The Efficacy of Equine Oral Joint Supplements

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Abstract

Few studies have examined the efficacy of glucosamine, hyaluronic acid, and chondroitin sulfate supplements in horses. The purpose of this study is to determine if the commercially available supplements are meeting the label guarantees, and to analyze any correlation between price point and efficacy of use. The supplemental ingredients of interest to this study are combinations of glucosamine, hyaluronic acid, and chondroitin sulfate. Horses in the study were fed each supplement for a 14-day period with synovial fluid extracted through aseptic arthrocentesis at days 0 and 14. The 12 horses followed a 14-day feeding period accompanied by a 28-day dry out period. This protocol was repeated 3 times, each with a different supplement. During these trials and the dry-out periods, the horses were divided into groups of 4 and exercised at different levels depending on the group. Physical data was collected on days 0 and 14 of each of the 3 trials to determine any physical differences associated with the use of the supplements. The veterinarian scored the horses at a walk and trot before carrying out flexion tests on all 4 limbs. The pulse, temperature, respiratory rate, and body condition scores were also collected. Enzyme-linked immunosorbent assays were used to quantify the amounts of chondroitin sulfate in each sample. The results for the glucosamine and hyaluronic acid are still pending.

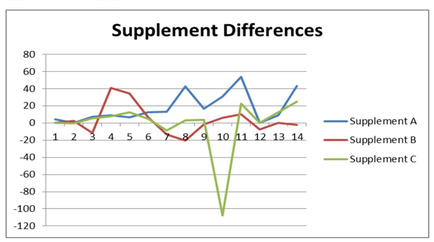
Objectives

The objectives of this research are to determine the efficacy of the supplements compared to the product recommendations and guarantees and to determine the correlation between price and the efficacy of the supplement.

Methods

- 14 horses (13 Quarter Horses, 1 Arabian) were housed in open pastures in groups of 4 with individual feeding pens.
- Horses were fed in individual pens and monitored to ensure consumption of the joint supplement.
- The 12 horses within each trial followed a 14-day feeding period accompanied by a 28-day dry out period. This protocol was repeated 3 times, each with a different supplement.
- Synovial fluid was collected on days 0 and 14 and analyzed for Chondroitin Sulfate using ELISA (Antibody Research Corp.)
- The horses were divided into groups of 4 and exercised at different levels depending on the group.
- Physical data was collected on days 0 and 14 of each of the 3 trials. Physical data includes temperature, pulse, respiratory rate, body condition score, flexion tests, and soundness evaluations.

Graph 1: Supplement Differences



Introduction

Previous studies have evaluated lameness scores and sensitivity while feeding supplements to horses, but none have successfully evaluated the exact quantity of the molecules within the nutraceutical that reach the intended target. This study is focused on evaluating the exact quantity of chondroitin sulfate, hyaluronic acid, and glucosamine from the oral joint supplement reaching the joints in the horse.

The evaluation of synovial fluid, blood serum, soundness evaluations, and flexion tests allows a quantification of the amount of each molecule reaching the joint as well as if the molecules are entering the cardiovascular system and whether the supplements are influencing any visual changes in the animal.

Within this study, three different products were fed per product recommendations to twelve horses between the ages of seven and twenty-three. These products were evaluated to prove the efficacy of the supplement in reaching the target joint, the exact amount of each molecule were quantified through the specific assays for each molecule, and compared to the guarantees to determine the correlation between price and the efficacy of the specific supplement. Three other products were also be used to observe the amount of each molecule within the product compared to the label guarantee.

Exercise regiments of different levels were tested to determine the connection between amounts of exercise and supplement efficacy. The samples of each supplement, blood serum, and synovial fluid were evaluated using enzyme-linked immunosorbent assays (ELISA) to quantify the chondroitin sulfate and hyaluronic acid. Fluorophore assisted carbohydrate electrophoresis (FACE) was used to quantify the glucosamine molecules in each supplement product.

Discussion

Joint disease is a significant concern among the performance horse industry due to the constant stress on their joints. Primary injuries may seem minor, but secondary injuries may present themselves later in life as joint disease caused by uneven weight bearing during the original injury.

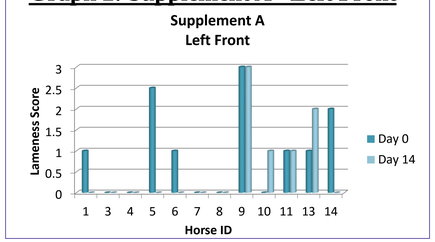
Lameness evaluations were conducted on days 0 and 14 of each trial to determine any correlation between supplementation and physical changes. Graphs 2, 3, and 4 represent the data collected from the veterinarian over the 3 trials on the left front leg of each horse. The data showed no relationship between supplementation and physical change.

Graphs 5, 6, and 7 represent each of the 3 fed supplements on day 0 and day 14. The graphs compare day 0 and day 14 to show the change in each horse's synovial fluid chondroitin sulfate content. Supplement A presented a consistent increase from day 0 to day 14 in every horse without variation from environment or exercise regimen. Supplements B and C varied in the chondroitin sulfate data; the supplements showed an increase in some horses but a decrease in others. There are no patterns of consistency between pastures or exercise regimen.

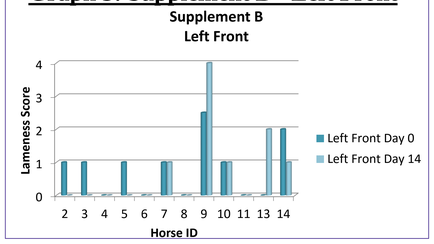
The difference was taken between day 14 and day 0 for each supplement to represent a positive or negative change. Table 2 shows the differences of each horse for supplements A, B, and C. The results are represented in Graph 1 to show the drastic difference between the 3 supplements. According to the graph, supplement C showed the most negative differences, there were a few negative differences in supplement B, and only positive differences were found using supplement A.

Along with the 3 supplements fed to the horses, another 3 supplements were added to the research in order to determine the quantity of molecules in each product. Since nutraceuticals are not regulated in North America, there is a difference in price and label guarantees from company to company. These 6 supplements were analyzed for hyaluronic acid and chondroitin sulfate content using ELISA kits and glucosamine using fluorophore-assisted carbohydrate electrophoresis. The results are shown in Table 3 representing the stated label guarantee and the analyzed quantity in the product. The hyaluronic acid assay only accurately quantified supplements A, C, and F, which all showed higher analyzed quantities than the label guarantees. The chondroitin sulfate assay showed half of the analyzed products had a lower chondroitin sulfate than stated on the label guarantee. The glucosamine assay found the label guarantees were much higher than the amount found during analysis for all supplement products.

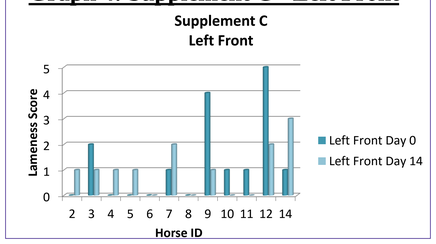
Graph 2: Supplement A - Left Front



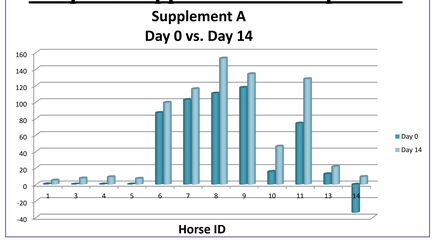
Graph 3: Supplement B - Left Front



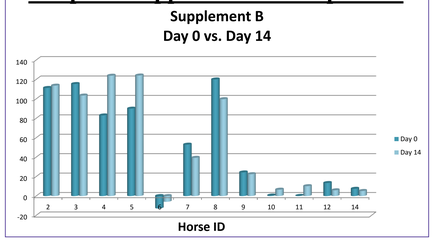
Graph 4: Supplement C - Left Front



Graph 5: Supplement A Comparison



Graph 6: Supplement B Comparison



Graph 7: Supplement C Comparison

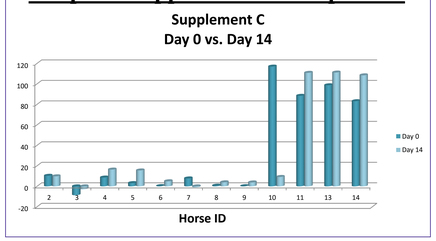


Table 1: Pasture and Exercise Groupings

ID	Gender	Pasture	Age	Exercise
1	2	1	11	Moderate
2	1	1	7	Moderate
3	2	1	9	Moderate
4	2	1	9	Moderate
5	1	1	16	Moderate
6	1	2	10	Light
7	1	2	19	None
8	1	2	16	Light
9	1	2	22	None
10	1	3	19	Light
11	1	3	13	None
12	1	3	22	Light
13	1	3	22	Light
14	1	3	21	None

Table 2: Supplement Differences

ID	Supplement A Difference	Supplement B Difference	Supplement C Difference
1	4.574939	.	.
2	.	2.3889	-0.492957746
3	7.308618	-11.8469	5.802816901
4	8.81139	40.90014	7.774647887
5	6.909927	34.14586	12.35211268
6	12.42844	6.845070423	4.716535
7	13.1524	-13.56338028	-8.656556
8	42.5598	-20.32394366	3.292183
9	16.5698	-1.830985915	3.6775
10	30.69014085	6.022616	-107.757074
11	53.98591549	10.024259	22.44357
12	.	-7.472047	.
13	8.929577465	.	12.43536
14	43.422559	-2.238602	25.25899

Table 3: Label Guarantee vs. Analyzed Quantity

Product	HA Guarantee (mg/g)	HA Analysis (mg/g)	CS Guarantee (mg/g)	CS Analysis (mg/g)	Glucosamine Guarantee (mg/g)	Glucosamine Analysis (mg/g)
Supplement A	1.06	22.95	29.98	16.1985	88.18	7.74
Supplement B	2.94	.	70.59	47.5414	423.53	5.268
Supplement C	1.06	9.29	17.64	9.205	264.55	4.784
Supplement D	1.76	.	73.19	156.335	176.37	3.548
Supplement E	2	.	16	26.627	133.33	4.694
Supplement F	0.59	11.80	11.76	16.568	58.78	1.791

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