ELECTRICAL STIMULATION MAINTAINS SPIRAL GANGLION NEURONES FOLLOWING REMOVAL OF EXOGENOUS NEUROTROPHINS

Shepherd R.K.[1,2], Epp S.B.[1] and Coco A.[1]
[1]Bionic Ear Institute, 384-388 Albert St., East Melbourne 3002. [2]Department of Otolaryngology, 32 Gisborne St., East Melboourne, 3002.

Purpose: Exogenous neurotrophins (NT) rescue spiral ganglion neurons (SGNs) from degeneration, however, to be effective they must be supplied continuously[1]. We previously reported significant rescue advantage when NT is combined with chronic electrical stimulation (ES)[2]. Here, we examine whether chronic ES can maintain SGN survival long after cessation of NT delivery. **Methods:** Ten adult guinea pigs were deafened and unilaterally implanted with an intracochlear electrode array and drug delivery system. Brain derived neurotrophic factor (BDNF) was delivered to the cochlea for 4 weeks in combination with ES. One cohort (n=5) received ES for 6 weeks (a 2 week period after the cessation of BDNF delivery; ES_6); a second cohort (n=5) received ES for 10 weeks, (a 6 week period following cessation of BDNF delivery; ES_{10}). Cochleae were harvested for histology and SGN density determined for each turn for comparison with normal controls (n=4). **Results:** The withdrawal of BDNF resulted in a rapid loss of SGNs in turns 2-4 of deafened/BDNF-treated cochleae; this was significant as early as 2 weeks following cessation of the NT when compared with normal controls ($p<0.05$). Importantly, while there was a small reduction in SGNs in turn 1 (i.e. adjacent to the electrode array) after NT removal, this reduction was not significant compared with normal controls. **Conclusions:** These results demonstrate that chronic ES can maintain SGNs after initial rescue using exogenous NTs. This finding has implications for the clinical application of NTs and supports earlier work demonstrating a rapid SGN loss after NT removal[1].
[1]Gillespie et al., 2003 J Neurosci Res 71, 785-790. [2] Shepherd et al., 2005 J. Comp. Neurol. 486, 145-158.