MAGNETIC NANOPARTICLES WITH ANTIOXIDANT ENZYMES IMMOBILIZED ONTO SURFACE FOR THE TREATMENT OF CARDIO-VASCULAR DISEASES

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Abstract

With the aim to design enzyme-immobilized magnetic nanoparticles (enzyMNP), catalase and superoxide dismutase (SOD) have been used as targeted antioxidant enzymes. These enzymes contain active centers with coordinated metals, which decompose superoxide anion and hydrogen peroxide, respectively, the most important reactive oxygen species involved in cardio-vascular diseases (hypertension, stroke, ischemia, inflammation and restenosis). For modulation the enzyMNP efficiency the following parameters of the immobilization process were studied: the enzyme type, the method of immobilization (direct and carbodiime mediated), the ratio enzyme/MNP. FT-IR data, zeta potential and hydrodynamic particle mean diameter - determined by dynamic light scattering, confirmed the enzymed immobilization onto magnetic nanoparticles. Scanning electron microscopy (SEM) data revealed the spherical shape of the nanoparticles. The citocompatibility was demonstrated in cell culture (MTT assay) and the hemocompatibility data indicated no interference of the enzyMNP with blood coagulation system. Enzymatic activity analysis confirmed that the proposed formulations preserve the enzymatic activity, which is dependent of magnetic particles concentration, the nature and the quantity of enzyme immobilized onto magnetic nanoparticles and indicate the potential of the prepared enzyMNP in targeted antioxidant enzyme therapy.

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