

# Nicotinamide Riboside for the Prevention and Treatment of Hearing Loss

## Lead Inventor:

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## Background & Unmet Need

- Noise exposure is a major cause of hearing loss, which lacks effective treatment or prophylaxis
- Following noise exposure, hair cells release neurotransmitters that lead to excitotoxic damage to the neurites, resulting in synaptic disruption and neurite retraction
- Nicotinamide adenine dinucleotide (NAD<sup>+</sup>) exhibits axon-protective effects in cultured neurons, but its ability to block degeneration in vivo is confounded by poor cell permeability and serum instability
- **Unmet Need:** Novel neuroprotective therapeutics that prevent against hearing loss after noise exposure

## Technology Overview

- **The Technology:** Method of preventing and treating hearing loss by administering agents that increase intracellular NAD<sup>+</sup> levels
- **Discovery:** Augmentation of intracochlear NAD<sup>+</sup> levels protects mice from noise-induced hearing loss (NIHL)
- Administration of nicotinamide riboside (NR) provides an efficient route to increase NAD<sup>+</sup> levels in the cochlea in mice and protects from NIHL
- NR also prevented retraction of spiral ganglia neurites from the inner hair cells, demonstrated that NR activates a NAD<sup>+</sup>-SIRT3 pathway that reduces neurite degeneration caused by noise exposure

## Inventors:

Samie R. Jaffrey  
Anthony A. Sauve  
Kevin Brown

## Patents:

US Patent [9,861,651](#)

## Publications:

[Brown et al.](#) *Cell Metabolism*. 2014.

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## Cornell Reference:

D-5990

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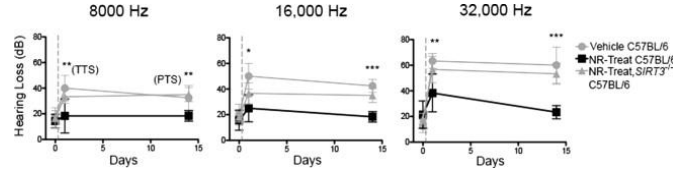
## Technology Applications

- Therapeutic agents for preventing and treating hearing loss
- Method to determine if a compound acts as a hearing protective agent

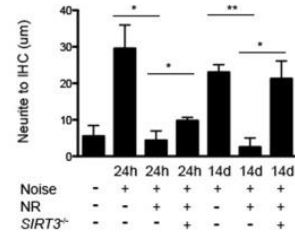
## Technology Advantages

- Nicotinamide riboside, an NAD<sup>+</sup> precursor, overcomes the cell permeability and serum instability challenges of directly administering NAD<sup>+</sup>
- May be given prophylactically to patients at high risk of hearing loss (e.g., musicians, construction workers)

## Supporting Data / Figures



**Figure 1:** Administration of nicotinamide riboside prevents NIHL in a SIRT3-dependent fashion.



**Figure 2:** Activation of SIRT3 by the NAD<sup>+</sup> precursor nicotinamide riboside prevents neurite retraction from the inner hair cells in a SIRT3-dependent manner.

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