**Protection of the auditory nerve following gelfoam-mediated neurotrophic treatment in deafened guinea pigs**

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1. **Introduction**

The auditory nerve degenerates following severe damage to the organ of Corti including loss of hair cells. For optimal hearing performance with a cochlear implant (CI), a healthy auditory nerve is essential. Over the last two decades the protective effect of neurotrophic treatment on the nerve has been well demonstrated. Clinically applicable methods are developed for treatment in CI patients or in patients with synaptopathy. Here, we use gelfoam to deliver neurotrophic compounds including small molecules.

2. **Objectives**

We seek neurotrophic compounds that yield a high survival and good responsiveness of spiral ganglion cells (SGCs). Therefore, we compare various neurotrophic compounds in deafened guinea pigs using histological and electrophysiological outcome measures.

3. **Materials & methods**

Guinea pigs were ototoxically deafened two weeks prior to neurotrophic treatment. The animals received brain-derived neurotrophic factor (BDNF), neurotrophin-3 (NT-3), a combination of these two, or the small-molecule BDNF-mimetic 7,8,3’-trihydroxyflavone (THF) by means of gelfoam placed on the perforated round window membrane of the right cochlea. Four weeks after treatment onset, electrically evoked compound action potentials (eCAPs) were recorded to assess auditory nerve responsiveness. Subsequently, the cochleas were harvested and SGCs were quantified.

4. **Results**

The highest SGC counts were found for treatment with a combination of BDNF and NT-3, outperforming the other treatments in the basal and middle cochlear turn. Separate treatments of BDNF, NT-3 or THF yielded significant SGC survival only in the basal turn. Surprisingly, the best eCAP outcomes were observed in animals treated with BDNF alone.

5. **Conclusion**

Considering both structural and functional data we suggest that BDNF alone or in combination with NT-3 is preferable as neurotrophic compound to reduce auditory nerve degeneration