



GOVERNMENT OF CANADA'S RESEARCH RESPONSE TO COVID-19



TO PROMOTE AND PROTECT THE HEALTH OF CANADIANS THROUGH LEADERSHIP, PARTNERSHIP,
INNOVATION AND ACTION IN PUBLIC HEALTH.

—Public Health Agency of Canada

Également disponible en français sous le titre :
Réponse du gouvernement du Canada à la COVID-19 dans le domaine de la recherche

To obtain additional information, please contact:

Public Health Agency of Canada
Address Locator 0900C2
Ottawa, ON K1A 0K9
Tel.: 613-957-2991
Toll free: 1-866-225-0709
Fax: 613-941-5366
TTY: 1-800-465-7735
E-mail: publications@hc-sc.gc.ca

This publication can be made available in alternative formats upon request.

© Her Majesty the Queen in Right of Canada, as represented by the Minister of Health, 2020

Publication date: April 2020

This publication may be reproduced for personal or internal use only without permission provided the source is fully acknowledged.

COVID-19 / 12-02-01 / 2020.04.20

OVERVIEW

The Government of Canada has mobilized Canada's research and scientific communities in response to the spread of the novel coronavirus (COVID-19). The Public Health Agency of Canada is engaging federal partners in dialogue about current and planned research activities, with a focus on leveraging strengths and building synergies. Priority research areas include medical countermeasures (vaccines, therapeutics, and diagnostics), clinical management research, as well as social and policy research.

At the international level, Canada joins other G7 countries in sharing information and providing scientific expertise and leadership to accelerate research efforts. Government agencies (Canadian Institutes of Health Research, Public Health Agency of Canada, Health Canada, Canadian Food Inspection Agency, and the National Research Council) are working with the World Health Organization (WHO)¹ and the World Organization for Animal Health (OIE) to enhance global coordination, support transparent global research, enable priority setting, and build common research platforms. Canada's Chief Science Advisor Dr. Mona Nemer is in close contact with the chief science advisors of various countries to exchange information and mobilize global research approaches regarding the COVID-19 response. To help advance research and vaccine development for COVID-19, Canada is participating in the international collaboration, coordinated by the World Health Organization and the Coalition for Epidemic Preparedness Innovations.

Canada's research response aligns with this global effort. The Canadian response leverages world-class domestic research networks within and external to government that have been built over many years of investment. The Government of Canada has established mechanisms for mobilizing rapid research responses for this type of emergency, which have been activated to accelerate development of medical countermeasures, to support priority research on the transmission and severity of COVID-19, and to understand the potential benefits and potential limitations of medical, social and policy countermeasures.

There are several federal programs available aimed at mobilizing industry, innovation and research to respond to COVID-19. Capacity at federal research facilities is being

leveraged, and federal granting agencies are strategically aligned to support Canadian research capacity. The Canadian private sector (R&D, manufacturing) is being engaged to contribute research and development solutions. The Government of Canada is also supporting various strategies to bring significant findings arising from these research efforts to decision-makers in a useful and timely way.

FEDERAL COVID-19 R&D INVESTMENT

Through the Canadian Institutes of Health Research (CIHR) Rapid Research Response² program, a total of \$54.2 million has been invested so far to support 99 research teams from across Canada who are focusing on two broad research areas:

- ▶ Medical countermeasures (vaccines, therapeutics, diagnostics, transmission dynamics and clinical management)
- ▶ Social and policy countermeasures (understanding the social dynamics of transmission and how individuals and communities understand and react to COVID-19; assessing the public health response; developing strategies to combat stigma, misinformation and fear; and studying international relations and global coordination mechanisms.)

Many of these funded projects have international collaborations and partnerships with government departments as well as industry. Several are equipped for real-time data sharing. This positions the research to be more quickly translated into effective prevention, detection, clinical management, and impact on policy and practice for Canadians.

On March 11, 2020, the Government of Canada announced more than \$1 billion for a whole-of-government COVID-19 Response Fund which includes \$100 million to support federal public health measures such as enhanced surveillance, increased testing at the Public Health Agency of Canada (PHAC)'s National Microbiology Laboratory (NML) and ongoing support for preparedness in First Nations and Inuit communities.

The Government of Canada is supporting our country's researchers as they do critical work to protect the health and safety of all Canadians, and people around the world, during

1 World Health Organization in collaboration with the Global Research Collaboration for Infectious Disease Preparedness (GloPID-R) and the Coalition for Epidemic Preparedness Innovations (CEPI).

2 In addition to CIHR, funding for this Response was provided by the Natural Sciences and Engineering Research Council of Canada, the Social Sciences and Humanities Research Council, the Canada Research Coordinating Committee, the International Development Research Centre, Genome Canada, as well as contributions from Research Manitoba, Research Nova Scotia, and Alberta Innovates.

the COVID-19 outbreak. On March 23, 2020, \$275 million was announced as part of the \$1 billion investment to support research and large-scale efforts towards countermeasures to combat COVID-19. The funding is facilitating partnerships among various Canadian stakeholders including other government departments, industry and academia to respond to COVID-19 and build Canadian capacity to produce domestic supply of potential vaccines and treatments.

As part of its Alliance COVID-19 Grants Initiative, the Natural Sciences and Engineering Research Council is providing up to \$15 million to support academic researchers to contribute their expertise and their research results to address challenges and questions raised by the public and not-for-profit sectors, as well as industry in the context of the pandemic. Support for up to \$50,000 for one-year projects is being made available immediately.

Government of Canada scientists have been using key federal resources including biocontainment laboratories³, critical in addressing key research questions. The NML is leading emergency operation efforts in a range of areas, including:

- ▶ **Diagnostics:** Providing molecular COVID-19 diagnostic testing across Canada; guiding and leading the Canadian Public Health Laboratory Network; researching, testing and implementing new diagnostic tests and methods; and coordinating the supply and distribution of reagents and lab supplies with provincial and territorial authorities.
- ▶ **Understanding the COVID-19 virus:** Investigating and tracking the genetic diversity of SARS-CoV-2, the virus that causes COVID-19, across Canada to better respond to its spread; evaluating and establishing blood test (serologic) methods to determine the immune status of Canadian populations; and research and research coordination with partners to develop COVID-19 animal models and medical countermeasures.

VACCINES

At this time, there is no vaccine authorized to protect against COVID-19. Nevertheless, early stage clinical trials for COVID-19 vaccines have already begun around the world, and Health Canada is working with vaccine developers and manufacturers to help expedite the development of vaccines to prevent COVID-19. In Canada, current efforts are focused to advance projects that are already underway by university researchers

and others to respond to COVID-19, and to build Canadian capacity to produce potential vaccines. These include recently announced investments:

- ▶ **Medicago (Quebec City)** for pre-clinical and clinical testing of a plant-based, virus-like particle vaccine, with expansion of manufacturing capacity;
- ▶ **The University of Saskatchewan's Vaccine and Infectious Disease Organization – International Vaccine Centre's (VIDO-InterVac)** to strengthen VIDO-InterVac's existing expertise on coronavirus research and upgrade its manufacturing facility to meet good manufacturing practice (GMP) standards; to support this effort, the NML and the Canadian Food Inspection Agency (CFIA) are collaborating with VIDO-InterVac and with the National Research Council to develop and test vaccine candidates against COVID-19; and,
- ▶ **National Research Council (NRC)** to upgrade the Human Health Therapeutics Research Centre in Montreal to meet GMP standards. This facility will be available to produce clinical trial lots as soon as vaccine candidates become available, beginning as early as late spring 2020.

Using its existing bioprocessing facility, the NRC's Human Health Therapeutics Research Centre is already working on scale-up processing for clinical trial material, and collaborating with a number of companies developing COVID-19 diagnostics, therapeutics and vaccines, such as VBI Vaccines Inc. (Massachusetts). It will be collaborating with, and providing support to, other companies and organizations developing vaccine and therapeutic candidates for deployment in Canada.

Defence Research and Development Canada (DRDC) has internal investments in a range of efforts including antiviral therapeutics, personal protective equipment and decontamination solutions that will increase overall scientific knowledge and technologies.

Recognizing the vast numbers of organizations around the world exploring medical countermeasures, the Government of Canada is closely tracking progress in the race to develop vaccines, drugs, antibodies and diagnostics, with particular attention to promising candidates currently undergoing clinical trials.

Streamlined regulatory and purchasing pathways are being developed for the expeditious approval and purchase of vaccines, once available. Health Canada is responsible for the authorization of vaccines and surveillance of their safety,

³ At the Public Health Agency of Canada, the Canadian Food Inspection Agency, National Research Council, and Defence Research and Development Canada.

efficacy and quality. Should prioritization of available vaccine become necessary, the federal-provincial-territorial Special Advisory Committee on the Novel Coronavirus is expected to make recommendations based on the best available evidence and the epidemiology of the virus.

CANADA'S ACTION ON CLINICAL TRIALS AND OTHER EFFORTS TO DELIVER EFFECTIVE TREATMENTS TO CANADIANS

The Government of Canada is supporting efforts to advance projects that are already underway by university researchers and others to respond to COVID-19, and to ensure domestic supply of potential treatments. This includes:

- ▶ **AbCellera:** A Vancouver-based biotech company that has built the world's leading technology for antibody discovery is at the forefront of developing antibody-based drugs to treat and prevent COVID-19. AbCellera's technology is being used to search blood samples of patients who have recovered from COVID-19 to find naturally-produced antibodies that can be used for treatment and prevention. AbCellera was the first company in North America to receive a sample from a convalescent patient, and within days identified over 500 human antibodies that are candidates for development as a treatment. The company has partnered with global biopharmaceutical company Eli Lilly to rapidly manufacture and distribute a treatment with the goal of beginning clinical trials in July 2020.

The Government of Canada is leveraging existing research and surveillance networks to fast-track understanding of the clinical characteristics of COVID-19 infection in order to advance the development of guidelines for clinical care and public health measures.

Health Canada is closely tracking all potential therapeutic treatments and vaccines in development in Canada and abroad. The Department is working with vaccine developers, researchers, and manufacturers to help expedite the development of medical products such as vaccines, antibodies, and drugs to prevent and treat COVID-19. In addition, Health Canada is working to fast-track clinical trial applications for COVID-19 vaccines and treatments. Companies and researchers with products in development that may be effective in preventing or treating COVID-19 are being encouraged to contact Health Canada to facilitate the submission of clinical trial applications.

Canadian Blood Services is collaborating with Health Canada and the NML on the characterization and production of safe blood products (serum and plasma) from patients that had been infected with COVID-19. These products will be used in clinical trials by various research groups across Canada.

Furthermore, "SOLIDARITY" is an international clinical trial to help find an effective treatment for COVID-19, launched by the WHO and partners, including Canada. By enrolling patients in multiple countries, the SOLIDARITY trial aims to rapidly discover whether any of the drugs slow disease progression or improve survival. WHO has secured access to all treatments so as to obviate the supply issues that may be associated with other trials. The Canadian arm of the global trial, dubbed CATCO (Canadian Treatments for COVID-19), is being funded by the CIHR, which provided nearly \$1 million. The initiative started recruiting patients across 20 sites in Canada on March 29, 2020.

There are currently a number of COVID-19 clinical trials authorized for therapeutic products in Canada. This number continues to grow and will be updated regularly on the website at: www.canada.ca/en/health-canada/services/drugs-health-products/covid19-clinical-trials/list-authorized-trials.html.

As research progresses over the next several months and candidate vaccines become available through research organizations and industry, Canada will work to prioritize efforts and may leverage the following capacity:

- ▶ **Canadian Immunization Research Network's Clinical Trials Network (CTN):** Able to conduct rapid clinical trials with a focus on safety, immunogenicity, and mechanisms of immunity, the Network is run out of the Canadian Center for Vaccinology in Halifax, and includes numerous sites across Canada: Vancouver, Calgary, Winnipeg, Sudbury, Hamilton, Toronto, Ottawa, Montreal, Quebec City, and Halifax.
- ▶ **Clinical Trials Ontario:** The Trial Site Network enables industry to connect directly with Ontario's agile, efficient and high-performing clinical trial sites. The Network is comprised of highly engaged research personnel representing more than 150+ research institutions, hospitals and trial sites across Ontario and Canada.
- ▶ **Contract research organizations:** Several contract research organizations offer end-to-end services to conduct various phases of clinical trials in Canada. Vaccine development organizations can contract these organizations directly to conduct the trials.
- ▶ **Vaccine Evaluation Center (VEC):** Established in 1998 as a collaborative effort between the University of British Columbia and the B.C. Children's Hospital, the objective

of VEC is to develop a focus of recognized excellence in all aspects of vaccine research and evaluation. To meet this objective, the VEC has a team of vaccine experts with extensive experience in local and provincial public health, pediatrics, infectious diseases, immunology, laboratory research, data management and study design. Research projects have spanned basic vaccine science, pre-licensure clinical trials, epidemiology research, post-marketing evaluation including optimizing immunization schedules, social science, promotional and programmatic research as well as laboratory-based assay development.

CANADA'S INNOVATION AGENDA WITH ACADEMIA AND INDUSTRY

The Government of Canada has been approached by a vast number of companies and academics, and has been engaging with them to gain insights on possible research and applications that could assist in the COVID-19 response.

Canada's academic research community responded overwhelmingly to the CIHR COVID-19 Rapid Research Funding Opportunity in early 2020, but is also stepping up on other fronts like supplying critical consumables for laboratory testing in public health laboratories across Canada.

Innovation, Science and Economic Development (ISED) has a range of programs and agencies providing targeted funding to support research and manufacturing capabilities. These include the Strategic Innovation Fund, Innovative Solutions Canada (ISC), granting councils and regional development agencies programs. The ISC's Challenge and Testing Stream has recently launched three challenges to Canadian innovators to develop new and improved premarket medical countermeasures:

- ▶ Low-cost sensor system for COVID-19 patient monitoring – NRC is seeking a low-cost system (unit cost < \$25) that can continuously measure temperature, peripheral capillary oxygen saturation (SpO₂), blood pressure (BP), pulse and respiration rates, and transmit this information wirelessly to a base station for COVID-19 patient monitoring in locales including ERs, general wards, communities and homes.
- ▶ Point of care and home diagnostic kit for COVID-19 – PHAC and NRC are seeking a solution that will diagnose individuals affected by COVID-19 within three days of the start of their symptoms using a sample, other than a nasopharyngeal swab, with a rapid single-use home testing kit analogous to a home pregnancy test.
- ▶ Made in Canada filtration material for the manufacture of N95 respirators and surgical masks – NRC is seeking a

solution that will provide alternative filtration materials at large scale volumes that are suitable for use in the manufacture of N95 respirators and surgical masks for healthcare workers to protect them against exposure to airborne particles and droplet hazards related to COVID-19.

The NRC's Industrial Research Assistance Program (NRC IRAP) provides advice, connections, and funding to help Canadian small and medium-sized businesses increase their innovation capacity and take ideas to market. The program is focused on expediting funding support to get money in place with its recipient firms as quickly as possible. NRC IRAP has funded three COVID-19 projects to date. Several others under discussion are at various stages of development, focused on short and medium term responses to COVID-19 and aligned with priority areas (PPE, sanitization, diagnostics, etc.).

To bring about transformative, high-risk, high-reward research with the potential for game-changing scientific discoveries and technological breakthroughs, the Government of Canada has provided \$150 million over 5 years, with \$30 million per year ongoing, to the NRC to fund its researchers to work with innovators from post-secondary institutions and businesses on multi-party research and development programs. In addition, the NRC is receiving \$15 million in funding for a Pandemic Response Challenge Program, to form dedicated teams to address R&D needs in the fight against COVID-19. The Challenge Program is focusing on three main research themes: 1) rapid detection and diagnosis; 2) therapeutics and vaccine development; and 3) digital health. This challenge has garnered a high degree of enthusiasm from academia, government, and the private sector, with over 1,100 expressions of interest received by NRC between March 20 and April 1, 2020. Directed and open calls on specific challenges and proposed project activities begin April 27, 2020, and will roll out as they are finalized.

CANADA'S CONNECTIONS TO THE GLOBAL ENTERPRISE

Connection to the global R&D enterprise is critical in our response to COVID 19:

- ▶ Canada, through CIHR and the International Development Research Centre, is a member of the Global Research Collaboration for Infectious Disease Preparedness (GloPID-R), a consortium of funders that facilitates the international rapid response to infectious disease outbreaks such as COVID-19. CIHR's Scientific Director of the Institute of Immunity and Infection is a Vice-Chair of GloPID-R. Canada continues to work with international

partners through the GloPID-R and the WHO's R&D Blueprint to leverage global efforts and avoid duplicative activities. CIHR is one of 67 international research funders that are signatories to a statement to rapidly and openly share COVID-19 research data and findings.

- ▶ Canada is participating in the WHO's SOLIDARITY trial, a multi-national clinical trial to study possible treatment options for COVID-19. The goal is to rapidly generate robust data with the same study protocol applied to multiple sites in order to obtain sufficient number of patients enrolled into the clinical trial to ensure statistically sound results. Over 70 countries have now confirmed participation. Canada has invested nearly \$1 million through the CIHR to support the Canadian arm of this trial.
- ▶ The CFIA, in partnership with DRDC and PHAC, established the Biosafety Level 4 Zoonotic Disease Network (BSL4ZNet) which is a network of 15 government organizations from five different countries (Canada, US, UK, Germany and Australia), each with a responsibility over the regulation of human, animal and zoonotic pathogens with pandemic potential. The BSL4Znet has been conducting COVID-19 emergency meetings since early January with international partners to facilitate the sharing of scientific information and research capacity needs in a secure and trusted platform. Canada, as a member of the Five Eyes (FVEY) Intelligence Alliance, has been participating in biweekly meetings to discuss

COVID-19 research and development capacity. Technical points of contact on COVID-19 research from Australia, New Zealand, the United Kingdom and the United States and Canada represented by the BSL4Znet secretariat have been sharing updates on research priorities and progress. The CFIA has also contributed knowledge towards the World Organization for Animal Health (OIE) risk assessments of COVID-19 on its zoonotic potential and in identifying priority research needs on host pathogen interactions.

- ▶ NRC, PHAC and CFIA regularly engage with the Coalition for Epidemic Preparedness and Innovation (CEPI), which is a key international funding mechanism for vaccine development. Canada has also provided \$14 million to CEPI, which is leading efforts to have COVID-19 vaccine candidates ready for clinical trials by late spring.
- ▶ HC is engaged with other international regulators to monitor any impacts on global supply of medicines as a member of the International Pharmaceutical Regulators Programme. PHAC and DRDC are members of the Medical Countermeasures Consortium, in partnership with the Department of National Defence, where they engage with the US, UK and Australian governments to promote collaboration in research, development and acquisition.
- ▶ In addition, research information is being shared between the 27 regulatory authorities, representing every region on the world, that make up the International Coalition of Medicines Regulatory Authorities.

