



New ATA-Funded Research As of July 12, 2008

Birgit Mazurek, M.D., Ph.D., Charité University Hospital, Berlin, Germany

Research project: Molecular Basis of Salicylate-Induced Tinnitus

Funded: 1 year; \$39,624

Scientists widely recognize that tinnitus results from miscommunication between cells in the auditory system. We hypothesize that this incorrect communication reflects an abnormal *gene expression*. This means that perhaps the auditory cells of tinnitus sufferers produce too many or too few of the proteins important in auditory communication. This ATA grant enables us to do further analyses on expression of 18 genes involved in communication and function of the auditory system. We will perform these experiments on normal-hearing rats and rats with aspirin-induced tinnitus. We trust that the outcome of our work will uncover new therapeutic targets for tinnitus treatment.

Jennifer Melcher, Ph.D., Massachusetts Eye and Ear Infirmary, Boston, Mass.

Research project: Neurophysiology of Hyperacusis

Funded: 1 year; \$50,000

Many people with tinnitus find certain sounds unbearably loud, even though the same sounds may not be bothersome at all to other people. This condition is called *hyperacusis*. Using a type of brain imaging called *functional Magnetic Resonance Imaging* (fMRI), we showed that hearing centers in the brain are more active than normal in people with hyperacusis. Each hearing center contains many different types of brain cells. In our current research, we will test for over-activity by a particular subset of cells using techniques (EEG and MEG) that are sensitive to various aspects of brain activity. If the culprit cells can be identified, it may be possible to design ways to restore normal function, for instance, using drugs or electrical stimulation.

Athanasios Tzounopoulos, Ph.D., University of Pittsburgh School of Medicine, Pittsburgh, Pa.

Research project: Cellular Mechanisms of Tinnitus

Funded: 1 year; \$75,000

Neuronal connections and neuronal activity can change as a result of ongoing experience. This is known as plasticity of the brain. This plasticity can lead to changes in memory or learning, compensation for loss of function and adaptation to changing demands. However, plasticity-induced changes can also cause signs and symptoms of disease. Tinnitus – commonly referred to as ringing in the ears or head – is the perception of sound in the absence of an environmental acoustic stimulus. Recent studies have shown that individuals with tinnitus have increased neuronal activity in certain areas of the brain. We hypothesize that the same cellular mechanisms responsible for mediating plasticity in these areas may also underlie tinnitus. Determining these mechanisms will point to specific drug treatments that may reduce or alleviate tinnitus.

Fan-Gang Zeng, Ph.D., University of California, Irvine, Calif.

Research project: Tinnitus Suppression

Funded: 1 year; \$88,006

One misperception is that, except for masking tinnitus, for instance with music, tinnitus does not interact with external sounds. In our opinion, this misperception has severely limited our options in treating and potentially curing tinnitus. Different from masking, which typically requires a masker to have higher intensity and similar pitch to the tinnitus, tinnitus *suppression* can occur with sounds that are softer and potentially more pleasant than the tinnitus. The novel aspect of our research is to understand interaction between tinnitus and external sounds, using acoustic and electrical stimulation, with a particular focus on searching for external sounds that can effectively suppress tinnitus.