Medical Xpress

Microrobots used to build bridge between rat nerve cell networks

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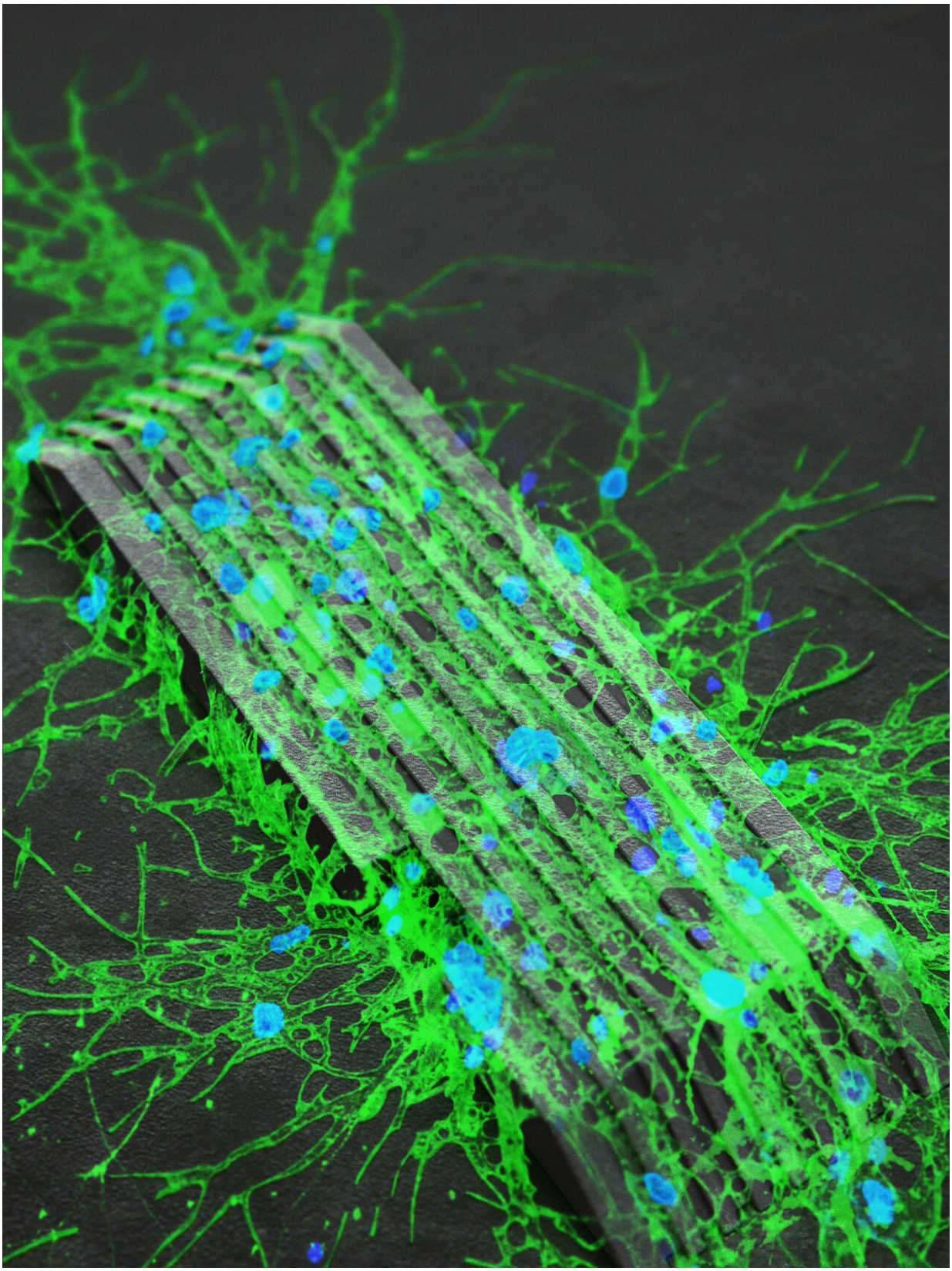

Neurons on a magnetically controlled microrobot for artificial neural network. Credit: Hongsoo Choi, Professor & Chair, Department of Robotics Engineering, Co-Director, DGIST-ETH Microrobotics Research Center, DGIST

A team of researchers affiliated with several institutions in South Korea has created microrobots that are able to serve as bridge builders between rat nerve cell networks. In their paper published in the journal *Science Advances*, the group describes how their microrobots were constructed and how well they served as a bridge builder between neural networks.

Scientists have taken many approaches to study of the brain. One way is to try to grow a brain from nerve cells. Prior work has shown that it is possible to grow a network of neural cells on a glass plate Such a network is, of course, 2-D. In this new effort, the researchers have taken a step toward the creation of a 3-D neural network by devising a way to connect 2-D neural networks using microrobots.

The work consisted of creating rectangular microrobots (300 micrometers long and 95 micrometers wide) out of a polymer coated with nickel and titanium. The movement of the microrobot was controlled by applying external magnetic fields. To make use of such robots, the researchers first grew two separate neural networks on a plate of glass just 300 micrometers apart. Next, they grew another neural network on the surface of the microrobot. Once all the networks were grown and in place, the researchers applied a magnetic field to the robot to push it into place between the other two neural networks. Another magnetic field was used to fine-tune the position of the microrobot relative to the two networks. And then the researchers simply waited and watched as events unfolded. They found that not only did nerve cells grow from either end of the microrobot toward the other neural networks, but the other networks began reaching out to the network on

the microrobot. Over time, a bridge formed between the two original neural networks. The researchers found that when they applied a slight charge to one of the original networks, it was carried across the bridge to the other network, proving that it worked as intended.

The researchers suggest that it is possible to build neuronal bridges as part of an effort to connect existing neuronal networks, and also note that it could lead to use in repairing nerves in injured patients.

More information: Eunhee Kim et al. A magnetically actuated microrobot for targeted neural cell delivery and selective connection of neural networks, *Science Advances* (2020). DOI: 10.1126/sciadv.abb5696