BACKGROUND

Structures that direct neurite extension are important for regeneration following spinal cord injury and peripheral nerve injury. Within the spinal cord, neurons encounter a glial scar environment that impedes regeneration. In the peripheral nervous system, endogenous regeneration cannot occur across nerve gaps greater than 2 mm. Current repair strategies use guidance conduits to channel axonal growth towards distal targets. While showing promise, conduit walls do not provide a suitable environment for neuronal attachment or extension, and axonal growth within conduits remains tortuous. Hence, there is a need for development of three-dimensional (3D) structures that use contact guidance—rather than confinement—as a means of guided regeneration.

INVENTION

Michigan Tech researchers have developed aligned, electrospun fiber matrices that have been shown to direct neurite extension in vivo using rat models. In addition, a gradient of the glycoprotein laminin-1 has been adsorbed onto aligned microfiber matrices to stimulate directional growth. These matrices were then manipulated into 3D conduit structures. Novel polymeric conduits that utilize contact guidance and contain gradients of molecules that stimulate directional growth have the potential to foster fast, directed regeneration into and through conduit structures.

ADVANTAGES

- Inexpensive manufacturing process
- Biodegradable and biocompatible fiber materials (polylactic acid)
- Blood vessels enter quickly and remain patent for a long term

APPLICATIONS

- Peripheral Nerve Surgery
- Spinal Cord Injury

TECHNOLOGY STATUS

In-Vivo testing completed in collaboration with Johns Hopkins
Seeking commercialization partners

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