Development of a Novel Rodent Model for Examining Central Auditory Plasticity with Cochlear Implant Use

David Perry[1,2], James Fallon[1,2], Hugh McDermott[1,2], Robert Shepherd[1,2]
[1]*The Bionic Ear Institute,* [2]*The University of Melbourne*

The plasticity of the auditory system is undoubtedly a significant contributor to the success of the cochlear implant. Work in our laboratory has been directed towards examining this issue in appropriate deaf animal models[1]. This paper describes the development of a novel rat model of cochlear implantation, which permits the delivery of behaviorally-relevant intra-cochlear electrical stimulation (ICES), together with ongoing behavioral and electrophysiological measurement of auditory acuity.

Our fully-implantable rodent stimulator is capable of delivering two channels of ICES. It is powered by an omni-directional inductive link. Stimulation is controlled over a 2.4 GHz radio connection, allowing dynamic adjustment in response to environmental cues. The implant is capable of generating up to 700 pps per channel, including amplitude modulation, at frequencies between 5 and 175 Hz. *In vitro* testing of the implant encapsulation has demonstrated viability for >6 months. We will present *in vivo* results of chronic stimulation, behavioral testing (using a conditioned avoidance paradigm), and electrophysiological recording in the rat.

Our model allows us to examine the changes in temporal processing that occur following chronic ICES. Of particular interest is whether the behavioral relevance of the ICES, or exposure to an extended range of modulation frequencies during ICES, results in improved temporal processing.

This work was funded by NIDCD (NO1-DC-3-1005 & HHS-N-263-2007-00053-C). The Bionic Ear Institute acknowledges the support it receives from the Victorian Government through its Operational Infrastructure Support Program.