A38: BILATERAL COCHLEAR IMPLANTS IN CATS: PRELIMINARY OBSERVATIONS ON SOUND LOCALIZATION ABILITIES

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Bilateral cochlear implants (BICI) are provided to a growing number of individuals with severe-profound sensorineural hearing loss, in order to provide acoustic cues that are used by the auditory system for sound localization and for improving speech understanding in noise. Numerous studies to date have reported that BICI users are able to localize sounds significantly better when using BICIs than when using a single CI. However, there remains a large gap in performance between best BICI users and persons with normal hearing (NH). While studies in humans provide important markers for successful outcomes in patient populations, numerous factors that cannot be controlled in humans may be responsible for the gap in performance between BICI users and NH listeners. In adults, these factors include the onset of deafness in the two ears, amount of time between onset of deafness and implantation, among others. We have been developing an animal model of adult-onset deafness followed by simultaneous bilateral implantation. The cat was selected as the species of choice because this animal species has been used extensively in the Yin lab to study sound localization behavior and physiological mechanisms underlying binaural hearing, in both anesthetized and awake-behaving NH adult animals.

In these experiments, adult cats are first trained extensively to localize sounds by training them with operant conditioning to food reward to look at sound and light sources. Hence pre-implantation data for localization with acoustic and visual stimuli are available for comparisons. Animals are then deafened acutely using ototoxic antibiotic application and bilaterally implanted using the Nucleus® CI24 implant, modified for the cat cochlea. Electrically evoked ABR (EABR) and NRTs are recorded for each stimulating electrode to confirm the functionality of electrodes within the cochlea and to set the threshold and maximum levels of stimulation. Animals are then stimulated throughout much of the day with Nucleus® Freedom speech processors programmed to deliver stimulation at 500-pulses/ second/ electrode.

Testing on the sound localization task is measured following activation of BICIs. In these experiments, animals are tested on either visual-only, auditory-only or visual+ auditory targets, in azimuth. We have explored microphone placements in a backpack and near the pinnae. This presentation will focus on preliminary data from our first cats who have been trained prior to implantation, deafened, implanted and tested using the procedures described above.