COCHLEOTOPIC ORGANISATION OF THE CENTRAL AUDITORY PATHWAY IN THE NEONATALLY DEAFENED CAT

Wimberley C.J.[1], **Fallon J.B.[1, 2]**, Irvine D.R.F.[1] and Shepherd R.K.[1, 2]
[1]The Bionic Ear Institute. [2]Department of Otolaryngology, University of Melbourne.

Purpose: Using single- and multi-unit recordings it has been shown that long periods of deafness and / or chronic intra-cochlear electrical stimulation can effect the cochleotopic organisation of the primary auditory cortex (AI), despite lower auditory centres (including the cochlear nucleus and inferior colliculus) appearing to develop a near normal cochleotopic organisation. **Methods:** Nine animals were neonatally deafened and four of these animals were subsequently implanted with a multi-channel scala tympani electrode array. The implanted animals received unilateral electrical stimulation to restricted sections of the basal turn of the cochlea for periods of up to 11 months via a clinical speech processor and cochlear implant. Analyses of electrically evoked potentials, recorded from multi-channel electrode arrays inserted into AI, were used to determine the most efficacious intra-cochlear stimulating electrode for each cortical location. **Results:** Cochleotopic organisation, defined as a systematic change in the most efficacious electrode across the rostral-caudal dimension of AI (Pearson correlation; $p < 0.05$), was observed in three of the five unstimulated deafened animals and in three of the four chronically stimulated animals. Interestingly, chronic intra-cochlear electrical stimulation resulted in a significant increase in the rostral-caudal extent preferentially activated by each intra-cochlear electrode (Student-T test; $p < 0.05$). **Conclusion:** These results, based on evoked potential recordings and therefore dominated by the thalamo-cortical input volley, indicate that the basic cochleotopic organisation of the cortical input is not dependent on afferent activity. This is at odds with multi-unit recordings from AI, suggesting a difference in the cochleotopy of cortical input and local activity within AI.