# Characterization of Neuronal Repair within Injectable Fibronectin and Collagen Based Gels Implanted into the Injured Adult Rat Spinal Cord.

A. Alovskaya[1], D. Wei[2], V. King[2], J. Priestley[2], R.Brown[1]

[1] *Institute of Orthopaedics and Musculoskeletal Science, Tissue Repair and Engineering Centre, University College London*

[2] *Neuroscience Centre, Institute of Cell and Molecular Science, Queen Mary University of London*

**INTRODUCTION:** Injury of the adult mammalian spinal cord elicits a cascade of pathophysiological events that results in loss of neural tissue, and, consequently, partial or complete loss of neurological functions. Subsequent to injury of the spinal cord, fluid filled cavities often develop an inhibitory environment in the form of glial scar. These factors, in part, prevent regenerative repair in the spinal cord. In the current study we have begun to develop support materials that form gels when they are injected into lesion cavities in the spinal cord. The aim is to provide a substrate for axonal growth, infiltration of other beneficial elements (e.g. blood vessels) and reduces neural death.

**METHODS:** We examined three types of materials: (1) viscous fibronectin solution (2) collagen gel and (3) fibronectin/fibrin gels (Fn/Fb). Each of these materials was injected into a lesion cavity made in the dorsal aspect of the thoracic spinal cord. At one and four weeks post-injury we used immunohistochemistry to examine a variety of neuronal and non-neuronal elements at the implant site.

**RESULTS:** At one week post-injury both fibronectin containing materials had supported strong regeneration into the lesion site, with little cavitations within the spinal cord. In contrast, the collagen material resulted in very dense and cavity filled areas within the implant site itself. Immunostaining showed substantial axonal growth within both fibronectin groups as well as a infiltration of Schwann cells and blood vessels and the presence of the extracellular matrix molecule laminin. Within the dense areas of the collagen implant, little infiltration of these elements was seen. In addition, extensive macrophage infiltration was present within all implants. The amount of macrophage infiltration in the surrounding intact tissue was no more than that seen following injury alone, indicating that none of the materials increased the inflammatory response of the spinal cord. By four weeks post-injury, some large cavities had developed at the interface between the intact tissue and implant in the fibronectin group only, but this was minimal in animals with Fn/Fb injection. Infiltration of the various cellular and non-cellular elements at this time point was grossly similar between the two fibronectin materials.

**DISCUSSION & CONCLUSIONS:** The results indicate that injectable fibronectin gels are effective in filling in lesion cavities in the damaged spinal cord. However, the Fn/Fb material was superior both in terms of the completeness with which the cavities were filled and in the degree of axonal regeneration supported.

**ACKNOWLEDGEMENTS:** This work is supported by BBSRC project grant.