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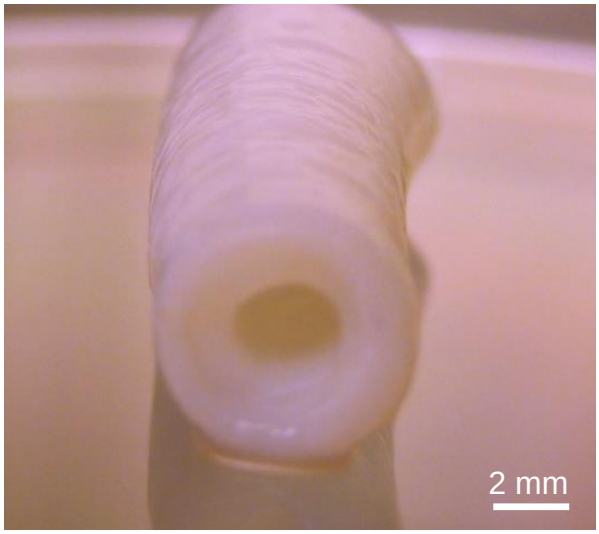
Human-Sized Tubular Tissue Scaffolds

A team at the University of Cambridge has developed a novel method for generating human-size tubular tissue scaffolds, which have the potential to be used as a replacement for a range of diseased or damaged conduits in the human body.



Human-sized collagen tube with 2.5 mm lumen diameter and 1.5 mm wall thickness.

Advantages:

- Custom tubes fabricated *de novo.*
- Readily fabricated for a range of diameters and wall thicknesses.
- Surface and bulk seeding of cells/organoids.
- Luminal surface patterning.
- Suitable for surgical implantation.
- Bioactive, biocompatible, collagen-based scaffold material.
- Comparable mechanical strength to native tissue.
- Seamless tube with patent lumen.

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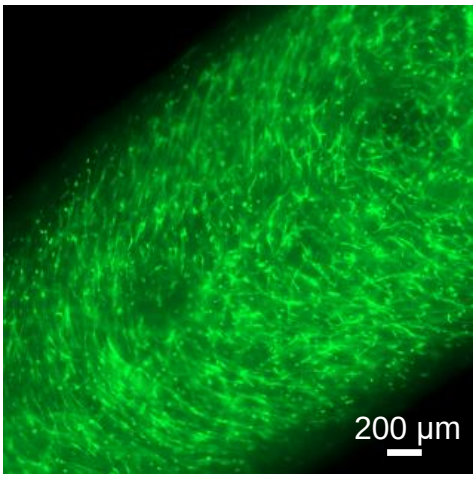
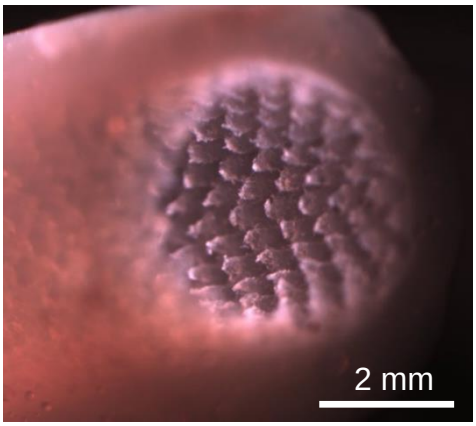
Technology Overview

Replacement of diseased tissues is hindered by donor availability, variability, and suitability and risks of transmitting pathogens. Artificial tubular constructs often fail to fulfil the mechanical and/or biological requirements.

To overcome these limitations, the inventors from University of Cambridge have developed a novel method for fabricating human-sized tubular scaffolds made of biocompatible polymeric hydrogel materials, which support cell/organoid growth, whilst having sufficient mechanical strength for surgical implantation. Also have the ability to do luminal patterning at different length scales (down to 250 µm), using a 3D printing-based procedure, which offers the potential for improved cellular attachment and for forming biomimetic tissue structures.



Cellular co-culture displaying capillary-like structures in the bulk of a densified collagen scaffold.



Luminal surface patterning showing 250 µm size features.

Potential Applications

Replacement for damaged or diseased tissues in a range of fields:

- gastrointestinal (bile duct, small and large intestine, oesophagus),
- genitourinary (ureter, urethra)
- respiratory (trachea, bronchi)
- cardiovascular (coronary artery and large diameter vessels)
- peripheral nerve repair.

Commercialisation

We are seeking a commercial partner for collaboration and development of this technology, which is protected by patent application number: GB1905040.0

Reference

Sampaziotis, F et al. Reconstruction of the murine extrahepatic biliary tree using primary extrahepatic cholangiocyte organoids. Nature Medicine; 3 July 2017; DOI: 10.1038/nm.4360