# DEVELOPMENT OF A PERIPHERAL NERVE CONDUIT OF ALIGNED POLY (LACTIC ACID-CO-GLYCOLIC ACID) NANOFIBERS

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Introduction: Peripheral nerve injuries cause damage to sensitive and motor functions and decrease life quality by movement limitation or neuropathic pain. Autologous grafts are used to repair peripheral nerve lesions but require the removal of a nerve from another location. Another strategy is to fabricate artificial nerve grafts by tissue engineering techniques using biomaterials and stem cells. Conduits made with aligned nanofibers may contribute to nerve regeneration by providing a confined microenvironment and oriented fiber growth. Poly (lactic acid-co-glycolic acid) (PLGA), a biocompatible and biodegradable polymer which is currently in broad used in tissue engineering, was used in this study. Electrospinning is a powerful technique for producing nanofibers, using a high voltage to deform a polymer droplet expelled from a needle. To produce aligned nanofibers, a rotor/mandrel is used as a collector. Aims: To develop an artificial nerve graft for future use in peripheral nerve injuries as a substitute of autologous nerve graft. Materials and Methods: An 18% PLGA solution in hexafluor-2-propanol was used to produce aligned nanofibers using a ±20 kV voltage, 1mL/h flow rate and 15 cm distance between the needle and the collecting mandrel. To avoid shrinkage, the scaffold was incubated at 37°C for 24h. A conduit with 1.5 mm diameter and 5 mm length was produced by rolling the aligned nanofibers around a needle and fixing the edges with the polymer solution. To characterize both scaffolds and conduits, scanning electron microscopy was performed to analyze fiber morphology, measure the nanofiber diameter and alignment coefficient; contact angle measurements were performed to provide information about hidrophobicity/hydrophilicity and the dynamic mechanical

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analysis to determine Young's modulus. Once produced and characterized, the conduits were seeded with mesenchymal stem cells from deciduous tooth pulp. The electron microscopy images show that the scaffolds presented uniform aligned fibers with an average diameter of 880±33 nm. Results: The average thickness was 70 nm and the contact angle 112.5°±0.12. The calculated alignment coefficient was 0.788 ± 0.07. The aligned fibers had a Young's modulus of about 443 ±75 MPa. Mesenchymal stem cells, known for their anti-inflammatory properties and their capacity to differentiate in neural progenitors, adhered and maintained viability on the conduits, as analyzed by WST8 viability and Live/Dead assays. Conclusion: The use of proper biomaterials, stem cells and tissue engineering designs will probably improve the life quality of patients. Financial support: CNPq, CAPES, FAPERGS and Stem Cell Research Institute.

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