Properties of Alpha-Synuclein and Its Relation to Parkinson's Disease Celine Cheung

Alpha-synuclein is a protein that is found mainly within the synuclein gene of central nervous system neurons. Though its structure is largely understood, its function in pathological and physiological conditions is mainly unknown. However, a connection between alpha-synuclein and Parkinson's Disease has been recognized. Many patients with Parkinson's Disease lose dopaminergic neurons, leaving only Lewy Bodies behind, which contain alpha-synuclein. The growth of alpha-synuclein gene clusters and the point mutation of alpha-synuclein are clear symptoms of Parkinson's Disease. Additionally, in the ventral tegmental area, increased amounts of alpha-synuclein neurons have been linked to conditions resembling early-Parkinson's Disease symptoms. Alpha-synculein has been related to both the familial and sporadic forms of Parkinson's Disease. However, the true relationship between alpha-synuclein and Parkinson's Disease is not clear. As such, investigating the properties of alpha-synuclein helps understand the protein and its relationship to Parkinson's Disease better. Three different full length polymorphs of alpha-synuclein were simulated in a box of water: PDB files 1XQ8, 2N0A, and 2KKW. It revealed that hydrogen bonds, and hydrophobic sites especially, are important in alpha-synuclein amyloid fibrillation. When alpha-synuclein transforms from a helix state to an extended state, it is transformed into an unstable state of alpha-synuclein, which speeds up the creation of amyloid fibrils. As such, it is likely that preventing NAC region separation will lower the creation of toxic amyloid fibrils. Differences between fibril states and micelle-bound conformations also affect the appearance of alpha-strands. Understanding these basic properties of alpha-synuclein forms the basis of connecting its properties to the cause of Parkinson's Disease.