Video Article

BioMEMS: Forging New Collaborations Between Biologists and Engineers

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Abstract

This video describes the fabrication and use of a microfluidic device to culture central nervous system (CNS) neurons. This device is compatible with live-cell optical microscopy (DIC and phase contrast), as well as confocal and two photon microscopy approaches. This method uses precision-molded polymer parts to create miniature multi-compartment cell culture with fluidic isolation. The compartments are made of tiny channels with dimensions that are large enough to culture neurons in well-controlled fluidic microenvironments. Neurons can be cultured for 2-3 weeks within the device, after which they can be fixed and stained for immunocytochemistry. Axonal and somal compartments can be maintained fluidically isolated from each other by using a small hydrostatic pressure difference; this feature can be used to localize soluble insults to one compartment for up to 20 h after each medium change. Fluidic isolation enables collection of pure axonal fraction and biochemical analysis by PCR. The microfluidic device provides a highly adaptable platform for neuroscience research and may find applications in modeling CNS injury and neurodegeneration.

References

