TOOLBOX

Miniature brain bulbs manipulate neurons

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24 APRIL 2013

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A light-emitting device implanted in a mouse brain can activate neurons wirelessly, allowing researchers to control and observe the mouse's behavior, according to a report published 12 April in *Science*[1].

The method builds on an existing technique called **optogenetics**, in which researchers engineer light-sensitive channels into certain mouse neurons. They can then activate or dampen these neurons using beams of light.

Researchers typically outfit the mice with headgear attached to fiber-optic cables that penetrate the brain and allow light to enter. The cables are bulky and tether the mice, however, which may interfere with assays of social behavior.

In another optogenetics method, researchers can activate neurons and **then remove the headgear**, but they cannot control the mouse's behavior in real time.

In the new technique, the researchers instead place light-emitting diodes (LEDs) in the brain, next to the target neurons. They attach the sensors to the tip of a fine needle with silk glue, allow the glue to dissolve once the sensors are in the right place, and then remove the needle.

Each LED is about 1,000 times thinner than similar devices. Because it is attached to wireless headgear, the mouse can freely interact with its peers and explore spaces, such as circular mazes and a rotating cylinder, that are too restrictive for a traditional tether.

The device not only emits light on command but also reads the electrical current emitted by a neuron when it fires and the temperature in its vicinity. This information is transmitted through the wireless sensors.

The researchers tested the device by using it to activate neurons that express the chemical messenger dopamine when mice go to a certain place in their cage. Dopamine release creates a sensation of pleasure, or reward. They found that the mice with a light-sensitive channel engineered into their dopamine neurons seek to continuously activate these neurons.

REFERENCES:

1. Kim T.I. *et al. Science* **340**, 211-216 (2013) **PubMed**