A hydrogel that could help repair damaged nerves

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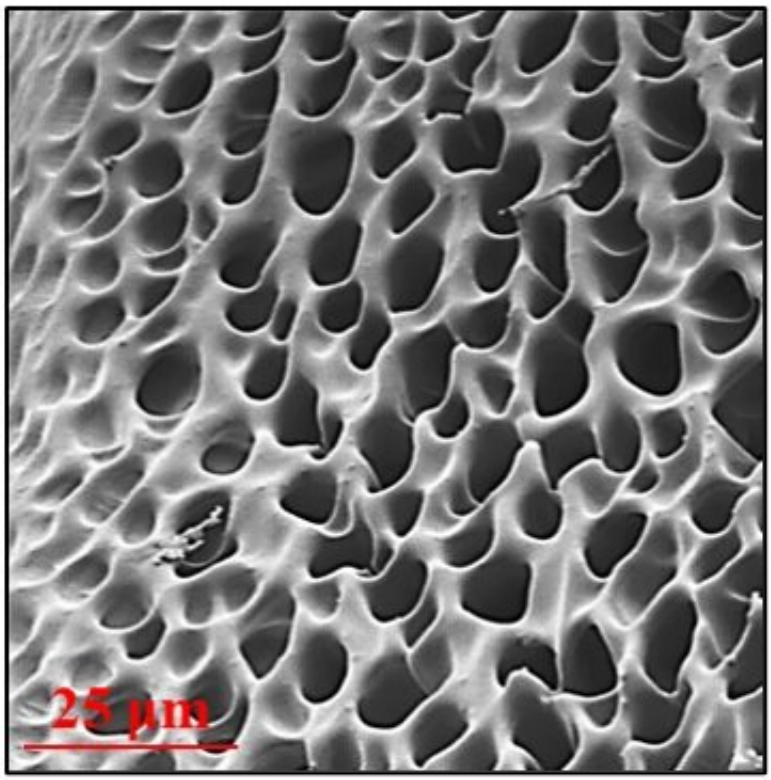

A conductive polymer hydrogel could help repair damaged peripheral nerves. Credit: Adapted from *ACS Nano* 2020, DOI: 10.1021/acsnano.0c05197

Injuries to peripheral nerves—tissues that transmit bioelectrical signals from the brain to the rest of the body—often result in chronic pain, neurologic disorders, paralysis or disability. Now, researchers have developed a stretchable conductive hydrogel that could someday be used

to repair these types of nerves when there's damage. They report their results in *ACS Nano*.

Injuries in which a peripheral nerve has been completely severed, such as a deep cut from an accident, are difficult to treat. A common strategy, called autologous nerve transplantation, involves removing a section of peripheral nerve from elsewhere in the body and sewing it onto the ends of the severed one. However, the surgery does not always restore function, and multiple follow-up surgeries are sometimes needed. Artificial nerve grafts, in combination with supporting cells, have also been used, but it often takes a long time for nerves to fully recover. Qun-Dong Shen, Chang-Chun Wang, Ze-Zhang Zhu and colleagues wanted to develop an effective, fast-acting treatment that could replace autologous nerve transplantation. For this purpose, they decided to explore conducting hydrogels—water-swollen, biocompatible polymers that can transmit bioelectrical signals.

The researchers prepared a tough but stretchable conductive hydrogel containing polyaniline and polyacrylamide. The crosslinked polymer had a 3-D microporous network that, once implanted, allowed nerve cells to enter and adhere, helping restore lost tissue. The team showed that the material could conduct bioelectrical signals through a damaged sciatic nerve removed from a toad. Then, they implanted the hydrogel into rats with sciatic nerve injuries. Two weeks later, the rats' nerves recovered their bioelectrical properties, and their walking improved compared with untreated rats. Because the electricity-conducting properties of the material improve with irradiation by near-infrared light, which can penetrate tissues, it could be possible to further enhance nerve conduction and recovery in this way, the researchers say.

More information: "Conductive Hydrogel for Photothermal-Responsive Stretchable Artificial Nerve and Coalescing with a Damaged Peripheral Nerve" *ACS Nano* (2020).

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