

Effect of magnetic nanoparticles on the amyloid aggregation of lysozyme

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Amyloid protein aggregation is associated with human pathologies known as amyloid diseases such as Alzheimer's disease or type II diabetes. The common feature of amyloid diseases possessing distinct clinical and biochemical characteristics is presence of specific amyloid deposits in various parts of the body. Although the precise mechanisms of toxicity are not fully elucidated there are evidences that prevention or reversion of amyloid aggregation is beneficial. We studied effect of electrostatically stabilized magnetic nanoparticles of Fe₃O₄ on the amyloid aggregation of the hen egg white lysozyme as prototypical amyloidogenic protein. The ability of nanoparticles to affect the aggregation was followed in vitro by an assay based on the specific binding of dye Thioflavin T (ThT fluorescence). We found, that magnetic nanoparticles interfere with amyloid aggregation of lysozyme. The significant inhibition of amyloid formation and depolymerization of lysozyme amyloid aggregates were observed in presence of particles showing the dose-dependent manner. The nanoparticle induced disassembly of amyloid aggregates was studying also by scanning probe microscopy, where significant ability of nanoparticle to destroy aggregates is visible. The high disaggregation activity of magnetic nanoparticles proposes their use as a therapeutical agent against amyloid diseases besides their utilization as the carrier system to deliver a therapeutic moiety. This work was supported by project of ESF 26220120021, EU-NMP-STRP 032652 BIODOT and by Slovak Academy of Sciences in frame of CEX NANOFLUID and VEGA grants 7055, 0056 and 0038.