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Multimodal multi component polymer conduits for repair of nerve injury

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Injury to nerve tissue in the peripheral nervous system (PNS) results in long-term impairment of limb function, dysaesthesia and pain, often with associated psychological effects. Minor injuries can regenerate without intervention and short gaps can be repaired by end joining, however larger or more severe injuries commonly require autogenous nerve grafts which often result in suboptimal clinical outcomes. The challenges that persist with nerve repair have resulted in development of synthetic nerve guides from non-neural biological tissues and polymers to improve the prognosis for repair of damaged nerves. This study describes the design and fabrication of a nerve regeneration conduit, synthesised using polylactic acid and poly (lactic-co-glycolic) acid co-polymers, in addition to aneurotrophin-enriched hydrogel. The conduit was used to promote repair of transected sciatic nerve in rats over a period of 4 weeks. Over this period, it was observed that over-grooming and self-mutilation (autotomy) of the limb implanted with the conduit was significantly reduced in rats implanted with the full-configuration conduit compared to rats implanted with conduits containing only an alginate hydrogel. This indicates return of some feeling to the limb via the fully-configured conduit. Immuno histo chemical analysis of the implanted conduits removed from the rats after the implantation period confirmed the presence of myelinated axons within the conduit, distal to the site of implantation, further supporting that the conduit promoted nerve repair over this period of time. This study describes the design and fabrication considerations of a novel multicomponent, multimodal bio-engineered synthetic conduit for peripheral nerve repair.

Biography

Rob M.I. Kapsa completed his PhD in 1996 at the University of Melbourne Dept. Medicine, St Vincent's Hospital (Melbourne). He is Program Director for the Bionics Platform of the ARC Centre for Electromaterials Science (ACES) and concurrent Principal Scientist and Head of Research Neurosciences at St Vincent's Hospital in Melbourne. He has published 85 peer-reviewed manuscripts including 2 book chapters and one book in the areas of muscle biochemistry, genetics, gene therapy and muscle and nerve engineering. His work is focused on the development of autologous cell-based regenerative therapies for hereditary nerve and muscle disease.

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