Patterning of Carbohydrates on Lab-on-a Chip devices using carbohydrates

"Lead Inventors: Jeffrey T. Koberstein PhD, Nicholas J. Turro PhD, and Greg T. Carroll

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Printing method for Lab-on-a-chip devices using sugar:
Patterned surfaces of DNA, Proteins, and Sugars (micro-arrays) form the basis of Lab-on-Chip (LOC) style assays, which are of great interest for use in everything from basic research and clinical diagnostics to environmental sensors/detectors. Carbohydrates in particular have garnered a great deal of interest in the growing field of glycobiology. Attachment of the active molecules, however often requires modification to the chemical structure of the molecule, potentially impairing its functionality. Additionally, fabrication of the arrays is often expensive, involved process. Thus a simple, reliable way to modify, and pattern surfaces while preserving the native chemical functionality of the attached ligand would be huge boon.

Printing patterns on Lab-on-a-chip devices using UV method to bind sugar droplets:
The technology described here is a chemical platform for modifying surfaces through covalent attachment of carbohydrates. Quartz, silicon, or glass can be coated with a photo-activatable monolayer, and upon UV irradiation the monolayer will covalently bind sugars, or more generally anything containing a C-H bond directly. Spatially controlled patterning of the substrate can be achieved with the use of a photomask. A micro-spotting technique can be used to pattern the micro-array as well, by depositing small droplets of solution containing the desired sugar. The area of attachment is defined by the size of the droplet. UV irradiation is still required to crosslink the sugar, but photomasking is no longer necessary.

Applications:
• Scaffolds for biological materials
• Biological sensors
• Biomolecular array consumables for genomics, proteomics, and antigens
• Glycoprotein proteomics and platform for screening antibody activity
• Photo-patterning of any biological or synthetic compound containing C-H bond

Advantages:
• Surfaces can be patterned by photolithography or robotic spotter
• Any sugar (or C-H bond containing compound) can be attached without chemical modification
• Sugar modified surfaces are stable and robust, standing up to washing and reuse


Licensing Status: Available for Licensing and Sponsored Research Support
Publications: Photons to illuminate the universe of sugar diversity through bioarrays; Gregory T. Carroll, Denong Wang, Nicholas J. Turro, Jeffrey T. Koberstein; *Glycoconj J* (2008) 25:5-10

Inventors

Jeffrey Thomas Koberstein