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'Molecular machete' used to repair spinal cord injuries

By Steve Connor Science Editor

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Preliminary experiments on paralysed rats with crushed spinal cords have shown the technique can restore movement to the legs. Clinical trials on paralysed humans could begin within five years, the scientists said.

Car accidents, industrial and sports injuries and violence are the most common causes of paralysis resulting from damaged spinal cords. Two cases of spinal cord injury occur every day in Britain alone.

A failure of nerve cells to regrow was thought until recently to be irrevocable but over the past five years a number of studies have suggested regeneration can occur under the right conditions.

The latest study, by a team led by Elizabeth Bradbury of King's College London, has concentrated on the branching filaments of proteins that pack the scar tissue quickly forming in the damaged region of a spinal cord.

"One of the reasons why nerve regeneration fails after a spinal cord injury is because scar tissue forms at the injury site," Dr Bradbury said. "The glial cells surrounding damaged nerves multiply to form a dense scar that nerves are unable to cross. This stops the nerves from growing back."

An enzyme recovered from a common bacterium was found to snip off the branches to these scar-tissue proteins - much like a gardener prunes a rose bush - making space for the nerve cells to send out new "shoots" and restore nerve function.

The bacterial enzyme, called chondroitinase ABC, works by cutting off the carbohydrate side-branches of the proteins, making it easier for nerve fibres to regrow.

"We found that in spinal cord-injured rats that were treated with chondroitinase ABC, injured nerves were able to grow through the injury scar and that these regenerating nerves formed new connections and so were able to transmit signals to other cells and 'talk to each other'," Dr Bradbury said.

Rats with crushed spinal cord were able to walk nearly normally after treatment, although they were still unable to feel anything below the damaged area, suggesting full sensory function of the nervous system had not been restored.

The study, which is published today in the journal *Nature*, was nevertheless an important advance in the field of spinal cord injury, Dr Bradbury said.

"It demonstrates for the first time that treatment with the bacterial enzyme chondroitinase ABC can induce some useful recovery of neurological function following a spinal cord injury," she said.

Clinically, the research could be used in conjunction with other techniques known to encourage the regrowth of nerve cells, such as synthetic antibodies that block proteins in damaged spinal cords that are known to inhibit regeneration.

"Spinal cord injury is a major neurological problem because damage to the spinal cord is irreversible. This may mean paralysis and loss of sensation, which can obviously be devastating for patients," Dr Bradbury said.

"We believe that treatments such as ours, which target the glial scar, will be used in combination with other treatments. Clinical trials for this type of multitargeted therapy may begin within the next five years," she added.

Lars Olson, a neuroscientist at the Karolinska Institute in Stockholm, Sweden,said other work had shown that injecting chondroitinase ABC did not destroy any crucial proteins of the body .

"In the short-term, the prognosis for people with complete spinal cord injury remains grim. Yet, looking further into the future, we can perhaps allow ourselves to be a bit more optimistic," Dr Olson said.

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