

Public Abstract

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Title:The Role of Load in Initiation and Progression of Cartilage Pathology

Articular cartilage is primarily responsible for dissipation of load in diarthrodial joints. Load plays a critical role in maintaining cartilage health, but can also be a primary contributing factor in cartilage disease. Osteoarthritis, initially seen as cartilage degradation, can result from application of abnormal loads to normal tissue or application of normal load to abnormal tissue. IL-1 β is known to play a major role in the initiation and progression of osteoarthritis through inciting cascades which cause inflammation and degradation. When cartilage degradation and the associated symptoms occur, corticosteroids are used extensively in the equine industry. Corticosteroids do have beneficial effects with respect to lameness and inflammation, but can exacerbate cartilage degradation and hinder tissue healing. Therefore, it is important to understand the roles and interactions of load, IL-1 β , and corticosteroids with respect to cartilage health and disease.

To better understand the effects of corticosteroids and IL-1 β on articular cartilage in vivo, relevant gene expression, extracellular matrix composition, and biomarker production of cartilage subjected to various combinations of load, corticosteroids, and IL-1 β were analyzed using in vitro tissue explant and 3-D chondrocyte culture systems. The results from this study have begun to disclose some of the effects of various loads on articular cartilage. Higher frequencies and durations of compressive loading seemed to have more pronounced deleterious effects on cartilage, even within physiological loading ranges. In combination with corticosteroids, compressive loads at 2 and 6 MPa delivered at a frequency of 1 Hz for 20 minutes three times a day resulted in changes similar to those reported in corticosteroid-induced arthropathy. However similar compressive load delivered at lower frequencies at 2 and 6 MPa delivered at a frequency of 0.1 Hz for 20 minutes three times a day seemed to mitigate some of the deleterious effects of IL-1 β as evidenced by decreased expression of matrix metalloproteinases when compared to unloaded samples and samples loaded at higher frequencies.