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Conduit enrichment strategies for severe peripheral nerve injuries

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Chitosan conduits have demonstrated to allow a good regeneration of an injured peripheral nerve (1), but an empty chitosan conduit is successful only for short nerve gap. For gap longer than 10mm it is necessary to enrich the conduit in order to create inside it an environment that allows and improves the regeneration of a damaged peripheral nerve. The conduit enrichment could be achieved by neurotrophic factor (NTFs) delivery within the nerve conduits via nanotechnology or cell engineering and transplantation. Here, we investigated in vitro the bioactivity of selected NTFs conjugated to iron oxide nanoparticles (IONP) and of bone marrow-derived stem cells genetically engineered to overexpress those NTFs. Moreover we reported preliminary in vivo experiments aimed to test the effect of free versus conjugated NTFs on regeneration of the rat sciatic nerve after a sever segment loss.

In vitro experiments demonstrated that IONP-NTFs have a long-term bioactivity, even superior to free NTFs, while engineered NTF-cell proved to be less effective in induction of sensory neurite outgrowth but demonstrated an increased bioactivity in the PC-12 cell culture system (2).

In vivo experiments, after the functional analysis and the morphometrical analysis of regenerated nerves, lead to conclude that after 5 months no differences are detectable between rats treated with free versus conjugated NTFs.

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References

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Chitosan conduit; nanoparticles; regeneration; trauma.