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Effects of rifampicin on osteogenic differentiation and proliferation of human mesenchymal stem cells in the bone marrow

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ABSTRACT. This study was designed to investigate the effect of different concentrations of rifampicin on osteogenic differentiation and proliferation of mesenchymal stem cells (MSCs) in human bone marrow. Rifampicin treatment at 0, 4, 8, 16, 32, 64, and 128 μg/mL was applied throughout the whole process, from stromal cells purified from human bone marrow to differentiated bone cells. The effect of rifampicin on MSC proliferation was determined using the MTT assay. The effect of rifampicin on the expressions of type I collagen (COL1A1), osteopontin/bone Gla protein (OPN/BGP), and alkaline phosphatase (ALP) in human osteoblast cells were determined by real-time polymerase chain reaction, and the expressions of COL1A1, OPN/BGP, and the runt-related transcription factor (RUNX2) were determined by Western blot. Results showed that the proliferation of MSCs was significantly inhibited when the rifampicin concentration exceeded 32 μg/mL. In addition, increased rifampicin concentrations inhibited the formation of calcium nodules, OPN/BGP, and COL1A1 in osteoblasts after 28 days of induction. The RNA expressions of OPN/BGP, COL1A1, and ALP were significantly downregulated compared to those of the control group in osteoblasts

after induction. The protein expressions of RUNX2, COL1A1, and OPN/BGP were also significantly downregulated compared to those of the control group after induction. In conclusion, rifampicin at exorbitant concentration exerts adverse effects on the proliferation of MSCs in human bone marrow and the differentiation of osteoblasts.

Key words: Rifampicin; Proliferation; Mesenchymal stem cell; Osteoblast differentiation

