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Neurotrophic effects of trangenic fibroblasts on neonatal spiral ganglion cells

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Introduction: Neurotrophic factors have been demonstrated to protect spiral ganglion cells from ototoxic trauma. In addition, cultured spiral ganglion cells derived from neonatal rats demonstrate neurite outgrowth in the presence of neurotrophic factors, especially brain-derived neurotrophic factor (BDNF). The aim of the study was to demonstrate the neurotrophic effect of transgenic fibroblasts expressing BDNF to induce neurite outgrowth of cultured spiral ganglion cells.
Materials and methods: Murine NIH-3T3 fibroblasts were transfected with a lentiviral vector containing a BDNF and GFP gene controlled by a tetracycline-driven promotor. All resulting fibroblast cells produced BDNF and GFP in the presence of tetracycline. Spiral ganglion cells were dissected from neonatal rats (P3-5) and cultured in a serum-free medium, serum-containing fibroblast medium or supernatant derived from fibroblast cultures. Spiral ganglion cells were cultured for 52 hours and then evaluated for spiral ganglion cell survival and neurite outgrowth.
Results: The highest number of survival in spiral ganglion cells and most advanced neurites were determined in cultures incubated with supernatant derived from transgenic fibroblasts. In comparison pure fibroblast media and serum-free media did only result in minor spiral ganglion cell survival. ELISA showed the presence of BDNF (produced by fibroblasts) in the supernatants derived from transgenic fibroblasts.
Conclusions: Our results demonstrated that trangenic fibroblasts secrete significant amounts of neurotrophic factor to the media where they can act on neural tissue, especially spiral ganglion cells. The results suggest a potential application of this technique alternative to fluid-based drug delivery to induce cochlear protection and inner ear regeneration