TU DUBLIN
OLLSCOIL TEICNEOLAÍOCHTA BHAILE ÁTHA CLIATH
TECHNOLOGICAL UNIVERSITY DUBLIN

Hothouse

# Technology to Licence T-20-023

## Guided Bone Regeneration (GBR) Membranes

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# Overview

Guided bone regeneration (GBR) membranes are widely used in dental and craniomaxillofacial applications to seal the bone defects from the invasion of surrounding soft connective tissues, thereby providing an osteogenic environment for enhancing bone regeneration. The desirable characteristics of GBR membranes include biocompatibility, cell occlusion, host integration capability, space-making ability, and adequate mechanical properties. A variety of non-degradable materials have been employed successfully as GBR membranes such as extended-PTFE (e-PTFE) and titanium mesh. However, they have infection issues, low success rate in healing bone defects and a second surgical intervention for the removal of the membrane.

TU Dublin researchers have explored biodegradable synthetic aliphatic polyesters ((Polylactic acid (PLA), Poly(lactic-co-glycolic acid) (PLGA), Poly-caprolactone (PCL) and Polyglycolic acid (PGA)) to manufacture GBR membranes. These polymers have good mechanical properties, drug encapsulation capability, biocompatibility, and controlled degradability. TU Dublin Researchers propose cyanoacrylate crosslinked-multifunctional (PCL/PLGA/PLA)-hydroxyapatite (HA)-magnesium oxide nanoparticles (MgO NPs) porous GBR membranes for healing dental/craniomaxillofacial bone defects.

The use of cyanoacrylate-based crosslinker controls the porosity and mechanical property of the membrane, whereas the inclusion of hydroxyapatite (HA) and MgO NPs promote the osteoconductivity of the membrane. Triethanolamine (TEOA)/allylamine can be used as a dispersant while in parallel facilitating surface modification with natural polymers. The biophysiochemical properties of the proposed components can be exploited in unison to get desirable GBR membranes. All the components involved in the preparation of proposed GBR membranes are approved by the FDA.

# Advantages

The advantages of the proposed GBR membranes over existing technology are:

- The use of cyanoacrylates as a crosslinker to control the porosity and mechanical properties of synthetic aliphatic polyesters containing inorganic components (hydroxyapatite, Mg-based mineral) of the natural bone.
- The positively charged amines improve the properties of GBR membranes in many ways (a) acts as a dispersant for the even distribution of inorganic solids in the polymer matrix, (b) Initiates the polymerisation and crosslinking of cyanoacrylate and (c) facilities the surface functionalisation of bone extracellular matrix (organic components) for enhancing the biological response of bone cells, and (d) induce porosity and surface wettability.
- The multifunctional nature of the GBR membrane will be effective in treating the vertical and horizontal bone defect more effectively due to biomimetic surface (presence of organic and inorganic bone components) and cell occlusion properties.
- The solvent cast method of preparing GBR membranes is rapid and cost effective when compared to the freeze-drying and electrospun techniques.

# Stage of Development

TU Dublin is seeking commercial partners to assist in bringing this technology to market.

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# Contact Us

## See how TU Dublin Technologies can work with your business.


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