ABSTRACT

Recent discovery of tau paired-helical filaments, and straight filaments from Alzheimer's disease patient's brain led scientific community to compare these structures to the commonly used heparin-induced aggregates of tau protein. The comparison revealed that heparin-induced aggregates are heterogeneous in nature and are not the replica for the Alzheimer's disease pathology. Therefore, characterizing other aggregation inducers is essential, which can be utilized to mimic Alzheimer's disease tau pathology.

In the following study, we expressed recombinant human tau protein isoforms (0N3R, and 0N4R) in *E. coli* BL21(DE3) RP strain. The cell lysis and extraction of protein was experimented by three methods – 1) direct boiling, 2) sonication with direct boiling, and freeze – thaw with direct boiling. Maximum protein extraction was observed by sonication with direct boiling method. Further, the purification of the protein was experimented by three methods – 1) size-exclusion chromatography, 2) affinity chromatography, and 3) Ion exchange chromatography. For the purification of tau protein by different methods, protein was expressed in their corresponding buffers. The results of different purification methods suggested that ion exchange chromatography served as the best method for the purification of tau protein.

Later, tau protein was utilized to perform aggregation assay using heparin, and octadecyl sulphate as aggregation inducers. There are variety of aggregation inducers available such as polyanions, fatty acids, and detergents. The induced aggregates were characterized by three microscopy methods – fluorescence microscopy, field emission-scanning electron microscopy, and atomic force microscopy.

Keywords: Aggregation inducers, Fibrils, Tau protein isoforms, Heparin, Octadecyl sulphate.