Evaluating structural alterations and neuroinflammation in a non-human primate model of Batten Disease

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Batten disease (BD) is a rare, fatal pediatric neurodegenerative disease, characterized by progressive intellectual and neurological degradation. A defining feature of BD is a lysosomal storage dysfunction in the neuronal cytoplasm. This dysfunction causes the accumulation of waste material called ceroid lipofuscin in lysosomes, leading to cell dysfunction and death. The main cause of this defect lies within a genetic recessively inherited mutation of the neuronal ceroid lipofuscinoses (NCL) genes. BD is an umbrella term covering different NCL mutation types, ranging from CLN1 to CLN14. Common symptoms across subtypes include visual deficits, seizures, motor deficits, and dementia. Currently, there is no cure for BD and diagnosis in humans remains challenging due to the rarity of the disease and lack of biomarkers. The Oregon National Primate Research Center (ONPRC) found the spontaneous emergence of a CLN7-\- mutation in their non-human primate (NHP) Japanese macaque colony that recapitulates the CLN7-\- mutation observed in humans.

By using different imaging modalities, this research aims to investigate how the CLN7-\- mutation affects the brain of the macaques and to identify suitable translational imaging biomarkers. Specifically, we use magnetic resonance imaging (MRI) to assess structural brain changes and positron emission tomography (PET) imaging to measure glucose metabolism ([18F]FDG PET) and neuroinflammation ([11C]PBR28 PET). Since macaques share many similarities with humans in brain structure, development and function, this model could help in development of future therapies for this devastating childhood disease.