Introducing Small Footprint Silicone (PDMS) Devices with Two (2) Culture Units

Abstract

Xona Microfluidics introduces a new Silicone (PDMS) Device called the Small Footprint device (SF150x2). Small Footprint devices reduce the number of neurons used per compartmentalized culture unit by one half or more. In addition, this new Small Footprint configuration provides a simpler method for loading neurons into an optimally sized loading port. Because of the small footprint of the devices, each PDMS chip now contains (2) culture units. This supplemental protocol provides details on how to prepare and use these devices. Our main Silicone Devices protocol should be referred to for basic information regarding the preparation and use of Silicone Devices.

Introduction

Compartmentalized microfluidic devices, pioneered by Xona Microfluidics, have become mainstays of neuron-based cell culture assays. Increasing sample size of neuron-based assays presents challenges because neurons are post-mitotic, in finite supply, and require long culture times. There exists a need to develop assays that use fewer neurons per culture unit so that sample size can be increased given a fixed number of neurons. To address this need, Xona developed a new microfluidic platform called the Small Footprint (SF) device. This Tech Note focuses on the silicone (PDMS) version of the SF devices. A XonaChip® version of the SF configuration containing four (4) culture units is also available.

A schematic of the SF device and a picture of the device with dye showing compartmentalization is shown in Fig. 1. The outside dimensions are 28 mm by 20 mm. The Small Footprint Silicone (PDMS) Device has a smaller culture surface area so that fewer neurons are needed. With this new culture platform, half or fewer neurons are needed compared with our standard devices. This SF device is ideal for imaging-based assays with fewer microgrooves (18) than our SND or RD series devices. The microgroove barrier width is 150 µm.

To facilitate cell loading and reproducibility, the SF device has a 2 mm diameter cell loading port. This smaller cell port eliminates the need for angling the pipette tip and makes cell loading more consistent between culture units.

Below we describe the supplemental procedures needed to use these SF devices. Our main Silicone Devices protocol should be used together with this supplemental protocol.

Procedure

Note: Glass coverslips and glass bottom dishes purchased by the customer must have a flat glass surface > 30 mm.

1. Place the sterilized SF devices onto a PDL-coated glass surface as described in Xona's Silicone Devices protocol.
2. Prepare neuron cell suspension at a density of 10-12 million cells per mL.
3. Load 5 µL of the neuron cell suspension into the cell loading port. Avoid contact with side walls of loading port. Check under a microscope to ensure the neurons are flowing into the main compartment. Load neurons into the remaining cell loading ports as desired for your experiment.
4. Wait 5 min for cells to attach.
5. Add approximately 15 µL of culture media to the cell loading port. Add 100 µL to the larger 6 mm well.
6. Fill the adjacent compartment with 20 µL in the cell loading port and 100 µL in the larger well.
7. Return the devices to the incubator.

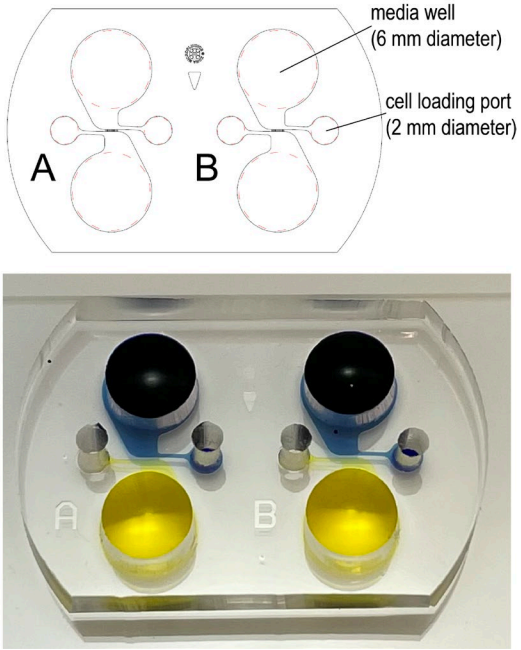

Fig. 1: The small footprint (SF150x2) PDMS device is designed to use fewer neurons and improve cell loading consistency and reliability between culture units. Two (2) culture units are contained in each PDMS chip.

8. After 24 h, perform a media change by removing media from the cell loading port and media well. Make sure the channel remains filled. Add 120 µL back to the media well.
9. Media should be monitored every 2-3 days and changed as needed. When changing media replace only 50% from each well and remove from the cell loading port first and then the media well.

Example Result

eGFP-expressing human induced pluripotent stem cell (hiPSC) derived glutamatergic neurons from BrainXell were grown within SF150x2 PDMS devices (**Fig. 2**). Extensive axonal growth was observed by 7 days.

About Xona Microfluidics, Inc

Xona Microfluidics, Inc is a life sciences company based in Research Triangle Park, North Carolina. More information can be found at xonamicrofluidics.com.

If you are interested in testing the SF150x2 devices contact us at info@xona.us.

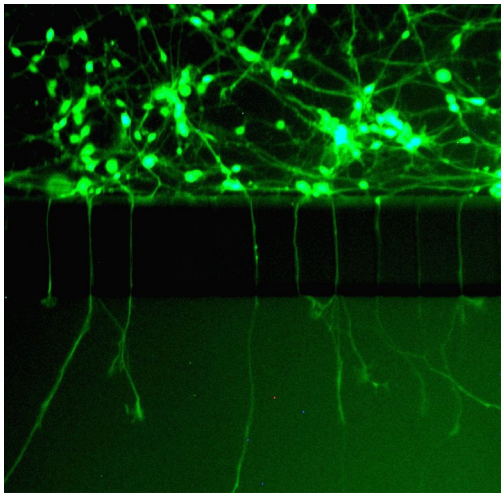

Fig. 2: GFP labeled hiPSC cortical neurons (BrainXell) grown in a SF150x2 PDMS device at 7 days in vitro.