Use of Porous Elastomer Foams to Support Long Term Three Dimensional Neuronal Cultures

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Introduction

Certain neurodegenerative diseases, including Multiple Sclerosis, are caused by a loss or decrease in interaction between neural cells like neurons, oligodendrocytes, and astrocytes. These cells interact in three dimensional (3D) space. In order to study these interactions it is necessary to interact in three dimensional (3D) space. In order to study these interactions it is necessary to culture these cells in 3D spatial arrangements. This can be done using an elastomer that is porous in structure.

Objective

- Create a porous elastomer for spatial 3D growth of neuroblastoma cells
- Create a 3D culture which includes multiple types of neural cell types
- Induce neurodegenerative conditions
- Stimulate re-myelination of neurons through the use of different additives

Methods

- Human neuroblastoma cells (SH-SY5Y) were cultured and seeded on the porous elastomer
- Samples were grown for over 60 days
- The neuroblastoma cells were stained using DAPI and Neurofilament staining fluorescent stains
- Cells were imaged using confocal microscopy

Results and Discussion

- Elastomer follows below structure PCL—PEO—PCL
- Elastomer can be synthesized and used to support neuroblastoma cell growth for over 60 days
- Cells show signs of maturing and extend neurites on elastomer

<table>
<thead>
<tr>
<th>Sample</th>
<th>Week</th>
<th>Slices</th>
<th>PCL–PEO–PCL</th>
<th>AVG Extension Length (μm) w/ RA</th>
<th>AVG Extension Length (μm) w/o RA</th>
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</thead>
<tbody>
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<td>2</td>
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<td>1.4 × 10¹⁶</td>
<td>10.8 × 10³</td>
<td>10.8 × 10³</td>
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<td>2</td>
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<td>2.0 × 10³</td>
<td>2.0 × 10³</td>
</tr>
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</tbody>
</table>

Conclusion

- Porous elastomer can be synthesized and used to support neuroblastoma cell growth for over 60 days
- Cells show signs of maturing and extend neurites on elastomer

Future

- Cell cultures using primary cells containing multiple cell types will be performed
- Stimulating neurodegenerative effects and promoting re-myelination will be performed on the cell cultures containing multiple cell types

Acknowledgements

- Elda Hegmann Lab group

References