Nanowire Device Gives Insight in Cell Forces

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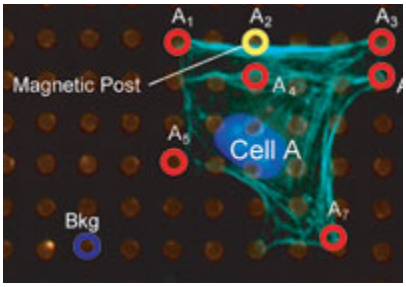

Immunofluorescent micrograph of cell A under force stimulation by a magnetic micropost. (PNAS, Sept. 5, 2007)

A nanoscale device, developed by a team of researchers from Johns Hopkins University and the University of Pennsylvania, provides previously unknown information on how cells react to environmental forces.

The device offers a better understanding of cell mechanics and a potential means for scientists to compare how healthy and diseased cells react to forces. This knowledge, in turn, could spur the development of novel drug therapies, researchers say.

The team's findings are reported in Proceedings of the National Academy of Sciences (Early Online Edition, Sept. 5, 2007).
Daniel Reich, Johns Hopkins University professor of physics and Institute for NanoBioTechnology affiliated faculty member, explains that the device uses an array of microposts that are 3 µm (micrometers) in diameter and 10 µm in length.

To this "carpet," the team introduced magnetic cobalt nanowires. To measure the cells' reaction to forces, a magnetic field was applied to the array. The nanowire enhanced (magnetic) microposts pushed on the cells as the posts attempted to align with the magnetic field. Changes in the deflections of the surrounding nonmagnetic posts were used to report on the individual cells' reaction to external force.

In much the same way that the whole human body would react if poked with a pin in one part, the entire surface of the cell reacted in response to forces applied remotely.

"The contractile tension of a cell is a complex thing," Reich says. "This system allows you to stimulate one spot but to measure reaction globally."

Surprisingly, the response of the cells in the experiments was strongest, not at locations close to the point of force application, but at remote points on the periphery of the stimulated cells.

With this nanowire-based system, Reich adds, "We can see how the whole cell responds to a locally applied force. This technique has the potential to open up new lines of research into how mechanical changes in cells are transduced into cell function."

Read the full text article: Nathan J. Sniadecki, Alexandre Anguelouch, Michael T. Yang, Corinne M. Lamb, Zhijun Liu, Stuart B. Kirschner, Yaohua Liu, Daniel H. Reich, and Christopher S. Chen. Magnetic microposts as an approach to apply forces to living cells. PNAS, (Sept. 5, 2007, online before print) at http://www.pnas.org - (Applied Physical Sciences)

Read the abstract in PubMed.

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