Toxic effects of gentamicin on marrow-derived human mesenchymal stem cells.

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We hypothesized that the high concentrations of gentamicin achieved after local administration would have toxic effects on human mesenchymal stem cells. These cells were isolated from bone marrow from three healthy adult donors and cultured with different concentrations of gentamicin (0 microg/mL, 50 microg/mL, 100 microg/mL, and 200 microg/mL) for 7 days. After 7 days of gentamicin exposure, we examined cell viability, proliferation, and in vitro and in vivo osteochondrogenic capacity. Gentamicin did not have an adverse effect on the viability of human mesenchymal stem cells in all test groups, but did inhibit cell proliferation at concentrations of 100 microg/mL and 200 microg/mL. In vitro osteogenesis, gentamicin decreased the DNA content and alkaline phosphatase activity of human mesenchymal stem cells at an early stage (Days 4 and 8) in a dose-dependent manner. For chondrogenesis, glycosaminoglycan content and Type II and Type X collagen deposition were lower in the pellets made with cells expanded in gentamicin at 100 or 200 microg/mL relative to cells expanded in medium without gentamicin. A comparable effect on osteochondrogenesis was observed in an in vivo model. At a high concentration, gentamicin inhibits proliferation and differentiation of human bone marrow mesenchymal stem cells and could compromise the bone-healing process.

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