Immediate Effect of Low-intensity Pulsed Ultrasound on Cartilage Metabolism:
A Study Used Different Intensities

Akira ITO, PT, Shoki YAMAGUCHI, PT, Hiroshi KUROI, PT, PhD
Motor Function Analysis, Human Health Sciences, Graduate School of Medicine, Kyoto University

Tomoki AOYAMA, MD, PhD
Development and Rehabilitation of Motor Function, Human Health Sciences, Graduate School of Medicine, Kyoto University

Haruhiko AKIYAMA, MD, PhD
Department of Orthopaedic Surgery, Graduate School of Medicine, Kyoto University

**Purpose:** The purpose of this study was to investigate the immediate effect of low-intensity pulsed ultrasound (LIPUS) used at several intensities on chondrocyte metabolism by gene expression analysis.

**Methods:** Chondrocytes were isolated from the knee joint of 12-week-old Wistar rat. In order to induce osteoarthritis (OA) -like condition experimentally, interleukin-1β (IL-1β) of 0 pg/ml, 100 pg/ml and 1000 pg/ml concentration was added to the isolated chondrocytes. Then the chondrocytes were stimulated for 20 min by LIPUS of 0, 7.5, 30 and 120 mW/cm² intensity. After stimulation, gene expression analysis was conducted.

**Results:** Matrix metalloproteinase (MMP) -13 mRNA expression, articular cartilage degeneration factor, induced by IL-1β at a concentration of 100 pg/ml was inhibited in an LIPUS intensity-dependent manner. Type 2 collagen and aggrecan mRNA expression, main articular cartilage matrix component, showed the inhibiting tendency by LIPUS stimuli.

**Conclusions:** Our results suggest that LIPUS may potentially protect articular cartilage by inhibiting MMP13 mRNA expression in an intensity-dependent manner.