Gene Expression Patterns in Bone Following Mechanical Loading

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Abstract

Mechanical loading is a potent anabolic stimulus that substantially strengthens bones, and the time course of bone formation after initiating mechanical loading is well characterized. However, the time sequence for gene expression in a bone subjected to mechanical loading, over an extended period of time, has not been established. The advent of high-throughput measurements of gene expression and bioinformatics analysis methods offers new ways to study gene expression patterns. The primary goal of this study was to determine the time sequence for gene expression in a bone subjected to mechanical loading, during key periods of the bone formation process, including expression of matrix-related genes, the appearance of active osteoblasts, and bone desensitization. We evaluated loading-induced gene expression over a time course of 4 hours to 32 days. We then used bioinformatics tools to cluster genes into similar expression patterns and created groups of genes with common functions or signaling pathways.