The Effect of Sugar Substitutes on Amyloid-BETA Plaque Aggregation: A Novel Link Between Type 2 Diabetes and Alzheimer's Disease

Hinkle, Paige (School: Wilson High School)

Amyloid-beta is a protein that can misfold into pathological fibril aggregations and lead to the formation of plaques in the brain—one of the hallmarks of Alzheimer's disease (AD). While the causes of AD are not well understood, there exists strong evidence for a correlation between type 2 diabetes and AD. Researchers at the University of Paris found that individuals who had type 2 diabetes for over 10 years were more than twice as likely to also have AD at age 70, hazard ratio (HR) of 2.1. While the connection between diabetes and Alzheimer's is strong, the link may not be direct causality; underlying factors could explain the correlation. Individuals with diabetes often consume artificial sweeteners as an alternative to natural sugars. The Framingham study found a link between artificial sweeteners and AD. They reported that daily consumption of artificial sweeteners almost tripled the risk of AD (HR 2.9). My research explores a potential mechanism underlying the correlation between type 2 diabetes and AD by comparing the effect of artificial sugar substitutes to natural sugar (glucose) on amyloid-beta aggregation. A Thioflavin T assay was used to measure fibril formation. Data was collected and analyzed using a multimode microplate reader. Amyloid-beta plaque aggregation was found to be significantly higher in the presence of artificial sugar substitutes compared to the glucose control. My research suggests a potential dietary linkage underlying the correlation between type 2 diabetes and AD, and it provides evidence of a novel mechanism by which artificial sugar substitutes could contribute to Alzheimer's pathology.