Research Manitoba

Manitoba COVID-19 Research Fund

Final Report

Contents

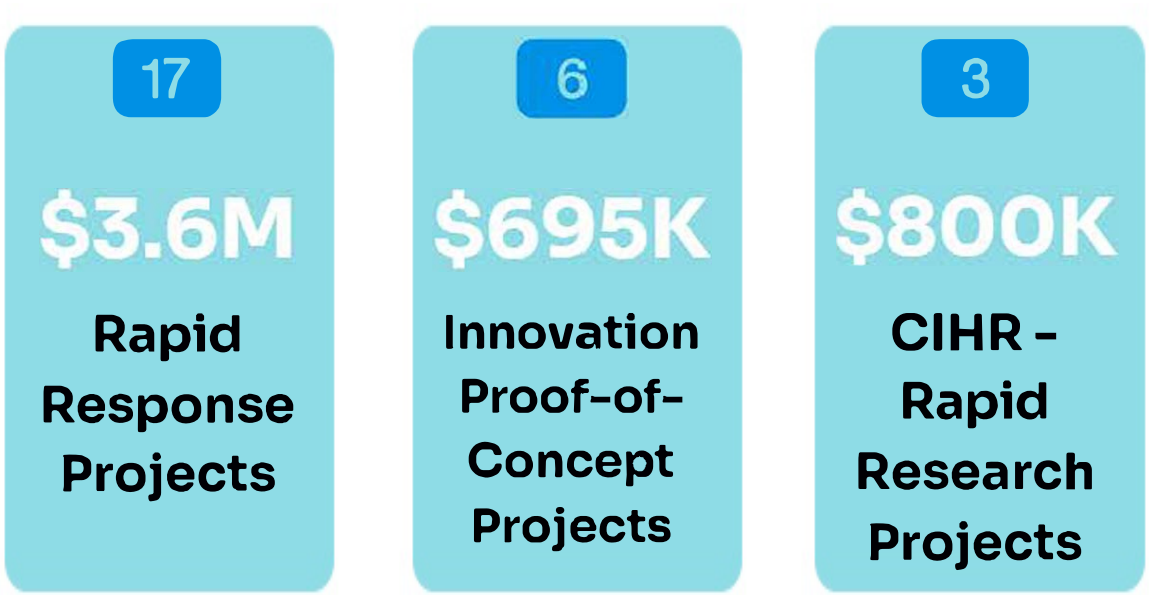
Introduction

In February 2020, the Canadian Institutes of Health Research, with numerous partners, launched a funding opportunity to contribute to the medical and social countermeasures to mitigate the rapid spread of COVID-19. Research Manitoba seized this opportunity to support local researchers and leverage federal investment by providing $800,000 in the 2019-20 fiscal year to support three Manitoba-based projects.

Following this initial investment, a group of Manitoba clinician-researchers, basic science researchers and senior officials from Manitoba Health, Shared Health and the Winnipeg Regional Health Authority identified several other local research projects with strategic objectives such as:

- Testing possible treatments in clinical trials;
- Better understanding of how the disease was developing in Manitoba; and
- Better understanding how the health system needs to react to different complications that are emerging around the world.

Consequently, the Research Manitoba COVID-19 Research Fund was established in the 2020-21 fiscal year that ultimately invested nearly $4.4 million dollars into 23 Manitoba-based projects to develop local, national, and international solutions to the pandemic.



Grant Programs

COVID-19 Rapid Response Grant
17 Projects - $3,673,558 Funded

Purpose:

- To support clinical trials, and applied health research related to COVID-19.

COVID-19 Innovation-Proof-of-Concept
6 Projects - $695,547 Funded

Purpose:

- Support research to create, enhance, or strengthen technology or product maturity towards supporting the COVID-19 pandemic.
- Advance industrial research, development and technology demonstration through collaboration between academia, non-profit organizations and the private sector.
- Support talent development and build capacity for translational research in Manitoba.

Grant Programs

CIHR Partner - Canadian Novel Coronavirus (COVID-19) Rapid Research Funding
3 Projects - $800,000 Funded

Purpose:

- Accelerate the availability of high-quality and real-time evidence to support Canada's rapid response to the global pandemic in order to better prevent, detect, treat and manage COVID-19.

- Develop, test, and study the implementation of effective interventions to prevent, detect, treat, and manage COVID-19 at the individual and/or population levels by reorienting or amplifying existing research platforms, networks, and trials as well as funding new research projects within existing and established research infrastructure.

- Enable Canadian engagement and coordination in national and international large-scale trials and better enable harmonized data collection, sharing of data, quasi-experimental and observational studies, and rapid large-scale evaluation of impact.

- Provide evidence to inform clinical and health system management and public health response, and/or decision-making and planning within and across jurisdictions in Canada and internationally.

- Enhance local, national and/or international collaborative efforts, including in low- and middle-income countries, to mitigate the rapid spread of COVID-19 and related negative consequences.

Table 1

COVID-19 Innovation Proof-of-Concept

PI	Title & Abstract	Sector	Funding
Bram Ramjiawan	*Evaluation of a Novel Saliva Based Test for Detection of SARS-CoV-2* Intrinsic Analytics is a private company that offers Covid-19 screening test using Health Canada approved assays and protocols for detection of SARS-CoV-2 in nasopharyngeal swab. Intrinsic Analytics is interested in a proof-of-concept study to validate a new assay designed to use saliva samples for detection of the virus and thereby reduce the need for difficult and invasive nasopharyngeal sample collection. In addition, this novel method of detection using saliva as the test sample will simplify sample preparation and the need for specialized equipment and reagents and allow for a direct approach for detection. If successful, this saliva assay will be a fast and robust solution that will increase cost-effective testing in order to support population-level surveillance testing for SARS-CoV-2.	Bioscience	$100,000
Bram Ramjiawan	*Copper-Infused Reusable Protective Face Mask for Prevention of SARS-CoV-2 Infections* Masks are used to protect individuals from airborne diseases and show a reduced spread of respiratory viruses. Most masks have a nonwoven layer that prevents the passing of a pathogen through the mask either from the environment to the person wearing the mask, or from the individual to the environment. Healthcare workers are among the highest risk of people for exposure to microbes and infections. Copper is known to have antiviral properties. This product has an inner copper nonwoven layer that can fight against viruses, bacteria and fungi. Accordingly, the project will be undertaken to test the effectiveness and reliability of a novel fabric face mask that is layered with copper. As the demand for protective masks is likely to increase over the foreseeable future, the ability to commercialize and distribute locally manufactured masks will be highly beneficial to the economy, public health and safety, as well as for the protection of healthcare frontline workers at risk of exposure to dangerous and contagious pathogens. The copper-infused fabric has the potential for widespread domestic, industrial, and healthcare applicability in the form of linens, surgical drapes or any cloth-based products that are used for health and safety.	Bioscience	$100,000
Donald Miller	*Development and Characterization of utRAP Technology - a Nanoparticle Platform for Preventing SARS-Cov2 Infection in Airway and Vasculature* A common entry point for the COVID-19 virus is the airway epithelial cells that line the nasal passages, bronchials and lung. Compared to other viruses, COVID-19 has a much higher rate of transmission. The high rate of COVID-19 transmission is believed to be due to its efficient entry into host cells through binding to a specific protein on the surface of the epithelial cells called angiotensin converting enzyme 2 (ACE 2). This research project aims to reduce viral entry within the airway epithelial cells through the creation of a nanoparticle platform that blocks viral docking with ACE 2 through decoy receptors. This novel nanoparticle platform, termed utRAP-Covid-19, consist of stable, unabsorbable nanoparticles decorated with ACE2 binding peptide that acts as a decoy for binding and trapping of the viral particles. The utRAP-Covid-19 nanoparticles are formed from poly-(amido amine) PAMA branched chain polymers and will be optimized for activity using airway epithelial and vascular endothelial cell culture models. These proof-of-concept studies will result in lead formulations for development as a localized inhalational therapy or systemic injectable for use in vulnerable or at-risk individuals.	Bioscience	$86,550

PI	Title & Abstract	Sector	Funding
Claudio Rigatto	Can Virtual Lifestyle Programming Limit Collateral Health Damage from the COVID-19 Pandemic: A Pilot Study Wellness Institute (WI) is a medical fitness and lifestyle medicine center that provides medically integrated, evidence-based lifestyle modification programs for the prevention and management of chronic disease. These programs have demonstrated improved health outcomes and offered important healthcare support. COVID-19 and resulting social distancing policies has disrupted Manitobans access to in-person programming and services. This has accelerated innovations in the delivery of the WIs programming beyond in-person models so that people have access to programming and support to manage their health. WI is launching their programming though an established wellness digital online platform. The first program offered through this platform will be a Cardiometabolic Health and Weight Loss Program. The program is based on curriculums from WIs clinically validated programs that address lifestyle behaviors; the root cause of cardiometabolic conditions and diseases. Objectives of this research project are to: 1. Assess the impact of COVID-19 on lifestyle behaviors and types of supports and programming needed 2. Pilot and validate WI's new online program. This program will integrate health trackers and devices, use artificial intelligence to develop personalized content and will improve Manitoban's access to much needed lifestyle programs during this crisis and beyond.	Information and Communication Technologies	$99,892
John Pacak	*High-Throughput Rapid Detection of Infectious Diseases such as COVID-19* The aim of this project is to develop a high-throughput method to detect and identify infectious diseases such as COVID-19 based on advanced spectral technologies developed by Manitoba based InnovoXL Inc. and its subsidiary Adva Diagnostics Inc. The spectral technologies produce a multi-dimensional spectral "fingerprint" of samples in minutes without the use of reagents. The spectral fingerprints from samples will be analyzed to identify differences between COVID-19 and other infectious diseases.	Bioscience	$150,000
Lisa Bako	*Cubresa's Proof-of-Concept NuPET Bio Compatibility Kit for Small-Animal SARS-CoV-2 PET Imaging in a BSL-3 Environment* Understanding the pathogenesis of SARS-CoV-2 and developing drugs and a vaccine are key components in the fight against COVID-19. SARS-CoV-2 is a biosafety level 3 (BSL-3) pathogen and must be kept in a high-containment environment where specially built equipment must withstand rigorous decontamination and contain airborne pathogens. Positron Emission Tomography (PET) is an imaging modality that has great value in the study of pathogenesis and drug discovery for diseases including COVID-19; however, the size and weight of commercial scanners makes them difficult to integrate into the BLS-3 environment. Cubresa is developing a BSL-3 compatibility package, the NuPET Bio, for the NuPET, the worlds smallest mobile preclinical PET scanner, allowing it to be used safely in this environment. The NuPET Bio includes a sealed small-animal handling bed and tube with which the user can perform advanced imaging on infected animals, and a protective plastic casing that encases the body of the device. The tube will filter airborne particles while allowing for oxygen/anaesthetic delivery, and the whole unit can be cleaned and decontaminated with industrial-grade agents/gases, preventing cross-contamination. The NuPET Bio will enhance preclinical PET imaging technology, allowing researchers to understand the safety and effectiveness of prospective drugs and vaccines against COVID-19.	Information and Communication Technologies	$100,000

CIHR Partner Funding – Canadian COVID-19 Rapid Research Funding

PI	Title & Abstract	Sector	Funding
Bradley Pickering	*Development of Field-Deployable and Point-of-Need Diagnostics for SARS-CoV-2 Using CRISPR-Based Technology* Current diagnostic testing for the SARS-CoV-2 outbreak requires the use of specialized equipment for molecular-based pathogen detection. The equipment must be housed in a facility with electricity and freezers for storage of temperature sensitive materials and equipment operation. Lateral flow-based assays are an alternative diagnostic tool that is inexpensive, temperature stable, user-friendly and has a faster turn-around-time (TAT). However, this platform takes longer to develop, with reduced specificity, sensitivity, and accuracy compared to molecular-based assays. An ideal diagnostic tool combines the adaptability and reliability of molecular assays with the TAT, cost-effectiveness, and stability of lateral flow. Clustered Regularly Interspersed Short Palindromic Repeats (CRISPR) based diagnostics can provide these capabilities and revolutionize the field of point-of-need molecular-based diagnostics. Our goal is to develop CRISPR-based diagnostics to detect SARS-CoV-2 at the point-ofneed, such as at the bedside, passenger screening, or returning travellers who may have been exposed. We recently demonstrated that CRISPR-based diagnostics is reliable, sensitive and can be used to detect Ebola virus and Crimean-Congo hemorrhagic fever virus. SARS-CoV-2 is highly contagious and caused more than 69,000 infections and contributed to over 1600 deaths. Therefore, it is of utmost importance to quickly diagnose SARS-CoV-2 infection to administer appropriate patient care and isolation. CRISPR-based diagnostics is a next-generation diagnostic tool that can provide results in a timely manner and fill this gap. Implementation of CRISPR-based diagnostics will complement our armamentarium against high-consequence pathogens and will address the need for faster, cheaper, and more robust diagnostics for emerging infectious diseases of public health concern.	Bioscience	$270,550
Xiao-jian Yao	*Development of a Novel DC-Targeting Vaccine Approach Targeting 2019-nCoV Spike Protein for Controlling nCoV Infection* COVID-19 is a coronavirus identified as the cause of an outbreak of respiratory illness that was first detected in Wuhan, China. There is currently no vaccine to prevent COVID-19 infection. The spike protein (SP) of the virus is the key molecule for entry into a cell and is a main target of host protective immune responses. A receptor-binding domain (RBD) located in SP is essential for the infection of COVID-19. Previous studies have demonstrated that RBD of SARS-CoV consists of multiple neutralizing epitopes that induce highly potent neutralizing antibodies. The neutralizing antibody can bind to SARS-CoV and interferes with its ability to infect a cell. These findings suggest that RBD of COVID-19 is an ideal anti-COVID-19 vaccine candidate. Dendritic cells (DCs) are antigen-presenting cells that play critical roles to efficiently present viral antigens to the T cells of the immune system. Therefore, targeting DCs is a promising strategy to improve vaccine effectiveness. Recently, we have developed a highly efficient DC-targeted vaccination technology, and in this study, we will use this vaccination technology to expose the RBD of COVID-19 to host immune system. We will also investigate the potential of this novel vaccine approach to elicit potent immune responses against COVID-19 and SARS-CoV infections in vivo. The success of this proposed study will lay the groundwork for the quick development and production of anti-COVID-19 vaccine candidates, and contribute to a rapid response towards controlling the COVID-19 pandemic in China and worldwide	Bioscience	$270,550

PI	Title & Abstract	Sector	Funding
Koi Yu Adolf Ng	*An Investigation on Epidemic Logistical Response and Planning: The Case of Novel Coronavirus (Covid-19)* Effective mitigation to the impacts of sudden, large-scale epidemic outbreak is a key issue as it poses substantial impacts on human lives and society. As numerous urban and social activities involve logistics, it means that effective epidemic logistical response and planning is key to secure social security and prosperity, now and the future. Hitherto, however, there is a serious scarcity of knowledge on how the logistical system can adapt to epidemic outbreak. There is an urgency to investigate whether epidemic logistical planning approach is appropriate. Hence, by focusing on Covid-19, the goal of this project is to develop effective logistical strategies and solutions to tackle the social impacts caused by sudden, large-scale epidemic outbreak so as to enhance the resilience of cities, countries, and societies. It strives to achieve five key objectives: 1. To investigate how individuals and societies with difference characteristics (e.g., age, jobs) perceive and react to the social impacts of and logistical strategy in tackling COVID-19. 2. To identify attributes that can catalyze information sharing and coordination between cities and countries in epidemic logistical planning. 3. To identify ways that can facilitate the transfer of strategies and solutions to cities and countries under diversified geographical and cultural contexts, especially those with relatively weak health systems. 4. To investigate how governments plan and respond to the different logistical needs of society in the outburst of a sudden, large-scale epidemic at different stages. 5. To develop strategies, solutions, and a supporting framework to governments and societies to mitigate the rapid spread of Covid-19 in terms of logistical service control, especially for vulnerable groups and areas. By improving the logistical response and planning, we strongly believe that this project will secure healthier and more secure societies in Canada, China, and around the world in the long term.	Infrastructure - Transportation	$258,900

Manitoba COVID-19 Rapid Response Research Grant

PI	Title & Abstract	Sector	Funding
Carol Hitchon	*Safety and Immunogenicity of SARS-CoV2 Vaccines* This study was an observational prospective cohort study to evaluate the safety and immunogenicity of SARSCoV2 vaccines in people with immune mediated inflammatory diseases (IMIDs). We enrolled people with inflammatory arthritis (IA), systemic autoimmune rheumatic disease (SARDs), inflammatory bowel disease (IBD)or multiple sclerosis (MS)who received COVID-19 vaccines. Participants were seen before vaccination, 1 month and 3 months following each vaccine dose. At each visit we collected data on COVID-19 infection, IMID disease activity, and side effects from the vaccine. Participants provided a blood sample either by collecting at home (finger poke with dried blood spot and mailed in) or by blood draw from which dried blood spots were obtained. The blood was tested for antibodies reflecting the immune response to the vaccine or infection. In a subset, blood was collected to measure neutralizing antibodies and the cellular response to vaccine.	Bioscience	$84,105
Razvan Romanescu	*Mobility and COVID-19 Trends* In the field of infectious disease modeling, the ability to perform model calibration and prediction based on the effective reproductive number (R_t) will increase speed and accuracy of predictions compared to existing approaches, which is paramount during an emergency situation for obtaining actionable information. One factor that contributes to accuracy and is unique to this research is the ability to model public health interventions via changes in the underlying network of connections. Currently, these interventions are modeled as a change in person-to-person transmission probability, which is a modeling over-simplification and leads to prediction inaccuracies. The ability to extract R_t as a complete curve for a particular location vs. a point estimate (which is standard at the present time) is important not only scientifically, but also for communicating about modeling with more applied researchers and with the public. The objectives of this grant are as follows. 1. Develop evidence informed recommendations to direct Manitoba's reopening strategy following the second wave. 2. Identify specific "high-risk" points of interest that can be targeted for restrictions or excluded from reopening plans. 3. Develop a predictive model summarizing the association between mobility patterns and COVID-19 transmission prior to and after COVID-19 mitigation strategies to predict transmission under different reopening scenarios.	Information and Communication Technologies	$100,000
Sherif Eltonsy	*The Impact of Population-Level Physical Distancing During COVID-19 Pandemic on Healthcare Services in Manitoba: A Focus on Vulnerable Populations* The COVID-19 pandemic has led provincial governments to introduce unprecedented new regulations to reduce community spread. While it is true that the entire world is affected, the health risks are not the same for everyone. While earlier reports showed greater risk among seniors, the restrictive measures could have substantial impact on different vulnerable groups, like pregnant women and those with chronic disease. Given the scale of the pandemic, it becomes crucial to identify the population groups who are most likely to struggle. We aim to understand the implications of the COVID-19 physical distancing measures on vulnerable population groups in Manitoba. First, we will explore if people who need important medications are able to access them. Second, we will look at whether pregnancy and births during this period experience any different outcomes than pre-COVID-19. Lastly, we will answer whether postponing in-person health care visits had any major effects on individuals requiring these services. This study will help to identify if vulnerable groups in Manitoba were impacted differently from COVID-19 measures. This study will also help in creating interventions that could ease the effects of COVID-19 and assist with planning for future pandemics.	Bioscience	$150,000

Manitoba COVID-19 Rapid Response Research Grant

PI	Title & Abstract	Sector	Funding
Nathan Nickel	*A Distinction-Based Study on Equity in COVID-19 Testing among Manitoba First Nations, Metis and Inuit* First Nations, Metis and Inuit (FN/M/I) Peoples are more likely than other Canadians to be affected by the COVID-19 pandemic. Many FN/M/I experience high rates of poverty and live in over-crowded houses. This makes it difficult for them to practice physical distancing and increases their risk of COVID-19 infection. If they are infected, they may be at risk of developing severe COVID-19 symptoms, due to their higher rates of chronic illness (like diabetes, heart disease and lung disease). Because their health and social services funding is often inadequate, FN/M/I communities may be unable to respond quickly if a health crisis occurs. To help prevent this type of crisis, this project will provide data on COVID-19 testing in Manitoba, an important initial step to control the spread of the virus. We will use routinely collected data to examine the geography of testing, compare rates among FN/M/I people and other Manitobans, and develop models to predict the number of tests required in Manitoba. By providing this information to FN/M/I and government decision makers, this project will direct COVID-19 resources to areas where they are needed.	Information and Communication Technologies	$99,435
Lauren MacKenzie	*Manitoba COVID-19 Serology (MaCS) Network* Healthcare workers and individuals in congregated settings are at high-risk of infection with Coronavirus disease 2019 (COVID-19). Current diagnostic testing methods rely on imperfect tests that look for presence of virus. New serological tests that look for host antibodies against the COVID-19 virus in blood are being developed, however validation of these tests has not been completed. These assays have the advantage of being able to identify those who had infection previously, which can provide insights for targeted public health interventions. We are creating a network of researchers to: 1. Validate a panel of serological tests utilizing participants from COVID-19 trials underway in Manitoba; and 2. expand outreach of the leading candidate serological tests to vulnerable and at-risk Manitobans (e.g., emergency shelters, long term care and correctional facilities). This project has been identified as a priority by Manitoba Health and involves their collaboration as results will guide future public health interventions. The methodology leverages established COVID-19 trials that are underway in Manitoba, and collaboration with our Provincial Laboratory and National Microbiology Laboratory in Winnipeg. Identification of antibody-positive individuals will also feed into promising opportunities for use of convalescent serum for therapeutic interventions.	Bioscience	$448,500
Gayle Halas	*Virtual Visits and Management of Primary Care in a Pandemic Environment* The COVID-19 pandemic has caused rapid shifts in health care delivery. Although Manitoba has few active cases of COVID-19, future pandemic-related waves are expected to impact primary care, particularly where specialty care has been put on hold, interrupted, or where health care for existing health conditions has been avoided due to fear of COVID-19. Across Manitoba, a key change has been the immediate implementation of telephone and video-based visits. The primary purpose of this project is to examine these new ways of delivering primary healthcare. This includes using information available in existing databases to describe what happened during a telephone or video visit, and how primary care providers, patients and caregivers experienced and evaluated this approach. The research team and key stakeholders will develop recommendations for telephone and video-based health care to manage the primary health care needs of Manitobans at a time when change is occurring due to the COVID-19 pandemic.	Information and Communication Technologies	$184,677

Manitoba COVID-19 Rapid Response Research Grant

PI	Title & Abstract	Sector	Funding
Kristin Reynolds	*Dissemination and Evaluation of a Cognitive Behavioural Therapy E-Health and M-Health Intervention for Anxiety in Pregnancy and Postpartum During COVID-19* Pregnancy and postpartum can be both joyous and challenging times in life. Women are adjusting to physical, emotional, and lifestyle changes. Research studies have shown high rates of stress, anxiety, and depression and low rates of mental health service use among pregnant and postpartum women, which are concerning since these symptoms can have negative impacts on the growing fetus and infant. The impacts of increased worry about health and safety due to COVID-19 as well as future-related uncertainties, paired with social (physical) distancing, may be felt especially strongly among pregnant and postpartum women. Our group of University of Manitoba Clinician Scientists have developed a 6-session cognitive behavioural therapy program for anxiety in pregnancy and postpartum, which improves anxiety and depression. In this grant application, our aim is to add material related to COVID-19 and transfer this treatment online, where pregnant and postpartum women can go through the sessions on their own. We will test how well the program works in lowering COVID-19-related stress, anxiety, and depression. This program has the potential to reach a large number of women now, when they need it most.	Information and Communication Technologies	$104,945
Ryan Zarychanski	*Antithrombotic Therapy to Ameliorate Complications of COVID-19 (ATTACC): A Randomized, International, Multi-centre, Adaptive, Controlled Clinical Trial* These clinical trials are critical to the health of Manitobans. In the absence of these trials, potentially effective, yet still experimental, therapies would not be available to Manitobans infected with COVID19 or to healthcare worker at risk of contracting the infection. The clinical trials initiated are deliberately selected as 'shovel ready' national or international collaborations design to quickly evaluate the effectiveness of several interventions along a continuum of care, from pre-exposure prophylaxis to critical illness. The trials developed by Dr. Zarychanski demonstrate Manitoba's ability to lead clinical trials at a global level. Manitoba has historically not developed and led multinational randomized therapeutic trials. Our ability to demonstrate this ability defines and illustrates new research capacity in Manitoba for others to leverage and for companies to target in terms of investment	Bioscience	$500,000
Kathleen Decker	*Evaluating the Impact of the Response to the COVID-19 Pandemic on Manitobans Diagnosed with Cancer* Understanding the pathogenesis of SARS-CoV-2 and developing drugs and a vaccine are key components in the fight against COVID-19. SARS-CoV-2 is a biosafety level 3 (BSL-3) pathogen and must be kept in a high-containment environment where specially built equipment must withstand rigorous decontamination and contain airborne pathogens. Positron Emission Tomography (PET) is an imaging modality that has great value in the study of pathogenesis and drug discovery for diseases including COVID-19; however, the size and weight of commercial scanners makes them difficult to integrate into the BLS-3 environment. Cubresa is developing a BSL-3 compatibility package, the NuPET Bio, for the NuPET, the world9s smallest mobile preclinical PET scanner, allowing it to be used safely in this environment. The NuPET Bio includes a sealed small-animal handling bed and tube with which the user can perform advanced imaging on infected animals, and a protective plastic casing that encases the body of the device. The tube will filter airborne particles while allowing for oxygen/anaesthetic delivery, and the whole unit can be cleaned and decontaminated with industrial-grade agents/gases, preventing cross-contamination. The NuPET Bio will enhance preclinical PET imaging technology, allowing researchers to understand the safety and effectiveness of prospective drugs and vaccines against COVID-19.	Bioscience	$122,154

Manitoba COVID-19 Rapid Response Research Grant

PI	Title & Abstract	Sector	Funding
Leslie Roos	*The PACT Program: Parenting Apart while Coming Together* Since its emergence in December 2019, COVID-19 has reshaped the world. Mental health problems are predicted to rise dramatically as a secondary effect of the disease and measures put in place to contain it. Our emerging evidence shows parents of young children have not been spared from these effects and are experiencing 4-fold increases depression and anxiety. Young children are highly vulnerable to parent mental illness due to their reliance on caregivers to meet basic needs. Interventions are needed that consider the unique mental health and parenting challenges families are encountering during the pandemic. Our team of mental health and program development experts will address these needs through an online psychoeducation and social-connection platform, the PACT Program: Parenting Apart while Coming Together. PACT brings together best practices in online telehealth programs in a highly personalized and interactive format to address multiple family needs. With clinical research investigators across provinces, PACT will provide services to 600 mothers of 0 – 5-year-old children in Manitoba and Alberta, with the potential to rapidly expand clinical reach across Canada to address long-term family mental health needs.	Information and Communication Technologies	$198,232
Song Liu	*Potent Renewable Anti-Viral Face Mask* Personal protective equipment (PPE) is essential in stopping transmission of diseases. The current COVID-19 pandemic places a huge demand on PPE and highlights the dangers of contamination of PPE. In response to this challenge, we propose to develop reusable masks that provide anti-viral activity for better protection. Instead of passively filtering viral particles, a better mask would do more: trapping and eliminating viruses on contact. The objective of this project is to develop new reactivatable anti-viral masks. This mask will consist of three layers. The outermost layer is endowed with potent renewable anti-viral activity to reduce surface contamination. This will reduce risks to care providers contacting these areas during removal. A replaceable nanofibrous membrane with built-in antiviral activity will be inserted into a pocket formed between the outermost and innermost layers and effectively trap and zap viruses in the air stream. The innermost layer will be material known to be comfortable during prolonged wear. The most noteworthy benefit of this new mask is that its anti-viral activity is designed to be easily rejuvenated by very dilute bleach in the regular laundry process, simplifying reusability. The antiviral coating will last >30 washing and reactivation cycles.	Bioscience	$200,063
Christine Leong	*Evaluating the Impact of COVID-19 Public Health Measures on Healthcare Utilization, Psychotropic Drug use, and Mortality Among Individuals Living with Mental Illness: A Population-Based Study Using Administrative Data* The coronavirus disease 2019 (COVID-19) pandemic and public health measures that took place are expected to have direct and indirect consequences on mental health and health service use. We aim to study the changes in medication dispensation, health service use (physician visits, hospital visits, emergency department visits), and death rates before and during the COVID-19 pandemic in the general population and in those with a history of mental illness. This study will also look into whether adherence to medication or the rate of discontinuing medication used to treat mental illness have changed before and during the pandemic. We will use health data from Manitoba to study these changes. This study will help us understand how the healthcare system can help individuals living with mental illness.	Bioscience	$100,000

Manitoba COVID-19 Rapid Response Research Grant

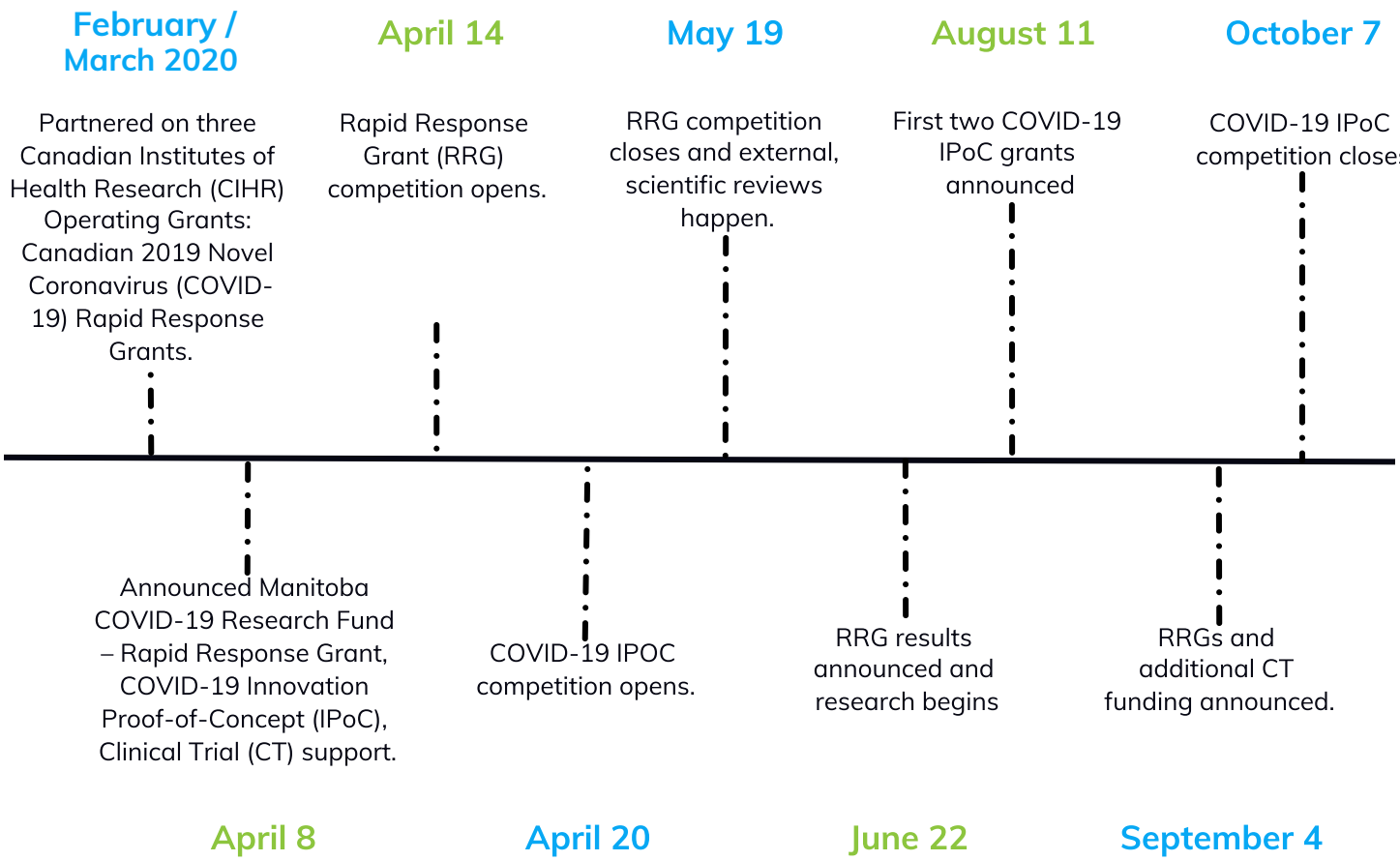
PI	Title & Abstract	Sector	Funding
Meghan Azad	*Rapid Research in the CHILD Cohort to Inform Manitoba's Response to the COVID-19 Pandemic: Investigating the Prevalence and Predictors of SARS-CoV-2 Infection, and the Health and Psychosocial Impact of the COVID-19 Pandemic on Manitoban Families* Many Manitobans could be infected by coronavirus, but only a few will develop severe COVID-19 disease. Others will have mild symptoms, or none at all. We don't know why some infected people get sick and others do not, and we don't know the true rate of infection in the population. Social distancing and business closures have helped slow the spread of COVID-19, but we don't know how they will affect long-term mental health and wellbeing, especially in children. These questions must be answered quickly to control outbreaks, inform social distancing regulations, and minimize unintended consequences of pandemic management policies. We will study the direct effects of infection and indirect effects of the pandemic in the Manitoba CHILD Study, involving 1000 families followed since 2008. Most recently, families provided health data and blood samples in 2018-2020 (just before the pandemic), providing a powerful opportunity to study what influences the risk and outcome of coronavirus infection. CHILD families will now report COVID-19 symptoms, be tested for COVID-19 antibodies, and complete surveys about their behaviours and emotions during the pandemic. This research will provide important real-time data to Public Health authorities to inform Manitoba's COVID-19 response.	Bioscience	$100,000
Jody Haigh	*Development Of Humanized ACE2 Mouse Models For COVID-19 Research* The present SARS-CoV-2 viral pandemic has infected more than 4M and led to the death of more than 280,000 people worldwide and is caused by viral entry into human cells by binding to the cell surface receptor ACE2. ACE2 is an important cell surface enzyme that regulates the renin-angiotensin system (RAS) and plays important roles in many organ systems. As a result of SARS-CoV-2 binding to ACE2, the virus may enter target cells in the lung, heart, kidney, brain and intestine to drive many of the pathologies seen in COVID-19 patients. It is however unclear how SARS-CoV2 virus is capable of causing multi-organ failure. One possibility is that in addition to causing destruction of cells that it infects, it down regulates ACE2 and as a result the RAS system becomes hyper-activated and drives many of the pathologies seen in COVID-19 patients. This proposal will create humanized mouse models that will allow cell/tissue specific express the human ACE2 viral target in the mouse in order to development novel therapeutics that can limit viral entry into cells and better understand and treat the various pathologies seen in COVID-19 patients.	Bioscience	$65,000
Sonia Udod	*The Healthcare Leader's Role During the COVID-19 Pandemic: Integrating Crisis Leadership and Organizational Resilience* COVID-19 has been declared a global crisis by the World Health Organization and has placed enormous pressure on Manitoba's healthcare system. It is anticipated that COVID-19 infection rates will continue in cycles over the next 18 to 24 months. Supporting the healthcare system and leaders to adapt to, thrive in, and recover from a crisis is a priority to ensure best outcomes for care providers and patients. There are few studies that exist on healthcare leadership during a crisis, and there is no known research that identifies how healthcare leaders respond to a crisis while maintaining operations, and how to strengthen their ability to function in a subsequent crisis. This information is needed to help healthcare leaders strengthen their ability to lead in a crisis, while maintaining operations, and strengthening hospital capacity in subsequent crises. Partnerships with leaders in the MB healthcare system will ensure findings are translated promptly to provide knowledge and evidence to inform decision-making. Local, national, and international stakeholders can adapt these findings to their specific contexts to strengthen healthcare leader strategies and identify actions to better prepare hospitals to build capacity in addressing the current COVID-19 crisis and future health crises.	Bioscience	$95,876

Manitoba COVID-19 Rapid Response Research Grant

PI	Title & Abstract	Sector	Funding
Harvey Chochinov	*Death, Dying and Dignity in the time of the COVID-19 Pandemic* The COVID-19 global pandemic is not only changing the way we live, but also changing the way we die. Whatever the cause of death, due to public-health infection containment strategies, patients are dying alone. Family members are barred from seeing their loved one, denying them the ability to say goodbye, address unfinished business or have a sense of closure. Physical distancing policies mean that, tragically, families are unable to engage in community rituals of mourning. Healthcare providers are also encountering multiple concurrent deaths, an overloaded healthcare system; having to enforce restricted visitation, and moral distress, which may lead to heightened stress and possible burnout. This program of research on death, dying and dignity in the time of COVID-19 is organized across three pillars: Patients, Families and Healthcare Providers. Each pillar includes two studies; one delineating the issues imposed by the pandemic, and one addressing a possible response, mitigating emotional/psychosocial distress. These studies build on a distinguished program of research led by the study principal investigator. Therefore, Manitoba is uniquely positioned to become a leader in dignity-conserving care, ensuring that, wherever patients are dying, dignity does not fall prey to this insidious virus.	Bioscience	$235,676
Mahmoud Torabi	*Projection of COVID-19 Pandemic and Possible Interventions in Manitoba* The recent emergence of COVID-19 as a global pandemic is one example of a critical public health threat that challenged management systems. The rapid spread of COVID-19 across much of the globe is not well understood yet. The COVID-19 which is now a high priority disease in Canada is difficult to accommodate in quantitative frameworks and hamper the ability to use data and modeling products to accurately monitor the virus and identify vulnerable populations. Our research goal is to better understand the spread of the coronavirus in Manitoba using sophisticated modeling approaches to predict the needs of the Manitoba healthcare system and plan for intervention strategies. In particular, our study objectives are to: develop models in order to accurately project the coronavirus in Manitoba, identify vulnerable populations in Manitoba affected most by this virus, and also find the geographical variation of coronavirus in Manitoba. By addressing the objectives proposed in this research proposal, policymakers in Manitoba will have improved models for understanding disease etiology and advising population health management to improve the health of Manitoban.	Information and Communication Technologies	$68,500

COVID-19 Research Fund 2020 Timeline

26 COVID-19 related grants were administered between February 2020 and February 2021.



COVID-19 Grant Outcomes

Funding Impact

$23.1 million in leveraged funding and $4.53 return on investment

138 Researchers Supported

- 25 principal investigators
- 62 highly qualified personnel
- 51 students

44 Organizations Supported

- 39 government and not-for-profit organizations
- 14 from Industry

Pre-Commercialization

- 12 patents
- 1 spin-off company

Policy and Program Outcomes

Anxiety Management

A six-week online self-directed program to teach anxiety relief and management techniques.

Weight Wellness

A virtual weight-loss program intended to support health maintenance related to increasing sedentary behaviour during pandemic restrictions.

Métis Health

A study informing the roll-out of vaccine and testing services for Manitoba Red River Métis citizens.

Immunocompromised Vaccines

Recommendations for COVID-19 vaccination directed to immunocompromised individuals.

COVID-19 Treatments

Discovery of 1 out of only 4 available treatments given to patients who are admitted to hospital for COVID-19, which has influenced International treatment of COVID-19 patients.

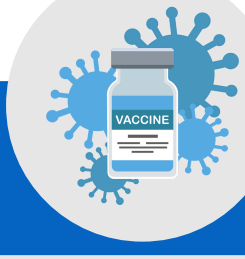
Clinical Trial Design

Development of a multiplatform randomized controlled trial, which is a new type of trial that permitted global collaboration of many independent trial platforms to complete a single randomized trial. This type of trial design is already being adopted and refined by research groups around the world.

2 Clinical Trials

Manitoba-based trials of new medications, therapies, devices and new ways of using current treatment. These trials are used to determine if new drugs or therapies are both safe and effective with the goal to improve diagnosis, prevention and treatment of disease or injury and to improve the health and quality of life of individuals.

4 Databases Created



COVID-19 Vaccine Safety

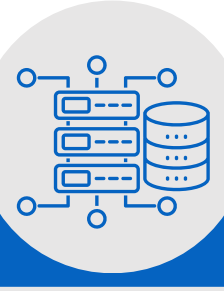
Evaluating the safety and immunogenicity of SARSCoV2 vaccines in people with immune mediated inflammatory diseases.

CHILD Longitudinal Database

Expanding the CHILD longitudinal study database for (1) determining the prevalence and transmission of COVID-19 among families; (2) predictors of infection susceptibility and severity; (3) health and psychological impacts.

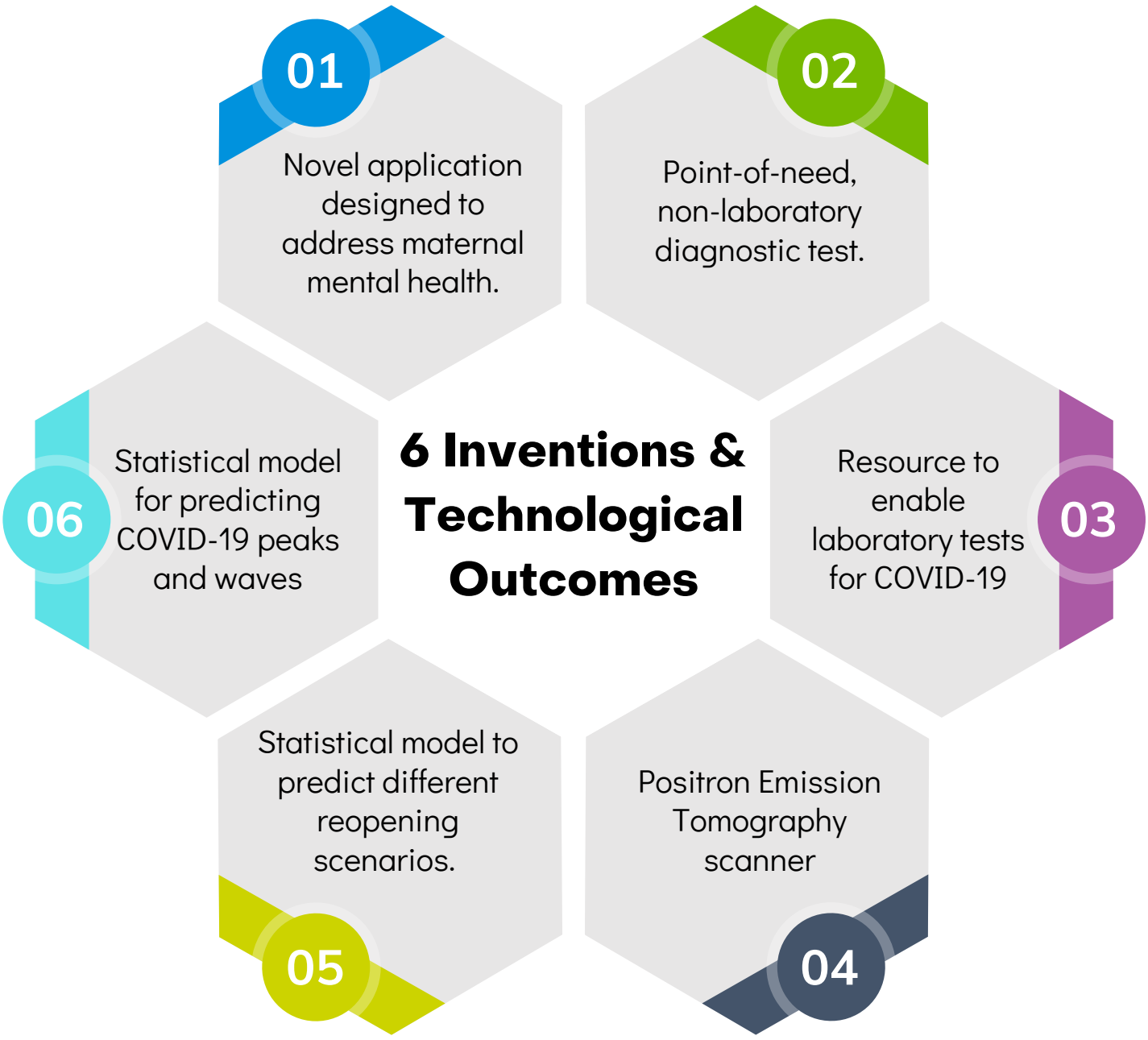
Diagnosing COVID-19

Spectra of SARS-COV-2 protein samples to enable rapid diagnostic test for SARS-COV-2 and other viral infections.



Hydroxychloroquine Clinical Database

Clinical database for hydroxychloroquine efficacy in lessening the effects of COVID-19, such as cough, fever, difficulty breathing and pneumonia in the lungs, and slow its spread.


6 Inventions & Technological Outcomes
01
Novel application designed to address maternal mental health.
02
Point-of-need, non-laboratory diagnostic test.
03
Resource to enable laboratory tests for COVID-19
04
Positron Emission Tomography scanner
05
Statistical model to predict different reopening scenarios.
06
Statistical model for predicting COVID-19 peaks and waves

Development and Characterization of utRAP Technology - a Nanoparticle Platform for Preventing SARS-Cov2 Infection in Airway and Vasculature

from l to r: Vern Dolinsky, Mateusz Tomczyk, Nur Safa, David Petch (utR Biotech), Don Miller, and Vinith Yathindranath.

Our COVID-19 research project was directed at the development and proof-of-concept for a nanoparticle-based system that could be used as a locally administered nasal spray to prevent the spread and reduce the severity of COVID-19 infections in the nose and upper airway. Our two-prong approach focused on making lipid nanoparticles with surface coatings designed to attract viral particles – acting as host receptor decoys for the virus. In addition, a second lipid nanoparticle was created to deliver an RNA-based therapeutic to the nose and respiratory tract cells, resulting in reduced production of the host receptor for COVID-19, Angiotensin converting enzyme 2 (ACE2).

We developed and tested over 25 different nanoparticles for activity in preventing uptake and infection in multiple cell culture models. Several of the nanoparticles were able to reduce viral uptake in human airway cells by 90% or more. Our lead nanoparticles were examined for tissue distribution and safety following nasal administration in a mouse model.

Studies showed the nanoparticles were retained in the nose, upper airway and lung with limited distribution to other tissue sites.

The tissue distribution of our nanoparticles following nasal administration served to maximize nanoparticle exposure in the nose and upper airway where viral loads are also high.

The funding provided by Research Manitoba and our industry partner, utR Biotech allowed our research group to rapidly adapt research collaborations from a focus on improved treatment for diabetes to the creation of nanoparticle-based COVID-19 therapeutics. At the time we received funding for our project, most of the resources were being directed towards vaccine development and the repurposing of existing drugs. The funds from Research Manitoba were essential to allow us to work on potentially new therapeutic approaches for treating COVID-19.

We have filed a provisional patent application on both the decoy nanoparticles as well as the nanoparticles to provide reversible knock-down of host cell receptor targets for COVID-19. We are seeking additional funding to move the lead nanoparticles forward with testing in animal models using live SARS-CoV-2 variants of interest.

Primary PI: Donald Miller
COVID-19 Innovation Proof-of-Concept
Funding: $86,550

About our COVID-19 Programs

Research Manitoba's COVID-19 research funding enabled a diverse range of researchers and organizations to launch projects that spanned vaccine development, epidemiological studies, public health interventions and the broader societal impact of COVID-19. Through these innovative endeavors, our researchers contributed to the collective effort to combat COVID-19 and enhanced our province's capacity to respond effectively to future public health challenges.

About Research Manitoba

Research Manitoba promotes, supports, and coordinates the funding of research excellence and innovation in health, natural and social sciences, engineering, and the humanities in Manitoba.

Research Manitoba supports local talent development by providing research support to early career researchers and graduate students, along with fostering strategic partnerships to strengthen research and innovation in Manitoba.

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