

Open Research Online

The Open University's repository of research publications and other research outputs

Adapting aligned, stabilised 3D tissues for large-scale neurobiological research

Conference or Workshop Item

How to cite:

O'Rourke, Caitriona; Drake, Rosemary; Loughlin, Jane and Phillips, James (2014). Adapting aligned, stabilised 3D tissues for large-scale neurobiological research. In: Tissue and Cell Engineering Society Annual Conference 2014, 2-4 Jul 2014, Newcastle, p. 29.

For guidance on citations see [FAQs](#).

© 2014 The Author

Version: Version of Record

Link(s) to article on publisher's website:

<http://conferences.ncl.ac.uk/tces2014/conference/scientificprogrammeconferencebooklet/TCES%202014-Conference%20Booklet>

Copyright and Moral Rights for the articles on this site are retained by the individual authors and/or other copyright owners. For more information on Open Research Online's data [policy](#) on reuse of materials please consult the policies page.

oro.open.ac.uk

Adapting aligned, stabilised 3D tissues for large-scale neurobiological research

Caitriona O'Rourke¹, Rosemary Drake^{2*}, Jane Loughlin¹ & James B Phillips³

¹Life, Health & Chemical Sciences, The Open University, Milton Keynes

^{2*}TAP Biosystems, Royston, Cambridge, ³Biomaterials & Tissue Engineering, UCL, London

caitriona.orourke@open.ac.uk

INTRODUCTION:

Recreating the 3D environment of the CNS using hydrogel matrices allows neurons and glial cells in vitro to behave similarly to their counterparts in vivo, providing a relevant tool for neurobiological studies¹. The overall aim is to develop robust 3D CNS tissue models engineered by a process of glial cell self-alignment and subsequently stabilised. Furthermore, these models have been developed for multi-well plate format at a scale suitable for high throughput screening. CNS tissue equivalents can be used to assess numerous aspects of the CNS in a reproducible, controllable and consistent manner.

METHODS:

Characterisation studies assessed alignment and stabilisation of neurons and glia in collagen gels within a 96-well plate test rig prototype. Their potential for use in neurobiological studies involved identifying neurite growth, neuron-glial interactions and myelination following defined periods in culture. Detection and quantification analysis was conducted via immunohistochemistry and confocal microscopy.

RESULTS:

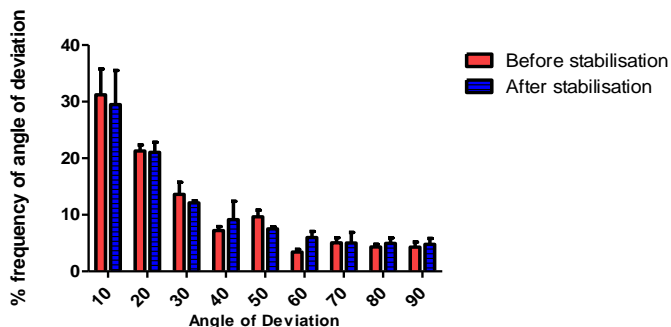


Fig 1 Alignment of neural cells persists following stabilisation of hydrogels

Hydrogels constructed within a 96-well plate rig displayed comparable cellular alignment to traditional methods using larger moulds², in mid and side regions, before and after stabilisation of constructs.

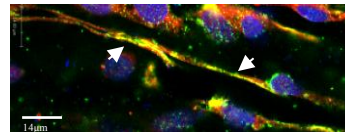


Fig 2 Confocal micrograph showing cellular alignment and neuron-glial interaction in aligned 96-well plate rig hydrogel after 14 days. Arrowheads indicate immunoreactivity for myelin basic protein adjacent to neuronal structures (Red- β -tubulin, green-MBP, blue-Hoechst).

Neurite growth was detected and measurable in the aligned tissue equivalents. Markers for myelination were identified in close proximity to neurites.

DISCUSSION & CONCLUSIONS:

Results suggest that a highly organised, stable hydrogel can be created within the dimensions of a 96-well plate. The aligned nature of the cells and extracellular matrix in this anisotropic system facilitates quantitative analysis of CNS cellular features such as neurite length and the process of myelination. This simple, consistent and physiologically relevant model system, which uses a multi-well plate format can potentially be used at a scale suitable for commercial R&D.

REFERENCES:

1. E. East et al (2012) *Tiss Eng* **16**: 3173-8.
2. M. Georgiou et al (2013) *Biomaterials* **34**: 7335-43.

