

Preparation and Application of Biocompatible Nanobioactive Glass as Therapeutic Agents for Bone Tissue Engineering

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Abstract : This paper focuses on the synthesis and application of nanobioactive glass for bone regeneration studies. Nanobioactive glass has been synthesized by sol gel method having a combination of silicon, calcium and phosphorous in the molar ratio of 75:21:4. The prepared particles were analyzed for surface morphology by FEG SEM and FEG TEM. Physicochemical properties were investigated using ICP AES, FTIR spectroscopy and X-ray diffraction (XRD) techniques. To ascertain their use for therapeutic use, biocompatibility evaluation of the particles was done by performing soaking studies in SBF and in vitro cell culture studies on MG63 cell lines. Cell morphology was observed by FE SEM and phase contrast microscopy. Nanobioactive glasses (NBG) thus prepared were of 30-200 nm in size, which makes them suitable for nano-biomedical applications. The spherical shape of the particles imparts high surface to volume ratio, promoting fast growth of hydroxyapatite (HA), which is the mineral component of bone. As evaluated by in vitro cell culture studies the NBG was found to enhance the surface activation which enhances osteoblast adhesion. This is an essential parameter to improve bone tissue integration, thereby making nanobioactive glass therapeutically suitable for correcting bone defects.

Keywords : biocompatibility, bone tissue engineering, hydroxyapatite, nanobioactive glass

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