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**Post-traumatic fetlock osteoarthritis in Standardbred racehorses: The culprit of long-term progression to degenerative joint disease?**

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**Title:** Post-traumatic fetlock osteoarthritis in Standardbred racehorses: is it the culprit of long-term progression to degenerative joint disease?

### **Abstract Body**

**Introduction:** Osteoarthritis (OA) begins many years before structural changes are detectable, since DJD span over a life in man. In racehorses progression from post-traumatic OA stage to DJD seems much shorter. The purpose of this study was to assess changes in inflammatory and structural biomarkers in serum (S) and synovial fluid (SF) in a cohort of STBRs diagnosed with post-traumatic fetlock OA over the racing career of the animals. We hypothesised that biomarkers assay could demonstrate the progression of degenerative status in the joints after post-traumatic OA, better than clinical and radiographic assessment.

**Materials and methods:** Thirty-seven STBRs between 18-24 months of age, diagnosed with fetlock joint OA as a cause of lameness, were included in the study. Horses were observed over a period of 5-years of racing activity. Six sound, age-matched STBRs were used as healthy controls. Blood and SF sampling from affected joints, lameness and radiologic examinations were performed at the first lameness episode and repeated once a year. Samples were processed for IL-1 $\beta$ , IL-6, TNF- $\alpha$ , COMP and CTX-II using ELISA kits. A semi-quantitative radiographic-based score was employed to define the severity of OA. A mixed linear model analysis was employed for multiple comparisons between C and OA groups over the timeframe of the study.

**Results:** Twenty-five horses fulfilled study requirements. Significant differences between C and OA were detected for all the biomarkers in SF at T4 and T5. In S those differences were not recorded for IL-6. Concentrations of inflammatory cytokines in OA decreased at T2, followed by an increase with time in SF and S, and attaining a significant difference to baseline at T4 (IL1 $\beta$ , TNF- $\alpha$ ) and T5 (IL1 $\beta$ , IL-6, TNF- $\alpha$ ). Structural biomarkers showed an increased trend during consecutive assessments with a significant difference to T1 in S and SF at T3, T4 and T5. A significant progression over time was evident for radiographic score in the OA group, but not for clinical assessment. In a multivariate analysis only TNF- $\alpha$  values in SF significantly and independently contributed in explaining radiological changes at T4 and T5.

**Discussion/Conclusions:** Both inflammatory and structural biomarkers were increased in the S and SF of OA-affected STBRs, demonstrating that long-term increased concentration of biomarkers is a disease-effect. Biomarkers could predict structural progression of traumatic OA with a better accuracy than clinical and radiological assessment. TNF- $\alpha$  in the SF was correlated with radiological changes, raising the suggestion that cartilage degradation is up regulated by inflammatory stimuli. In conclusion, this study underlines that early post-traumatic fetlock OA and the DJD status are closely interdependent processes.