Comparative morphometric evaluation of the supraspinatus and infraspinatus muscles in the horse.

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1. Introduction

Knowing the important differences in muscle architecture between different muscles, the aim of this study was to compare the cross-sectional area (CSA) of supraspinatus and infraspinatus muscles (which haven't been studied too extensively in the past) to the CSA of well studied muscles like triceps brachii and semimembranosus.

Image 1. Image of a transversal section of the supraspinatus muscle. One muscle fiber is being measured with the *ImageJ* software.

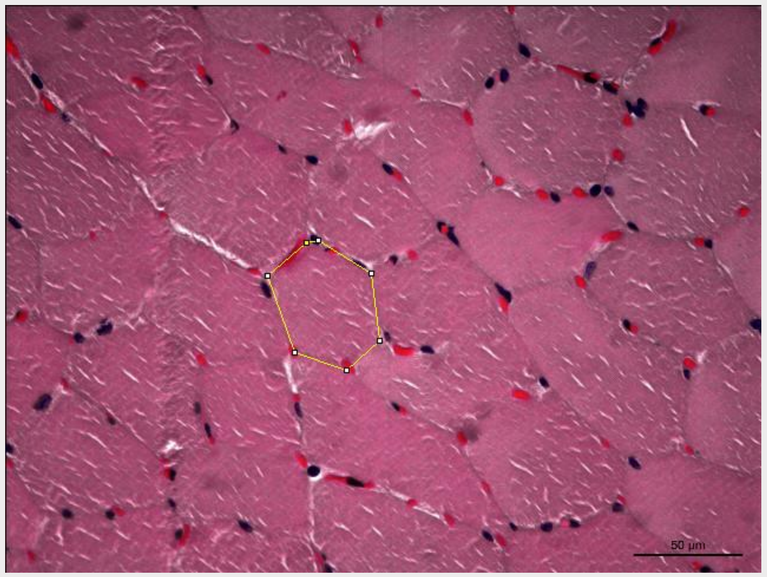
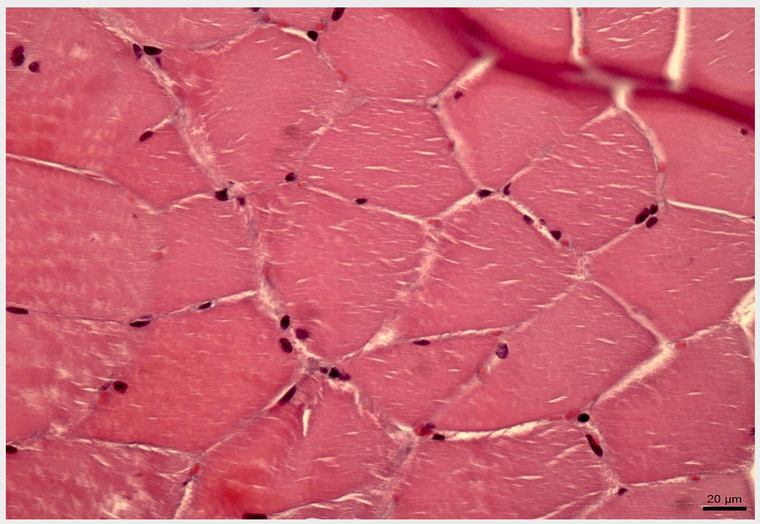
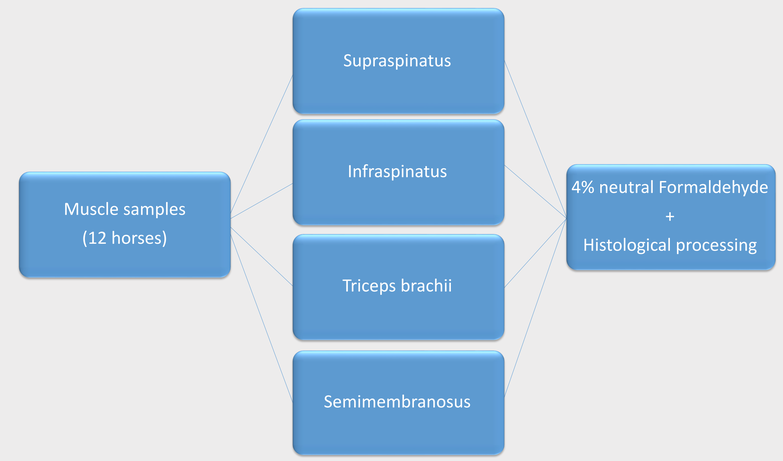


Image 2. Image of a transversal section of the triceps brachii muscle. A difference in muscle fiber size can be appreciated.



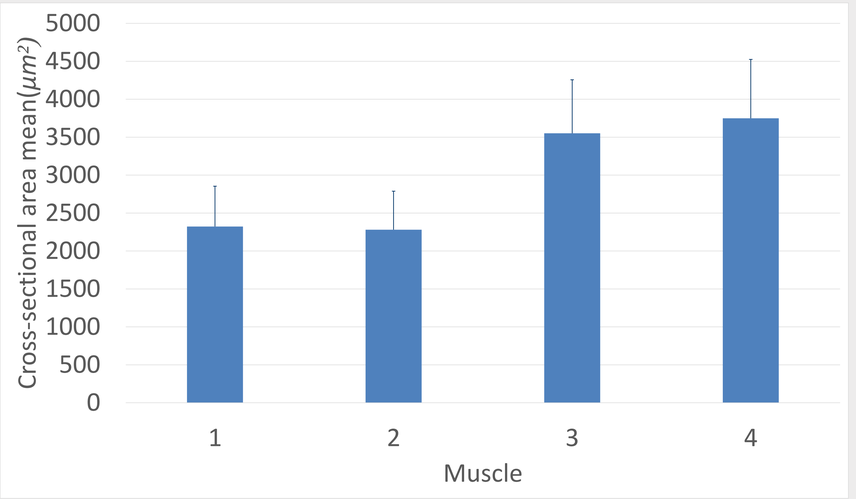
2. Materials and Methods



3. Results

As seen in *Graphic 1,* the findings after the measuring of 550 muscle fibers for each muscle among the eleven horses studied, show that the mean CSA of supraspinatus (2322,91µm^2) and infraspinatus (2281,07 µm^2) muscles were lower than the ones found in the triceps brachii (3551,46 µm^2) and semimembranosus (3749,01 µm^2) muscles.

After running the Bonferroni and Student-Newman-Keuls statistical tests the difference between the means of supraspinatus and infraspinatus weren't statistically significant as the ones from triceps brachii and semimembranosus.



Graphic 1. Bar Chart showing the cross-sectional (CSA) mean of the studied muscles. (1) Supraspinatus, (2) Infraspinatus, (3) Triceps brachii, (4) Semimembrenosus.

4. Conclusions and Discussion

As the CSA between the two muscle groups (supraspinatus and infraspinatus in comparison with triceps brachii and semimembranosus) is significantly different, we could expect them to have also different functionality, but they all are described as flexor or extensor muscles of the fore or hindlimb. Supraspinatus and infraspinatus are extensor muscles of the shoulder, triceps brachii is a flexor of the shoulder and semimembranosus a extensor of the hip, among other functions.

Therefore, as suggested by Watson J. C. And Wilson A. M (2007) [1], supraspinatus might serve more as a stabilizer of the shoulder than a flexor of it. This data could be extrapolated to the infraspinatus also, as it's location and function doesn't differ significantly from supraspinatus and the findings were similar.

Following the idea that Type I, slow contracting and with oxidative metabolism, muscle fibers tend to have lower CSA [2] the dominance of those fibers in the supraspinatus and infraspinatus muscles could explain the findings.

The small sample pool and the usage of an H&E stain to process the histological sections was a limitation of this study. A bigger sample pool would have ensured more accurate results. Using H&E stain didn't make it possible to differentiate muscle fiber type, what could have turned the outcome to another direction.

[1] Watson JC, Wilson AM. Muscle architecture of biceps brachii, triceps brachii and supraspinatus in the horse. *J Anat*. 2007;210(1):32–40.

[2] Lopez-Rivero JL, Piercy RJ., Chapter 5: Muscle physiology: responses, exercise and training. In: Kenneth W Hinchcliff, Andris J. Kaneps, Raymond J. Geor, Equine Sports Medicine and Surgery: Basic and clinical sciences of the equine athlete, 1st Edition, SAUNDERS (Elsevier Ltd), 2004, p. 45-76.