Otolaryngology online journal

ISSN: 2250-0359 **Mini Review** Volume 11 Issue 4: 217 2021

The Potential Tinnitus Treatment

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Received: April 22, 2021; **Accepted:** April 24, 2021; **Published:** April 30, 2021

Despite the ubiquity of tinnitus, its pathophysiology is poorly understood and there is no FDA approved cure or treatment. For more than 100 years, however, it has been known that a long sound stimulus can briefly eliminate or reduce tinnitus (Spaulding, 1903), a phenomenon known as residual inhibition. About 80% of patients with tinnitus describe some degree of residual inhibition, but the underlying mechanisms remain unknown. Knowledge about this natural internal ability to suppress tinnitus by a sound might shed light on brain abnormalities leading to tinnitus. More importantly, it might help to identify therapeutic strategies for tinnitus treatment.

There is basic agreement among scientists that elevated spontaneous activity in the auditory system is linked to tinnitus. Our research in mice has demonstrated that neurons in the central auditory system show a suppression of their spontaneous activity immediately after presentation of a 30-second sound. The duration of this suppression is long-lasting, resembling the duration of residual inhibition in humans. There are additional striking similarities between the nature of this suppression in mice and the basic features of residual inhibition observed in tinnitus patients. These similarities strongly suggest that this suppression could be an underlying mechanism of residual inhibition. Our most recent work is aimed to reproduce the effects of long sounds by other means. We found that a class of neurochemical receptors-metabotropic glutamate receptors-play a key role in the sound-induced suppression of spontaneous activity. Furthermore, the drugs targeting these metabotropic glutamate receptors, administered systemically, can reversibly suppress both spontaneous activity of auditory neurons as well as tinnitus in tinnitus-positive mice, for at least two hours.

We are exploring whether these drugs could provide a potential therapeutic approach for tinnitus suppression in humans. Supported by grants R01 DC011330 and 1F31DC013498-01A1 from the National Institute on Deafness and other Communication Disorders.