

**An Analysis of Glucosamine and Chondroitin Sulfate Content in Oral Joint Supplement Products  
Marketed to Horse Owners**

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Numerous dietary supplements containing glucosamine and/or chondroitin sulfate are marketed to horse owners as a way to help support, improve or restore the health of their horse's joints. In humans, the glucosamine and chondroitin sulfate market has been estimated to be over 500 million dollars in retail sales between July 1998 and May 1999. While it is not clear that such products are actually effective, it is unlikely that they would be effective if the products did not contain what was on the label.

Horse owners may not be aware that over-the-counter supplements are not subject to the same stringent requirements for quality manufacturing as are pharmaceutical products. The quality of dietary supplements becomes a question because of the lack of regulatory provisions regarding the actual content of active ingredients contained in the jar, bucket or bottle. It is a sad fact that horse owners have no way of judging the quality of the products that they are purchasing.

Independent analyses of a variety of supplement and herbal products designated for the human health market have yielded disturbing results. Many such products have been tested, including calcium, St. Johnswort and ginko biloba, to name a few. The results of these tests have indicated that many marketed products actually have ingredients in far lesser amounts than the package labels state. Some even have zero active ingredients. Testing of glucosamine and chondroitin sulfate products intended for human use have also showed wide differences between published label amounts and the actual content of active ingredients.

While the effectiveness of oral joint supplement products may be in doubt, it should be obvious that even were the products to be effective, they would not work if they were not in the supplement product. Thus, a project, funded by the Dolly Green Foundation, was developed to analyze 11 over-the-counter supplements intended for horses that contained either chondroitin sulfate, glucosamine, or both. Three samples from 11 different products were taken from off-the-shelf joint health products contained in a feed store. The samples were numbered but not otherwise identified so that the laboratories performing the testing would not know the origin of the samples. The samples were first sent to Rush-Presbyterian Medical Center in Chicago, Illinois, where the chondroitin sulfate content was measured. Then, the samples were forwarded to the University of Maryland, where a newly developed test for glucosamine was performed.

When the results of the tests were obtained, the average of the measured amount of the product was compared to the label claim, giving a percentage of the label claim, as follows:

$$\% \text{ Label claim} = \text{Measured amount (mg)} / \text{Labelled amount (mg)} \times 100$$

According to their labels, five products contained glucosamine only (Figure 1). As can be seen from the figure, the average amount of glucosamine found in the product was different from that suggested by the label, with deviations from the label claims ranging from as low as 63.6% to 112.2%.

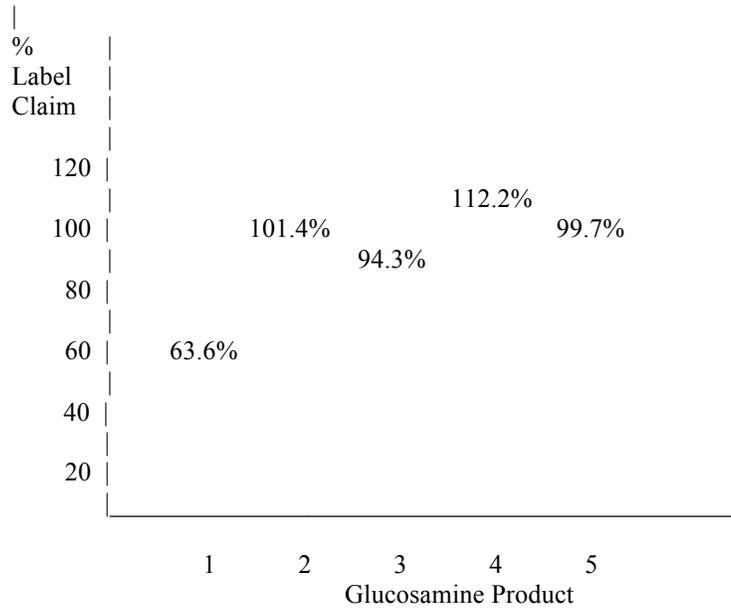


FIGURE 1

According to their labels, five products contained chondroitin sulfate only (Figure 2). As can be seen from the figure, the average amount of chondroitin sulfate found in these products was also quite different from that suggested by the label. Deviations from the label claims ranged from as low as 22.5% to over 155.7%.

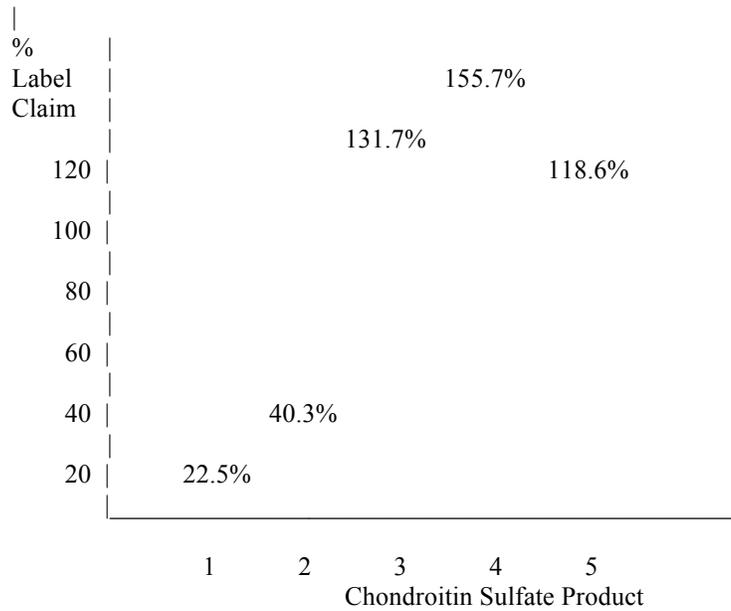


FIGURE 2

One product contained both glucosamine and chondroitin sulfate. However, the amounts of the labeled products were somewhat lower than the label claims. Glucosamine content was 86.0% of label claim and the chondroitin sulfate content was 83.3% of the label claim.

One study of oral joint supplement products intended for humans indicated that the quality of the product may be a function of the retail price. The price of the products tested in this study was calculated on a per gram of ingredient content as reflected on the label. The price of glucosamine varied from a low of 11 cents per gram to a high of 79 cents per gram. The price of chondroitin sulfate varied from a low of 21 cents per gram to a high of \$1.36 per gram. However, as seen in Table 1, the price of the product did not appear to be related to the purity.

**TABLE 1**

<b>Glucosamine</b>	<b>Chondroitin Sulfate</b>
<b>Price/gram = per cent of label claim</b>	<b>Price/gram = per cent of label claim</b>
.11/g G = 94.3	.21/g CS = 118.6
.23/g G = 112.2	.39/g CS = 22.5
.25/g G = 101.4	.44/g CS = 40.3
.27/g G = 99.7	.78/g CS = 155.7
.46/g G = 83.3	.79/g CS = 131.7
.53/g G = 63.6	1.36/g CS = 86.0

This study shows that in some instances, the amount of chondroitin sulfate or glucosamine found in over-the-counter products may vary greatly from the amount reported on the label. The implications for this study suggest that horse owners may not be purchasing what they think that they are purchasing. In spite of terms such as “quality tested” appearing on labels, the fact is that there is no way for horse owners or even veterinarians to compare one product against another, or even to judge the quality of the products that they are buying or recommending. There is an obvious and urgent need for regulation of the oral joint supplement manufacturing process.

In light of the findings of deviations between the content of active ingredients and what is stated by the manufacturers on the labels of their products, it is interesting to ask, “What’s a person who wants to employ oral joint supplements supposed to do?” Some recommendations, based on suggestions made by The Arthritis Foundation for people interested in such products may be helpful:

1. Horse owners should consult with their veterinarians concerning these two supplements
2. Veterinarians should become knowledgeable about glucosamine and chondroitin sulfate products
3. Horse owners should not buy such products through the mail or over the internet unless they know the seller
4. Horse owners should ask manufacturers for research showing that their brand has been scientifically proven or studied, and should ask their veterinarians for help in interpreting the results
5. Horse owners should avoid products that are not backed by scientific research
6. Horse owners and veterinarians should look skeptically at products that make claims such as the ability to regenerate, rebuild or renew joint cartilage or cure arthritis. Such claims have never been demonstrated in any species.

These findings validate an overall attitude of skepticism in regards to claims of quality control in the nutraceutical industry. It should always be kept in mind that these products are not pharmaceuticals and there is no requirement that manufacturers of such products follow Good Manufacturing Practices to guarantee high quality products or consistency between batches of product. Furthermore, consumers cannot be sure that just because they have purchased the most expensive product, they have also purchased a pure product. It is perhaps not surprising to learn that the Arthritis Foundation has recently suggested that “when a supplement has been studied with good results, find out which brand was used in the study and use that.” While that may be the best advice that can be given, it is also obvious from these results that not all manufacturers of oral joint supplement products appear to be concerned about the quality of their products.