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Inhibitory Impacts of Fulvic Acid-Coated Iron Oxide Nano Particles on the Amyloid Fibril Aggregations

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Abstract : In this study, we report fulvic acid-coated iron oxide nanoparticles of 10.7 ± 2.7 nm size, which serve to inhibit amyloid fibrillation formation. Although the effect of fulvic acid on tau fibrils was investigated, to our best knowledge, its inhibitory impacts on amyloid aggregation formation have been assessed neither in-vitro nor in-vivo. On the other hand, iron oxide nanoparticles exhibit anti-amyloid activity on their own. This study investigates the inhibitory effect of fulvic acid coated iron oxide nanoparticles on amyloid aggregations formed from the commonly used in-vitro model, lysozyme from chicken egg white. FESEM, XRD, and FTIR characterization confirmed that fulvic acid was coated onto the surface of the nanoparticles. The inhibitory effects of the fulvic acid coated iron oxide nanoparticles were verified by Thioflavin T assay, circular dichroism (CD), and FESEM analysis. Furthermore, the toxicity of the nanoparticles on the neuroblastoma SH-SY5Y human cell line was assessed through an MTT assay. Our results indicate that fulvic acid coated iron oxide nanoparticles can efficiently inhibit the formation of amyloid aggregations while exhibiting negligible in-vitro toxicity; thus, they can be used as anti-amyloid agents in the development of the potential drug for neurodegenerative diseases.

Keywords : Alzheimer’s disease, fulvic acid coated iron oxide nanoparticles, fulvic acid, amyloid inhibitor, polyphenols
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