

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 as 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.