



## Exercise Biochemistry Review

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### Effects of Exercise on Gene Expression Correlative to Bone Metabolism in Peripheral Blood Mononuclear Cells

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**Objective** To examine the gene expression pattern of Peripheral Blood Mononuclear Cells (PBMCs) and to explore exercise-sensitive genes correlative to bone metabolism in PBMCs. Thus to provide a theoretical basis for exercise intervention to prevent and treat osteoporosis.

**Methods** Uphill (+8°) and downhill (-8°) training were used for the exercise loading in two-month-old male Sprague-Dawley rats. The exercise method performed at 25 m/min, training 50 min/d, 5 d/wk, for 12 wk, respectively. Bone mineral density of distal femurs was measured using dual X-ray absorptiometry, and the expressed gene profile of PBMCs was examined using Gene Chip IVT Labeling Kit (Affymetrix).

**Results** Compared with control (CON) group, the BMD of the femur in the downhill (DOWN) group was significantly increased. Compared with the uphill (UP) group, the BMD and BMC of the femur in the DOWN group were significantly increased. There were 38 genes detected differentially expressed between two exercise groups together with CON group. The expression of genes modified by running involved in immunity, cell proliferation, Rheumatoid arthritis, Cell adhesion molecules and Tnf signaling pathway. There were 105 differently expressed genes between the DOWN group and the UP group which were mainly enriched in biological processes and pathways such as response to hydrogen peroxide, lipopolysaccharide, cell factor and mechanical stimulus, Cell adhesion molecules, cell migration, collagen biosynthetic process and Tnf signaling pathway. Tnf, Cxcl2, Ccl2, Jun and Mmp9 as the key nodes of protein interaction network were identified as candidate genes related to bone metabolism and sensitive to exercise.

**Conclusions** With weight gaining, age increasing and training time prolonging, long-term and high-intensity exercise will be harm for bone. At the same time and same running speed, downhill running conduces to increase bone density more than uphill running. It may be associated with differential expression of exercise-sensitive genes involved in bone metabolism in PBMCs.