Fructooligosaccharides increase bone mineral density through an interleukin-6-mediated mechanism in growing female Wistar rats


Fructooligosaccharides (FOS) are prebiotics (nonviable food components which confer health benefits through modulation of microbiota) that enhance calcium absorption and reduce bone resorption (removal of bone mediated by osteoclasts), resulting in beneficial effects on bone metabolism. We evaluated the effect of FOS on bone status of growing rats. Sixteen weaning female Wistar rats were assigned in two groups: control group=standard AIN-93M diet; FOS group=AIN-93M diet with 5% of FOS (Orafti® P95). Intervention was carried out for 16 weeks. Lumbar spine bone mineral density (BMD) was assessed using dual-energy x-ray absorptiometry. Serum interleukin-6 (IL-6), osteoprotegerin (OPG) and receptor activator of NF-kB ligand (RANK-L) concentrations (pg/mL) were determined by kits based on MILLIPLEX® MAP technology. Data were evaluated using one-way analysis of variance followed by Tukey test. Values are mean±standard error of the mean. Results were considered statistically different when p<.05. FOS significantly increased BMD (0.218±0.007 versus 0.166±0.003g/cm² of controls). RANK-L and OPG were not statistically different between the groups (RANK-L: control=193.130±51.555, FOS=276.025±63.306; OPG: control=949.03±136.607, FOS=1332.796±337.200). RANK-L induces macrophage colony-forming units (CFU-M) fusion to give rise to mature osteoclasts, activates and increases the survival of these cells, therefore leading to bone resorption. OPG neutralizes RANK-L, blocking bone resorption. FOS significantly decreased IL-6 (128.214±27.307 versus 758.350±256.778 of controls). IL-6 can increase osteoclasts number by stimulating CFU-M proliferation and induce osteoclast differentiation regardless of the presence of RANK-L. FOS intake improved bone health in growing rats. IL-6 reduction may be an important mechanism mediating FOS effect on bone resorption reduction, and consequently on BMC increase.