Structural and neurobiochemical correlates of noise-induced tinnitus: A magnetic resonance imaging and spectroscopy study.

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Using magnetic resonance spectroscopy (MRS), this research is designed to develop neurobiochemical biomarkers of noise-induced tinnitus within the auditory centers of the human brain in the left and right hemispheres. Being able to detect and measure metabolites in the millimolar range, such as *N*-acetyl aspartate (NAA), choline (Cho), creatine (Cr), glutamate (Glu), and gamma-aminobutyric acid (GABA), we can begin to understand if and or how tinnitus and hearing loss, either alone or in combination, alters the neurobiochemical environment of these auditory cortical areas. Such information is currently unavailable and advancements in this area will contribute substantially to tinnitus research. Two groups of individuals matched for age, gender, and hearing loss will be studied: Group 1 will include individuals with noise induced hearing loss *with* tinnitus and Group 2 will include individuals with noise induced hearing loss *without* tinnitus. Controlling for hearing loss is an imperative core issue that has confounded many previous studies in this area, making interpretation of results difficult if not impossible. Additionally, using voxel-based morphometry (VBM), we will determine the extent to which structural brain anatomy in the form of grey and white matter volumes are different between groups. Taken together, MRS and VBM have the potential to enhance our understanding of tinnitus related phenomena that is currently unavailable by any other methodologies. In sum, this work will contribute to tinnitus research by: 1) aiding in diagnosis, 2) contributing to understanding underlying mechanisms, 3) helping to monitor treatment options, and 4) being a segue towards a cure. Indeed, MRS in particular is a uniquely positioned tool between the domains of neurochemistry and structural brain imaging that can accomplish this goal in a non-invasive manner that is well suited for studying humans.

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