

Reducing brain inflammation could treat tinnitus and other hearing loss-related disorders

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Inflammation in a sound-processing region of the brain mediates ringing in the ears in mice that have noise-induced hearing loss, according to a study publishing June 18 in the open-access journal *PLoS Biology* by Shaowen Bao of the University of Arizona, and colleagues.

Hearing loss is a widespread condition that affects approximately 500 million individuals, and is a major risk factor for tinnitus—the perception of noise or ringing in the ears. Recent studies indicate that hearing loss causes inflammation—the [immune system](#)'s response to injury and infection—in the auditory pathway. But its contribution to hearing loss-related conditions such as tinnitus is still poorly understood. To address this gap in knowledge, Bao and his colleagues examined neuroinflammation—inflammation that affects the nervous system—in the auditory cortex of the brain following noise-induced hearing loss, and its role in tinnitus, in rodent models.

The results indicate that noise-induced hearing loss is associated with elevated levels of molecules called proinflammatory cytokines and the activation

of non-[neuronal cells](#) called microglia—two defining features of neuroinflammatory responses—in the primary auditory cortex. Experiments in mice that incur noise-induced hearing loss showed that a cell-signaling molecule called [tumor necrosis factor alpha](#) (TNF-?) mediates neuroinflammation, tinnitus, and synaptic imbalance—an altered pattern of signaling between neurons. Moreover, the researchers found that pharmacological blockade of TNF-? or depletion of microglia prevented tinnitus in mice with noise-induced hearing loss. According to the authors, the findings suggest that neuroinflammation may be a therapeutic target for treating tinnitus and other [hearing loss](#)-related disorders.

More information: Wang W, Zhang LS, Zinsmaier AK, Patterson G, Leptich EJ, Shoemaker SL, et al. (2019) Neuroinflammation mediates noise-induced synaptic imbalance and tinnitus in rodent models. *PLoS Biol* 17(6): e3000307. doi.org/10.1371/journal.pbio.3000307

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