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Biocompatible SPIONs with Superoxid Dismutase/Catalase Immobilized for Cardiovascular Applications

L. Lacramioara[1], A. Diaconu[2], M. Butnaru[1] and L. Verestiuc[1]
[1]*Gr.T.Popa University of Medicine and Pharmacy, Faculty of Medical Bioengineering, 9-13 Kogalniceanu Street, Iasi, Romania,*
[2]*P.Poni Institute of Macromolecular Chemistry, 41 Grigore Ghica Voda Alley, Iasi, Romania*

Antioxidant enzymes are involved in the therapy of the cardiovascular diseases associated with increased production of reactive oxygen species (ROS). The enzyme efficiency is dependent on the bioactive molecule's ability to achieve therapeutically adequate levels at the target site. In this paper, superoxide dismutase (SOD) and catalase, enzymes involved in decomposition of reactive oxygen species, have been immobilized onto superparamagnetic iron oxide nanoparticles(SPIONs) and characterized. FT-IR data, particles mean diameter and zeta potential confirmed the enzymes immobilization onto SPIONs. The particles dimensions vary from 400nm for catalase immobilization to 1μm for SOD immobilization. The particles morphology was studied by scanning electron microscopy (SEM) and suggests the particles tendency for clustering during the drying process. The biofunctinalized SPIONs are degraded by esterases. The citocompatibility tests (MTT) indicated normal values for the cells viability in presence of SPIONs with immobilized enzymes. Enzymatic activity of magnetic particles has been determined indirect by NTB-methionine-riboflavin (in the case of superoxide dismutase) and direct, with H_2O_2 (for catalase). EnzySPIONs preserve an enzymatic activity which is dependent of the magnetic particles concentration, the enzyme nature and biological molecule conformation onto magnetic particle.