New ATA Funded Research

January 2008

Shaowen Bao, Ph.D., University of California, Berkeley, California

Research project: Cortical Plasticity in Tinnitus
Funded: 1 year; $99,949

Recent studies have revealed substantial changes in brain activity patterns in tinnitus patients and in animals with hearing loss. These brain activity changes, known as *cortical plasticity,* potentially produce hearing loss-induced tinnitus. It is still unclear, however, whether cortical plasticity actually causes tinnitus. In the lab, we will induce cortical plasticity that is similar to that seen in tinnitus patients, only without any accompanying hearing loss. If the plasticity induces tinnitus, then it is not just a side-effect of hearing loss.

Paul Finlayson, Ph.D., Wayne State University, Detroit, Michigan

Research project: Tinnitus and Hyperactivity in the Dorsal Cochlear Nucleus Fusiform Cells: Biophysical Changes
Funded: 1 year; $49,954

The most common form of tinnitus develops after noise-induced trauma. Multiple changes in the brain occur following trauma due to intense sound exposure, including loss of cells, changes in the function of individual cells and in the communication between cells. This research will study the cellular changes affecting brain cell hyperactivity in the dorsal cochlear nucleus, which directly receives input from the auditory nerve. We will examine the movement of the ions that control the electrical activity in the cells. Determining how cells change, how their communication changes and why they become hyperactive is central to defining how these changes produce tinnitus and also help in developing possible tinnitus treatments.

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William Martin, Ph.D., Oregon Hearing Research Center, Oregon Health & Science University, Portland, Oregon

Research project: Clinical Trial of Acamprosate for Tinnitus
Funded: 3 years; $73,829

Acamprosate is a medication used to treat brain chemical imbalances that lead to alcohol addiction. This clinical trial will evaluate acamprosate to see if it can provide significant tinnitus relief for a subgroup of tinnitus patients. The study will further determine if there are patient-related factors (e.g., degree of hearing loss, duration of their tinnitus, depression, anxiety or insomnia) that we can use to predict whether or not acamprosate will be helpful for a specific patient. It will also help increase our understanding of the brain's role in tinnitus and improve future designs of new, effective treatments.

Virginia Ramachandran, Wayne State University, Detroit, Michigan

Student grant
Research project: Mechanisms Underlying Acoustic Masking of Tinnitus
Funded: 1 year; $10,000

Masking is commonly used to provide relief to tinnitus sufferers. Masking involves covering up the tinnitus with another sound. However, we do not yet sufficiently understand the process. The goal of this project is to determine the neural mechanisms underlying the relief of tinnitus from acoustic masking. We will measure activity in parts of the brain known to correlate with tinnitus perception. We will examine this brain activity before, during and after acoustic masking stimulation to determine if masking plays a role in changing tinnitus-related neural activity.

Daniel Stolzberg, State University of New York, Buffalo, New York

Student grant
Research project: Ensemble Spontaneous Activity in Tinnitus
Funded: 1 year, $10,000

Modern theories of tinnitus point to the hearing areas of the brain as the generator of this phantom sound. Neurons are the cells of the brain which are in constant, rhythmic communication with one another. In tinnitus, neurons in hearing areas of the brain may lose this normal rhythm, generating a persistent miscommunication which emerges as a phantom sound. Additionally, anesthesia changes how neurons normally communicate. To address that problem, this project will utilize animals that are awake (not anesthetized) to

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investigate the changes in communication between both individual neurons and groups of neurons, and to determine why these communication changes generate tinnitus.

Pim Van Dijk, Ph.D., University of Groningen, Groningen, the Netherlands

Research project: Response of the Central Auditory System in Tinnitus and Hearing Loss, an fMRI Study
Funded: 1 year, $99,100

Every sound we hear, including tinnitus, is related to some pattern of brain activity. Abnormal neural brain activity is the likely cause of tinnitus. This project will investigate brain patterns using *functional magnetic resonance imaging* (fMRI). An fMRI takes pictures of a brain's activity, much as a video camera takes pictures of a body's activity. We will compare hearing impaired patients with and without tinnitus to determine why some hearing impaired patients have tinnitus while others do not. We expect this to help clarify which brain activity patterns are specific to tinnitus.

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