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Discovery may help nerve regeneration in spinal injury

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Scientists at the Universities of Liverpool and Glasgow have uncovered a possible new method of enhancing nerve repair in the treatment of spinal cord injuries.

It is known that scar tissue, which forms following spinal cord injury, creates an impenetrable barrier to nerve regeneration, leading to the irreversible paralysis associated with spinal injuries. Scientists at Liverpool and Glasgow have discovered that long-chain sugars, called heparan sulfates, play a significant role in the process of scar formation in cell models in the laboratory.

Research findings have the potential to contribute to new strategies for manipulating the scarring process induced in spinal cord injury and improving the effectiveness of cell transplantation therapies in patients with this type of injury.

Scarring occurs due to the activation, change in shape, and stiffness of cells, called astrocytes, which are the major nerve support cells in the spinal cord. One possible way to repair nerve damage is transplantation of support cells from peripheral nerves, called Schwann cells. The team, however, found that these cells secrete heparan sulfate sugars, which promote scarring reactions and could reduce the effectiveness of nerve repair.

Scientists showed that these sugars can over-activate protein growth factors that promote astrocyte scarring. Significantly, however, they

found this over-activation could be inhibited by chemically modified heparins made in the laboratory. These compounds could prevent the scarring reaction of astrocyte cells, opening up new opportunities for treatment of damaged nerve cells.

Professor Jerry Turnbull, from the University of Liverpool's Institute of Integrative Biology, said: "Spinal injury is a devastating condition and can result in paralysis for life. The sugars we are investigating are produced by nearly every cell in the body, and are similar to the blood thinning drug heparin.

"We found that some sugar types promote scarring reaction, but remarkably other types, which can be chemically produced in the laboratory by modifying heparin, can prevent this in our cell models.

"Studies in animal cells are now needed, but the exciting thing about this work is that it could, in the future, provide a way of developing treatments for improving nerve repair in patients, using the body's own Schwann cells, supplemented with specific sugars."

Professor Sue Barnett, from the University of Glasgow's Institute of Infection, Immunity and Inflammation, said: "We had already shown that Schwann cells, identified as having the potential to promote nerve regrowth, induced scarring in spinal cord injury. Now that we know that they secrete these complex sugars, which lead to scarring, we have the opportunity to intervene in this process, and promote central nervous system repair."

The research is published in the *Journal of Neuroscience*.

Provided by University of Liverpool