

My research has primarily focused on investigating how surface topography, created through masterless soft lithography of PDMS¹, effects the growth of primary rat hippocampal neurons in low density culture.

In this technique, through selective exposure of the PDMS surface through UVO masks to UV/Ozone, the surface becomes activated and is now able to adhere to a glass substrate. When the bulk PDMS is removed, a distinct pattern of PDMS features remains on the substrate surface.

The hippocampal neurons are harvested from the brains of 1-2 day old Long Evans rats, and then plated onto the patterned substrates that have been coated with poly-lysine. Cultures are typically allowed to run for 7-10 days before either basic staining (with Coomacie blue) or immunohistochemistry are performed.

The neuronal growth will be quantified using the neuron tracing software, NeuroLucida. Specifically, the branching angles of neurites off the cell soma and the amount of primary and secondary branching will be compared with control samples (coverslips coated with poly-lysine).

The next step will be to combine this surface topography with closed channels, to direct neuron growth centrally. Promoting central growth of the neurons will allow us to damage the processes of individual neurons and then collect any agents that are released.

¹ “Masterless Soft Lithography: Patterning UV/Ozone-Induced Adhesion on PDMS Surfaces” Childs, Nuzzo, et al, Langmuir, 21, 10096-10105, 2005.