'Just clicking' a molecule to a biomolecule for another function

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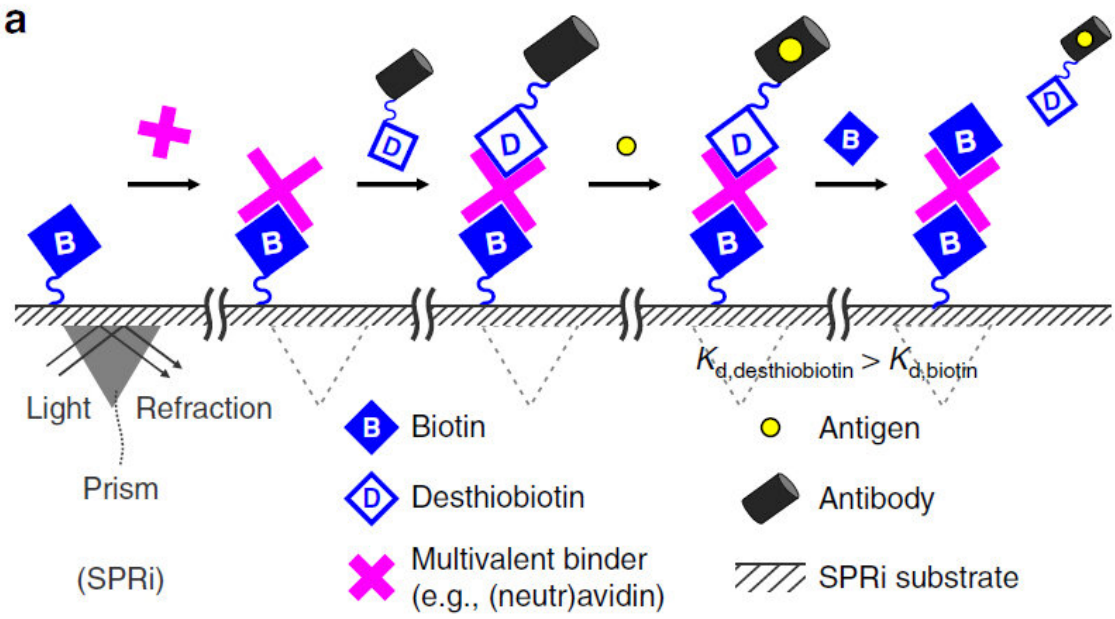

A desthiobiotin molecule, including antibody and an antigen, makes place for biotin. Credit: University of Twente

Researchers have reported a material that controls the behavior of cells in a dynamic way, just as happens in biology. A new technique uses functional components that can be 'clicked' to a material using vitamin H. Researchers of the TechMed Centre of the University of Twente will now be able to add functionality to biomaterials while cells of the

material are alive. The results are reported in *Nature Communications*.

Biological tissue is constantly changing and renewing. That is very clear in the healing of wounds, but it also occurs in aging. Biomedical engineers face the challenge of developing materials that can mimic the natural dynamic behavior of cells. Most current materials are static, and thus have one predefined function. They lack the versatility of natural tissue. Adapting materials properties was possible to some extent, but in many cases, this was done using complex techniques often using toxic substances harmful to the living cells. The technology that is now developed by UT researchers, is fully compatible with living cells and what's more: it is based on relatively cheap, simple, safe chemistry with a wide range of applications.

Vitamin H

The researchers applied vitamin H to the materials and proved that it is possible to click 'stimulating elements' to the biomaterials. The dynamic behavior of biological tissue can be mimicked by using two versions of vitamin H. Connecting vitamins with different strengths to the material, makes exchange possible. It is even possible to add materials with multiple functionality cell and even change them actively in time. This is an important breakthrough that offers chances to make tissue that can work in the same way as natural tissue, for example. Another option is to mimic diseases in the lab for development and testing of medication.

Bone and cartilage from stem cells

The new technology enables partial functionalization of a material, which opens the way to culturing complex tissue in the lab. You could think of a biomaterial with stem cells, in which cells in one half of the material are stimulated toward bone formation, while they create

cartilage in the other half. This could substantially improve joint defects caused by cartilage damage. The technology offers a wide range of possibilities for creating new biomaterials as a blueprint for creating lifelike organs.

The paper, "Spationtemporal material functionalization via competitive supramolecular complexation of avidin and biotin analogs," appeared in *Nature Communications*.

More information: Tom Kamperman et al. Spatiotemporal material functionalization via competitive supramolecular complexation of avidin and biotin analogs, *Nature Communications* (2019). DOI: 10.1038/s41467-019-12390-4

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