Department of Biomedical Engineering

University of Minnesota

Graduate Seminar Announcement

New approaches for treating hearing disorders and pain: Invasive to noninvasive and brain to body

By

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ABSTRACT

There are over 300 million people worldwide with disabling hearing loss, tinnitus (a form of phantom pain), or hyperacusis (oversensitivity or pain to sounds). Fortunately, there are hearing aids and cochlear implants to treat hearing loss or deafness. However, there are still many individuals who do not benefit from these treatments because they do not have a sufficiently functioning auditory nerve to transmit the sound information to the brain. Furthermore, there are no reliable treatments for tinnitus or hyperacusis, which are debilitating conditions for millions of people.

In my talk, I will present research in my lab that seeks to develop new approaches for treating hearing disorders. One direction for hearing restoration is to implant a deep brain stimulation device into the auditory midbrain. A major bottleneck for current hearing devices is the limited bandwidth of information that can reach the brain, and thus the inability to achieve more natural hearing. Directly stimulating within the midbrain would bypass the damaged auditory nerve and may enable greater information transfer to the brain. My lab has developed a new auditory midbrain implant (AMI) in collaboration with Hannover Medical School in Germany and Cochlear Limited in Australia that will be implanted in deaf patients in an upcoming clinical trial funded by the National Institutes of Health. The scientific, safety, surgical and regulatory steps to get to this clinical stage will be presented.

Another direction of the lab for treating tinnitus or hyperacusis is to utilize the dense interconnectivity and interactions across regions of the nervous system and body. The emerging field of electroceuticals along with complementary medicine attempt to modulate the nervous system to push the human body to heal itself. My lab has been developing a noninvasive approach to treat tinnitus or hyperacusis, called multimodal synchronization therapy (mSync), in order to synergistically activate multiple ascending and feedback pathways of the brain and body in precisely timed patterns using various modalities including acoustic, electrical, and ultrasound stimulation as well as stress relaxation techniques. The rationale for mSync and initial proof-of-concept data supporting its potential to treat hearing disorders will be presented. This research may open up alternative approaches for also treating somatosensory pain and autoimmune disorders.

3:35 – 4:30 P.M.

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Room 2-101 Nils Hasselmo Hall

BMEn 8601 Graduate Seminar

For information or disability accommodations please contact Rachel Jorgenson at bmengp@umn.edu or 612-624-8396.