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### Development Stage:

Pre-clinical studies

### Protection Status:

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### Publications

McConnell et al., 2024  
Mol. Ther. Nucl. Acids 35

<https://doi.org/10.1016/j.omtn.2024.102251>

Massey et al., 2023, ACS Sens. 8:  
3116-3126

<https://doi.org/10.1021/acssensors.3c00757>

### Seeking:

Development & pre-clinical  
testing partners  
Licensees

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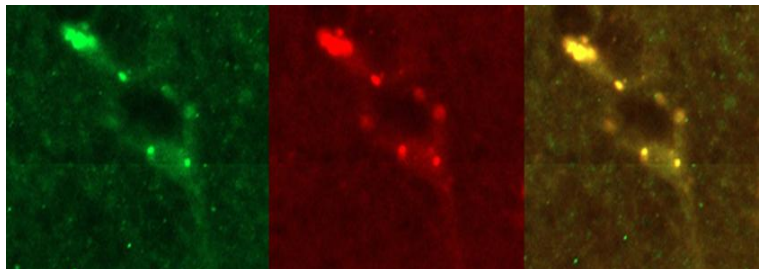
# DNA Aptamers to Detect and Prevent Neurodegenerative Diseases

## Background

The onset and progression of neurodegenerative diseases is often associated with the formation of protein fibrils and aggregates in the brain. Alpha-synuclein is a protein implicated in Parkinson's disease. There is evidence that the aggregation of this protein into large oligomers/fibrils is a part of the underlying mechanism of this disease.

## Description of the Invention

Carleton researchers have developed novel DNA aptamer sequences that bind to alpha-synuclein monomers and inhibit formation of the larger oligomers and fibrils associated with the onset and progression of neurodegenerative disease such as Parkinson's Disease. Data from studies in a mouse model of Parkinson's Disease show that the DNA aptamers, when packaged in liposomes, can cross the blood-brain barrier and bind to alpha synuclein. Further, the DNA aptamers have been incorporated into a diagnostic device where they have been shown to detect low levels of alpha-synuclein in biological samples.



### Aptamer delivery to the brain and binding to $\alpha$ synuclein in treated mice.

Fluorescence microscopy images of the distribution of  $\alpha$ -syn-1 aptamer and co-localization with  $\alpha$ -synuclein in brain tissue of treated mice. Left: anti- $\alpha$ -synuclein antibody (green) Middle: labelled aptamer, delivered by targeting liposome (red). Right: Image overlay showing extensive co-localization.

## Key Benefits

- **Response:** Compared with conventional antibodies, aptamers are not typically recognized by the immune system and are not immunogenic or toxic
- **Strong Selectivity:** Aptamers can discriminate between different conformations of the same target protein
- **Synthesis & scalability:** Can be easily generated by chemical synthesis

## Applications

- **Diagnostic:** point-of-care and laboratory methods to detect onset and monitor progression of neurodegenerative diseases
- **Therapeutic:** to reduce protein fibrillation and mitigate onset and progression of neurodegenerative diseases