Name of Disorder: Alzheimer's Disease

Essay title: Longevity and Alzheimer's Disease

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Alzheimer's Disease is the most common form of dementia. It is overwhelmingly a disease of later life (typically after the age of 60). There is no cure for Alzheimer's Disease and no efficacious drug is available to halt its progression. It can only be reliably diagnosed by examining the brain after death, although there are many tests currently being evaluated.

Alzheimer's Disease is thought to be a 'proteinopathy' caused by the denaturation (unfolding) of two proteins in the brain. These two proteins are Tau and Aβ. Aβ is deposited as so called 'senile plaques' on the surface of nerve cells. Tau forms insoluble aggregates inside the nerve cells that are known as paired helical filaments.

The connection between Tau and Aβ is still being investigated although it is noticeable that the process of aggregation in each case is preceded by truncation i.e. the cleavage of the original protein into a shorter version which is much more likely to aggregate and form insoluble clumps. Aβ is derived by proteolysis of a precursor protein known as Amyloid Precursor Proteiin (APP). At present researchers do not know if the clumps are the problem, or if the shortened versions of Tau and Aβ are the toxic species for brain cells.

It is possible that the ultimate cause of Alzheimer's Disease, and other age-related neurological diseases, such as Multiple Sclerosis can be traced to the deterioration of macromolecules in the human brain. A number of proteins in man, including Tau and Aβ and Myelin Basic Protein are long-lived and their breakdown over time may ultimately cause the cells that contain these proteins to become unviable and perhaps to die. At present our knowledge of age-related protein decomposition is fairly rudimentary. However, it is hoped that elucidating the spontaneous processes that occur as a result of a protein being present for a long time in the cell, may be vital in understanding the basis of age-related neurological diseases and hopefully for preventing them.