



Electrospun Scaffolds for 3D Cell Culture and Tissue Engineering

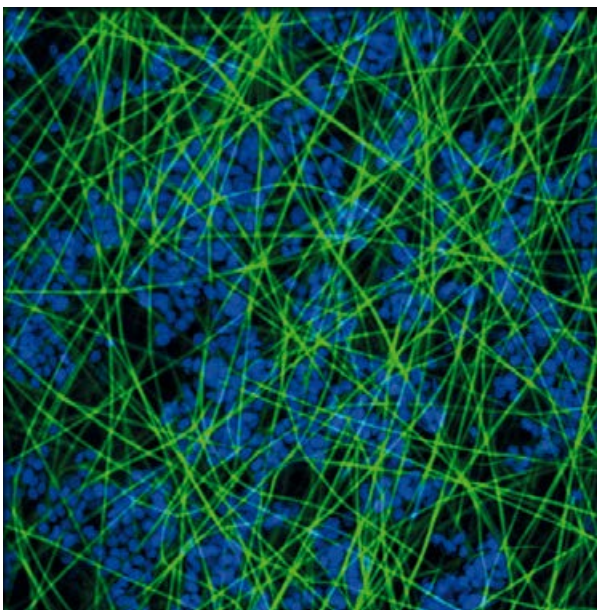


Image 1: Cells growing in 3D within an electrospun scaffold.

Why use 3D models for regenerative medicine?

- Cells grown in 3D are more representative of real cells in the body (*in vivo*) than those cultured in 2D models (*in vitro*), especially with respect to the cell-cell and cell-extracellular matrix interactions that influence molecular targets, uptake, and cellular metabolism of drugs.
- Cells in 3D have a more natural shape and structure (ellipsoids of 10-30 μm instead of flat cells with a thickness of 3 μm), and nearly all of their surface area is exposed to other cells or matrix, while cells in 2D have most of their surface area exposed to fluid and the flat culture surface.
- Difference in cell behaviour between the systems has been demonstrated in many functions including differentiation, drug metabolism, proliferation, and viability.
- Morphogenesis, angiogenesis and tissue invasion occur exclusively in 3D.

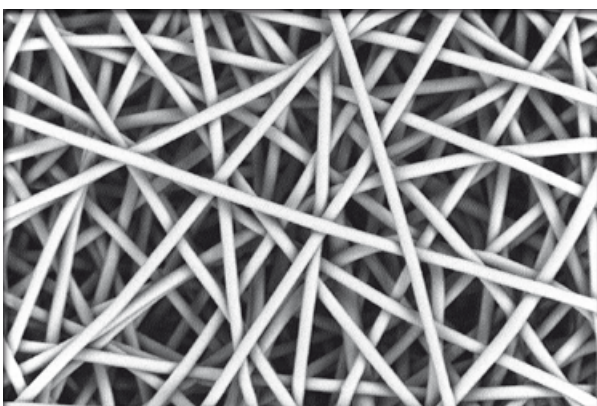


Image 2: An electrospun scaffold with randomly-oriented fibres resembles the extracellular matrix.

Electrospun scaffolds for 3D cell culture

Electrospun scaffolds are highly porous and mimic the extracellular matrix, providing an ideal environment to support the growth of cells in 3D. They are created by electrospinning polymers into nanofibres or microfibres. Xeno-free, FDA-approved, medical grade polymers can be selected to facilitate translation of research findings into clinical use.

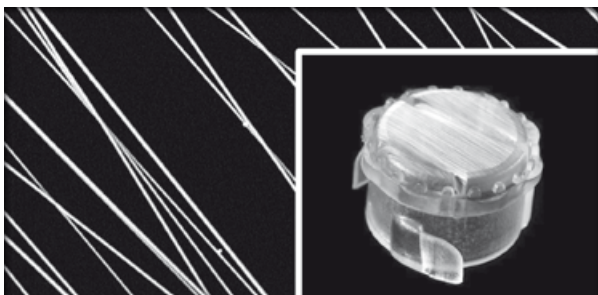


Image 3: Aligned fibre scaffold.

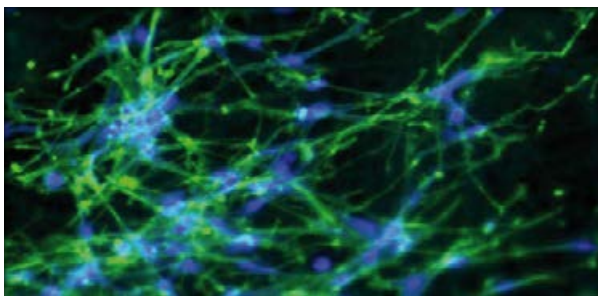


Image 4: Fibroblasts after 24 hours in a Mimetix scaffold (Photo courtesy of Prof. S MacNeil of Sheffield University).

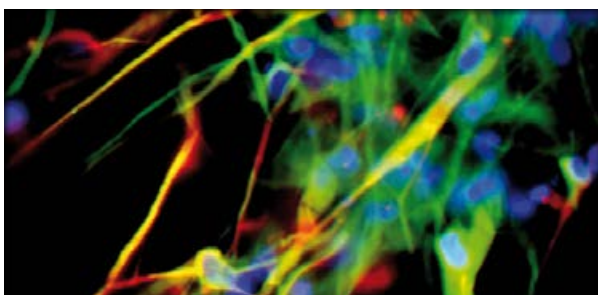


Image 5: Neural stems cells differentiating in an electrospun scaffold (nuclei in blue, Tubulin β III in green, DCX in red).

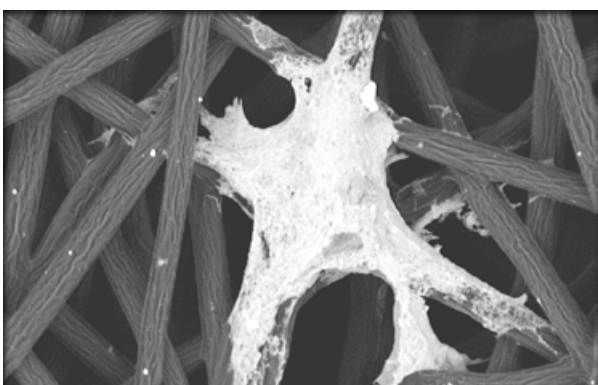


Image 6: Lung fibroblast after 36 hours on PLGA microfibre scaffold containing plant oil.

Adaptable for cell type and application

Scaffolds can be produced from biodegradable or non-biodegradable polymers and degradation time tuned to fit the desired culture period. Within scaffolds, polymer fibres can be randomly oriented in a non-woven mesh or aligned to support the differentiation of cells such as tenocytes or glial cells. Scaffolds can also be spun into 3D shapes. Fibre diameter and pore size can be varied to accommodate different cell types. Fibres can be coated with peptide motifs to promote cell attachment, growth and differentiation, while bioactive molecules can also be incorporated into fibres.

Mimetix® scaffolds

Our standard Mimetix scaffold is manufactured from the medical grade polymer poly-L-lactide (PLLA) and is available in a range of ready-to-use, sterile laboratory consumable formats including hanging inserts and multi-well plates. Mimetix has been validated with a number of primary cells, cell lines and stem cells. All our scaffolds are highly consistent with respect to fibre diameter and pore size from batch to batch. The company is working towards ISO certification.

Scaffold design and development

We offer a commercial service to develop bespoke scaffolds and protocols for the consistent manufacturing of our own and third party electrospun materials. We collaborate with different academic and industrial groups to develop novel materials and applications. For example, we participate in 2 EU FP7-funded projects developing liver organoids (ReLiver) and a desktop bioreactor for stem cell production (HESUB).



Image 7: Mimetix scaffold in a 6-well format with hanging inserts, allowing the formation of an air-liquid interface which can be used to model tissues such as skin or lung.



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Contact us: For more information on our products, to order samples and to discuss collaborative projects.