Coming together

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NERVE cells in a rat's central nervous system have been persuaded to regrow through scar tissue. The discovery could remove one of the obstacles to repairing spinal cords.

While the central nervous systems of some creatures can regrow after damage, mammals traded in this ability long ago in exchange for a more stable system. One of the key ways our body stops our brains and spines healing themselves is by making proteins that inhibit neural regrowth. Some of these proteins tend to build up in neural scar tissue after injury.

Now James Fawcett of Cambridge University and his colleagues have found a way to overcome this effect. One of the inhibitor proteins in scar tissue is normally coated with substances called chondroitin sulphate sugars. Fawcett's team has shown that the inhibitory effect is lost if you strip the protein of these sugars.

Fawcett's colleague Lawrence Moon, now at the Miami Project to Cure Paralysis, tested the approach on rats. He severed part of the brain and then treated the injury for 10 days with chondroitinase ABC, which strips the sugars off inhibitor proteins. Moon found that axons of damaged neurons grew back through the injury site, although the rats' behaviour remained abnormal.

Another study by Liz Bradbury of King's College London still unpublishedshowed that chondroitinase ABC also allowed axons to regrow through scar tissue in rats with severed spinal cords. However, the nerves only grew about 4 millimetres through the injury site. In people with, say, a neck injury, this amount of growth would not be nearly enough to fully restore movement. But the researchers say even a few centimetres of regrowth could mean that patients would regain the ability to breathe unaided or move their hands.

"People have been looking at nerve regeneration since the early 1990s, and have encouraged nerves to grow in the region of scar tissue before," says Fawcett. But he says this is the first study to address the main inhibitory proteins found in scar tissue and is perhaps the first to show nerves growing directly through that barrier.

His team now plans to find out if the treatment works after a delay, or if it must start immediately after the injury.

"This is an important part of regeneration," says Martin Schwab at the Brain Research Institute at the University of Zurich. But he points out that there are others, too: there are other kinds of inhibitory proteins; neurons need to be encouraged to regrow; and scar tissue can form a physical as well as chemical barrier. "Everyone in the field thinks that ultimately a combination of treatments will be useful," Schwab says. But human trials are still years away.

"Twenty years ago, no one thought [a cure for paralysis] would be possible," Moon says. "But now, in principle, in the long term, I think it is." Much remains to be done, Fawcett says. "With today's technology, we won't be able to repair a spinal cut well enough that someone in a wheelchair is going to get up and walk."

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