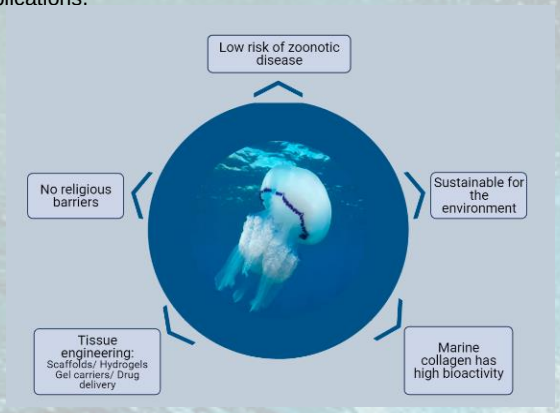
Marine collagen provides a sustainable material for developing neural stem cell implants

[1]Anthea R. Mutepfa, [1]Christopher F. Adams, [2]John G. Hardy
[1]Neural Tissue Engineering Keele, School of Life Sciences, Keele University
[2]Materials Science Institute, Lancaster University, Lancaster

Introduction

Marine collagen (MC) presents as an alternative to bovine and porcine collagen in tissue engineering, with multiple translational advantages. It is yet to be tested for neural tissue engineering applications.



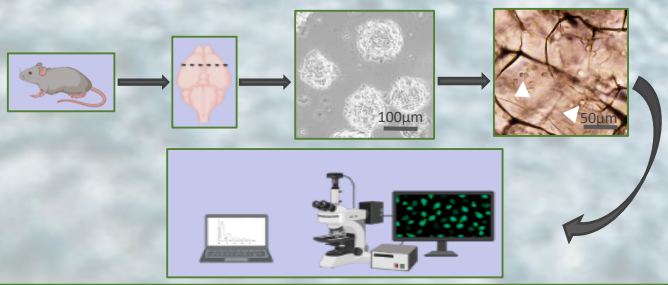
Objective: to develop a protocol to fabricate conductive scaffolds from Jellagen®, a Type I collagen derived from *Rhizostoma Pulmo* jellyfish, and to test its potential to maintain the key regenerative features of neural stem cells (NSCs)

Methodology

- *Fabrication of electroactive Jellagen® scaffolds*

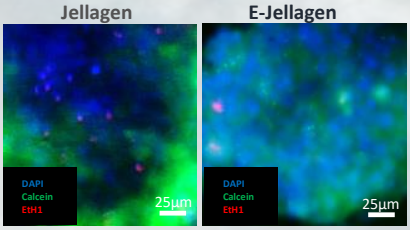
Chemical polymerisation: addition of an interpenetrating network of electrically-conductive polymer polypyrrole (PPY) to Jellagen® freeze-dried scaffolds

- *Neural stem cell culture*

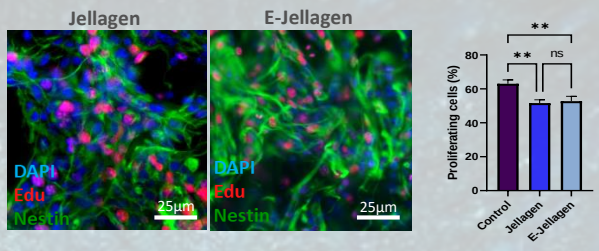


Results

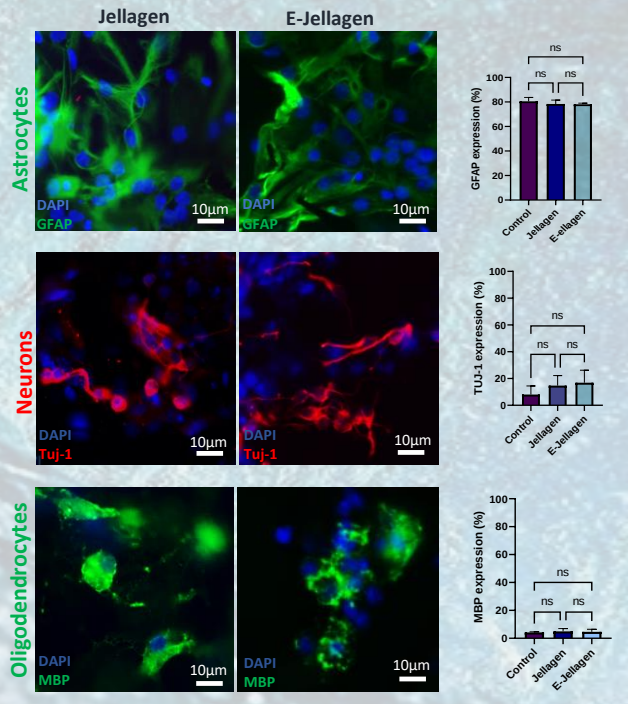
NSCs survive on electroactive Jellagen®



NSCs proliferate on electroactive Jellagen®



NSCs generate daughter cells on electroactive Jellagen®



Astrocytes, neurons and oligodendrocytes are the main cell types of the central nervous system.

Conclusion and research directions

- Jellagen® can be rendered electroactive through a non-cytotoxic chemical polymerisation protocol with PPY
- Electroactive Jellagen® does not affect the key regenerative features of NSCs and shows potential as a novel implantable device for cell therapies
- Currently examining the immune response induced by MC, and exploring combinatorial drug delivery and cellular electric stimulation strategies for neural tissue repair applications

Neural Tissue Engineering Keele
Keele University
Lancaster University
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