

Microfluidic Device for Patterned Surface Modification

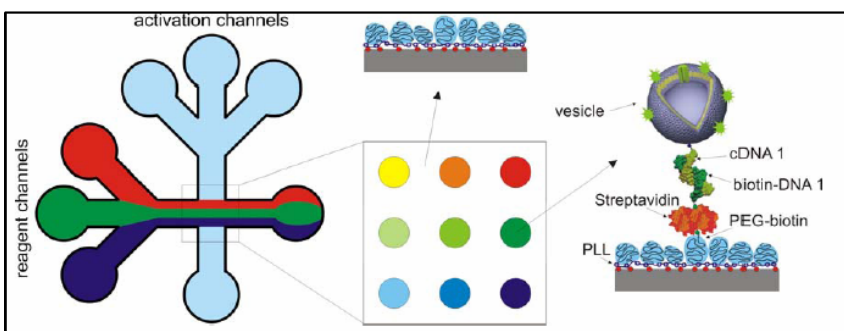
A highly parallel microfluidic device maintaining protein integrity

Invention

Traditional methods of patterning **functional proteins** on **microarrays** have met with limited success due to the degradation of proteins during the arraying process. An urgent need exists for a non-destructive environment for cell manipulation, cultivation and tissue engineering at the microscale.

Here, a novel approach creates heterogeneous arrays of different proteins or vesicles inside a microfluidic device. The concept combines the use of a 2-Step surface chemistry to allow activation and binding of a receptor molecule only on activated spots, and the crossing of microfluidic channels for the local functionalization by separated laminar streams. This allows the arraying and subsequent testing of proteins in a **hydrated environment**, thus maintaining their function by eliminating the problems of drying and subsequent sample degradation.

Intelligent surface nanoarchitecture and crossing microfluidic channels at perpendicular angles allow separate addressing of individual spots:



Lipid vesicles are bound to a chosen prepatterned spot by local hybridization of complementary DNA

Keywords

microfluidic devices
membrane proteins
lipid vesicles, surface patterning
surface modification
micro-scale tissue engineering
protein resistant surfaces
protein arrayer, cell cultivation
intelligent surface nano-architecture

Patent Status

Patent pending

Competitive Advantages

Integrity:

- Eliminates problems due to samples drying out:
Integrity of Protein Array maintained
- Functionalization in a fluid
- Highly parallel analysis of protein function and interaction

Simple and Cost Effective:

- Standard assembly methods
- No complex pre-alignment of PDMS device and MAPL chips

Applications

- High density Protein arrayers
- Microscale Tissue Engineering
- Functional arrays of delicate bio-molecules: e.g. Membrane Proteins
- Further advances in biohybrid devices

Additional Information:

Lab on a Chip Journal (Issue 12 2005):
<http://www.rsc.org/publishing/journals/LC/article.asp?doi=09957a>

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