

VIDO

VACCINE AND INFECTIOUS DISEASE ORGANIZATION

2019 - 2020 ANNUAL REPORT

UNIVERSITY OF SASKATCHEWAN



ADVANCING SCIENCE, PROTECTING HEALTH.

The Vaccine and Infectious Disease Organization (VIDO) is a world leader in infectious disease research and vaccine development for humans and animals. Based at the University of Saskatchewan, our expertise, infrastructure, and history of innovation puts us at forefront and makes us a valuable resource and source of pride for Canada.

For 45 years we have developed solutions to emerging threats and have continued this focus by playing a key role in Canada's response to the COVID-19 pandemic.

In recognition of our history we have re-established the original VIDO acronym — and in celebration of our future we are positioning ourselves as a centre for pandemic and emerging infectious disease research with a new visual identity symbolizing our national and international impact.

We develop vaccines and technologies that protect Canada and the world from infectious disease. This is our purpose. This is VIDO.

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VISION

**PROTECTING CANADA AND
THE WORLD FROM INFECTIOUS
DISEASES.**

MISSION

**TO CONDUCT RESEARCH AND
DEVELOP VACCINES AND RELATED
PRODUCTS WITH KEY NATIONAL
AND INTERNATIONAL PARTNERS FOR
THE PREVENTION AND CONTROL OF
HUMAN AND ANIMAL DISEASES.**

Photo: October 2019



MESSAGE FROM THE CHAIR

Since the emergence of COVID-19, VIDO's outstanding team has been on the frontlines determined to develop a trusted vaccine.

I want to thank everyone at VIDO for their work and dedication during these challenging times. Our team is in a unique position and by drawing on our experience in developing vaccines and animal models for other emerging coronaviruses, we are now recognized at the forefront of national and international SARS-CoV-2 research.

A sincere thank you to Dr. Volker Gerdts for the tremendous job he has done during his first year as Director and CEO. His exceptional ability to lead this team in these times of immense pressure has meant our organization continues to perform as a beacon of scientific excellence on the world stage.

Nothing would be possible without the significant financial support VIDO has received. Since January 2020, the provincial and federal governments have provided over \$50 million to accelerate the development of the COVID-19 vaccine, support our operations, and to complete construction of the vaccine manufacturing facility.

In that vein, I look forward to completing our vaccine manufacturing facility as it is a critical piece of Canada's pandemic response both for today and for the future. This facility will help fulfill a Canadian need and ensure Canada is more prepared for the next infectious disease threat.

I also want to thank our Board of Directors for their commitment to VIDO. It has been a pleasure to Chair a board with such a wide range of expertise and diverse backgrounds focused on one mission.

From developing critical vaccines for the livestock industry, to leading Canada's response to a global pandemic, VIDO's track record speaks for itself. I look forward to our future as we pursue a determined strategy for exploring and understanding zoonotic and emerging infectious diseases.

Ryan Thompson

Chair, Board of Directors



Photo: January 2020

BOARD OF DIRECTORS

RÉJEAN BOUCHARD – ONTARIO
KAREN CHAD – SASKATCHEWAN
AMY CRONIN – ONTARIO
DOUGLAS FREEMAN – SASKATCHEWAN
VOLKER GERDTS – SASKATCHEWAN
JEREMY GOWLER - SWITZERLAND (Not shown)
DANYA KORDAN – SASKATCHEWAN

CORNELIA KREPLIN – ALBERTA
TIPPI MAK – SINGAPORE
RORY MCALPINE – ONTARIO
GERALD PARKER – USA
DIETER SCHILLINGER - KENYA
RYAN THOMPSON – SASKATCHEWAN
CRAIG VANDERWAGEN – USA



MESSAGE FROM THE DIRECTOR AND CEO

COVID-19 has changed our lives and demonstrated in no uncertain terms how a single emerging disease can impact the ~7.8 billion people on this planet.

Since its inception, the Vaccine and Infectious Disease Organization (VIDO) has focused on the rapid response to emerging threats with recent examples including porcine epidemic diarrhea virus, Middle East respiratory syndrome coronavirus, Zika virus and African swine fever virus.

Importantly, our team has been at the forefront of COVID-19 research and development since the emergence of SARS-CoV-2. This includes being the first Canadian organization to isolate the virus, the first to develop an animal model of infection and the first in Canada to have a vaccine candidate in preclinical testing. We continue to advance our vaccine towards human clinical trials, and are simultaneously supporting the development of other vaccines, antivirals, and therapeutics for organizations in Canada and around the world. For these efforts I would like to thank our team for their extraordinary dedication, and the Governments of Canada and Saskatchewan for their financial support.

COVID-19 has demonstrated VIDO's evolution into a centre for pandemic and emerging infectious disease research — visualized by our new brand. We already operate Canada's largest high containment facility, one of the most advanced in the world, and have started constructing Canada's only containment level 3 vaccine production facility. This specialized capacity allows us to study high impact infectious diseases, perform trials with novel animal models from bats to bison, and will facilitate the development of new vaccines from research to production. VIDO continues to grow by attracting and recruiting expertise and by training the next generation of infectious disease researchers. We will aim to enhance the understanding of infectious diseases, innovate, and help strengthen Canada's response to future threats.

Volker Gerdts

Director and CEO



SENIOR MANAGEMENT TEAM

LORNE VANIN | CAM EWART | VOLKER GERDTS | PAUL HODGSON | SCOTT NAPPER

RESEARCH HIGHLIGHTS

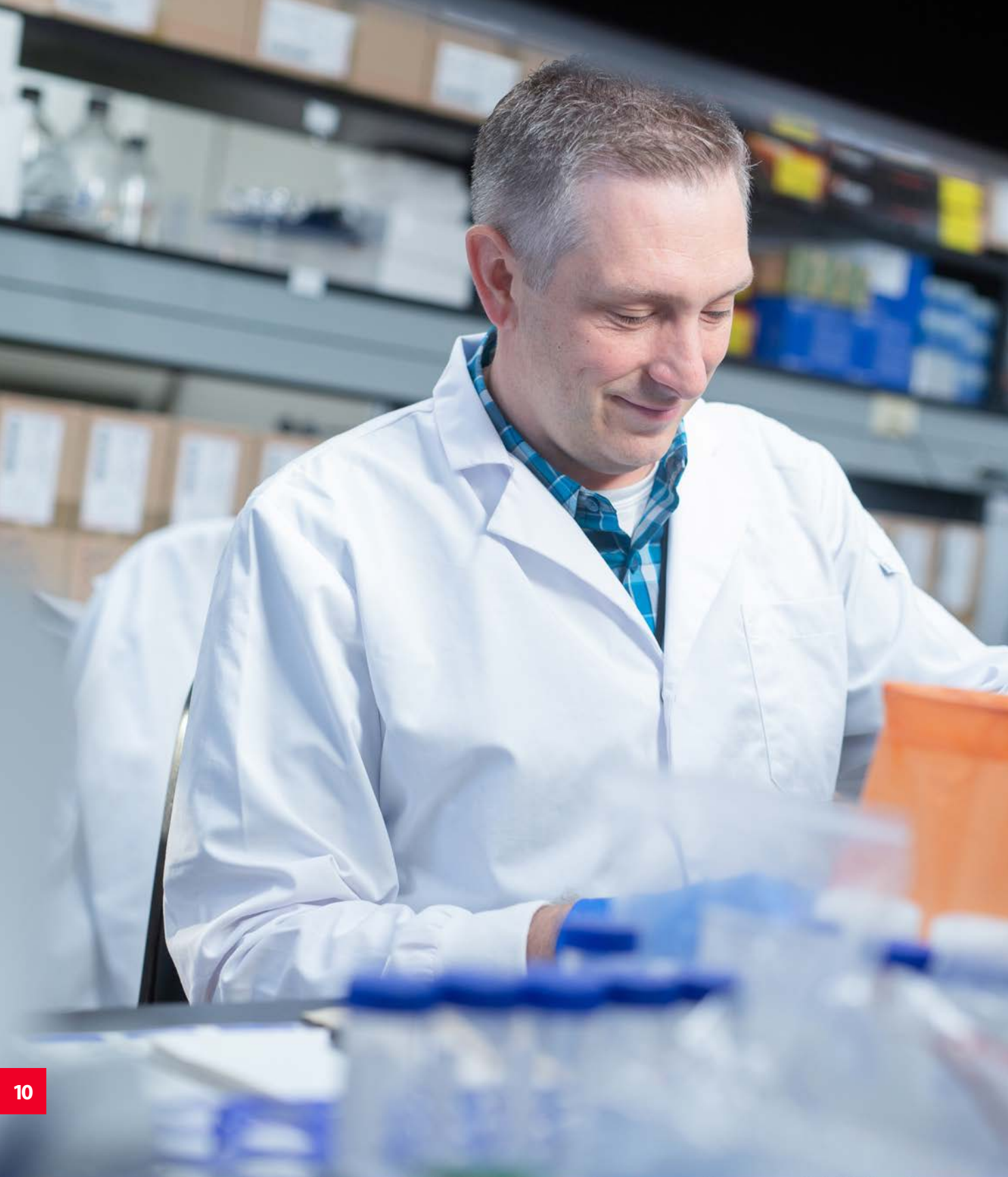
RAPID RESPONSE TO EMERGING THREATS

VIDO has a history of rapidly developing solutions for emerging human and animal infectious diseases. Our world-class containment infrastructure enables our team to understand high impact pathogens and develop vaccines and other therapeutics that help protect Canada and world from emerging threats—including this global pandemic.

Our COVID-19 Response

In December 2019 a new coronavirus was identified as the causative agent of pneumonia in a cluster of patients in Wuhan, China. The resulting disease, named COVID-19 (coronavirus disease of 2019), was characterized as a pandemic by the World Health Organization in March 2020 due to the rapid concurrent global spread of the virus.





VIDO HAS LED THE CANADIAN RESEARCH RESPONSE TO COVID-19 WITH THE FOLLOWING ACTIONS:

SARS-CoV-2 virus isolation

Our team was the first in Canada to isolate and grow SARS-CoV-2 using a specimen collected at Sunnybrook Health Sciences obtained through the National Microbiology Laboratory. The isolated virus was provided to the National Microbiology Laboratory and the American Type Culture Collection for distribution to researchers and other certified containment level 3 laboratories to accelerate research and development.

Animal models of disease

As part of preclinical testing, and the regulatory approval process, vaccine candidates must be shown to be safe in animals and to protect against infection. Our team was the first in Canada to develop an animal model of SARS-CoV-2 infection—a ferret model—and have also established a hamster model. These models are fundamental in helping us, and our collaborators, understand how the virus causes disease (pathogenesis) and in demonstrating the effectiveness of vaccines, antivirals, and therapeutics.

Candidate vaccines and effectiveness

Leveraging our experience working with human and animal coronaviruses, we identified a candidate antigen and formulated vaccine candidates for COVID-19. These vaccines induced a strong immune response, generated neutralizing antibodies, and protected the animals from infection.

Vaccine manufacturing and clinical trial preparations

We are currently manufacturing our vaccine and have started toxicology testing. Following approval of our clinical trial application from Health Canada, we will recruit volunteers and initiate human clinical trials in collaboration with the Canadian Centre for Vaccinology in Halifax. Our goal is to start Phase I clinical trials in Q4 2020.

Preparing for future pandemics

Multiple factors have increased the potential for infectious diseases to emerge and spread. VIDO aims to increase our role in mitigating the impact and support Canada's preparedness as a centre for pandemic and emerging infectious disease research.

As one of the largest and most advanced high containment facilities in the world—and one of the few with vaccine manufacturing capabilities—we will support the full vaccine development pathway from discovery to commercialization. Over the coming years we will use innovative techniques including bioinformatics and artificial intelligence to predict pathogen evolution and emergence and develop possible vaccines for diseases before they are even known.

These strategies will help VIDO ensure that Canada is positioned to rapidly respond to future infectious disease threats and develop the necessary solutions that safeguard health.

ZIKA VIRUS

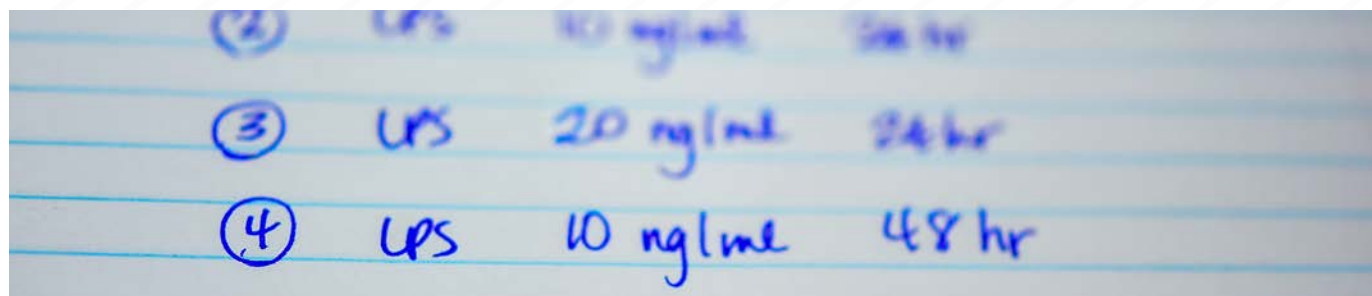
Our work on Zika virus is a key example of how animal models can improve understanding of a disease and help protect human health.

Two weeks before the World Health Organization declared Zika virus as a global public health emergency, we initiated a project to develop swine models for the disease. Our team was the first in the world to describe novel animal models for Zika virus in neonatal and fetal pigs. These models have been used by the industry to evaluate vaccines and therapies, and by our team to better understand the long-term health consequences of Zika virus infection in offspring.

MERS-COV

Middle East respiratory syndrome (MERS) is caused by a coronavirus that is primarily transmitted from camels to people with 33% mortality.

To protect people from the virus, our team developed an alpaca model of infection and helped develop the world's first MERS camel vaccine to stop the transmission of the virus. This vaccine is in preclinical testing using our alpaca model and will be tested in the field by our collaborators in Saudi Arabia.



PEDv

Porcine epidemic diarrhea virus (PEDv) is a swine coronavirus that emerged in North America in 2013 and is responsible for the death of millions of pigs. In less than two years, VIDO developed a novel vaccine that was used to help contain outbreaks in Manitoba. Research on PEDv started before any cases were identified in Canada.

We are currently involved in projects to improve PEDv diagnostics and develop biosecurity practices. As well, we are continuing to work on a next generation vaccine that will allow differentiation of infected and vaccinated animals (DIVA).

ASFv

African swine fever (ASF) is a highly contagious viral disease of pigs. The disease and control measures have caused the deaths of hundreds of millions of pigs in affected countries and led to significant socioeconomic impacts. ASF is a huge risk to pork producers worldwide. In 2019 VIDO became the first non-government facility in Canada, and the second in North America, approved to work with the ASF virus. This is an excellent example of how VIDO's containment infrastructure has enabled us to support national priorities against emerging infectious diseases.

Our research aims to develop and test vaccines and antivirals for this disease. While the threat of ASF is well-known, there are currently no vaccines or treatments approved for use.

A COVID-19 COLLABORATION

VIDO has engaged with over 80 organizations from around the world to advance the development of novel vaccines, antivirals, and therapeutics against COVID-19. Our goal is to help ensure a solution for this pandemic is developed as quickly as possible, realizing our vision of protecting Canada and the world from infectious diseases.



FACILITY HIGHLIGHTS

VIDO has some of the most advanced containment infrastructure in the world to support infectious disease research and vaccine development for humans and animals. From bats to bison, we can house a range of animals in our containment level 2 and 3-Ag facility.



OUR FACILITIES INCLUDE:
MORE THAN \$200 MILLION IN CONTAINMENT INFRASTRUCTURE

CONTAINMENT LEVEL 2

19 Laboratories

20 Animal Isolation Rooms

CONTAINMENT LEVEL 3

8 Laboratories

CONTAINMENT LEVEL 3-AG

18 Large Animal Isolation Rooms

A **160-ACRE CONTAINMENT LEVEL 2 RESEARCH STATION** FOR LARGE ANIMAL STUDIES WITH LEVEL 2 PATHOGENS

Assigned office space for visiting researchers from across Canada and around the world

In addition, the Community Liaison Committee ensures community engagement regarding our extensive biosafety and security measures.

VACCINE MANUFACTURING FACILITY

The COVID-19 pandemic has highlighted the importance of vaccine self-sufficiency. Our vaccine manufacturing facility will help address Canada's need. To our knowledge this will be Canada's only containment level 3 manufacturing facility and one of a few in the world.

The recent funding from the Government of Canada and Government of Saskatchewan will ensure this facility can be certified to Good Manufacturing Practice (GMP) specifications, a requirement for human vaccine production and animal vaccine production outside North America.

This facility will close a gap in Canada's vaccine innovation system and benefit the life sciences sector by strengthening Canada's existing vaccinology infrastructure, accelerating promising vaccine products, and enabling Canada to capitalize on the growing contract vaccine manufacturing market.



HELPING OUR COMMUNITY

In the face of the global shortage of N95 respirator masks we partnered with the Saskatchewan Health Authority to use our infrastructure to decontaminate masks for re-use and help ensure an emergency backup supply. To date over 13,000 masks have been decontaminated using vaporized hydrogen peroxide (VHP)—a procedure routinely used in our containment Level 3 facility. The VHP procedure is only available in a limited number of places in North America, and we are very pleased that we were able to leverage our infrastructure to help.



FINANCIAL HIGHLIGHTS

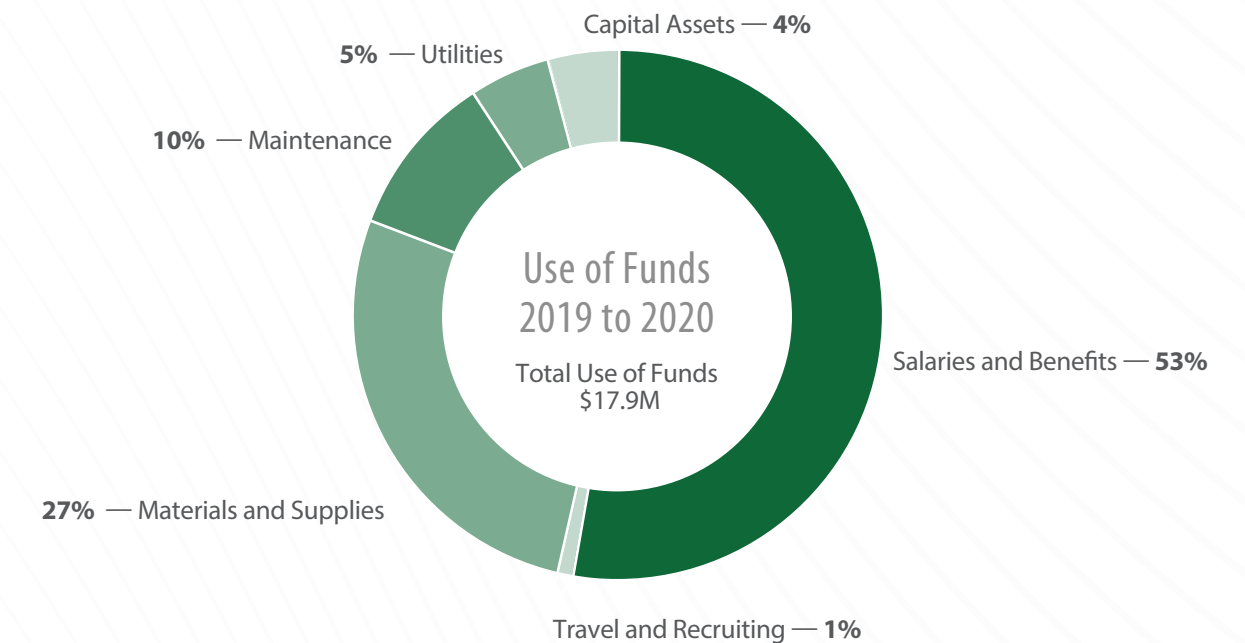
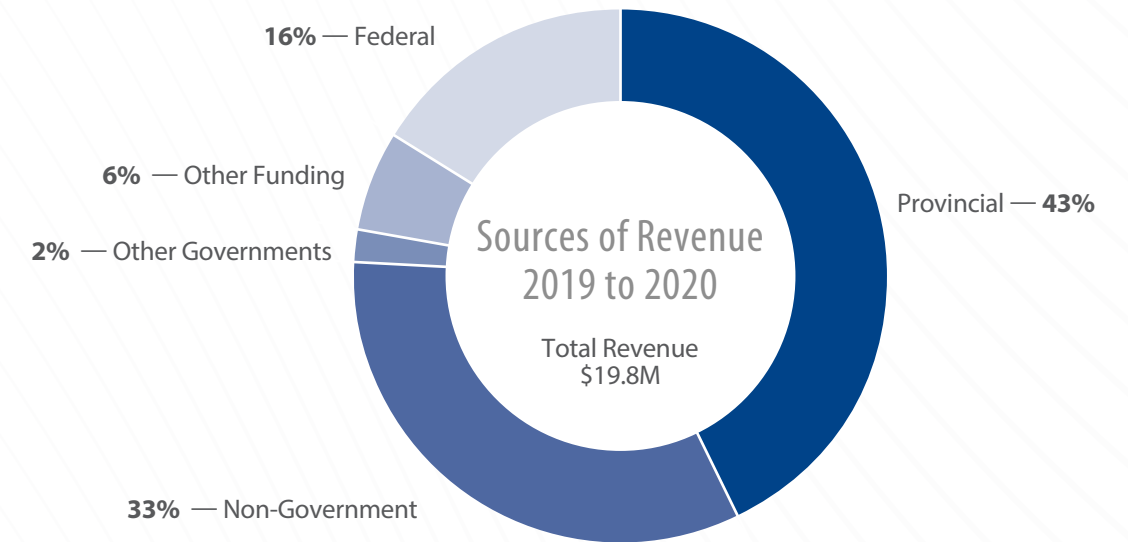
The financial support provided by our stakeholders is critical in ensuring our ability to rapidly respond to emerging infectious diseases.

In 2020 we had a significant increase in new funding to support our COVID-19 response and vaccine manufacturing facility, including \$4.2 million from the Government of Saskatchewan through Innovation Saskatchewan, and \$35 million from the Government of Canada through Western Economic Diversification Canada.

In addition, the Canada Foundation for Innovation increased our funding by \$11.3 million under the federal Major Science Initiatives program. This operational support enhances our research capacity for threats like COVID-19 and African swine fever and promotes ease of access for Canadian scientists.

This, together with revenue from other federal and provincial agencies, international governments, the livestock industry, foundations, companies, and philanthropic donations, amounted to an 18% increase compared to last year's revenue. A full list of financial contributors is on the back cover of this report.

We would like to thank all our contributors for supporting our COVID-19 response and the continued development of solutions to combat emerging infectious diseases.



2019-2020 COMMUNITY LIAISON COMMITTEE REPORT

The Community Liaison Committee is an example of best practices for containment facilities worldwide. Comprised of community leaders, the committee's role is to provide information to the public regarding safety and security at the International Vaccine Centre (InterVac). The committee helps create and maintain an atmosphere of trust, confidence, and transparency with the public.

The Community Liaison Committee was created by the University of Saskatchewan to serve as an independent organization working to ensure full and open communication on safety issues related to InterVac.

The committee meets regularly to be briefed on the work at InterVac. This past year we received reports on eight incidents, three of which were minor. The most significant issues involved equipment failure and an animal bite (employees were monitored following public health requirements and exposure ruled out). All incidents were resolved to the satisfaction of the committee with no risk to the public.

The committee also stays up to date on issues relating to infectious diseases, particularly as they apply to VIDO. This year members reviewed articles on protocols used in other facilities and, of course, the pandemic. In addition, the committee received presentations on African Swine Fever, protein misfolding diseases and facility security.

To better serve the community the committee launched a revised website intervaccl.ca and hosted a community meeting in November 2020.

Members of the public can contact the committee at intervaccl@usask.ca.

Susan Lamb

Community Liaison Committee Chair



Photo: 2019

2019 CLC MEMBERS:

VOLKER GERDTS | JANICE HOBBS | NOREEN JEFFREY | SUSAN LAMB
TRACEY THUE | MORGAN HACKL | BRIAN GIBBS

MISSING: DICK BATTEN | SIMON KAPAJ | GABE LAFOND
PATRICIA ROE | VERITY MOORE-WRIGHT

CONTRIBUTORS 2019-2020

ALBERTA AGRICULTURE AND FORESTRY

ALBERTA INNOVATES

AMP DISCOVERY

ANGES

AQUILA DIAGNOSTIC SYSTEM

BEEF CATTLE RESEARCH COUNCIL

BIOTECH LABORATORIES

BOEHRINGER INGELHEIM VETMEDICA

CANADA FOUNDATION FOR INNOVATION

CANADIAN POULTRY RESEARCH COUNCIL

CANSINO BIOLOGICS INC

CHICKEN FARMERS OF SASKATCHEWAN

CYTOPHAGE TECHNOLOGIES

DECHRA

EGG FARMERS OF ALBERTA

EGG FARMERS OF CANADA

EUPRAXIA PHARMACEUTICALS

GENOME ALBERTA

GENOME PRAIRIE

GOVERNMENT OF CANADA

CANADIAN INSTITUTES OF HEALTH RESEARCH

INTERNATIONAL DEVELOPMENT RESEARCH CENTRE

NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL

PARKS CANADA

PUBLIC HEALTH AGENCY OF CANADA

SOCIAL SCIENCES AND HUMANITIES RESEARCH COUNCIL

WESTERN ECONOMIC DIVERSIFICATION CANADA

GOVERNMENT OF SASKATCHEWAN

AGRICULTURE DEVELOPMENT FUND

INNOVATION SASKATCHEWAN

SASKATCHEWAN HEALTH RESEARCH FOUNDATION

GUANGZHOU INSTITUTE OF RESPIRATORY DISEASE

GUANGZHOU YUANBO MEDICAL TECHNOLOGY COMPANY

HUVEPHARMA

INSTITUT JULES BORDET

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NATIONAL INSTITUTES OF HEALTH

NATIONAL SANITARIUM ASSOCIATION

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SASKATCHEWAN CATTLEMEN'S ASSOCIATION

SOUTH CHINA VACCINE CORPORATION

THE BANTING RESEARCH FOUNDATION

UNITED STATES DEPARTMENT OF DEFENCE

UNITED HEALTH BIOLOGICAL TECHNOLOGY COMPANY

UNIVERSITY OF ALBERTA

UNIVERSITY OF BRITISH COLUMBIA



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