Engineered neural tissue as a substitute for the autograft in peripheral nerve repair

Conference or Workshop Item

Engineered Neural Tissue as a Substitute for the Autograft in Peripheral Nerve Repair

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Arial 11pt, Initials for first name followed by last name, superscript numbers for affiliations, presenting author underlined and corresponding author should be mentioned with "". Maximum number of authors is 10.*

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Arial 8pt

Engineered neural tissue (EngNT) has been developed comprising highly orientated Schwann cells that are functionally integrated within an anisotropic collagen matrix. This can provide a cellular guidance substrate for peripheral nerve repair when delivered within tubular conduits. In vivo tests in the rat sciatic nerve model showed that neurons regenerate within EngNT, with fibre diameters and myelin structures that are equivalent to those in an autograft (Fig 1). Conduits containing EngNT supported robust axonal growth across a 15mm gap and into the distal stump at 8 weeks, whereas empty conduits performed poorly in comparison. The Schwann cells within the EngNT provide trophic support to the regenerating neurons and are able to modify the extracellular environment through remodelling of collagen and deposition of matrix components. Because the formation of EngNT involves cells and native collagen fibrils aligning simultaneously via natural cell-matrix interactions, the resulting anisotropic material provides a simple tissue-like structure that can integrate easily with host tissue. The EngNT mimics the key structural and functional features of the nerve autograft and can be assembled using clinically relevant cells and materials. Autologous and allogeneic stem cells differentiated to a Schwann-like phenotype have been incorporated successfully into EngNT and the production process is suitable for scale-up and automation. Current research is focussed on developing the technology towards clinical application.

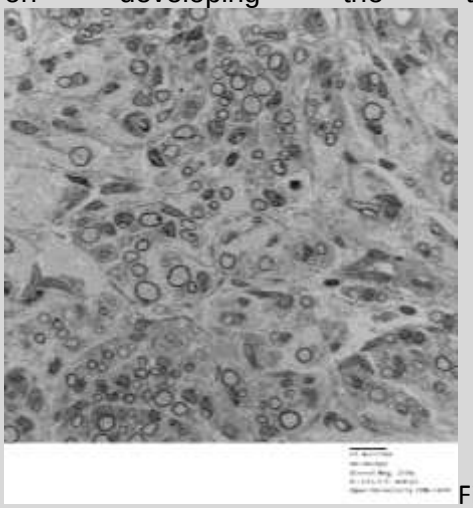

Figure 1: Neuronal regeneration within EngNT, rat sciatic nerve injury model, 15mm gap at 8 weeks