Exploring Viral Links Between Olfactory Dysfunction and Alzheimer's



Kaylee Stouder, Serena Lewis, Jocelyn Contreras, Amalia Bustillos, Brittney Feia, Andrew Bubak, Christy Niemeyer Department of Neurology, University of Colorado Anschutz Medical Campus, Aurora, CO Department of Psychology and Neuroscience, Regis University, Denver, CO

What is Alzheimer's?

• Alzheimer's Disease (AD) AD is a neurodegenerative disease impacting about 1/9 people above the age of 65





Trigeminal

ganglia

- Characterized by a misfolded protein thought to cause cell death
- Early AD is associated with olfactory dysfunction.
- Given viruses target the nasal pathway, this may be one way that HSV-1 contributes to Alzheimer's disease pathology

What is HSV-1 Virus?

The HSV-1 Virus, **aka cold sores**, infect the *majority* of Americans; 64% of the global population has HSV-1

- HSV-1 infects through the oral HSV-1 and nasal pathway and then lays dormant in sensory nerve fibers
- HSV-1 is identified to be a risk factor for Alzheimer's disease

Modeling HSV-1 in The Nose



5XFAD-Alzheimer's tissue







microscopy

- We used an AD mouse model and infected the sensory nasal tissue (Olfactory Epithelium) with HSV-1
- We then are able to fluorescently label infection and cell types

Cells in the Sensory Layer





• Image modified from Niemeyer et al., 2024b. HSV-1 infection of C57BI/6 in the OE at 3 days post-infection



- Fluorescent Stains; DAPI: Nuclear Stain, Ki67: HBC, OMP: mOSN, Tuj-1: iOSN
- HSV-1 infected OE in 5xFAD mouse model
- Fluorescent labeling allowed us to see different cell types in the OE



Let's Follow Our Noses





- We were able to uncover clear HSV-1 infection in these samples due to immunofluorescent staining.
- Achieved clear cell type discrimination of cells involved in OE using immunofluorescent markers.
- Further research in how external factors, like HSV-1 and other viruses, impact the Olfactory **Epithelium can** help us further understand its potential ties to Alzheimer's disease.



• AD's early olfactory dysfunction could be used as early detection, intervention, and improve quality of life for those already predisposed to Alzheimer's by limiting other potential risk factors