

CASE STUDY: The use of PeptiGels® for the Prevention of Oesophageal Strictures

The Challenge

Barrett's oesophagus is a condition in which the cells in the oesophagus grow abnormally and if left untreated, often lead to cancer. Oesophageal cancer is the 8th most common cancer in the world.

The disease can be managed by removing the pre-cancerous cells endoscopically. However, this treatment can also damage healthy cells and lead to fibrotic strictures, narrowing the oesophagus and causing further problems for patients.

These strictures are currently managed using endoscopic balloon dilation; however, perforation, bleeding and septicaemia are common side effects.

The Solution

One strategy to treat this condition is to apply a hydrogel after surgery to promote healthy regeneration of the oesophagus. Most hydrogels are currently derived from animal sources and consequently are not suitable for clinical translation. PeptiGels®, however, offer a clinically translatable solution.

The Science

Led by Professor Julie Gough, researchers at The Universities of Manchester and Nottingham have investigated PeptiGels® for use in the treatment of these strictures.

These hydrogels have been specifically designed to support cell growth, are fully synthetic and inherently immunogenic and biodegradable enabling the possibility for use in the clinic.

They also have shear-thinning properties, so they can be sprayed endoscopically directly to the treatment area and their mucoadhesive properties mean they remain at the site of administration, making them ideal candidates for tissue regenerative scaffolds.

Using Manchester BIOGEL's PeptiGels®, we were able to grow 3D co-cultures of primary oesophageal cells with the desired morphology and functionality. These findings are the first step in using these synthetic hydrogels to manage structures caused by endoscopic treatment of Barretts' oesophagus.

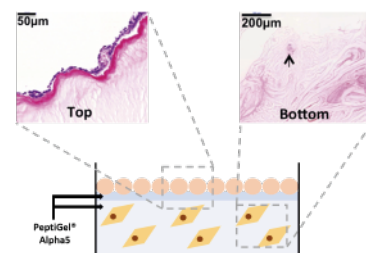
Julie Gough

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The Results

A library of PeptiGels® (Starter Pack) was explored to find the optimal hydrogel for the culture of each oesophageal cell; rat oesophageal stromal fibroblasts (rOSFs) within the hydrogel (3D) and mouse oesophageal epithelial cells (mOECs) on the surface (2D).

Perhaps unsurprisingly, the cells responded best to the PeptiGel® with the most similar mechanical properties to native human oesophageal tissue, Alpha5; the rOSFs were fibroblastic in appearance and desired mOEC morphology and epithelial sheet formation was observed.



Work then moved on to study a three-dimensional (3D) co-culture system, more representative of *in vivo* oesophageal tissue, using this PeptiGel®. After seven days, this multicellular and multi-layer matrix had successfully supported the formation of a functional, uninterrupted epithelial sheet.

The Future

These promising data are now being expanded upon to take the next steps towards a novel treatment for stricture management in Barrett's oesophagus.

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Kumar, D., et al., Adv. Funct. Mater.,
2017;12:1702424