
Comparative study on osteogenic differentiation of human bone marrow derived and human periodontal ligament derived mesenchymal stem cells by non-thermal bio-compatible plasma

Ying Li¹, Eun Ha Choi¹, and Ihn Han¹

¹Kwangwoon University, Korea, Republic of

Non-thermal bio-compatible plasma (NBP) in bone tissue engineering has been progressively attracting much attention. Several studies have investigated the role of plasma in enhancing or inducing stem cell to differentiate into osteoblasts, which points towards the idea that NBP as a new technology for bone tissue engineering. However, the regulation of proliferation and differentiation potential of NBP has been poorly understood. To establish the concept of NBP as a new technology in bone tissue engineering, the stem cells derived from human tissue was used in present study, namely human bone marrow-derived mesenchymal stem cell (hBMSCs) and human periodontal ligament-derived mesenchymal stem cells (hPDLSCs). Here, we elucidated the effects of NBP on cell metabolic activity, colony forming ability, alizarin red staining (ARS, as a marker of extracellular mineralization) and osteogenic related gene (alkaline phosphatase, runt-related transcription factor 2 (Runx2), osteocalcin and osteonin) for these two kinds of stem cells respectively, and particularly analyzed the effect of NBP on cell survival and osteogenic differentiation between hBMSCs and hPDLSCs. The results revealed that the NBP treatment increased the extracellular mineralization and the osteogenic gene expression, which might prove the enhancement of osteogenesis in human tissue derived mesenchymal stem cells by NBP treatment, offering the potential role of NBP as a clinical application for bone defects therapies by promoting bone tissue regeneration.

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