

INFLUENCE OF COLLAGEN HYDROLYSATE ON THE EXTRACELLULAR MATRIX METABOLISM OF HUMAN CHONDROCYTES

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Aim of the study: Clinical studies have demonstrated the positive effect of orally administered collagen hydrolysate in the treatment of osteoarthritis. The objective of this study was to investigate the effect of a specific collagen hydrolysate (CH) on the biosynthesis of human chondrocytes in a cell culture model.

Methods: The experiments were performed using monolayer cultures and 3D alginate cultures of human femoral head chondrocytes. Human articular cartilage was collected from patients that had undergone primary hip replacement after femoral neck fractures. Presence of osteoarthritis in the operated joint was excluded on the basis of x-ray examinations and patient interviews. Chondrocytes were isolated from the cartilage within 3 hours after surgery and cultured under reduced oxygen conditions.

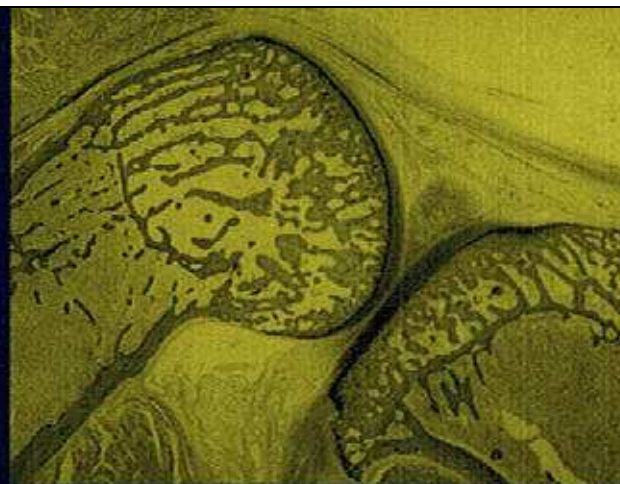
The CH used in the investigation had a mean MW of 3.3 kDa, with fragments predominantly representing degraded type I collagen. To start the experiment, culture medium of the isolated chondrocytes was supplemented with CH and at the end of the observation period type II collagen biosynthesis was quantified by means of ELISA technique. The results were confirmed by immunocytochemical detection of type II collagen and by analyzing the incorporation of ¹⁴C-proline into matrix proteins. Moreover, the amount of pericellular proteoglycans was determined by a colorimetric assay and protease activity in the culture media was assayed by means of gelatine-substrate zymography.

Results: Supplementation of the culture medium with CH led to a dose-dependent, statistically significant ($p < 0.05$) increase of type II collagen biosynthesis in human chondrocytes compared to the control cells cultured in basal culture medium. At a concentration of 0.5 mg CH/ml a maximum stimulation of type II collagen synthesis of more than 25% was observed. Moreover, the amount of pericellular proteoglycans was also significantly ($p < 0.05$) increased after administration of CH, whereas the presence of extracellular CH had no significant effect on the protease activity of human chondrocytes compared to the untreated controls.

Conclusion: These results indicate a stimulatory effect of CH on the synthesis of extracellular matrix macromolecules by human chondrocytes, whereas protease activity of the cells is not affected by CH treatment. Based on these data, we have provided evidence that CH might contribute to reduce degenerative alterations of the extracellular matrix and thus might be of therapeutic relevance in the treatment and prevention of osteoarthritis.

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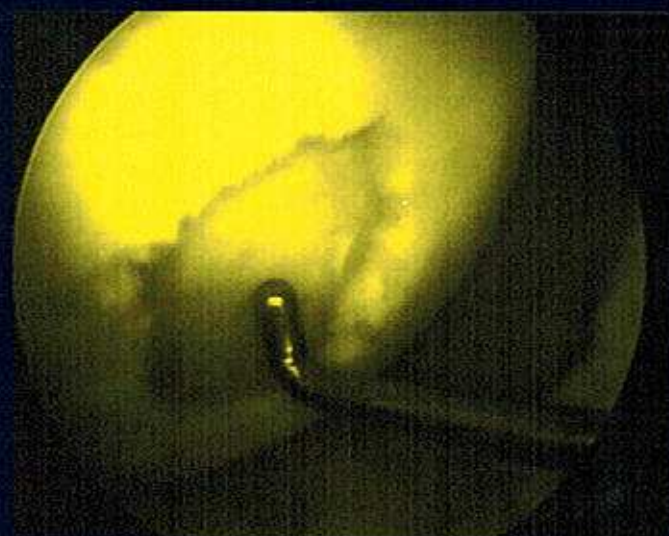
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