Interleukin-1 β disturbs the antioxidant enzyme system in bovine chondrocytes: a possible explanation for oxidative stress generation.

M Mathy-Hartert 1, L Hogge 1, C Sanchez 1, G Deby-Dupont 2, Henrotin Y 1,2

1 Bone and Cartilage Metabolism Research, University of Liege, Belgium.
2 Centre for Oxygen Research and Development, University of Liege, Belgium.

CONCLUSIONS.

We have demonstrated that IL-1β disturbs the antioxidant enzyme system in chondrocytes. This cytokine induces a rapid increase of SOD activity and a delayed decrease of Cat activity. These regulatory effects occur at transcriptional level. MnSOD gene activation was mediated by NF-κB. The imbalance between SOD and Cat could result in H₂O₂ accumulation, and generate intracellularly an oxidative stress. To reinforce the antioxidant defences of chondrocytes should be considered in the management of osteoarthritis.

AIM OF THE STUDY.

Reactive oxygen species (ROS) play a major role in the pathogenesis of degenerative joint diseases. To prevent ROS toxicity, chondrocytes possess a well-coordinated antioxidant enzyme system mainly formed by superoxide dismutases (SOD) and catalase (Cat). This work was designed to assess the effects of interleukin (IL)-1β on the gene expression and enzymatic activity of SOD and Cat in bovine chondrocytes.

METHODS.

Bovine chondrocytes were cultured in monolayer in the absence or in the presence of IL-1β. Cells were co-incubated with IL-1β and inhibitors of mitogen-activated protein kinases (MAPK) inhibitors (PD98059, SB203580, SP600125) or NF-κB inhibitors (BAY11-7082, MG-132). SOD and Cat enzymatic activities were evaluated in cellular extract by using respectively the SOD Assay Kit-WST (Dojindo Molecular Technologies) and the Amplex Red Catalase Assay (Molecular Probes). Cu SOD, Mn SOD and Cat gene expressions were quantified by real time RT PCR.

RESULTS.

SOD activity and Mn SOD gene expression was prevented by NF-kB inhibitors but not by MAPK inhibitors. IL-1β increased Mn SOD mRNA level, but decreased Cu SOD mRNA level. IL-1β increased Cat mRNA level. SOD activity and Mn SOD gene expression was prevented by NF-kB inhibitors but not by MAPK inhibitors.