Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Method for Superior Peripheral Nerve Regeneration

Acellular nerve graft with low DNA content, preserved native nerve structure, and enhanced bioactivity for the repair of large nerve gaps

Overview

This invention addresses the challenge of repairing long peripheral nerve gap injuries, which are common, debilitating, and costly to treat. The technology is an acellular nerve graft produced through a unique process: initial freeze-thawing, followed by unidirectional freeze-drying to create longitudinal pores, and then chemical and enzymatic decellularisation. This method enables deeper penetration of decellularisation agents, resulting in a graft with very low DNA content, preserved native nerve structure, and enhanced bioactivity. The key breakthrough is the ability to reliably generate long, porous, acellular nerve grafts that retain crucial extracellular matrix components and structural integrity, making them suitable for bridging large nerve gaps.

Advantages

Superior decellularisation: Achieves DNA content below 60 ng/mg (versus 257 ng/mg with prior methods), reducing immunogenicity and risk of rejection.

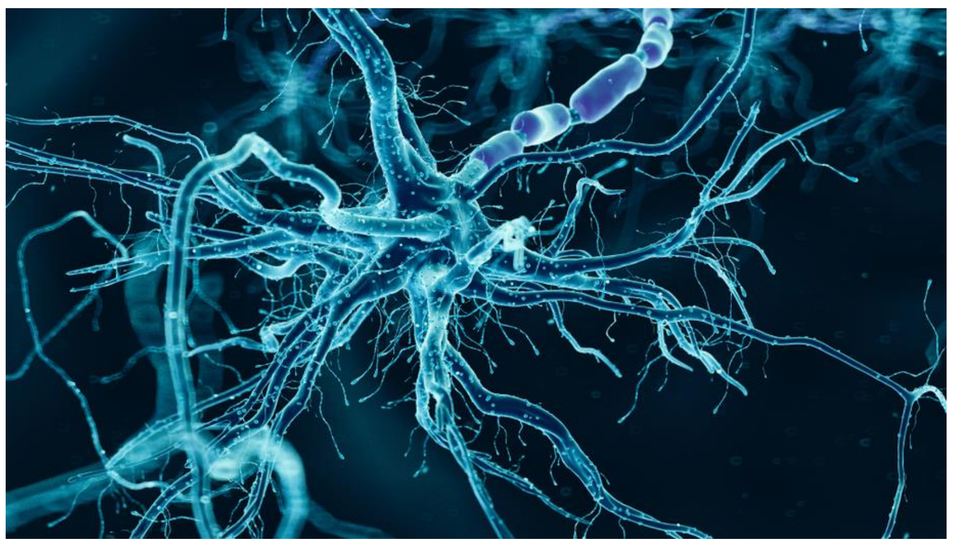
Enhanced porosity: Unidirectional freeze-drying creates longitudinal pores (average ≥40 µm), improving cell infiltration and nutrient diffusion compared to conventional scaffolds.

Retention of native structure: Maintains nerve fascicles and connective tissue layers (endoneurium, perineurium, epineurium), supporting axonal guidance and regeneration.

Improved bioactivity: Graft shows higher VEGF release, potentially enhancing vascularisation and healing.

Customisable composition: Option to enrich with sulphated glycosaminoglycans (sGAGs) for further regenerative support.

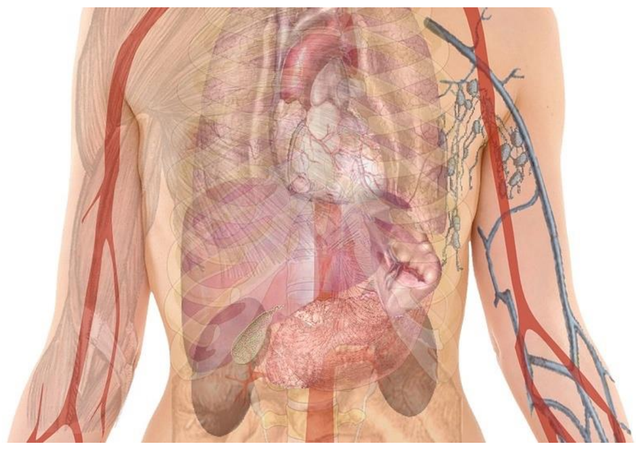
Compared to existing decellularised grafts, this technology offers greater decellularisation, better microarchitecture, and improved biological performance,



Applications

Primary industry classification: Regenerative medicine – peripheral nerve repair and tissue engineering.

Secondary application areas: Trauma surgery, reconstructive microsurgery, veterinary orthopaedics.



Technology Status

Development stage: Laboratory validation with porcine nerve models; process parameters and characterisation data established.

Validation status: Extensive in vitro characterisation (DNA, collagen, GAG content, mechanical properties, VEGF release); no clinical or animal implantation studies reported in the document.

Key milestones: Patent application filed; optimised protocols and reproducible graft fabrication achieved.

Market Opportunity

Target industries/applications: Peripheral nerve repair in trauma, reconstructive surgery, and neurosurgery; veterinary applications for large animals.

Market size estimate: Over 20 million Americans suffer peripheral nerve injury, with annual treatment costs exceeding $150 billion (US).

Unmet needs addressed: Provides an off-the-shelf, long-length nerve graft alternative to autografts, reducing surgery time, donor site morbidity, and infection risk.

Technology Sector
Med Tech

Patent Details
P13193EP00

Opportunity
Research collaboration
Available to License

Researcher(s)
Dr. Conor Buckley

Contact
Gordon Elliott
Case Manager, Med Tech
Gordon.Elliott@tcd.ie

Reference:
CB02-784-01

Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Rialtas na hÉireann
Government of Ireland

Co-funded by the European Union

Tionól Réigiúnach an Deiscirt
Southern Regional Assembly

Enterprise Ireland