Superior Wound Healing using Macromolecular Crowding Technology

A superior method of production for wound healing and other applications using macromolecular crowding

Objective

Seeking Licensing Opportunities or development partners to advance the technology into the clinic in a number of clinical indications.

Research and IP Status

Patent application submitted

Patents

US granted patent no. US 10,619133

European patent application no. 2 718 421

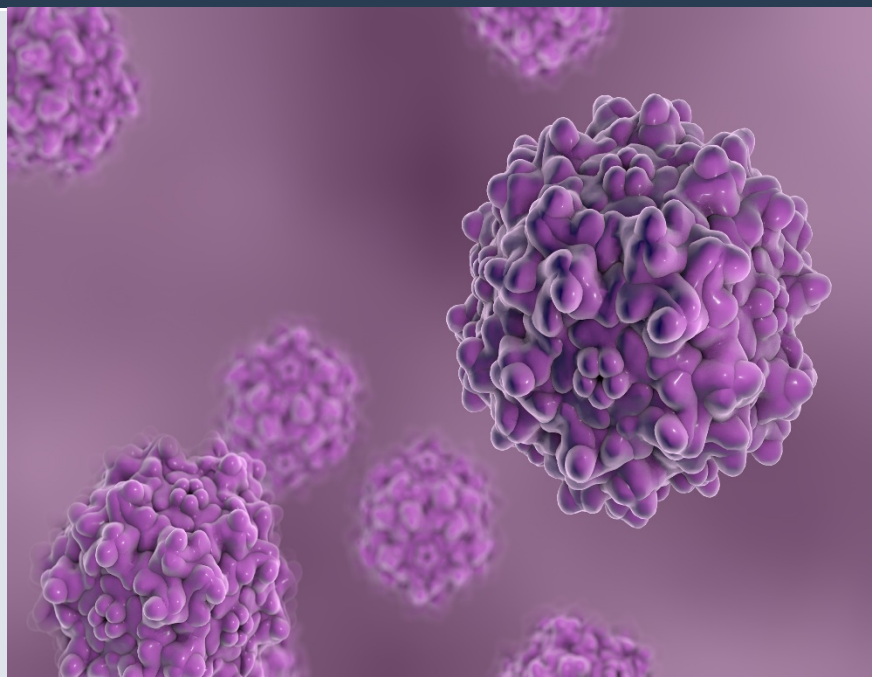

Image: www.shutterstock.com

Background

Scientists at NUI Galway have developed a macromolecular crowding (MMC) technology (MMC Method) and demonstrated its efficacy in wound healing. Most wounds heal by themselves or with a little help from conventional approaches (dressings, topical treatments). However, a sub-set of wounds are slow to heal, and more intensive approaches are called for. Advanced care products for the wound healing process can be prescribed by clinicians after assessment. These products are largely focused on utilising the body's own ability to heal itself, and on creating a hydrated microenvironment for cells to thrive.

NUI Galway has successfully applied it's patent protected macromolecular crowding (MMC) technology (MMC Method) and demonstrated that it enhances the intrinsic capacity of cells to produce tissue specific extracellular matrix (ECM), allowing for the development of improved tissue-like surrogates in the laboratory – a multifunctional implantable device can be produced faster and at lower cost.

This is a platform technology with a number of potential uses across regenerative medicine and cell therapy. These include skin (burns, wounds & ulcers), bone, cartilage, ocular and others. Scientists at NUI Galway have demonstrated efficacy of this technology in an *in vivo* wound healing model.

Tech Overview

NUI Galway has developed a patented technology (***MMC Method***) that exploits macromolecular crowding to increase over 80-fold extracellular matrix deposition within 2-6 days in culture for a range of human and equine permanently differentiated and stem cell populations. *In vitro* testing was carried out on the **MMC Method** in dermal fibroblasts, corneal fibroblasts, lung fibroblasts, tenocytes, osteoblasts, chondrocytes, bone marrow stem cells, adipose derived stem cells, umbilical cord stem cells) and has demonstrated efficiency / efficacy through a variety of cell assays (e.g. cell morphology analysis, cell metabolic activity, viability and proliferation analysis; protein synthesis/deposition analysis, gene expression analysis, FACS analysis).

Clinically, the technology has been validated *in vivo in* a humanised (splint) mouse wound healing model and the therapeutic benefit of tissue grown in the presence of the **MMC Method** has been extremely positive demonstrating scar-free healing, as opposed to the groups without MMC that resulted in scar formation.

Figure1: In vivo demonstration of wound healing using MMC Method

Applications

- Lead clinical application – proof of concept demonstrated in wound healing application
- The technology has the potential to provide functional therapeutic interventions for a range of clinical indications (e.g. skin, corneal, tendon, ligament, bone, cartilage, etc. repair and regeneration).
- Research applications
- Drug discovery applications
- Cellular agriculture and aquaculture

Benefits

A more functional device can now be produced faster, maintaining cellular phenotype and reducing manufacturing costs

- Lead clinical application – proof of concept demonstrated in wound healing application
- The technology has the potential to provide functional therapeutic interventions for a range of clinical indications (e.g. skin, corneal, tendon, ligament, bone, cartilage, etc. repair and regeneration).
- Shorter production time
- Lower waste
- Higher functionality
- No biological additives
- Patent protected Validated *in vivo*
- Patent claims method and superior tissue

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Appendix 1

Figure1: In vivo demonstration of wound healing using MMC Method

Preliminary *in vivo* data in a splinted wound healing model, with the application of the NUIG MMC Method in conjunction with a commercial collagen scaffold, resulted in scarless healing. The cells, scaffold and cells and scaffold and cells and macromolecular crowding groups were utilised 30,000 per 8 mm2 human bone marrow stem cells and were cultured for 6 days (5 days with macromolecular crowding).