agricultural Sciences^{1,2}.

Overview

- 20 Quarter Horses (22 ± 0.3 months; BW 966 ± 7 lb) were included in this study.
- Horses were fed a total dietary ration consisting of 60% hay, 40% concentrate.
- Horses were paired by age and sex and randomly assigned to 1 of 2 treatment groups:
 - Control – daily ration with no supplementation (CON; n=10)
 - Treatment – daily ration with 21 grams of TruEquine C postbiotic added to the concentrate portion (TEC; n=10)

Figure 1: Diets were offered continuously for 60 days



- Horses were exercised 4 days/week for 30-45 minutes/day at light to moderate intensity.
- On day 57, horses were placed in individual stalls and tethered with their heads elevated approximately 14 inches above wither height for 12 hours to mimic long-distance transport and to induce mild upper respiratory tract inflammation.
- Faeces, whole blood, and nasopharyngeal flush (NPF) samples were obtained at study initiation and before and up to 72 h after stress induction to evaluate immune responses.
- Lymphocyte proliferation response to lipopolysaccharide (LPS) concanavalin A stimulation was evaluated *in vitro*.
- Data were compared using mixed model ANOVA with repeated measures.

Results

Localised Mucosal Immunity Response

- Prolonged head elevation resulted in increased ($P < 0.05$) mucus production, total leukocytes, neutrophils, lymphocytes, monocytes, and ratio of neutrophils to lymphocytes in NPF that was mostly resolved by 72 hours.
- Neutrophils and lymphocytes were lower ($P < 0.05$) and monocytes higher ($P < 0.05$) in NPF from horses fed TEC vs CON.

Focus on Research

Results - continued

- Increased Immunoglobulin A (IgA) was observed in horses supplemented with TEC while no change was observed in CON horses ($P < 0.05$).
- Neutrophil phagocytosis of *Streptococcus equi* (a respiratory pathogen) was temporarily reduced ($P < 0.05$) after head elevation in both treatments.

Systemic Stress and Immune Cell Response

- Serum cortisol ($P < 0.01$) and blood leukocytes ($P < 0.05$) increased with head elevation.
- Similar increases in total leukocytes, neutrophils, lymphocytes, monocytes, and ratio of neutrophils to lymphocytes was observed in whole blood although these changes lagged NPF responses by 12 hours.
- Serum IgA, Immunoglobulin G (IgG), and Immunoglobulin M (IgM) were not affected by head elevation nor dietary treatment.
- Lymphocyte proliferation in response to lipopolysaccharide was lower ($P < 0.01$) following head elevation whereas concanavalin A stimulation decreased proliferation in CON horses after head elevation but was unchanged in horses fed TEC ($P < 0.05$).
- Phagocytosis-induced oxidative burst increased in horses fed TEC ($P < 0.01$) but did not change in CON horses undergoing head-tying stress.

Faecal Immunoglobulin Responses

- Head elevation increased ($P < 0.05$) IgA, IgG and IgM in faeces, and faecal concentrations of IgA and IgG were greater ($P < 0.05$) for CON than TEC.
- Additional faecal metagenomic and metabolomic outcomes are discussed in a separate publication and FOR.

Summary

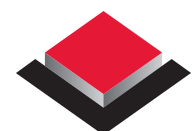
- The head elevation model utilised in this study successfully created acute peripheral and local stress inflammation in young horses as evidenced by increased airway mucus, serum cortisol, and immune cell responses in serum, NPF secretions and faeces.
- Changes in both local and systemic response to stress were indicative of TruEquine™ C postbiotic positively balancing the immune response:
 - A lower number of lymphocytes and neutrophils with higher levels of monocytes (developing macrophages) suggest TruEquine C exerts a role in immune cell architecture. Previous studies in other species have demonstrated that yeast cell wall and yeast-derived MOS affects immune cell numbers. This response is typified by fewer numbers of cells with increased ability to respond.
 - A reduction in lymphocyte proliferation in response to concanavalin A in CON horses with no change in those fed TEC suggests TruEquine C can help maintain a level of primary immune responsiveness under conditions of stress.
 - During the process of phagocytosis, immune cells such as macrophages undergo a strong respiratory burst during which they consume oxygen and convert it to potent oxidants to neutralise and destroy pathogens. The higher phagocytosis-induced respiratory burst noted in this study indicates that TruEquine C helped enhance local immune responsiveness.
 - Immunoglobulin A (IgA) is the most abundant antibody class present at mucosal surfaces and is involved in opsonising pathogens and inducing pro-inflammatory responses to help eliminate pathogens. Higher levels of IgA and changes in leukocytes and IgG in mucosal secretions suggest TruEquine C was involved in balancing the immune response.

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If you would like more information, please contact your local Diamond V representative.

2525 60th Avenue SW
Cedar Rapids, IA 52404 | USA
TF: 800.373.7234 | Phone: +1.319.366.0745
DiamondV.com



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