ENZYME MOLECULE CAN BE RELEASED FROM MNPS SURFACE AT AC MF EXPOSURES

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Abstract

Magnetic nanoparticles (MNPs) are widely used in magnetic resonance imaging and drug delivery. The concept of 'theranostics' is defined as combination of therapeutic and diagnostic functions in one system. In this work we try to develop a new method to improve drug release or its activity through MNPs and super low frequency magnetic field (MF). After low frequency MF exposures the Brown's relaxation dominates and MNPs could rotate. Moving of the particles leads to release or conformational change of bioactive molecules immobilized on MNPs surface.The aim of this study is to synthesize biopolymers coated MNPs nanoclusters and investigate the effect of super low frequency MF on immobilized biomolecules.Methods. We have synthesized 7-12 nm MNPs. The MNPs were coated with block-copolymer polylysine-polyethylene glycol. Superoxide dismutase 1 (SOD1) and catalase (Cat) were electrostatically adsorbed on the surface of the clusters. Results. Polylysine coated MNPs formed clusters with average diameter 86±5 nm and zeta potential 45±3 mV. After low frequency AC MF exposure immobilized enzyme activity and hydrodynamic size of clusters changed. We posit that the biomolecules are released from the MNPs surface followed with additional aggregation of complexes at the MF medium. Centrifugation of the nanosuspension after AC MF exposures resulted in an change of enzyme concentration in comparison with control sample without MF effect.Conclusion. We describe a new application and mode of remote control of MNPs and its application in drug delivery.

Keywords: MNPs, drug release

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