Analytical Instrumentation, Methods & Materials

Microfluidics Platform and Method That Mimic the Cellular Environment

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a microfluidics-based platform for mimicking the environment within a cell.

Overview

Most biochemical interactions are studied in solutions containing dilute concentrations of molecules. However, the complexity of the cellular environment makes it difficult to compare the results of studies performed in dilute solutions to the actual interactions inside cells. On the other hand, studies performed inside cells are often difficult to interpret because so many interactions are occurring simultaneously and because of the variation that exists between cells.

The Invention

UW-Madison researchers have developed a microfluidics-based platform for mimicking the environment within a cell. This model environment is simpler than a cell, yet captures the basic characteristics of the cellular nano-environment, including charge, crowding, water content and structure. It has many advantages over current systems, including the fact it uses much less protein, can detect weaker interactions and requires less time for experiments.

The platform includes a microfluidic device that contains a chamber. At least one hydrogel post is positioned within the chamber. Each post may contain a different density of polymers or a different cross-linker to simulate various crowding or caging effects. A solution containing proteins of interest is introduced into the chamber and the proteins diffuse into the hydrogel posts. The interactions between the proteins are then observed inside the posts.

Applications

- Studying drug interactions
- Developing improved sensors or more effective therapeutics
- Understanding the basic mechanisms of cell signaling and behavior
- High throughput screening

Key Benefits

- Simply and easily captures the basic characteristics of the cellular nano-environment
- Provides a more natural and *in vivo*-like environment for studying protein-protein interactions than current systems
- Dramatically reduces time needed for studies because experiments occur on the microscale
- Very little protein is needed.
- Weaker interactions can be detected than with conventional methods because crowding enhances weaker binding between biomolecules.
- Nano-environment can be adjusted to control the selectivity of monoclonal antibodies.

Additional Information

For More Information About the Inventors

- David Beebe

Tech Fields

- Analytical Instrumentation, Methods & Materials : Microfluidics
- Drug Discovery & Development : Drug production & design
- Research Tools : Protein interactions & function

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