STEM CELL NETWORK

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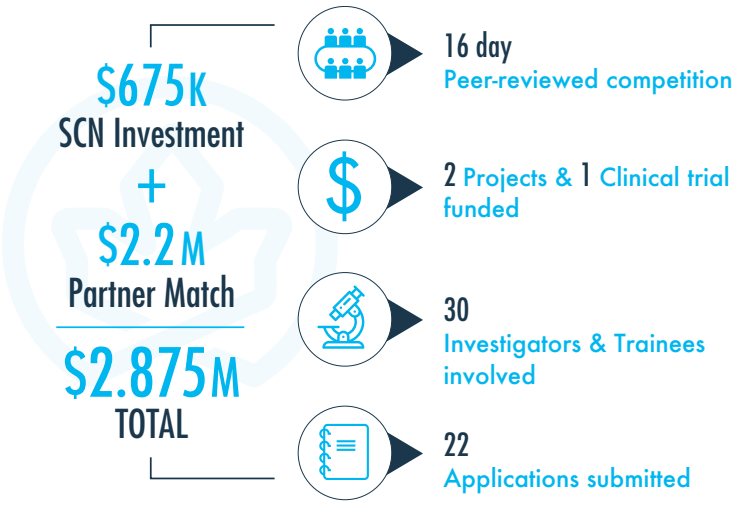
InFocus

STEM CELLS IN THE FIGHT AGAINST COVID-19

The COVID-19 pandemic has changed the world we live in. The impacts are numerous and there is no part of modern society that has not been affected. How we work, play, learn and interact with each other is changing. At the outset of Canada's outbreak, the Stem Cell Network (SCN) moved quickly to activate its health research community through its *COVID-19 Rapid Response Research Initiative*, seeding an environment in which crucial research could be supported.

SCN'S COVID-19 RAPID RESPONSE INITIATIVE

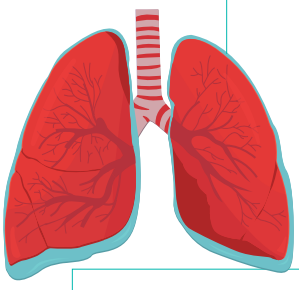


This fast-tracked program sought to catalyze high-quality stem cell and regenerative medicine approaches to combat illness caused by the SARS-CoV-2 virus. The initiative was open to translational research, early stage clinical trials and ethical, legal and social implications (ELSI) research associated with COVID-19. A total of 22 applications were received and following peer review, one clinical trial and two research projects were recommended for funding. SCN demonstrated its ability to be nimble in its response to the pandemic, by not only reallocating funding but compressing the competition process (from launch through peer review and Board approval) into 16 days.

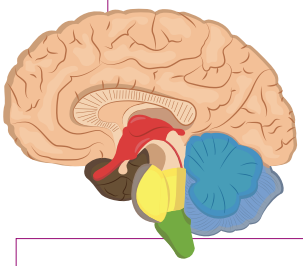
Impressed by the quality of research applications, SCN's Board of Directors decided to increase the original funding envelope by $175,000 to enable the top-rated projects to move forward. In total, $675,870 was allocated, with partner support valued at over $2.2M from the Ontario government, research institutes, industry and charitable foundations – an impressive 3:1 match on SCN's investment. These three projects involve over 30 researchers, clinicians and trainees from across the Stem Cell Network. SCN was honoured that on April 23, its projects were formally announced by the Prime Minister, as part of the Government of Canada's support for a national medical and research strategy to fight COVID-19.

Stem cells are helping us understand how COVID-19 is infecting the body and can help to reduce and treat the severity of the disease.

The virus that causes COVID-19 affects many organs in the body, including lungs, heart, brain, liver, kidneys and intestines.



COVID-19 causes significant damage in the lungs and respiratory system. Many people experience mild or no symptoms, but some are at risk of a severe response requiring medical attention and hospitalization.



Several different symptoms of severe COVID-19 infection have been reported in the brain and central nervous system, including:

- *brain inflammation (encephalitis),*
- *seizures,*
- *stroke,*
- *headaches,*
- *visual impairment,*
- *and loss of taste and smell.*

Using Stem Cells to Investigate How COVID-19 Affects the Brain

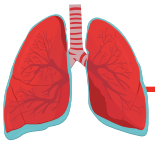
Recent evidence indicates that in addition to the severe impacts SARS-CoV-2 has on a patient's lungs, it also targets the brain. Many patients diagnosed with COVID-19 report loss of smell, taste, pain, visual disturbances, and headaches which are clues that the virus is infecting the specialized cells of the brain. At the Hospital for Sick Children in Toronto, Drs. Julien Muffat & Yun Li are leading a team that are assessing how and why the virus is targeting the brain. They are building upon their previous Zika virus research, an illness best known for causing serious birth defects in babies.

The Muffat & Li research team are working to understand which types of cells in the brain are most vulnerable and how they respond once in contact with SARS-CoV-2. In addition, they are studying how the immune cells that reside in the brain are impacted by the virus and what role they play in brain-related symptoms. By understanding how SARS-CoV-2 affects brain tissues a foundation will be established for addressing the sensory impacts that are being reported by many COVID-19 patients.

SCN awarded $180K to support this project as part of its *COVID-19 Rapid Response Research Initiative*, and the SCN award was complemented by partner support totaling $98K.

(T) DR. JULIEN MUFFAT (B) DR. YUN LI

Using 3D Technology to Understanding How Lung Cells Respond to COVID-19



Why do patients with COVID-19 present with varying degrees of infection and disease severity? The answer may lie in the genetic changes that take place within cells, when infected with the SARS-CoV-2 virus. With support from the Stem Cell Network a team led by Drs. William Stanford (Senior Scientist at the Ottawa Hospital Research Institute) and Amy Wong (Scientist at the Hospital for Sick Kids) are collaborating to better understand the genetic changes that take place.

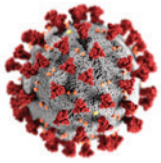
Using stem cells, Drs. Stanford and Wong are creating 3D human lung tissues to investigate how three main cell types in the lung respond to SARS-CoV-2 viral infection. These include:

- epithelial cells, the primary cells lining the airways;
- vascular cells, cells lining the blood vessels; and
- immune cells, surveillance cells that attacks respiratory pathogens.

Putting these cell types together is key to fully understanding how they interact and contribute to severe lung injury caused by COVID-19. This research is creating advanced lab models that can demonstrate how the virus impacts lung tissue, this is very important as such models are currently limited. In the coming months it is expected that the team will be able to use their 3D human lung tissue models to test Health Canada & FDA approved drugs to identify novel therapeutics to reduce COVID-19 disease severity.

Through SCN's *COVID-19 Rapid Response Research Initiative* the Stanford-Wong team were awarded over $195K to conduct this innovative and important research. This funding has been matched by other funding partners with in-kind and cash contributions of $397K.

(T) DR. WILLIAM STANFORD (B) DR. AMY WONG



SCN is proud of the Canadian stem cell researchers it supports and how they are contributing to the global COVID-19 response. This pandemic has changed the world we live in, but Canadians can have confidence in knowing that their stem cell researchers are making a meaningful difference.

CATE MURRAY, EXECUTIVE DIRECTOR & COO, STEM CELL NETWORK

Driving Towards a Novel Treatment for COVID-19

As the COVID-19 pandemic continues to grip the world, uncertainty about the future persists for Canadians. The good news is that Canadian scientists are fully engaged in addressing COVID-19 by developing an innovative cell-based treatment. Dr. Duncan Stewart from the Ottawa Hospital Research Institute and his experienced research team have been funded by the Stem Cell Network and the Province of Ontario to conduct a clinical trial, entitled CIRCA-19. The CIRCA-19 trial will administer a specialized cell product for critically ill patients, with the goal of tampering down the aggressive inflammatory response that prevents the transfer of oxygen to the blood and damages the lungs. Recent research demonstrated that of seven patients given a similar cell product, lung function and symptoms improved significantly after 48 hours. The CIRCA-19 trial will look to confirm the safety and efficacy of this potential treatment. The trial will take place in three stages and enroll up to 27 patients from Ottawa and Toronto.

SCN was the first to support this clinical trial, awarding $300K in April 2020. Not only is this support key, but so too are previous research investments made by SCN. More than $2M has been previously invested by the Stem Cell Network in research that confirmed the safety of the cell product being used, and developing a partnership with the Center for Regenerative Therapies in Germany who are providing specialized cells required for the CIRCA-19.

DR. DUNCAN STEWART

Tomorrow's health is here. The Stem Cell Network (SCN) is a national non-profit that supports stem cell and regenerative medicine research, training the next generation of highly qualified personnel, and delivering outreach activities across Canada. SCN's goal is to advance science from the lab to the clinic for the benefit of Canadians. SCN has been supported by the Government of Canada since inception in 2001. This strategic funding, valued at $118M has benefitted approximately 178 world-class research groups and 3,000 trainees and has catalyzed 24 clinical trials.

To learn more about SCN's COVID-19 Rapid Response Research Initiative projects >**click here to view the webinar.**

To view SCN's COVID-19 Announcement >**click here**.

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