

**OSEZ  
RÊVER.**

**DREAM  
BIG.**

**OSEZ  
RÊVER.**

**DREAM  
BIG.**

**OSEZ  
RÊVER.**

**DREAM  
BIG.**

**OSEZ  
RÊVER.**

**DREAM  
BIG.**

# **DREAM BIG: END A PANDEMIC**

**COVID-19 EMERGENCY FUND  
IMPACT REPORT**

January 2021

**Fondation  
du Centre universitaire  
de santé McGill**



**McGill University  
Health Centre  
Foundation**

# TABLE OF CONTENTS

|  |           |
|--|-----------|
| <b>AN UNPRECEDENTED RESPONSE.....</b>                | <b>4</b>  |
| <b>IMPACT.....</b>                                   | <b>5</b>  |
| <b>MI4 RESEARCH PLATFORMS.....</b>                   | <b>5</b>  |
| Hot Zone: The MUHC’s Level 3 Containment Lab         | 5         |
| Clinical Trials Research Platform                    | 6         |
| <b>IMPROVED TESTING.....</b>                         | <b>7</b>  |
| Made-in-Canada COVID-19 testing reagents             | 7         |
| A faster test for COVID-19                           | 8         |
| Predicting the severity of COVID-19 infection        | 8         |
| Costs and benefits of COVID-19 testing strategies    | 8         |
| <b>TRANSMISSION.....</b>                             | <b>9</b>  |
| Keeping tabs on COVID-19 transmission                | 9         |
| Mapping COVID-19 risk by neighbourhood               | 9         |
| <b>VACCINE DEVELOPMENT.....</b>                      | <b>10</b> |
| Finding the key to a COVID-19 vaccine                | 10        |
| A novel approach to a COVID-19 vaccine               | 10        |
| <b>USING EXISTING DRUGS TO FIGHT COVID-19.....</b>   | <b>11</b> |
| Hydroxychloroquine as a pre-emptive COVID-19 therapy | 11        |
| Canadian Treatments for COVID-19 (CATCO)             | 11        |
| Steroid Ciclesonide as a treatment for COVID-19      | 12        |
| Anti-coagulant drugs against COVID-19                | 12        |
| <b>CREATING NEW DRUGS TO FIGHT COVID-19.....</b>     | <b>13</b> |
| Using computers to design COVID-19 drug therapies    | 13        |
| Halting transmission of the coronavirus              | 13        |
| A new treatment for COVID-19                         | 14        |
| Understanding how SARS-CoV-2 infects the body        | 14        |
| <b>ILLNESS &amp; COVID-19 OUTCOMES.....</b>          | <b>15</b> |
| A healthy gut to improve COVID-19 outcomes           | 15        |
| Heart disease & COVID-19                             | 15        |
| Caring for heart patients during COVID-19            | 15        |

---

|   |           |
|---|-----------|
| <b>PROTECTING OURSELVES &amp; OTHERS.....</b>                                       | <b>16</b> |
| COVID-19 testing strategy shortens isolation time for essential health care workers | 16        |
| A way to disinfect and reuse surgical masks   | 16        |
| An app to help care for COVID-19 patients at home                                   | 17        |
| <b>COMMUNICATION.....</b>   | <b>18</b> |
| COVID-19 vaccine tracker  | 18        |
| Public expectations for vaccine development   | 19        |
| Timeline for a successful COVID-19 vaccine  | 19        |
| <b>IMMUNITY.....</b>  | <b>20</b> |
| Understanding the immune system’s response to COVID-19                              | 20        |
| <b>ETHICS &amp; LAW.....</b>  | <b>21</b> |
| Law in pandemic times   | 21        |
| The ethics of research during the COVID-19 crisis                                   | 21        |
| <b>MENTAL HEALTH.....</b>   | <b>22</b> |
| Understanding how pandemics affect mental health                                    | 22        |
| Coping with social distancing and chronic illness                                   | 23        |
| Helping families cope with self-isolation   | 23        |
| Connecting isolated COVID-19 patients to their families                             | 24        |
| Safeguarding the mental health of health care workers                               | 25        |
| Understanding how minorities approach COVID-19 measures                             | 26        |

## AN UNPRECEDENTED RESPONSE

The McGill Interdisciplinary Initiative in Infection and Immunity (MI4) was created in response to the threat of infectious diseases: antibiotic resistance, tuberculosis and pandemics like COVID-19. Even before the COVID-19 pandemic was declared on March 11, 2020, MI4 had already mobilized to find solutions to this global crisis. With your support of the McGill University Health Centre (MUHC) Foundation's COVID-19 Emergency Fund, MI4 launched the Emergency COVID-19 Research Fund (ECRF) within weeks. This initiative provided seed funding for research projects that have helped increase our understanding of the novel coronavirus and given us new tools to fight it. Thanks to your support of the COVID-19 Emergency Fund, totalling over \$7 million, ECRF funded over 50 innovative projects to develop treatments, reduce transmission and accelerate vaccine development and delivery. Within these pages, you will find updates on these projects and learn how your donation led to new knowledge, aided the province's response, addressed supply shortages, tested treatments and vaccine candidates, and much more.

Without you, none of these innovations would have been possible. MI4 Director Dr. Don Sheppard says it well:

---

**"We had 250 researchers who would have been sitting on their hands during the entire first wave if not for your funding."**

*– Dr. Don Sheppard, infectious disease expert and Director, MI4*

---

With your generous support, MI4 researchers began working to solve the COVID-19 pandemic immediately. Thank you.

# IMPACT

## MI4 RESEARCH PLATFORMS

### HOT ZONE: THE MUHC'S LEVEL 3 CONTAINMENT LABS

Working with live coronavirus is inherently risky, and can only be done in a federally designated level 3 containment lab (CL3). The MUHC is home to a CL3—colloquially referred to as a “hot zone”—which was created to allow work with tuberculosis. When the very first case of COVID-19 occurred, CL3 Director Dr. Marcel Behr immediately applied to work with live SARS-CoV-2 virus and the MUHC was granted the license on March 26, 2020, one of the first in Canada to receive this designation.

To date, Dr. Behr and the CL3 team have provided research support to three labs developing new COVID-19 tests, and are planning four new collaborations with Montreal-based academic labs and companies. The lab is also providing expertise, protocols and reagents to the McGill CL3 lab to increase the city's capacity for additional coronavirus research. Your gift allowed Dr. Behr to shift the MUHC's Hot Zone to study the coronavirus. Recently, this generous support leveraged a \$2.1 million grant from the Canadian and Quebec Foundation for Innovation to obtain new and specialized equipment to enable cutting-edge virologic studies.



Dr. Marcel Behr, MI4 Co-Director, working in the Hot Zone at the MUHC

## CLINICAL TRIALS RESEARCH PLATFORM

MI4 created the Clinical Trials Research Platform (MI4-CRP), co-led by Dr. Marina Klein of the MUHC and Dr. Christina Greenaway of the Jewish General Hospital, in response to the COVID-19 pandemic. MI4-CRP is enabling world-class investigator initiated and industry sponsored studies to contribute to global research efforts to address COVID-19. Since its inception in March 2020, MI4-CRP has grown rapidly, and has launched a number of successful projects:

- **Clinical trial support** - Project manager Jonathan Roger is overseeing a team of three research nurses, two ethics and regulatory officers and three clinical research coordinators to support a growing number of public and industry-sponsored trials across the two sites.
- **Scientific Steering Committee** - Comprised of experts in infectious diseases, immunology, pharmacology, intensive care and respiratory medicine, this committee reviews and selects the highest quality studies for support, including the CATCO study evaluating existing drugs to treat COVID-19 (see page 11) and the CONCOR study evaluating the effectiveness of convalescent plasma to treat hospitalized COVID-19 patients.
- **Study sponsorship** - MI4-CRP has supported four studies in collaboration with Harvard University and UBC in which data on over 800 patients with COVID-19 were collected.
- **Biobanking** - Through the development of common protocols and consents, MI4-CRP streamlined processes to bank important biological specimens from trial participants alongside the *Fonds de la recherche en santé du Québec* (FRQS) Quebec Biobank initiative. This work has led to ground-breaking insights into why some people develop severe COVID-19 diseases, opening the door to a new approach to treating these at-risk individuals

Beginning during the second wave of COVID-19 in Fall 2020, MI4-CRP has been running three industry-sponsored randomized trials to test novel antiviral drugs and immunotherapies in patients hospitalised at the MUHC, JGH and beyond. Two studies aimed at understanding protection from COVID-19 among health care workers are also underway.

The MI4-CRP will continue expand the range of clinical studies in infectious diseases and immunology in the future.

# IMPROVED TESTING

## MADE-IN-CANADA COVID-19 TESTING REAGENTS

Widespread testing is one of the keys to controlling COVID-19. Knowing who has the virus and how it is being transmitted allows public health agencies to stop the disease and save lives. But at the beginning of the pandemic, the chemical reagents required to test for COVID-19 were scarce and produced internationally, and as a result, Canada and many other countries were initially limited to testing only people presenting symptoms of the virus. Two Montreal scientists changed this.

With the help of start-up funds provided by your generous donation to the COVID-19 Emergency Fund, M14 scientists Dr. Don van Meyel and Dr. Martin Schmeing are making COVID-19 tests in Montreal. By June 2020, the researchers had developed a gold-standard COVID-19 test kit.

This milestone would not have been possible without your generosity. Thanks to you, Dr. van Meyel and Dr. Schmeing were able to develop a scalable process for creating the chemical reagents. In the summer of 2020, the team delivered its first batch of 15,000 tests to the MUHC clinical laboratories for more widespread use in Montreal. This in itself is a triumph, but the impact goes even further: the project recently received a substantial government grant to create 30 million COVID-19 tests.



Left to right: Dr. Marcel Behr, Dr. Susanne Bechstedt, Dr. Raymond Tellier, Dr. Maureen McKeague and Dr. Don van Meyel deliver the first batch of chemical reagents for COVID-19 testing to the MUHC.

## A FASTER TEST FOR COVID-19

Bioengineer Dr. Sara Mahshid has developed a new ultrasensitive device that can be used to rapidly detect small chemical changes in the body, including presence of the SARS-CoV-2 virus. In collaboration with virology expert Dr. Chen Liang, Dr. Mahshid and her team are working to optimize the test, allowing for more rapid testing of at-risk patients. They have been successful so far, creating a test that uses fewer reagents than the current COVID-19 test and provides results in only 10 minutes. The test uses a colour scale, and in positive COVID-19 tests the fluid will change from pink to yellow.

## AN AT-HOME TEST FOR COVID-19

Biological and biomedical engineer Dr. David Juncker is developing an at-home, self-administered test for COVID-19. Users will be able to take a sample of saliva and receive their test results within 15 minutes. Dr. Juncker and his team are developing this device using a special chip—which was also developed by the team—that can complete testing that typically requires large laboratory equipment. The result will be a fast, affordable and easily-accessible COVID-19 test, similar in form to an at-home pregnancy test.

## COSTS AND BENEFITS OF COVID-19 TESTING STRATEGIES

Social isolation cannot go on indefinitely. The measures currently in place in Canada are harmful to the economy and take a toll on the mental health of Canadians. Dr. Dick Menzies and Dr. Jonathon Campbell recently conducted research to determine public health strategies that will allow the government to ease social isolation while keeping the population safe. They found that the best way to contain outbreaks is testing. The study focused on testing five groups: people exposed to the coronavirus, health care workers at acute and long-term care centres, residents of those centres, essential workers with contact with the public and schoolchildren. It found that active testing of these groups is feasible, and would support the reopening of the economy and schools more broadly. They also concluded that this strategy appears affordable compared with the billions of dollars committed by the federal government as a response to the pandemic.

The research team has published numerous papers advocating for effective testing, and have received widespread media coverage including: *Quebec Science*, *La Presse*, *Winnipeg Tribune*, *CTV News*, *CBC News*, *Global News*, *CityTV News*, and radio stations *CBC Daybreak*, *CJAD (Montreal)*, *CBC (Quebec)*, *Global (Calgary)*, *CFRA* and *CJOB (Winnipeg)*.

The duo is now putting their findings into action and conducting a pilot project to screen essential workers in Montreal Nord.

# PREVENTING TRANSMISSION

## KEEPING TABS ON COVID-19 TRANSMISSION

MI4 scientists Dr. Mathieu Maheu-Giroux and Dr. David Buckeridge are working with the *Institut national de santé publique du Québec* (INSPQ) to inform the public of Quebec's COVID-19 transmission rate, or R value. This measurement helps us understand how quickly the coronavirus is spreading. For example, if the R value is 1, then every person with the virus is, on average, infecting one other person. If it is 2, then each infected person is infecting two other people. The goal is to have an R value that is as low as possible, because if the virus is not being spread, then it will die out.

The team is also providing the INSPQ with modelling of hospital bed usage to optimize use of hospital resources. This important work is providing the Quebec government with critical data to help make public health decisions. The team has presented to Ministry of Health officials on numerous occasions, and has published research on the impact of March Break on early coronavirus transmission. In January 2021, Dr. Maheu-Giroux was named Radio-Canada's Scientist of the Year for 2020 for this work.

## MAPPING COVID-19 RISK BY NEIGHBOURHOOD

Urban governance expert Dr. David Wachsmuth and his team are conducting a project called "A spatial analysis of COVID-19 risk and recovery in Canadian cities." The project has developed a set of models and tools for evaluating COVID-19 transmission risk related to urban mobility (daily commuting and other routine travel), and opportunities and threats to social distance-based recovery policies in Canadian cities. The team will soon launch an interactive online dashboard which integrates a range of different data sources and relates the results of analyses and models in an easy-to-understand format.

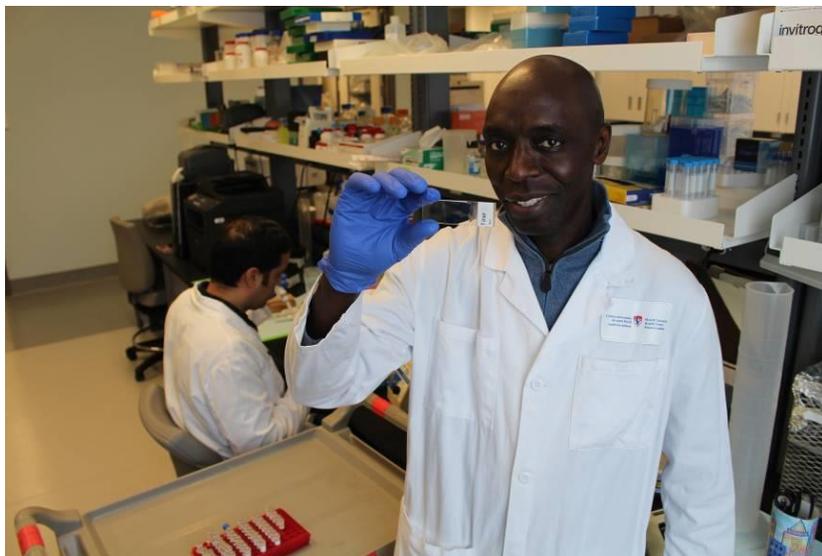
# VACCINE DEVELOPMENT

## FINDING THE KEY TO A COVID-19 VACCINE

Dr. Joaquin Ortega is part of an international team which has discovered a technique that could help increase the effectiveness of vaccines against SARS-CoV-2. Published in *Advanced Materials* on November 28, 2020, the study found that designing vaccines that mimic the structure of the virus may be more effective than traditional approaches. The team's research showed that this method elicits a stronger antibody response than other vaccine-creation techniques, which means a greater chance of the vaccine conveying immunity to the virus. While this vaccine platform shows promise, it will need to undergo rigorous testing in humans before it can be administered widely. The vaccine platform may also be useful for informing future vaccine design.

## A NOVEL APPROACH TO A COVID-19 VACCINE

Thinking outside the box is critical if we are to generate solutions for the COVID-19 crisis. To protect the population in the short and long term, infectious disease experts Dr. Momar Ndao and Dr. Michael Reed are working to develop a COVID-19 vaccine using a unique method. They are re-purposing existing and approved vaccinations and combining them in new ways to effectively prevent COVID-19 infection and transmission over the long term. To date, they have successfully generated multiple vaccine constructs. They are now ready to begin the exciting task of testing the efficacy of these vaccine candidates.



Dr. Momar Ndao, Scientist with MI4 and in the Infectious Diseases and Immunity in Global Health program at the RI-MUHC, works in his lab.

# USING EXISTING DRUGS TO FIGHT COVID-19

## HYDROXYCHLOROQUINE AS A PRE-EMPTIVE COVID-19 THERAPY

In collaboration with researchers from across Canada, Dr. Todd Lee, Dr. Matthew Cheng and Dr. Leighann Parkes conducted a clinical trial to determine whether hydroxychloroquine could prevent development of COVID-19 in those exposed to the virus. In August 2020, the team published a paper in the *New England Journal of Medicine*, in which they concluded that hydroxychloroquine is not an effective therapy for preventing COVID-19 in individuals exposed to the virus.

## CANADIAN TREATMENTS FOR COVID-19 (CATCO)

CATCO is a Canada-wide study testing existing drugs in patients who have been hospitalized with COVID-19. Co-led by M14 scientists Drs. Matthew Pellan Cheng, Todd Lee, Jesse Papenburg, Emily McDonald and Leighanne Parkes, CATCO's goal is to determine whether these drugs can effectively treat the disease. Your generous gift to the COVID-19 Emergency Fund provided funding to help the Montreal CATCO team conduct clinical trials.

The CATCO trial is partnered with the WHO Solidarity trial, an international clinical trial that is consolidating research findings from around the world related to potential COVID-19 treatments and their efficacy. The WHO Solidarity Trial published a paper in Fall 2020 showing that hydroxychloroquine, remdesivir, lopinavir and interferon are not effective in the treatment of COVID-19. Although the results were not what was hoped for, this research is still incredibly important: it gives a conclusive answer, provides health care professionals with the most up-to-date information about how to prevent and treat COVID-19, saves patients from being exposed to ineffective drugs and allows the CATCO team to shift its focus to testing other drugs that may have more beneficial results.

## **STERIOD *CICLESONIDE* AS A TREATMENT FOR COVID-19**

Dr. Nicole Ezer, Junior Scientist in the Translational Research in Respiratory Diseases Program at the RI-MUHC, is conducting a clinical trial of ciclesonide, an inhaled steroid, to test whether it can treat patients with mild COVID-19. If successful, it will give physicians a tool to treat patients with mild COVID-19 symptoms at home. Dr. Ezer's work received coverage on [CBC News](#), [CTV Montreal](#), [The Suburban](#), [Narcity](#) and the [McGill Tribune](#).

## **ANTI-COAGULANT DRUGS AGAINST COVID-19**

Evidence shows that those with severe cases of COVID-19 develop abnormal blood clotting that can endanger their lives. Dr. Kristian Filion and his team, which includes several collaborators from Sungkyunkwan University in South Korea, are combing through a Korean health care database to determine whether administering anti-coagulant (blood thinning) drugs to COVID-19 patients eases their symptoms and increases chances of survival. The team has created the computer models required to analyze the data, and is now analyzing this large dataset.

# CREATING NEW DRUGS TO FIGHT COVID-19

## USING COMPUTERS TO DESIGN COVID-19 DRUG THERAPIES

Dr. Nicolas Moitessier and Dr. Anthony Mittermaier have partnered with Montreal-based company Molecular Forecaster to use innovative computational methods to design new drugs. They are looking for a molecule that will target one of the key biological mechanisms by which COVID-19 replicates and spreads. Since beginning last spring, they have tested 50 molecules using computer models, and have also conducted a number of tests using the actual molecules. With the platform and methodology, they have created they are confident that they will discover the molecule they are searching for. Once they do, it can be put forward as a drug candidate to treat COVID-19.

## HALTING TRANSMISSION OF THE CORONAVIRUS

Dr. John Hanrahan and his team are studying potential targets for drugs to treat COVID-19. The team is studying how the coronavirus “packages” infectious particles so they can be released into tiny liquid droplets, expelled from the mouth and nose, that carry them to other people. They are also investigating potential drugs that could stop this process from taking place, effectively halting transmission. Once a potential drug is found, the team will test it on the SARS-CoV-2 virus in the level 3 containment laboratory at the MUHC. The research will provide new information on coronavirus transmission and lay the groundwork for developing antiviral drugs that block disease transmission. The team recently applied to a grant competition with the hope of leveraging your support to continue the project.

## A NEW TREATMENT FOR COVID-19

Dr. Gonzalo Cosa is conducting research to better understand how the SARS-CoV-2 virus replicates itself inside the body. When a person is infected with the coronavirus, the virus enters the individual's cells and begins to make copies of itself. Those copies are then transported to other cells, and when enough cells are infected, the individual becomes sick. Dr. Cosa is working to understand the mechanism used by the virus to replicate, which will in turn allow him to identify potential drugs that could block the virus from copying itself and spreading throughout the body.

In a scientific first, Dr. Cosa and his team were able to observe specific steps in the coronavirus' replication process. Over the coming months, the team will continue to study the replication process and begin to test drug candidates to find one that can halt replication of the virus, keeping it from spreading in the body and causing illness. In particular, they will test a drug developed by their collaborators at the University of Alberta, called RespVirex, which has been shown to halt other viral respiratory infections.

Dr. Cosa and his team were awarded \$95,000 for this research thanks to your gift. This seed funding helped the team secure a grant of \$338,000 from the Canadian Foundation for Innovation (CFI) in November 2020 and \$662,000 from the Canadian Institutes of Health Research (CIHR), amplifying the impact of your gift ten-fold.

## UNDERSTANDING HOW SARS-COV-2 INFECTS THE BODY

Vesicles are tiny sacs produced by cells to move biological materials from one cell to another. Drs. Janusz Rak, Maziar Divangahi and Dongsic Choi based their COVID-19 research on the fact that the SARS-CoV-2 virus mimics these vesicles, attaching to cells and inserting copies of itself into them. The team conducted experiments to help them understand how the coronavirus infects the body, and how to stop its penetration into cells.

The researchers began by observing how coronavirus proteins exited the cells and deposit in the surrounding cells, using the same mechanism as vesicles. Understanding the mechanism by which the coronavirus spreads is helping the team develop a vesicle that mimics the SARS-CoV-2 virus and which can block the pathways the coronavirus uses to infect cells. Over the past few months, the team has successfully created these vesicles, and have been testing them in the lab. Preliminary tests have shown the coronavirus-mimicking vesicles to be successful in blocking the channels through which the coronavirus enters the cell. In the coming months, Dr. Rak and his team will continue to validate their virus-mimicking vesicle, testing whether it is effective as a COVID-19 treatment, and even whether it could be used as a vaccine.

# ILLNESS AND COVID-19 OUTCOMES

## A HEALTHY GUT TO IMPROVE COVID-19 OUTCOMES

Gut health is an important factor in overall health. Studies have shown that the gut microbiome—the collection of good bacteria that live in the intestines and aid digestion—can play help curb respiratory infection. In fact, a diverse and healthy microbiome can decrease mortality in those with severe influenza. With this in mind, Dr. Irah King and his team are studying whether a healthy gut could help improve the health of patients with severe COVID-19 infections. Dr. King and his team have created organoids—tiny clusters of gut cells grown in a petri dish that mimic the composition of the intestines—and are verifying whether the intestines have receptors for the SARS-CoV-2 virus. This is the first step in determining if boosting the health of the gut could be an effective measure in the overall treatment of COVID-19.

## HEART DISEASE AND COVID-19

COVID-19-related pneumonia significantly impacts patients with heart disease. Studies suggest that drugs commonly used to treat heart disease may increase the ability of the SARS-CoV-2 virus to infect the body, resulting in severe pneumonia. Cardiologist Dr. Abhinav Sharma, in collaboration with a team of cardiologists and infectious disease experts from the MUHC, is assessing whether these drugs negatively impact COVID-19 patients and should be withheld. The team is partnering with a medical team in Brazil who are conducting a similar study to share data.

## CARING FOR HEART PATIENTS DURING COVID-19

Have heart attacks decreased since social isolation began? Cardiologists Dr. Stéphane Rinfret and Dr. James Brophy have noticed an unexpected decrease in heart attacks since the COVID-19 pandemic started. They are conducting research to determine whether people suffering from cardiac episodes are avoiding hospitals for fear of contracting COVID-19, or if social isolation has indeed reduced the incidence of heart attacks due to reduced physical activity and work-related stress. To determine the answer, the team is contacting cardiology units across the country to learn whether there has been a reduction in cardiac procedures (placement of stents, valve replacements, etc.). To date, the team has received data from 92% of cardiac centres in Canada, and continues to collect data. Their findings will help cardiologists across Canada take steps to ensure their patients are receiving the best treatment they need during this pandemic.

## PROTECTING OURSELVES AND OTHERS

### COVID-19 TESTING STRATEGY SHORTENS ISOLATION TIME FOR ESSENTIAL HEALTH CARE WORKERS

We all know that 14 days of self-isolation is mandatory following exposure to the coronavirus, and this is a big problem when frontline health care workers come in close contact with infected patients. To avoid a shortage of essential medical staff, M14 scientist Dr. Benjamin Smith studied whether this isolation period could be shortened by as much as half. In his study, he tested health care workers exposed to the coronavirus to find out. Each subject received a COVID-19 test on days 7, 9, 10 and 14 after being exposed to determine how soon the virus can be detected. His findings were the first to demonstrate that if an exposed individual is going to develop COVID-19, the virus is usually detectable by day 7. These findings have now been corroborated by other studies, and this protocol has been endorsed by the US CDC to reduce the impact of post-exposure quarantine.

### A WAY TO DISINFECT AND REUSE SURGICAL MASKS

Many countries, including Canada, have faced shortages of personal protective equipment. Face masks, gowns and face shields are essential to keeping health care workers safe and preventing transmission of COVID-19, but the huge increase in demand caused shortages of this vital equipment. Virologist Dr. Selena Sagan and respirologist Dr. Richard Menzies are studying whether masks can be sterilized using ultraviolet (UV) light.

The research team is testing whether UV light is effective in sterilizing N95 masks, surgical masks and plastic face shields. They are also assessing whether the light degrades the filtration quality of the masks. Dr. Sagan tested two UV light units, one capable of holding 20 masks, the other capable of holding two. The masks were inoculated with a relative of the SARS-CoV-2 virus and exposed to UV light for several minutes. The team found that the small UV light unit completely disinfected the masks, and that the large light unit reduced the concentration of the virus significantly, though it did not eliminate it completely. The team is now repeating the experiments to confirm these results.

## AN APP TO HELP CARE FOR COVID-19 PATIENTS AT HOME

In Quebec, almost 95% of individuals who test positive for COVID-19 self-isolate at home with limited access to medical resources. Guiding patients in the monitoring of their symptoms and connecting them with a health care team may significantly reassure them, while ensuring a more timely follow-up. To do this, infectious disease primary care specialist Dr. Bertrand Lebouché has teamed up with Opal app creators Dr. John Kildea and Dr. Tarek Hijal to adapt the Opal patient portal to provide resources for COVID-19 patients isolating at home.

COVID-19-positive patients enrolled in the study will use the Opal app to complete a daily virtual follow-up over the course of two weeks. Participants will fill out a daily self-assessment of their health condition on the app, including COVID-19 symptoms, vital signs and mental health. The study's nurses will monitor the responses, and put any patients with worsening symptoms or psychological distress in contact with a physician via Zoom. Information on COVID-19 and educational materials related to self-isolation and at-home follow-up will also be available on the app.

Opal for COVID has been developed and has now been tested by COVID-19 patients from the Opal-COVID patient committee, as well as nurses and clinicians, to ensure that it meets the requirements of all stakeholders. The team is currently recruiting patients and will produce preliminary results on the effectiveness of the app soon.

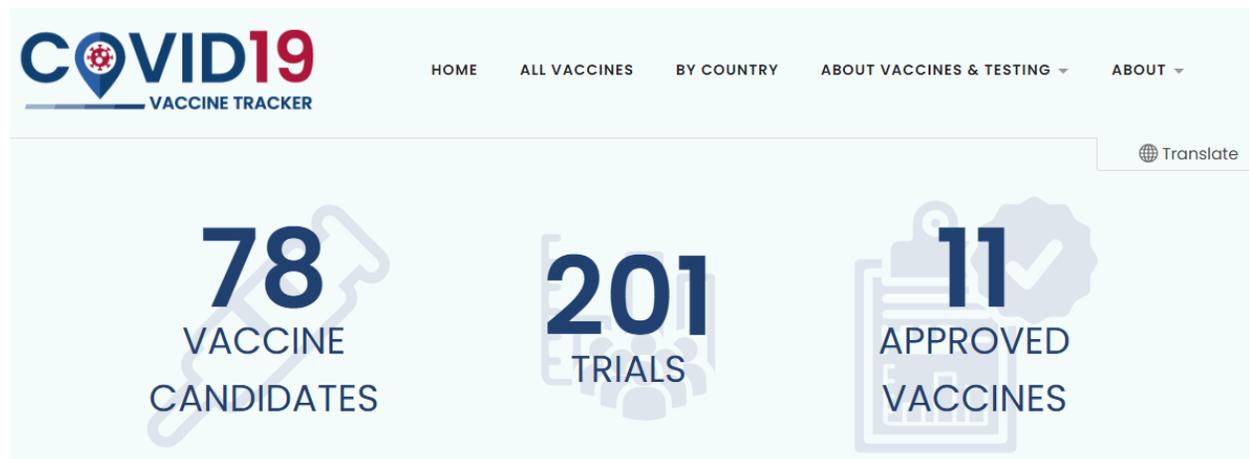
### OPAL APP

The Opal health application empowers patients to take control of their own health care. Opal provides users with an appointment calendar, easy access to laboratory test results and clinical notes written by their doctor, and information on their condition and treatment options. The app was co-created by the late Laurie Hendron, a renowned McGill computer science professor who realized the need for such a tool during her cancer treatment.

# COMMUNICATION

## COVID-19 VACCINE TRACKER

MI4 scientist Dr. Nicole Basta developed a public website that provides updates on COVID-19 vaccine development. The COVID-19 Vaccine Tracker ([covid19.trackvaccines.org](https://covid19.trackvaccines.org)) provides a real-time interactive map of COVID-19 vaccine projects happening all over the world. Colour coding provides a quick look at what phase of development each country is in, and clicking yields information on the number of trials, the affiliated partners and more. There is even a tool to model virus transmission and the effectiveness of vaccination. The COVID-19 Vaccine Tracker, made possible by your generous donations, is a fantastic way to communicate current and accurate information on COVID-19 vaccine development amidst many conflicting and inaccurate reports.



A graphic from [COVID19.trackvaccines.org](https://covid19.trackvaccines.org), created by Dr. Nicole Basta.

## PUBLIC EXPECTATIONS FOR VACCINE DEVELOPMENT

Bioethicist Dr. Jonathan Kimmelman and vaccinologist Dr. Brian Ward conducted two studies in Fall 2020 to determine the perceptions of experts and the general public regarding when a COVID-19 vaccine will be available. This study was conducted to help inform public communication to ensure realistic expectations regarding vaccine development and availability. The results were as follows:

- **Experts' perceptions** - While media reports were often optimistic that a vaccine would be available in early 2021, many experts were much more conservative in their estimates. The collective opinion among experts surveyed suggested that, on average, most did not anticipate a vaccine being available until September 2021. The study results were published in September 2020 and received widespread media attention.
- **General public's perceptions** - For members of the general public, perceptions of vaccine availability varied widely. When aggregating and taking an average of the responses, however, public perceptions showed a similar timeline to that estimated by experts.

## TIMELINE FOR A SUCCESSFUL COVID-19 VACCINE

Dr. Jonathan Kimmelman conducted a second study with pediatric infectious disease specialist Dr. Jesse Papenburg and epidemiologist Dr. Nicole Basta to use historic success rates for viral vaccine development to create projections for when a COVID-19 vaccine might be available. The study concluded that the time required for vaccine development varies significantly between types of vaccines, and that creating a SARS-CoV-2 vaccine in just one year constitutes an unprecedented achievement for non-influenza viral vaccine development. The study was published in *Annals of Internal Medicine*, a top academic journal.

# IMMUNITY

## UNDERSTANDING THE IMMUNE SYSTEM'S RESPONSE TO COVID-19

The immune system is the body's best defence against infection. Dr. Jörg Fritz and Dr. Ciriaco Piccirillo are investigating the body's immune response to the SARS-CoV-2 virus to answer two critical questions: how does the immune system fight off the virus? And do those who have recovered from the virus gain immunity through the development of antibodies? Because vaccines work by prompting the body to create antibodies that convey immunity to a disease, understanding the body's immune response to COVID-19 is helping researchers create more effective vaccines. The team recently discovered two peptides (components of proteins) that may be players in the body's immune response to the coronavirus, an important first step in this critical research.

# ETHICS AND LAW

## LAW IN PANDEMIC TIMES

For the first time in our modern era, Canadian federal, provincial and municipal governments face a large-scale pandemic. Acting quickly in response to immediate needs, government authorities are testing the limits of their powers in a way that challenges our democratic ideals. These changes reinforce the need for transparency, oversight and accountability. McGill Law Professor Lara Khoury and her team are using this crucial period in our history to evaluate public powers and accountability mechanisms in relation to emergency public health decision making, and have shared their findings both with the legal community and the general public through mainstream media.

## THE ETHICS OF RESEARCH DURING THE COVID-19 CRISIS

Is there a tension between conducting COVID-19 research and providing the best care to COVID-19 patients? As researchers push to identify effective treatments for COVID-19, frontline health care workers are increasingly involved in caring for patients enrolled in clinical trials. This can lead to ethical tensions related to the importance of research to combat the pandemic and health care workers' obligations to particular patients. Global health ethicist Dr. Matthew Hunt, with Dr. Lisa Schwartz and Rachel Yantzi from McMaster University, is conducting an interview-based study with health care providers across Canada and internationally to better understand their moral experiences.

# MENTAL HEALTH

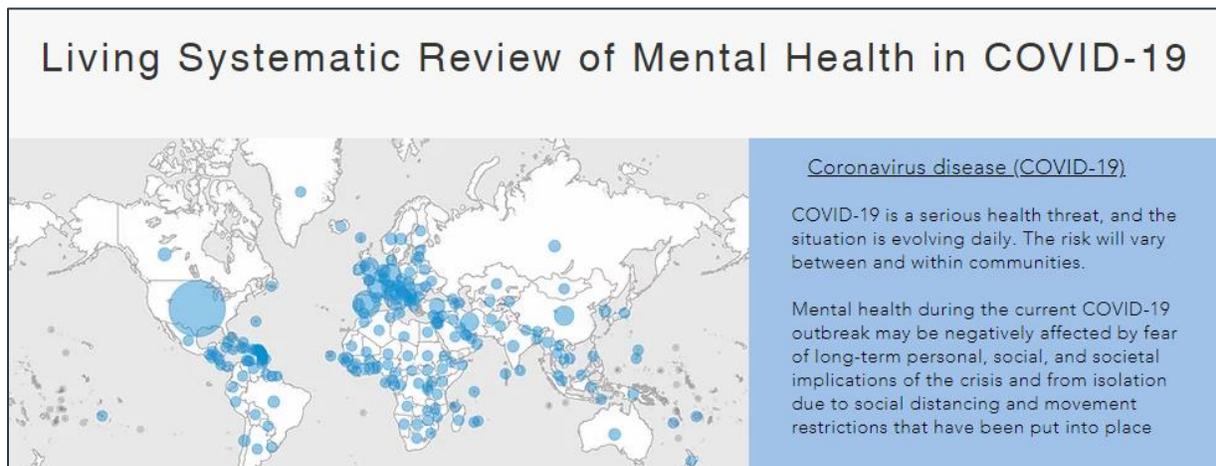
## UNDERSTANDING HOW PANDEMICS AFFECT MENTAL HEALTH

There are no recent infectious disease outbreaks that compare with the global impact of COVID-19, and very little understanding of the effects the pandemic has had on mental health. Health practitioners and policymakers need to understand how COVID-19 is affecting the mental health of Canadians in order to make decisions that best serve the population. Psychologist Dr. Brett Thombs and biostatistician Dr. Andrea Benedetti are conducting a living systematic review of mental health research to evaluate:

- Changes in mental health symptoms from pre-COVID and at various points during the COVID-19 pandemic (e.g., outbreak announcement versus peak restrictions, peak restrictions versus post-restrictions)
- Factors associated with levels or changes in symptoms during COVID-19
- The effect of interventions on mental health symptoms during COVID-19

Since the spring of 2020, the team has reviewed over 6,000 papers from an initial pool of over 25,000. Of these papers, they extracted data from 111 of them and published a summary of study characteristics, outcomes and risks of bias on their [website](#).

Living systematic reviews are continually updated and provide ongoing access to results via online publication. This research is helping us better understand the effects of a large-scale global health crisis on mental health, and will help the Canadian health care system better maintain the wellbeing of all Canadians. To date, the team has received two CIHR grants for this project, totalling over \$200,000.



A graphic from Dr. Thombs and Dr. Benedetti's website.

## **COPING WITH SOCIAL DISTANCING AND CHRONIC ILLNESS**

Restrictions on social interaction during a pandemic can lead to negative mental health. Dr. Brett Thombs and his team are studying a cohort of over 2,000 people with chronic illness from 50 sites around the world to evaluate the effects of the COVID-19 pandemic on mental health outcomes. The team leveraged the funding you provided to secure an additional \$150,000 for this project. To date, they have submitted two papers for publication:

- The development of a measure for fear during COVID-19 for people with chronic medical conditions
- A comparison of anxiety and depression in this cohort from a pre-COVID baseline

Their findings are helping assist public health programs aimed at safeguarding the mental health of the chronically ill during health crises.

## **HELPING FAMILIES COPE WITH SELF-ISOLATION**

Evidence suggests that self-isolation has negative effects on mental health, including stress, anxiety and PTSD-like symptoms. These problems are worsened by quarantine-specific stressors like fear and financial strain. Dr. Lily Hechtman and her team have identified that the strain of social isolation can particularly affect families. They are exploring how COVID-19 isolation measures are affecting the mental health of families using a survey. To date, they have recruited 250 families to take the survey, and are analyzing the results. Preliminary data shows that most families are faring better than expected in terms of levels of anxiety and depression. Next, the team will explore how socio-economic and demographic factors including household income, employment status, and pre-existing conditions in the family members have influenced these markers of mental illness.

## CONNECTING ISOLATED COVID-19 PATIENTS TO THEIR FAMILIES

Upon hospitalization, patients with COVID-19 are physically isolated. Only essential health care personnel interact with them, hidden behind masks and gloves and for restricted periods of time. This isolation, though essential to avoid spreading the disease, can lead to loneliness, depression, anxiety and fear. Rheumatologist Dr. Inés Colmegna, internal medicine physician Dr. Amal Bessissow and computer scientist Dr. David Meger are studying whether video calls from patients to their loved ones can reduce negative emotions.

From June to December 2020, 108 patients admitted to the Royal Victoria and the Montreal General Hospitals affected by isolation measures participated in the study. Forty percent of the participants had either never used a tablet or did not feel comfortable using a tablet before entering the study. Despite this, 90 per cent of the study patients were able to establish communication through the tablet with their loved ones. Moreover, half of the participants were able to either often or always initiate communication using the tablet without assistance of the research group.

Importantly, most of the patients in the study (83%) reported that the tablet helped them to communicate with their family. The impact of the study on individual patients is illustrated through these testimonials from two participants:

“Never used a tablet, but I like it. The setup is easy. I would definitely use one in the future. My husband calls me while he is in the kitchen and I tell him what to cook. Interaction is so much better than a phone call, it's comforting, and with the COVID measures he is able to stay home, call and it feels that he is here somehow. I will get a tablet in the future.”

“This project has saved part of my life. With this whole isolation and my family in Panama, this has been life-changing.”

The study is ongoing and its final analysis will determine if, beyond the rewarding experiences of individual patients, the use of a tablet (i.e. video calling) helps to reduce the negative emotions associated with isolation.

## SAFEGUARDING THE MENTAL HEALTH OF HEALTH CARE WORKERS

COVID-19 presents an increased challenge in the psychological wellbeing of health care professionals. The added strains of caring for patients with COVID-19 and putting themselves at risk of contracting the disease take an emotional toll. Affective psychologist Dr. Jason Harley and Psychiatrist Dr. Tina Montreuil are investigating coping strategies health care workers use to deal with stress, assessing their effectiveness and using this information to recommend new measures to protect the mental health of health care professionals. The preliminary results were featured in the [Globe and Mail](#) and on [CBC Radio](#), and [Global News](#) did a feature on the project in May 2020. As a final dissemination component of the project, the team drafted a white paper to be shared publicly.

Excerpt from the *Globe and Mail* article:

Jason Harley, an assistant professor in the department of surgery at McGill University, conducted a survey of 64 nurses and 55 physicians in the McGill University Health Centre network in August, comparing their stress levels before and after the pandemic began.

Harley said the survey, completed with fellow McGill professor Tina Montreuil and funded by the McGill Interdisciplinary Initiative in Infection and Immunity, found significant increases of stress, anxiety, depression and burnout among the workers.

Fifty per cent of nurses and 20 per cent of physicians surveyed were considering quitting, while they said difficulties finding a work-life balance and keeping up with management strategies to manage the pandemic were among their biggest stressors.

“There’s no question that our health care professionals, they need support,” Harley said.

“It’s critical for our society that ... our health-care system is able to continue to function, especially in this period of time when it’s under extra strain and in turn, the people who are providing us with care are under additional strain.”

## UNDERSTANDING HOW MINORITIES APPROACH COVID-19 MEASURES

Psychiatrist Dr. Cécile Rousseau and her team conducted surveys and interviews with 4,000 Quebecers to understand how minority status, low socioeconomic status, discrimination/stigmatization and mental health affect understanding and adoption of COVID-19 public health measures. The study's findings are contributing to the knowledge base of the psychosocial impact of COVID-19 in Quebec. More specifically, researchers identified sub-populations at increased risk of negative mental health based on age, gender, race/ethnicity, and socioeconomic status. The work also identified complex relationships between engaging in COVID-19 prevention behavior, perceived risk of COVID-19, COVID-19 discrimination, and COVID-19 stigma.

The study results were leveraged to inform evidence-based policy decisions in Quebec related to COVID-19, particularly around the importance of collecting data to document health disparities related to the pandemic in marginalized communities. It also informed evidence-based tailoring of COVID-19 public health communication in marginalized communities (more specifically in Montreal). This communication took into consideration dynamics of COVID-related stigma and discrimination to provide much-needed outreach and service delivery for these populations.

Dr. Rousseau and her team have built on their findings to launch CoVivre, a comprehensive program of community outreach and advocacy, global and focused communications, and health care resource networking with marginalized communities in Montreal.

# THANK YOU

This remarkable work would not be possible without our many donors to the COVID-19 Emergency Fund. We give particular thanks to the Hewitt Foundation, the Trottier Family Foundation, and the late Elspeth McConnell, who collectively gave \$4 million to the COVID-19 Emergency Fund to kick-start MI4's effort against the coronavirus. Every single dollar counts, and we are grateful to our donors big and small for putting their faith in MI4. Together, we have addressed the COVID-19 test shortage, developed vaccine candidates, tested drugs new and old against the virus, found ways to safeguard mental health during global crisis, tracked transmission, and so much more.

Though the COVID-19 pandemic has been a difficult time for all, you can be proud that you contributed to these 50+ projects to help us weather the storm and return to our everyday lives.

**Thank you. We couldn't do it without you.**