



Original Research

Effects of a Novel Dietary Supplement on Indices of Muscle Injury and Articular GAG Release in Horses

Michael I. Lindinger^{a,*}, Jennifer M. MacNicol^{a,b}, Neil Karrow^b, Wendy Pearson^{a,b}^a The Nutraceutical Alliance, Campbellville, Ontario, Canada^b The Department of Animal Biosciences, University of Guelph, Guelph, Ontario, Canada

ARTICLE INFO

Article history:

Received 7 June 2016

Received in revised form 11 August 2016

Accepted 11 August 2016

Available online 12 September 2016

Keywords:

Exercise

Oxidative stress

Inflammation

Nutraceutical

Muscle enzymes

Synovial fluid

ABSTRACT

This study determined the ability of an oral nutraceutical supplement to attenuate the oxidative stress and inflammation that occurs in muscles and joints with repeated bouts of high-intensity exercise in horses. The supplement, fed daily, was comprised of whole dried mushrooms, golden flaxseed, omega-3 fatty acids, plant-based enzymes, a melon-concentrate powder, and *Saccharomyces cerevisiae boulardii*. Ten horses participated in a partial cross-over design, with 7 horses completing the Control trial and 7 horses completing the supplement trial. Blood and synovial fluid samples (from the intercarpal joint) were taken before, and at 1 and 24 hours after a standardized, repeated high-intensity exercise test that was performed before supplementation and on the 22nd day of supplementation. At the end of the supplement trial exercise resulted in reduced concentrations of plasma markers of oxidative stress (decreased thiobarbituric acid reactive substances, with increased total antioxidant status and increased superoxide dismutase activity); there was no effect on plasma markers of muscle injury (creatinine, creatine kinase, and aspartate aminotransferase) or inflammation (PGE₂, nitric oxide). Within synovial fluid, there was a tendency for increased superoxide dismutase activity, and decreased concentration of glycosaminoglycans. It is concluded that the supplement, when fed to horses as part of the normal diet for 23 days, was associated with reduced concentrations of markers of oxidative stress and inflammation in muscle and synovial fluid.

Crown Copyright © 2016 Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Historically, the main research focus on traditional (non-nutraceutical) nutritional supplements for horses has been on macronutrients (carbohydrates, fats, and protein or amino acids), trace minerals and electrolytes for their ability to improve health and performance. However, despite seemingly optimizing these aspects of nutrition, horses often do not appear to reach their genetic and/or physiological potential. Recent research efforts are increasingly directed towards examining the effects of

nutraceuticals or functional foods on health, wellness, and physical and cognitive performance. These products are typically single animal or plant components, or blends of such components that are believed to exert wellness benefits that cannot be readily attributed to classical nutrition. Nutraceutical products often comprise a vast array of bioactive molecules that interact with numerous biochemical and signaling pathways in virtually every cell system within the body. The plant and animal parts from which these nutraceutical products are derived tend to have a long history of use in human and animal folklore medicine. At the same time, we have a poor understanding of these products because of their complex nature and myriad interactions. Therefore, research using such products is needed.

* Corresponding author at: Michael I. Lindinger, The Nutraceutical Alliance, Campbellville, ON, Canada L0P 1B0.

E-mail address: mi.lindinger@gmail.com (M.I. Lindinger).

There are numerous products in the veterinary nutraceutical supplements marketplace aimed at reducing the negative effects of oxidative stress and inflammation that occurs as a result of high-intensity exercise training. The rationale is that excessive oxidative stress can result in an exaggerated inflammatory response [1,2] and may be detrimental to normal healing of affected tissues [2]. At the same, it is recognized that inflammation is a normal part of the tissue repair, and that normal adaptation to normal stress (i.e., exercise training and competition) requires controlled inflammation that allows repair to occur without severe tissue destruction.

In horses, oxidative stress occurs during intense exercise [3–5] and endurance exercise [6,7] and is often associated with muscle membrane leakage. In animal studies, strenuous exercise that results in muscle microtrauma (ultrastructural damage) is characterized by leukocyte infiltration and an inflammatory response resulting from oxidative stress [1]. Part of the healing process to microtrauma involves the inflammation that occurs in response to the damage.

The present study tested the hypothesis that a nutraceutical supplement comprised of ingredients that confer antioxidative, anti-inflammatory, and immune-enhancing effects will attenuate the severity of oxidative stress and inflammation that occurs in skeletal muscle and joints as a consequence of high-intensity exercise training. The present study used a stress of repeated ~60 s gallop bouts with 4–5 minutes of walking rest between gallops. The supplement is comprised of mushrooms and yeast that are rich in immune-enhancing 1→3 and 1→6 β -glucans [8–13], a superoxide dismutase (SOD)-rich melon concentrate [14], golden flaxseed, and a microencapsulated fish oil rich in omega-3 oils (minimum 28% by weight including EPA and DHA) selected to confer anti-inflammatory effects [15,16]. The product also is comprised 20% by weight of a blend of nonanimal source enzymes containing a combination of proteases, peptidase, amylase, and lipase.

2. Materials and Methods

Ten privately owned healthy, adult horses of mixed breed and gender participated in the study (Table 1). Owners freely agreed for their horse(s) to participate and signed an informed consent. Horses were outdoor stabled, with access to large run-in shelters with free access to hay and water at all times. The study was performed during the fall of 2015 near Toronto, Canada. A horse health check and lameness examination were performed on animals selected for the study. Five of the horses had to be withdrawn from the study: two due to lameness, two at the owner's request, and one due to negative behavior associated with the arthrocentesis procedure. Therefore, five horses fully completed both the placebo and supplement trials (double crossover design), with two additional horses completing either the placebo trial or the supplement trial. Animal care and use procedures were approved by the Nutraceutical Alliance Animal Care Committee in compliance with the Animals for Research Act (Ontario) and the Canadian Council on Animal Care guidelines.

Horses (Table 1) were fed twice daily (~7 am and ~4 pm) an individually tailored ration designed to meet their nutritional needs based on their work, body condition, and nutritional analysis of forage. Horses had ad libitum access to hay and water. The basal diet for Daisy, Stella, Lance, Lilo, Sasha, Rosalie, and Snoopy was 250 g of a ration balancer (Equilibrium Equalizer, Agribands Purina, Woodstock, ON, Canada) and 40-g trace mineralized salt (Canadian Stockman, Sifto, Mississauga, ON, Canada). The basal diet for Dixi, Lucus, Norman, and Reese was 1.5 kg of Happy Horse pelleted feed ration (W-S Feeds, Tavistock, ON, Canada), 1-kg beet pulp pellets (Sharp's Feed Mills, Guelph, ON, Canada), 700-g ground flaxseed (Sharp's Feed Mills, Guelph, ON, Canada) and 75 g of trace mineralized salt (Canadian Stockman, Sifto, Mississauga, ON, Canada). The ingredients in Equilibrium Equalizer are soy hulls, dehydrated alfalfa meal, soy oil, flaxseed, wheat shorts, lysine, vitamins, minerals, and flavoring

Table 1

Characteristics of the horses that completed trials in the study.

Horse	Treatment	Initial, Final Mass, kg	Sex	Age, y	Breed	Exercise Bouts	Reason for Withdrawal
Sasha	C	583	M	6	Dx	4	Lameness
Lance	C	498, 491			Morgan	3	
	S	489, 466 ^a				3	
Stella	S	511, 516	M	5	Px	3	
	C	480, 493				3	
Lilo	S	585, 587	M	7	OH	4	
Rosie	C	565, 566	M		TB	4	Behavior
Norman	C	571, 582	G	9	TB	4	
	S	586, 578				4	Owner request
Lucus	C	533, 535			TB	4	
	S	530, 528				4	
Dixi	S	472, 474	M	6	TB	4	
	C	467, 477				4	Owner request
Snoopy	S	597, 604	G	6	Paint	3	
Daisy	C	630, 629			TB	3	
Reese	S	613, 610	M	5	Dx	4	Lameness

Abbreviations: C, control; Dx, Dutch warmblood cross; G, gelding; M, mare; OH, Oldenburg Holsteiner cross; Px, Hafflinger pony cross; S, supplement; TB, thoroughbred.

^a Not completing the morning meal, but completed the afternoon meal.

Download English Version:

<https://daneshyari.com/en/article/5535715>

Download Persian Version:

<https://daneshyari.com/article/5535715>

[Daneshyari.com](https://daneshyari.com)