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New chitosan-based scaffolds for peripheral nerve regeneration – Pre clinical studies

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There is a need for new conduits that could provide a replacement strategy to autologous nerve grafting in the reconstruction of peripheral nerve injuries with substance loss. The natural biopolymer chitosan has gained increasing interest in biomedical and tissue engineering applications because of its biocompatibility, biodegradability and low toxicity. Initial cytotoxicity tests were performed *in vitro* and followed by bridging of 10 mm sciatic nerve gaps in adult rats with chitosan tubes. Out of medical grade chitosan the tubes were manufactured by a proprietary extrusion process followed by adjustment of different degrees of acetylation (DA): DAI (~2%), DAII (~5%), and DAIII (~ 20%). Multidisciplinary and comprehensive *in vivo* evaluations revealed that while growth factor regulation is not altered by chitosan tube implantation, DAI and DAIII tubes display reduced support of early regeneration events. Functional and structural regeneration was most similar to autologous nerve graft reconstruction when DAII chitosan tubes were used. Furthermore, DAIII tubes displayed much less stability and a too fast degradation (Haastert-Talini et al., Biomaterials 2013, Dec; 34(38):9886-904). Fine-tuned chitosan tubes with a DA of ~5% are currently processed for the development of more complex artificial nerve devices. The optimal luminal enrichment for the tubes is currently investigated again *in vitro* and *in vivo*. With luminal enrichment also the reconstruction of longer nerve defects will be addressable. Therefore, we investigate combinations of regeneration promoting hydrogels with primary or genetically modified Schwann cells or bone marrow derived mesenchymal stromal cells or growth-factor-conjugated-nanoparticles. The new results will be presented with this paper.

Biography

Kirsten Haastert-Talini has completed her doctoral degree in 2002 from University of Veterinary Medicine Hannover, Germany, and postdoctoral studies from Hannover Medical School, Germany. She is Associate Professor at the Institute of Neuroanatomy, Hannover Medical School. Her research focuses on tissue engineering strategies for peripheral nerve repair. She has published more than 35 original and review articles in reputed journals. The work presented has received funding from the European Community's Seventh Frame work Programme (FP7-HEALTH-2011) under grant agreement n° 278612 (BIOHYBRID, coordinator C. Grothe).

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