Only 30 cents per Canadian!

Four determined men are wheeling across Canada on hand cycles on an incredible journey. They strongly believe that breakthrough Canadian research will enable them to walk again, making their grueling trek a Mission Possible. *All they are asking is that Canadians donate 30 cents each.*

This research will also have far reaching implications for conditions such as: Alzheimer's, Parkinson's, diabetes, stroke, concussive head injury, and major wounds. The importance of these findings was recently recognized by the scientific community – a huge hurdle - at the GTCbio International 4th Stem Cell Research & Therapeutics Conference in Boston where the Canadian research team was awarded the opportunity to present their findings: one of only three in the world to do so.

Canada's Breakthrough Medical Research

In 2006, after 25 years of hard work and collaboration with researchers around the world, a Canadian research team at McMaster University was able to accomplish what had never been done before. The Hamilton-based team, led by Dr. Michel Rathbone and Dr. Shucui Jiang, successfully regenerated nerves in the chronically injured spinal cords of rats. In doing so they restored the nerve signals from the brain to the legs, enabling the rats to walk again.

This "medical miracle", so dubbed by the four wheelchair-bound wheel chair athletes, was made possible by two breakthrough discoveries.

1. The rats' own cells from the nervous system of the intestine were successfully transplanted into the spinal cord

   Ethical questions about embryonic stem cells no longer need apply after the team discovered that adult cells (enteric glia) that support the nervous system of the gut could be injected into the spinal cord and enhance recovery of function without being rejected by the immune system. These adult cells are found in abundance in the intestines of animals and humans. When isolated, grown in cell culture, then transplanted back into the rats' spinal cords, these cells:

   - stimulated nerves to grow through the injured spinal cord;
   - reduced the damage in the spinal cord;
   - stimulated nerves to form functional connections; and
   - improved function of the injured spinal cord.

   This breakthrough avoided the problems of tissue rejection. They also are very stable since the mature enteric glial cells do not develop into other types of cells after transplantation into the central nervous system. Therefore they do not grow uncontrollably and form tumours.

2. <u>One of the body's natural substances stimulated adult stem cells in injured spinal cords to grow and to produce cells that insulated the damaged nerve fibres</u>

The team discovered that guanosine, a naturally occurring molecule in the body, enhances functional recovery after CHRONIC spinal cord injury by stimulating adult stem cells already present in the adult spinal cord to grow and develop into cells that insulated the nerve processes. This improved conduction of nerve impulses through the nerve processes that were still surviving after spinal cord injury.

These two approaches open a new perspective on treatment of spinal cord injuries. In essence, the rats' own enteric glial cells caused nerve fibres to grow, and guanosine, a natural molecule, stimulated the intrinsic stem cells to help repair the chronically-injured spinal cord.

The wide impact of this discovery

This Canadian medical discovery is a breakthrough not only for those with spinal cord injuries. It will have enormous spin off value for other diseases because all of us have stem cells present in many organs of our bodies, including the brain. These work in normal repair and maintenance functions. So it follows that this work in the future may have far reaching implications for development of treatments in a wide variety of disabling neurological conditions such as: Alzheimer's, Parkinson's, diabetes, stroke, concussive head injury, and major wounds. This will provide further incalculable benefit to the health of Canadians and savings in health care costs.

Next steps

The research has reached the stage where the team must now explore the molecular and cellular mechanisms underlying these important changes and translate these unique findings into clinical trials. It is a critical time as the team prepares to apply their breakthrough findings and take the research to the next level.

- Immediately, the research technique will be refined, then trials begin with small animals such as dogs who are prone to have spinal cord injury over the course of their lives.
- Within one to two years, trials could begin in humans because guanosine is a naturally occurring compound.
- In five years, the research team could begin combined enteric glial cell and guanosine trials in humans.
- In quadriplegics even a small improvement could transform their lives – if techniques like these can make the spinal cord recover over even a few centimeters – they would be able to use their arms, and gain a great deal of independence. This would dramatically change their lives.

Medical collaboration

Although the lead research team is based at McMaster University, they have collaborated on this research with several groups at McMaster as well as investigators in other universities in Canada such as the University of Prince Edward Island, the University of Calgary and the University of Western Ontario. The investigators of the Hamilton Neurorestorative Group also work with European groups, including those from University College, London, UK, the universities of Milan, Trieste, Camarino, and Chieti-Pescara, Italy,

The impact of spinal cord injury on Canadians

It takes only an instant for a spinal cord injury (SCI) to happen, but the devastating effects of the injury can last a lifetime. Over 84% of spinal cord injuries occur to people under the age of 34, and over 60% of people with spinal cord injury are unemployed. Healthcare costs over a lifetime can reach $2.5 million per person and that does not take into account other aspects of the economy that are influenced by a lack of participation in the workforce, nor the indirect economic impact on the 10 million Canadians whose lives are affected in some way by children, teenagers and adults living with spinal cord injury. Together these place a huge economic and personal burden on society.

Neurorestoration – a new approach

Dr. Shucui Jiang heads a unique NeuroRestorative Group at McMaster's Department of Surgery. This Group differs from most others around the world that work towards *improving* lives of those with spinal cord injuries. They, in contrast, are working to actually *restore* neural function after chronic spinal cord injury or disease.

This Group draws together individuals dedicated to neurorestorative research, developing collaborations and translating fundamental scientific findings into the clinical arena. The flow of research from molecular, cellular, whole animal studies, clinical studies and function in society for individuals with neurological deficits has been readily achieved through the collaborative efforts of the group and its national and international collaborators.

Turning research into reality

The NeuroRestorative Group is taking the holistic approach in order to turn the research into reality as quickly as possible. The group includes:

- those with expertise in the chemical synthesis of new molecules that will be needed to track the fate of the stem cells after they are implanted to spinal cords;
- surgeons capable of doing the necessary transplantations;
- kinesiologists to use state of the art body weight supported treadmill training; and
- social scientists to evaluate the effects of these interventions on the patients' emotional well-being.

What is needed to get the job done?

Only 30 cents from each Canadian!

This incredible journey, which took two years to plan, will be undertaken by: **Charlie Cetinski** of Waterdown, **Les McLaughlin** of Mississauga, **Chuck Mealing** of Crystal Beach (Fort Erie) and **Harvey Uppal** of Burlington.

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