Decorin: A Breakthrough Technology for Nervous System Repair

Stephen Davies PhD, Head, Spinal Cord Injury Research Program,
Department of Neuroscience, Monash University. (Email: stephen.davies@monash.edu)

The challenge of SCI

There are currently millions of adults and children around the world suffering from severe disabilities resulting from traumatic spinal cord injuries (SCI). It is estimated there are more than 180,000 new SCI cases worldwide each year with up to 400 SCIs per year in Australia alone. A common misconception is that sports activities account for the majority of SCIs, however studies show that the two leading causes are motor vehicle accidents (47%) and falls in persons 65 years of age and older (27%). We are therefore all at risk. Despite advances in rehabilitative medicine, the quality of life for patients who survive a severe spinal cord injury is poor. At present there are no clinically approved interventions that can promote significant recovery of spinal function after SCI – particularly for patients with long-term chronic injuries.

Decorin Infusion: A promising technology for treating SCI

Traumatic spinal cord injury results in the loss of many neurons, support cells, and the failure of severed nerve fibres to regenerate across sites of injury and re-establish neural circuits. Inflammation promotes scarring at sites of injury and within surrounding tissues that actively inhibits sprouting of surviving nerve fibres and the formation of new neural circuits ("neuro-plasticity"). Award winning studies from the Davies research team have shown that infusion of a naturally occurring protein called Decorin into the spinal cord immediately after injury is highly effective at preventing the formation of inhibitory scar tissue, allowing nerve fibres to grow across Decorin treated injuries. In addition, the Davies lab have shown that Decorin can induce the injured spinal cord to make enzymes that can actively breakdown established scar tissue - results that have recently been independently replicated by a research team in the UK. Furthermore, the Davies team have also demonstrated that Decorin can have a direct effect on neurons to effectively "de-sensitize" their nerve fibres to growth inhibitory molecules found within scar tissue and throughout the environment of the chronically injured adult brain and spinal cord.

Turning a discovery into a therapy

In seeking means of delivering Decorin to patients, the Davies team have recently discovered that infusion of human Decorin to cerebro-spinal fluid surrounding the brain and spinal cord in experimental studies can promote truly remarkable levels of nerve fiber sprouting, formation of new neural connections (called synapses) and recovery of locomotor function after SCI – even when administered to the chronically injured spinal cord. The ability of Decorin to suppress inflammation, scar formation, and promote extensive sprouting of neural circuits, strongly supports the development of Decorin infusion for treatment of a wide variety of other severe neurological disorders such as traumatic brain injury, cerebral palsy and stroke where these multiple benefits could be highly effective at promoting recovery of neural function. As Decorin protein is naturally found within the human nervous system but is suppressed after injury, infusion of the molecule to brain and spinal cord can be considered as being a "protein replacement" technology, much like providing insulin for diabetes patients. Unlike stem cell transplantation therapies which require complex surgeries and are limited in how many times patients can be treated, infusion of Decorin is a relatively simple procedure that could be combined with rehab and delivered multiple times to further improve recovery.

Importantly, having already worked closely with experienced biotech partners to establish a commercially viable source of pharmaceutical-grade human Decorin and intellectual property rights covering the infusion protocol, the stage is set for delivering a breakthrough treatment for the injured nervous system that could have a profound effect on the quality of life of adults and children suffering with neurological disorders in Australia and around the world.