

## Chondroprotective effects of low-frequency low-energy pulsed electromagnetic fields on human cartilage explants

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**Objective** To investigate the effects of low-frequency low-energy pulsed electromagnetic fields (PEMFs) on proteoglycans (PG) metabolism [1-2] of human articular cartilage explants derived from patients with different osteoarthritis (OA) grades in the presence and in the absence of anabolic and catabolic stimuli for cartilage.

**Design** Human knee cartilage explants derived from lateral and medial femoral condyles of OA patients were exposed to PEMF (1.5 mT; 75 Hz) for 1 and 7 days with and without insulin-like growth factor-I (IGF-I) (50 ng/ml) and interleukin-1 $\beta$  (IL-1 $\beta$ ) (0.01-50ng/ml). Histological analysis was used to classify cartilage according to the score developed by the International Cartilage Repair Society (ICRS). PG synthesis was determined by <sup>35</sup>S-sulfate incorporation. PG release into culture media was determined by the dimethylmethylene blue assay.

**Results** By histological evaluation, cartilage explants derived from lateral and medial condyles were classified as OA ICRS grade I and III, respectively. After 7 days treatment, in OA grade I cartilage explants, PEMF and IGF-I alone significantly increased <sup>35</sup>S-sulfate incorporation respect to control and counteracted the effect induced by IL-1 $\beta$  (0.01 ng/ml) of 26% and 24% respectively. The combination of PEMF and IGF-I resulted additive in all conditions. Similar results were obtained in OA grade III cartilage, although basal <sup>35</sup>S-sulfate incorporation was lower than in OA grade I. No effect was observed on medium PG release.

**Conclusions** PEMF exerts chondroprotective effects on human articular cartilage. The biological responsiveness of chondrocyte to PEMF was similar in different OA grades cartilage, suggesting that human chondrocytes maintain susceptibility to PEMF during OA progression.

### References

- [1] De Mattei M et al. (2004) Osteoarthritis Cartilage. 12:793-800.
- [2] De Mattei M et al. (2003) Connect Tissue Res. 44:154-9.

### Key words

Human cartilage, pulsed electromagnetic fields, proteoglycan metabolism, osteoarthritis