The Effects of Glucosamine Derivatives on Equine Articular Cartilage Degradation in Explant Culture

ABSTRACT

OBJECTIVE

To determine whether glucosamine-3-sulfate, glucose-3-sulfate (control) and N-acetyl glucosamine inhibit experimentally induced degradation of equine articular cartilage explants similar to glucosamine HCl.

DESIGN

Articular cartilage was obtained from the antebrachio-carpal and middle joints of horses (2-8 years old) killed for reasons unrelated to lameness. Cartilage discs were harvested from weight-bearing region of the articular surface and cultured. Media were exchanged daily and the recovered media stored at 4°C. On days 1 and 2 lipopolysaccharide (LPS, 10 µg/ml) was added to induce cartilage degradation. To evaluate the effects of different sources of glucosamine (on an equal molar basis), varying concentrations of glucosamine HCl (0.25, 2.5 or 25 mg/ml), glucosamine-3-sulfate (0.304, 3.04, or 30.4 mg/ml), or N-acetyl-glucosamine (0.256, 2.56, or 25.6 mg/ml) were added to the cultures. The glucose-3-sulfate control was added at 0.3075, 3.075 or 30.75 mg/ml. Nitric oxide and proteoglycan released into conditioned media and tissue proteoglycan synthesis and total tissue PG content were measured ad indicators of cartilage metabolism.

RESULTS

Glucosamine-3-sulfate consistently inhibited cartilage degradation in a manner similar to glucosamine HCl, while the effects of N-acetyl-glucosamine were highly variable and did not inhibit cartilage degradation. Glucose-3-sulfate did not inhibit cartilage degradation.

CONCLUSIONS

Our results indicate that glucosamine sulfate also has the potential to prevent or reduce articular cartilage degradation similar to glucosamine HCl in vitro. The amine group at the carbon 2 position appears important for the effectiveness of the glucosamine derivative. The therapeutic value of N-acetyl glucosamine remains questionable.