Analytical Instrumentation, Methods & Materials

Microfluidic Device for High Resolution, *In Vitro* Monitoring of Neuronal Tissue

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an *in vitro* device for examining and testing a slice of brain tissue.

Overview

Neuroscientists often study individual neurons in brain tissue *in vitro*. In order to reveal the cellular mechanisms underlying neural network reconfiguration, plasticity and behavior, many neurons must be stimulated simultaneously. However, current techniques of studying multiple neurons suffer from poor temporal resolution or provide little control over the stimulation of receptors.

The Invention

UW-Madison researchers have developed an *in vitro* device for examining and testing a slice of brain tissue, which delivers precise amounts of chemical stimuli to neurons with a high degree of spatial and temporal resolution. The device combines the localized drug delivery capability of microfluidics with multi-channel neural recordings.

The device includes a chamber and microfluidic channels that communicate with the chamber. A support structure within the chamber holds the slice of brain tissue and includes an array of electrodes that engages the slice, allowing for multi-channel electrical recording and stimulation of the slice at each of the electrode sites within the microfluidic channels. The microfluidic channels allow many parallel, but independent, laminar fluid streams to flow across the surface of the brain slice. Special valves enable a highly focused stream of chemicals to flow across the slice at any desired location while being pulsed with high temporal resolution.

Applications

- Studying brain tissue *in vitro*
- May lead to new discoveries in fields such as learning, memory, motor control, pain and principles of neural function

Key Benefits

- Inexpensive, versatile and easy to use
- Specific portions of neural networks *in vitro* can be rapidly and reversibly exposed to different drugs in various combinations, at different doses, and within a time-frame of milliseconds to minutes.
- Multiple chemical agents can be delivered simultaneously to different areas.
- Specific areas can be selectively deprived of nutrients for a precise period of time, while other areas are simultaneously pulsed with chemical agents.

Additional Information

For More Information About the Inventors

- Justin Williams
- David Beebe

Tech Fields

- Analytical Instrumentation, Methods & Materials : Microfluidics

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846