# Chronic Neurotrophin Infusion and Electrical Stimulation in the Deaf Cochlea: Implications for Cochlear Implant Spatial Selectivity

**Thomas Landry**[1,2], James Fallon[1], Andrew Wise[1], Robert Shepherd[1]
[1]*The Bionic Ear Institute,* [2]*Department of Otolaryngology, University of Melbourne*

The application of exogenous neurotrophins to the cochlear fluid prevents the degeneration of spiral ganglion neurons (SGN) following the loss of cochlear hair cells. The SGN peripheral nerve fibers also resprout in an abnormal disorganized manner following neurotrophin treatment [1]. This study aimed to investigate the extent of disruption of auditory nerve cochleotopic organization with regards to the spatial selectivity of electrical stimulation. Two weeks after ototoxic deafening, adult guinea pigs were given intracochlear neurotrophins or artificial perilymph via an osmotic pump. Half of each group also received chronic intracochlear electrical stimulation (ICES) from a banded electrode array and clinical speech processor. Following a four week treatment period multi-unit spike clusters were recorded across the inferior colliculus in response to ICES on different bipolar electrode pairs to determine the sharpness of spatial tuning. Chronic ICES resulted in significantly broader spatial tuning (Two-way ANOVA, $p<0.03$) across different stimulation sites and over a range of intensities up to 3.5dB above threshold. Neurotrophin treatment did not have a significant effect on tuning curve width ($p>0.05$). Therefore, neurotrophin treatment does not reduce the spatial selectivity of cochlear implant electrode arrays with designs based on current clinical models.

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