POSTER #3

Characterization of Magnetic Bioactive Glasses for Treatment in Bone Defects

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Objectives: Hyperthermia treatment by magnetic mesoporous glasses has been applied as potential therapeutic approaches for bone defects due to malignant tumors. The aim of this study was to synthesize and characterize the structural and biological properties of magnetic Fe-BG bioglasses for producing multifunctional glasses. The effect of addition of copper to the bioglass composition was also evaluated.
Methods: The two magnetic bioglasses Fe-BG (68% Si, 23% Ca, 4% P, 5% Fe) and Fe-Cu-BG (68% Si, 18% Ca, 4%P, 5% Fe, 5% Cu) were synthesized by template sol-gel method and the P123 copolymer was used as co-templates. TG-DTA (Differential Thermal Analysis) was done for defining the calcination temperature and thermal behavior of prepared powders. They were then calcined at 650 °C for 2 h to obtain the final MMBG (magnetic mesoporous bioglass). The formation of glasses was analyzed by Fourier Transform Infrared spectroscopy (FTIR), and X-ray diffraction (XRD). The morphology, particle size, composition, surface area, mesoporous structure and paramagnetic property were characterized using scanning electron microscopy (FE-SEM), Transmission electron microscopy (TEM), energy-dispersive X-ray spectrometer (EDX), The Brunauer-Emmett-Teller (BET) and Barrett-Joyner-Halenda (BJH), and vibrating sample magnetometer (VSM), respectively. In addition, the biological behavior (bioactivity, biocompatibility and antibacterial) of the bioglasses was evaluated for their applicability in bio-medicine.
Results: The characterization results displayed that the synthesized powders formed mesoporous glasses with nanoparticle morphology, good surface area and magnetic properties. Both bioglasses demonstrated suitable biological behavior. The magnetic properties of bioactive glass were increased by the addition of copper oxide. However, the best biocompatibility and antibacterial behavior were found for the Fe-BG compared to the Fe-Cu-BG.
Conclusions: The two bioglasses might have the capability for bone reconstruction for injuries due to tumor ablation in tissue engineering.