



## 2023 Hopewell M.I.N.D. Prize Finalists



**Finalist:** [Dr Aaron Phillips](#)

**Bio:** Dr. Aaron Phillips is a distinguished scientist and academic whose training in Biosciences has enabled him to uncover the intricate relationships between the nervous and cardiovascular systems. With a keen understanding of how these interactions can be disrupted in clinical conditions, Dr. Phillips has devoted his research to developing innovative therapeutics for individuals with neurological health issues. During his post-doctoral studies at the University of British Columbia (UBC), Dr. Phillips was awarded prestigious fellowships from Banting, CIHR, NSERC, and Craig Neilsen, as well as the Killam Research Award. In 2017, he established his laboratory at the University of Calgary, where he currently serves as Associate Professor of Physiology and Pharmacology, Biomedical Engineering, Clinical Neurosciences, and Cardiac Sciences. Dr. Phillips has been honored with numerous accolades, including the Brain Canada Future Leader Award, The Arthur Guyton Award for Excellence in Physiology from the American Physiology, and the Heart and Stroke Foundation New Investigator Award. Avenue Magazine also acknowledged him as a "top-40-under-40". He publishes in top journals such as Nature, Neurology, Circulation Research, and Nature Biotechnology. He consults for a number of organizations and has successfully commercialized his discoveries through start-up and publicly traded companies.

**Proposal Title:** A hemodynamic neuroprotection paradigm for spinal cord injury

### Summary:

Spinal cord injury is a traumatic event affecting 1.3 million North Americans and is associated with severe physical, psychological, social, and economic burdens on patients and their families.

While the primary spinal cord injury is determined by the initial forces acting on the spinal cord, a subsequent secondary injury develops, characterized by insufficient blood flow through the injury site that leads to ischemia and hypoxia, and a neurotoxic environment that insidiously expands the injury size, and limits neurorecovery. In fact, the secondary damage after the initial trauma underlies approximately half of the final injury severity.

Hundreds of promising therapies have been developed to protect and regenerate neurons after spinal cord injury, unfortunately with unsatisfying results with respect to both efficacy and translation. This may be due to an insufficient hemodynamic environment within the spinal cord preventing neurorecovery. A therapeutic paradigm that stabilizes spinal cord blood flow after spinal cord injury may lead to profound improvements in neurorecovery, and quality of life.

Our innovative and bold concept is centred around understanding if stabilizing blood flow in the spinal cord early after an injury can improve neurorecovery. We have recently developed a closed-loop system that titrates the inspired concentrations of a powerful vasoactive gas (carbon dioxide) and stabilizes spinal cord blood flow after spinal cord injury. We do not have pilot data to support



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that this approach promotes neurorecovery, but it is positioned logically to do so.

We aim to test if stabilizing spinal cord blood flow promotes neurorecovery after spinal cord injury. More specifically this research aims to:

- 1) Test the effect of stabilized blood flow on neurorecovery using closed-loop titrated carbon dioxide
- 2) Test the effect of stabilized blood flow on neurorecovery using titrated local delivery of alternative pharmacological interventions (e.g., sodium nitroprusside, acetazolamide)
- 3) Test combined effective hemodynamic approaches with rehabilitation to promote neurorecovery.

Over the past 6 years, my lab has developed implantable neurostimulators for restoring cardiovascular function in the chronic phase of spinal cord injury. This proposal is a new direction for my group as it uses a bold and untested approach that is potentially transformative for enhancing neurorecovery after spinal cord injury. If effective, this new treatment paradigm focused on optimizing the hemodynamic environment may herald an era of significant clinical advancement. We expect this approach may translate to a range of neurological injuries associated with impaired central nervous system hemodynamics such as traumatic brain injury and others.