Synthesize And Physicochemical Characterization Of Biomimetic Scaffold Of Gelatin/zn-incorporated 58s Bioactive Glass

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Abstract : The main purpose of this research was to design a biomimetic system by freeze-drying method for evaluating the effect of adding 5 and 10 mol. % of zinc (Zn)in 58S bioactive glass and gelatin (5ZnBG/G and 10ZnBG/G) in terms of structural and biological changes. The structural analyses of samples were performed by X-Ray Diffraction (XRD), scanning electron microscopy (SEM), and Fourier-transform infrared spectroscopy (FTIR). Also, 3-(4,5dimethylthiazol-2-yl)-2,5-diphenyltetrazoliumbromide(MTT) and alkaline phosphate (ALP) activity test were carried out for investigation of MC3T3-E1cell behaviors. The SEM results demonstrated the spherical shape of the formed hydroxyapatite (HA) phases, and also HA characteristic peaks were detected by X-ray diffraction spectroscopy (XRD)after 3 days of immersion in the simulated body fluid (SBF) solution. Meanwhile, FTIR spectra proved that the intensity of P-O peaks for 5ZnBG/G was more than 10ZnBG/G and control samples. Moreover, the results of alkaline phosphatase activity (ALP) test illustrated that the optimal amount of Zn (5ZnBG/G) caused a considerable enhancement in bone cell growth. Taken together, the scaffold with 5 mol.% Zn was introduced as an optimal sample because of its higher biocompatibility, in vitro bioactivity, and growth of MC3T3-E1cellsin in comparison with other samples in bone tissue engineering.

Keywords : scaffold, gelatin, modified bioactive glass, alp, bone tissue engineering

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