TOOLBOX

Silicon nanowires stimulate neurons with light

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6 APRIL 2018

Microscopic silicon wires could enable scientists to excite specific neurons with light without first inserting genes into the cells[1]. The wires could stimulate particular neuronal circuits, such as those linked to autism.

Using an established technique called **optogenetics**, researchers can control neuron activity with light by engineering the cells to produce light-sensitive proteins.

In the new approach, researchers created nanowires about 300 times thinner than a human hair that electrically stimulate any neurons they touch after light shines on them.

The wires consist of whisker-like crystals of silicon coated in gold. In the presence of light, electrons move from the gold shell to the silicon core, leaving subatomic ‘holes’ in the gold that electrons from outside the wire (such as those in a cell) rush to fill. This movement of electrons creates a small current.

The researchers sprinkled the nanowires on rat neurons in a petri dish. Some of the wires settled next to the cells, touching the neuronal membranes. When the researchers shined a laser light on the dish, the nanowires activated only the cells they touched.

Pulses of laser light lasting between 0.5 and 5 milliseconds are enough to stimulate the neurons, the researchers reported in the March issue of *Nature Nanotechnology*.

Scientists could deliver nanowires into the brain of an animal by simply injecting them into areas they wish to target. Shining light on a particular area of the brain could activate neurons in the target region. The nanowire surface also could be modified to stick only to specific cell types, allowing scientists to target particular circuits.

Nanowires could replace traditional bulky electrodes used to modulate neuron activity, which can damage tissue and require invasive surgery to implant.

REFERENCES:

1. Parameswaran R. *et al. Nat. Nanotechnol.* **13**, 260-266 (2018) **PubMed**