Kentucky Equine Research®
World Leaders In Equine Nutrition

Advances in Equine Nutrition

Volume II

Edited by

J.D. Pagan

GLUCOSAMINE INHIBITS NITRIC OXIDE PRODUCTION IN EQUINE ARTICULAR CARTILAGE EXPLANTS

J.I. FENTON, K. CHLEBEK-BROWN, J.P. CARON, M.W. ORTH
Michigan State University, East Lansing, MI

Osteoarthritis (OA) is a progressive degradation of articular cartilage that is a common cause of lameness for athletic horses. Oral supplementation of compounds that prevent cartilage degradation and/or joint injury is an attractive solution for lameness. Glucosamine is a potential antiarthritic compound currently being marketed. It is a naturally occurring, non-toxic molecule that decreased pain and improved mobility in osteoarthritic joints in a number of human studies. In vitro data suggests that glucosamine may increase the synthetic activity of chondrocytes. However, the biochemical basis to support its potential as an antiarthritic agent is not well documented. One molecule thought to accelerate the progression of OA is nitric oxide. Equine chondrocytes have recently been shown to produce nitric oxide in response to two arthritogenic molecules, lipopolysaccharide (LPS) or recombinant interleukin-1ß (rhIL-1ß). In addition, increased concentrations of nitric oxide and interleukin-1 are observed in synovial fluid from diseased joints. In vitro data suggest that nitric oxide activates cartilage degrading enzymes, specifically metalloproteinases. Therefore, the objective of this study was to determine whether glucosamine could inhibit nitric oxide production in equine articular cartilage explants. Articular cartilage was obtained from the carpal joint of horses (2-8 years old) sacrificed for reasons other than joint problems. Three 3.5 mm cartilage discs were biopsied from the weight bearing region of the proximal articular surface (weighing 40-60 mg total) and were placed in each well with 1 ml of Dulbecco's modified Eagle's medium: F12 (1:1) + 10% fetal bovine serum. Media was exchanged daily. The recovered media was stored at 4EC until analyzed. Explants were maintained in basal media two days prior to the start of treatments. Varying concentrations of LPS (10 or 50 µg/ml), rhIL-1 (50 ng/ml), and glucosamine (0.25, 2.5, or 25 mg/ml) were then added to wells. Treatments were done in triplicate. Control wells without LPS, rhIL-1ß, and glucosamine were run with each experiment. Nitric oxide released into media peaked the first day after adding LPS or rhIL-1ß and returned to baseline concentrations by the third day. In three separate experiments, the addition of 25 mg/ml of glucosamine to the explant culture in the presence of LPS or rhIL-1ß prevented the increase in nitric oxide production. Additionally, at 10 µg/ml LPS, 2.5 mg/ml glucosamine partially inhibited nitric oxide production. Our results suggest that glucosamine could prevent cartilage degradation by inhibiting nitric oxide production. Future experiments will focus on how glucosamine inhibits nitric oxide and whether these results are replicated in *in vivo* experiments.


Kentucky
Equine
Research®