Weill Cornell Medicine

Early Detection of Parkinson's Disease using Noninvasive Retinal Imaging Biomarkers

Lead Inventor:

Ching-Hwa Sung, Ph.D.

Professor of Cell and Developmental Biology, Cell and Developmental Biology, Weill Cornell Medical College

Professor of Cell Biology in Ophthalmology, Ophthalmology, Weill Cornell Medical College

The Betty Neuwirth Lee and Chilly Professor in Stem Cell Research, Ophthalmology, Weill Cornell Medical College

Business Development Contact:

Jeffrey James

Associate Director, Business Development and Licensing

(646) 962-4194

jaj268@cornell.edu

Early Detection of Parkinson's Disease using Noninvasive Retinal Imaging Biomarkers

Background & Unmet Need

- Parkinson's Disease (PD) is the second most common neurodegenerative disease and affects 10 million people worldwide
- The presence of Lewy bodies, which are made up by aggregated α-synuclein protein deposits, are a hallmark of PD
- Emerging diagnostics for PD measure levels of α-synuclein in spinal fluid, which is collected from invasive lumbar punctures
- However, lumbar punctures can be painful and put patients at risk for spinal fluid leakage, prolonged headaches, back pain, and bleeding
- It is currently difficult to accurately measure pathological α-synuclein aggregates in living patients using non-invasive methods
- **Unmet Need:** Noninvasive biomarkers for early assessment of Parkinson's disease

Technology Overview

- **The Technology:** A method for early detection of Parkinson's Disease using fundus imaging to measure autofluorescent microglia in the retina
- **The Discovery:** In a mouse model of PD, retinal microglia engulf lipofuscins from rod cells and express phospho-α-synuclein-positive inclusions and bright autofluorescence
- These microglia can be seen via fundus autofluorescence imaging or confocal laser scanning ophthalmoscopy as bright foci
- The emergence of autofluorescent foci temporally coincides with onset and progression of disease as well as Lewy body deposition
- **PoC Data**: In a mouse model of PD, diseased mice had significantly more autofluorescent foci in the eye ($p<0.001$) than control mice at 2 months old
- The number of autofluorescent foci increases over time in diseased mice, matching retinal degeneration, a measure of PD disease progression

Inventor:
Ching-Hwa Sung

Patents:
PCT Filed

Publications:
Fu et al. *Nat Commun*. 2024.

Biz Dev Contact:
Jeffrey James
(646) 962-4194
jaj268@cornell.edu

Cornell Reference:
D-10740

Weill Cornell Medicine

Early Detection of Parkinson's Disease using Noninvasive Retinal Imaging Biomarkers

Technology Applications

- Early, noninvasive detection of Parkinson's Disease
- Method of monitoring PD progression over time
- Method of assessing treatment efficacy during treatment and clinical trials
- Diagnosis of other neurodegenerative diseases with aggregated α-synuclein deposition in the eye, such as Lewy body dementia

Technology Advantages

- Noninvasive, unlike current diagnostics that utilize spinal taps or biopsies
- Measures actual levels of pathological α-synuclein inclusions, rather than amplifying the quantity, enabling more accurate assessment of the disease
- Increased autofluorescence correlates to disease progression, allowing for better assessment of the state of the disease or treatment efficacy
- More cost effective than methods requiring sampling and assays for protein or nucleic acid levels

Supporting Data / Figures

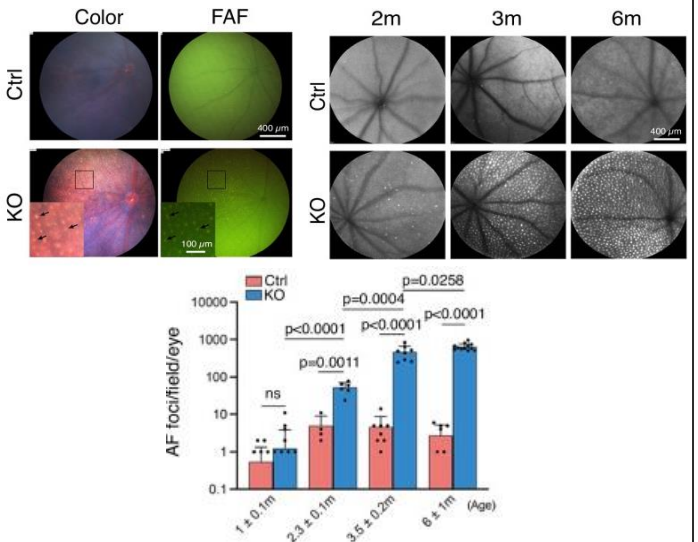

Figure 1: Autofluorescent foci are detected via color and autofluorescence (FAF) fundus imaging (top left) and confocal scanning laser ophthalmoscopy (top right) in the retina of diseased (KO) mice. The autofluorescent foci increase over time, mirroring disease progression (bottom).

Inventor:
Ching-Hwa Sung

Patents:
PCT Filed

Publications:
Fu et al. *Nat Commun*. 2024.

Biz Dev Contact:
Jeffrey James
(646) 962-4194
jaj268@cornell.edu

Cornell Reference:
D-10740

Weill Cornell Medicine

Weill Cornell Medicine