

# Tackling neovascularisation for tissue engineered skin

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## What is it?

- Delayed angiogenesis causes Tissue Engineered skin (TE skin) to fail post-grafting.
- TE grafts survive on well vascularised wound beds but fail on poorly vascularised wound beds. This problem is not unique to TE skin.

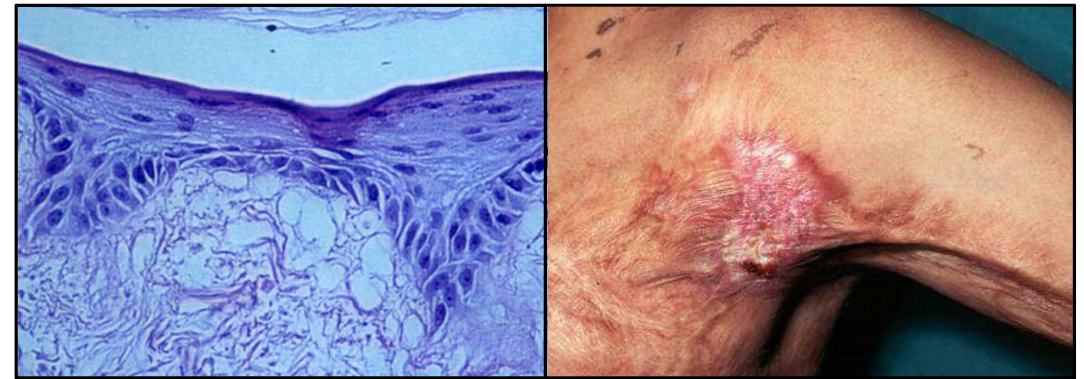
## How do you propose to tackle this?

- Through exploration of several approaches to develop biomaterials that deliver angiogenic stimuli and delivery of cells to promote angiogenesis

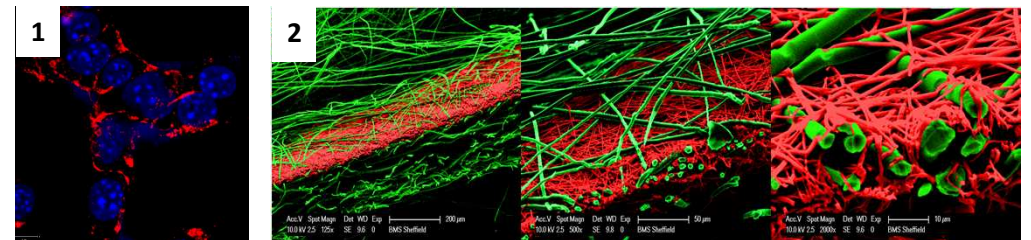
## Difficult Challenges

- Neovascularisation is complex - *in vivo* it involves a combination of pre-angiogenic and stromal cells, a range of angiogenic stimuli and is stimulated by inflammation, hypoxia and flow. An understanding of this complexity needs to be appreciated to make progress in this area.

Tissue engineered skin surviving well on patient  
BUT most do not because of slow neovascularisation

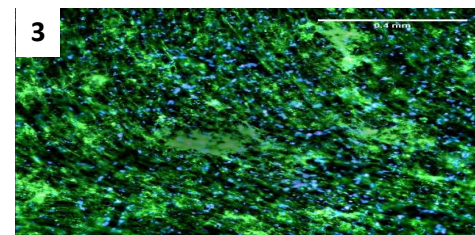


## EXPERIMENTAL APPROACHES

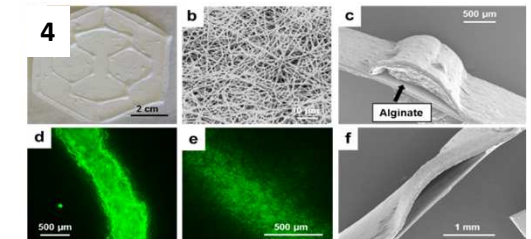


1  
PLGA Microparticles designed to deliver VEGF (with K. Shakesheff)

2  
Development of synthetic dermal substitutes including trilayers of micro and nanofibres (see Bye et al, 2014) Electrospun fibres have also been modified using an electrostatic layer by layer approach to bind heparin which then binds VEGF (Easton et al, 2014).



3  
Scaffolds to deliver MSC to promote angiogenesis



4  
Pseudovascularity to provide temporary perfusion for tissues

Bye FJ, Bullock AJ, Singh R, Sefat F, Roman S, MacNeil S. Development of a basement membrane substitute incorporated into an electrospun scaffold for 3D skin tissue engineering. *Journal of Biomaterials and Tissue Engineering*. 4(9) 686-692 (2014).

Easton C, Bullock AJ, McArthur S, MacNeil S. Application of Layer-By-Layer Coatings to Tissue Scaffolds – Development of a Pro-Angiogenic Biomaterial. *Journal of Materials Chemistry*. 2:5558-5568 (2014).