Role of Alpha-Synuclein (Alpha-syn) in Regulation of Retinal Iron Homeostasis by Promoting Uptake of Transferrin-Bound Iron (Tf-Fe) in Human RPE 47 Cells: Potential for Novel Treatment for Visual Manifestation of Parkinson's Disease (PD)

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Parkinson’s Disease (PD) is a common neurodegenerative disease affecting millions of people worldwide. PD is characterized by aggregation of alpha-synuclein (α-syn) proteins resulting in toxicity. Aggregates of α-syn, also known as Lewy bodies, are a diagnostic hallmark of the disease. The role of α-syn in the healthy brain is unknown, however it may play a substantial role in the pathophysiology of PD. PD results in both motor and non-motor symptoms that cannot be cured but can be controlled. Ophthalmic manifestations such as impairment of visual acuity, contrast sensitivity, color vision, and motion perception are common due to retinal involvement. α-syn is widely expressed in the neuroretina as a normal protein, which is of interest due to the ocular symptoms of PD. Rarely are aggregates found in the neuroretina, i.e., symptoms may be caused by dysfunction. α-syn is hypothesized to relate to iron homeostasis but it is unclear how the two interact with one another. In this study, in-vitro models were created using the human retinal epithelium cell line (RPE 47) cells to analyze the effects of ferric ammonium citrate (FAC) on α-syn expression levels and relative locations inside the cell. This model helps analyze the relationship between α-syn and transferrin bound iron to find a unique link between expressions levels and interactions within the cell. Results show that different FAC concentrations significantly alter α-syn, transferrin receptor (TfR), and ferritin expression levels as well identifying protein interactions and locations within the RPE 47 cells. This identification opens new avenues for novel treatments for the ocular symptoms of PD.