Effects of extracellular magnesium on the differentiation and function of human osteoclasts.

Magnesium-based implants have been shown to influence the surrounding bone structure. In an attempt to partially reveal the cellular mechanisms involved in the remodelling of magnesium-based implants, the influence of increased extracellular magnesium content on human osteoclasts was studied. Peripheral blood mononuclear cells were driven towards an osteoclastogenesis pathway via stimulation with receptor activator of nuclear factor kappa-B ligand and macrophage colony-stimulating factor for 28 days. Concomitantly, the cultures were exposed to variable magnesium concentrations (from either magnesium chloride or magnesium extracts). Osteoclast proliferation and differentiation were evaluated based on cell metabolic activity, total protein content, tartrate-resistant acid phosphatase activity, cathepsin K and calcitonin receptor immunocytochemistry, and cellular ability to form resorption pits. While magnesium chloride first enhanced and then opposed cell proliferation and differentiation in a concentration-dependent manner (peaking between 10 and 15 mM magnesium chloride), magnesium extracts (with lower magnesium contents) appeared to decrease cell metabolic activity (~50% decrease at day 28) while increasing osteoclast activity at a lower concentration (twofold higher). Together, the results indicated that (i) variations in the in...
vitro extracellular magnesium concentration affect osteoclast metabolism and (ii) magnesium extracts should be used preferentially in vitro to more closely mimic the in vivo environment.