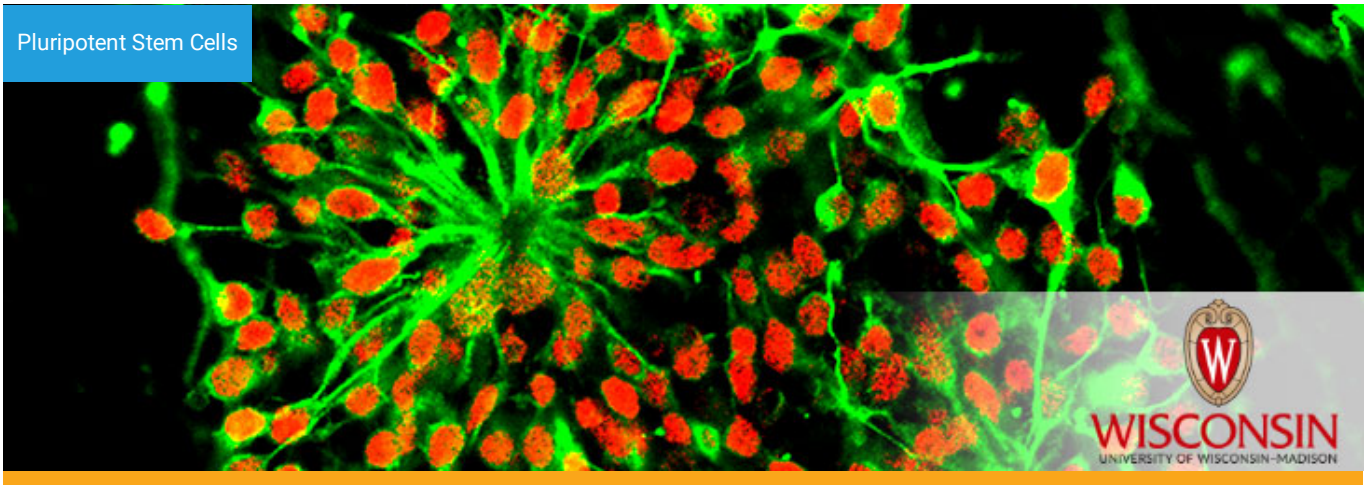

Hydrogel Arrays for Screening Cell-Substrate Interactions

View U.S. Patent No. 10,195,313 in PDF format.

WARF: P140097US01

Inventors: William Murphy, Stefan Zorn, Ngoc Nhi T. Le, Michael Schwartz, Eric Nguyen

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing patterned hydrogel arrays featuring individually controlled spots.

Overview

While extensive research has been devoted to understanding the influence of medium conditions on cell development, researchers have only recently begun to understand the role of culture surface properties. Self-assembled monolayer (SAM) substrates are a valuable tool in this process, enabling researchers to systematically expose cells to various surface-bound molecules — such as proteins, nucleic acids and polysaccharides — and analyze how these molecules influence cell behavior.

However, SAM technology has yet to become commonplace for cell biologists because preparing arrays is labor intensive (a typical experiment may require close to a thousand handling steps). Therefore, simplified preparation methods are needed to make SAMs a more practical tool.

The Invention

UW–Madison researchers developed a new method for forming patterned hydrogel arrays featuring any number of test spots possessing different characteristics, such as shape and chemical composition. The arrays can be used to culture a range of cell types and rapidly analyze their behavior (e.g., attachment, spreading, proliferation and differentiation).

The arrays are prepared using a hydrogel precursor solution containing a polymer and crosslinker. The solution is sandwiched between stenciled SAM layers containing hydrophilic ('water-loving') and hydrophobic ('water-hating') regions, then polymerized and released.

As a result of the process, the array features hydrophilic spots surrounded and isolated by hydrophobic regions, preventing any mixing of contents. The spots can have any desired shape, size and chemical composition.

Applications

- Research tool for 2-D and 3-D assays, stem cell culture and drug discovery
- May be used with common microarray add-ons of different sizes and shapes consistent with those of typical multiwell plates (e.g., 96 and 384 well plates, etc.)
- Useful with multichannel pipettes for enhanced-throughput cell culture, media exchange, etc.

Key Benefits

- Cost-effective fabrication
- Easier to make and use
- Permits independent control over the content and dimensions of each spot in the array

- Compatible with a wide range of cell and ligand types
- Supports enhanced throughput

Stage of Development

The researchers have developed PEG (polyethylene glycol) hydrogel arrays formed using alkanethiolate SAMs on gold substrates.

Additional Information

For More Information About the Inventors

- William Murphy

Related Technologies

- WARF reference number P120126US01 describes a different method to prepare SAM arrays featuring discrete spot-to-spot characteristics.

Publications

- Hansen et al. 2014. Biomaterial Arrays with Defined Adhesion Ligand Densities and Matrix Stiffness Identify Distinct Phenotypes for Tumorigenic and Non-Tumorigenic Human Mesenchymal Cell Types. J. Biomat. Sci. 5, 745-756.

Tech Fields

- Pluripotent Stem Cells : Tools
- Research Tools : Arrays

For current licensing status, please contact Rafael Diaz at rdiaz@warf.org or 608-960-9847