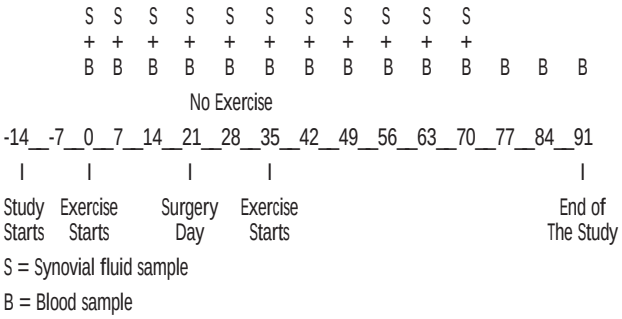
The Effect of Exercise on Synovial Fluid and Serum Markers of Musculoskeletal Diseases in Horses With and Without Osteochondral Fragmentation

Summary: This study attempted to distinguish between the normal changes in bone and articular cartilage biochemical markers as a result of exercise versus the pathological changes of these markers as a result of disease. Early results showed that the amount of breakdown of collagens and proteoglycans are significantly higher in exercised horses with OCF compared to the exercised horses without joint disease, and that there is an increase in the breakdown and synthesis of articular cartilage in the OCF group versus the horses without joint disease.

For his PhD work, Fahd Al-Sobayil, under the supervision of Drs. David Frisbie, Clark Billinghurst, Chris Kawcak, Wayne McIlwraith and Richard Park, is working to distinguish between the normal changes in bone and articular cartilage biochemical markers as a result of adaptation (exercise) versus the pathological changes of these markers as a result of disease (osteochondral fragmentation, which is a model of osteoarthritis in the horse).

Sixteen healthy, 2-year-old horses were used to study the effect of exercise on markers. All of the horses were exercised on the treadmill for three weeks. The exercise regimen was two minutes trotting (8-12 mph), two minutes galloping (25-33 mph), and two minutes trotting 5 days per week. Each horse was randomly assigned to be either in the treatment group (n = 8) or control group (n = 8). On day 21, the arthroscope was used to experimentally induce an osteochondral fragmentation (OCF) in the distal radial carpal bone of one randomly chosen intercarpal joint of each horse in the treatment group. Exploratory surgery, using the arthroscope, was performed to the opposite intercarpal joints of the treatment group and to those of the control group.

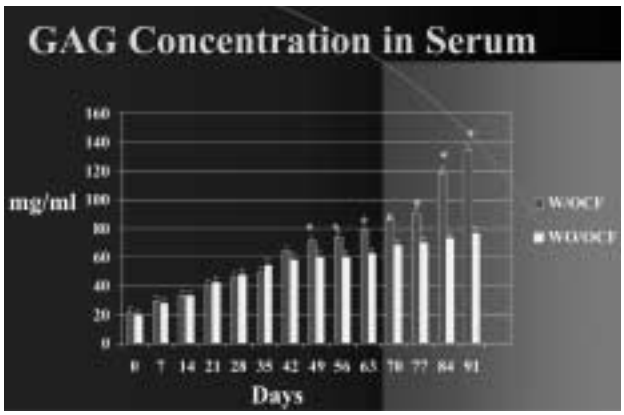


S = Synovial fluid sample

B = Blood sample

Exercise was stopped for two weeks after surgery, and started again on day 35 until the end of the study (day 91). Blood samples and synovial fluids were collected once a week from both right and left intercarpal joints of each horse beginning on day 0 until the end of the study (day 91).

Early results showed that there was a significant increase in the concentration of COL2-3/4Csort, SGAG, CPII, and CS846 in both serum and synovial fluid samples obtained from horses with OCF compared to the control. This indicates that the amount of breakdown of collagens and proteoglycans are significantly higher in exercised horses with OCF compared to the exercised horses without joint disease. On the other hand, there is an increase in the synthesis of type II collagen and aggrecans in horses with OCF compared to those without joint disease. This leads to the conclusion that there is an increase in the breakdown and synthesis of articular cartilage in the OCF group versus the control group. There was a trend for an increase in the concentration of serum osteocalcin in the exercised horses with OCF compared to the controls. However, no difference in the concentration of synovial fluid osteocalcin has been seen between the two groups.



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