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Non-invasive Diagnostic Measures of Sensorineural Hearing Loss in Chinchillas.

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ABSTRACT

According to the World Health Organization, disabling hearing loss affects nearly 466 million people worldwide. Sensorineural hearing loss (SNHL), which is characterized as damage to the inner ear (e.g., cochlear hair cells) and/or to the neural pathways connecting the inner ear and brain, accounts for 90% of all disabling hearing loss. More concerning is that significant perceptual and physiological aspects of SNHL remain “hidden” from standard clinical diagnostics. Hidden hearing loss (HHL) manifests as the inability to understand speech in loud, noisy environments (e.g., listening in a noisy restaurant) despite a normal audiogram (i.e., normal detection of soft sounds). Recently, HHL has been suggested to result from cochlear synaptopathy, a significant loss of inner-hair-cell/ afferent-nerve synaptic terminals after an acoustic over-exposure causing “only” a temporary threshold shift (TTS), e.g., after a rock concert. In this study, three physiological non-invasive diagnostic measures of HHL will be evaluated in chinchillas: otoacoustic emissions, auditory brainstem responses, and middle-ear-muscle reflex strength. As a first step, the effect of anesthesia will be evaluated. Four animals will be tested twice while awake and then also twice while under anesthesia (xylazine and ketamine). The repeatability, accuracy, and precision of each measure will be examined. Future work will include collecting these measures before and after TTS-inducing noise exposure. The long-term goal of this study is to establish and characterize reliable and efficient HHL measures in the lab using our noise-induced synaptopathy chinchilla model, and then to translate the animal results into a plausible clinical HHL diagnostic for humans.

KEYWORDS

Sensorineural hearing loss, hidden hearing loss, otoacoustic emissions, auditory brainstem response, middle ear reflex