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## **Uncovering the neural basis of cognitive impairment following hearing loss: an all-optical electrophysiology approach**

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# Uncovering the neural basis of cognitive impairment following hearing loss: an all-optical electrophysiology approach

## Background

Hearing loss is one of the most prevalent chronic health conditions. In addition to age-related hearing loss, it is well-recognized that excessive exposure to loud noise is a leading cause of hearing loss.

While the effects of the hearing impairment itself can be devastating, there is clear evidence that hearing loss is associated with a faster rate of cognitive decline - our brains 'age' faster with hearing impairment.

Despite this understanding of the impact of excessive exposure to loud noise, the underlying neural mechanisms remain elusive.

## The Problem

Up to now, we have successfully used a mix of electrophysiological recordings and behavioural testing to investigate the impact of noise-induced hearing loss on brain plasticity.

We have now reached the limit of what we can achieve with conventional electrodes - it's just not possible to tell which types of neurons are being recorded by them. If we are to continue this line of investigation and fully reveal the underlying mechanisms, we need to determine exactly how the different types of neurons are changing after noise exposure.

## The Project

We have access to state-of-the-art equipment that will enable us to visualize specific neuron types in animal models. This is a new approach that combines several recent advances in the field of 'optogenetics', a technique that uses light to control neurons. This approach will allow us to explore how hearing loss induced by loud noise exposure leads to abnormal neural activity in areas of the brain that control learning, memory and higher cognitive function.

## Funding Program

BrainsCAN Accelerator Grant:  
Stimulus

Awarded: \$95,900

## Additional BrainsCAN Support

Rodent Cognition Core

## Western Faculty, Group or Institution

Schulich School of Medicine & Dentistry, Department of Anatomy & Cell Biology

## Keywords

Hearing & auditory perception, neuroplasticity, aging

## Related

none

We will be able to visualize with millisecond resolution the changes in activity of different groups of neurons in our animal models during complex cognitive behavioural tasks. By completing this project, we will be combining cutting-edge optical data acquisition with a touchscreen testing chamber - by building expertise in this methodology, it will position our researchers, the Rodent Cognition Core and BrainsCAN as leaders in this exciting field.

Once we have successfully combined these optogenetics techniques with touchscreen behaviour testing, we will be able to test hypotheses related to neuron types and activity, noise exposure and noise-induced cognitive impairment.

## Western Researchers

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