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Vitamins mediated inhibition of protein aggregation: Possible role in prevention of amyloid diseases

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Protein misfolding and aggregation have been associated with several human diseases such as Alzheimer's, Parkinson's and familial amyloid polyneuropathy, etc. In this study, anti-fibrillation activity of vitamins (vitamin K3 vitamin K3, vitamin and vitamin B12) and their effect on the kinetics of amyloid formation of hen egg white lysozyme (HEWL), human insulin and Aβ-42 peptide were investigated. Here, in combination with Thioflavin T (ThT) fluorescence assay, circular dichroism (CD), transmission electron microscopy and cell cytotoxicity assay, we demonstrated that vitamins significantly inhibits fibril formation as well as the inhibitory effect is dose dependent manner. Our experimental studies inferred that vitamin K3 exert its neuro protective effect against amyloid induced cytotoxicity through concerted pathway, modifying the aggregation formation towards formation of nontoxic aggregates. Vitamin C and vitamin B12 protects neuronal cells from amyloid induced cytotoxicity, interestingly former also dissolves the preformed aggregates. This study points to a promising strategy to combat protein aggregation and may have broader implication for targeting other neurological disorders whose distinct hallmark is also amyloid formation.

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