Talk at the Nencki Institute of Experimental Biology

Thursday, April 21, 2016; 12h00

Microfluidic Neuron Culture Devices to Study Neural Development and Disease

Microfludic culture devices offer precise control over the chemical and physical microenvironment of the cells. A range of microfluidic devices have been designed for neurobiological applications ranging from molecular signalling and electrophysiology to axonal transport and guidance. Devices that fluidically isolate neurites from their cell bodies not only grant exclusive access to specific subcellular regions, but also facilitate co-culture, enabling research on myelination, synaptogenesis, network behaviour, and neuromuscular junction. I will discuss the advantages and limitations of microfluidic neuron culture with an emphasis on two recent studies using cortical neurons: (i) local and long-range signalling mechanisms downstream of Netrin-1 guidance molecule and (ii) promotion of axon growth towards a source of repellents by combining magnetic tweezers force application to growth cones and local inhibition of select signalling pathways.

<u>Accompanying articles:</u>

Park JW, HJ Kim, MW Kanga and NL Jeon. 2013. Advances in microfluidics-based experimental methods for neuroscience research, *Lab Chip*, 13:509-521

Kilinc D, A Blasiak, JJ O'Mahony and GU Lee. 2014. Low piconewton towing of CNS axons against diffusing and surface-bound repellents requires the inhibition of motor protein-associated pathways, *Sci Rep*, 4:7128

Blasiak A, GU Lee and D Kilinc. 2015. Neuron sub-populations with different elongation rates and DCC dynamics exhibit distinct responses to isolated Netrin-1 treatment, *ACS Neuro*, 6:1578-1590