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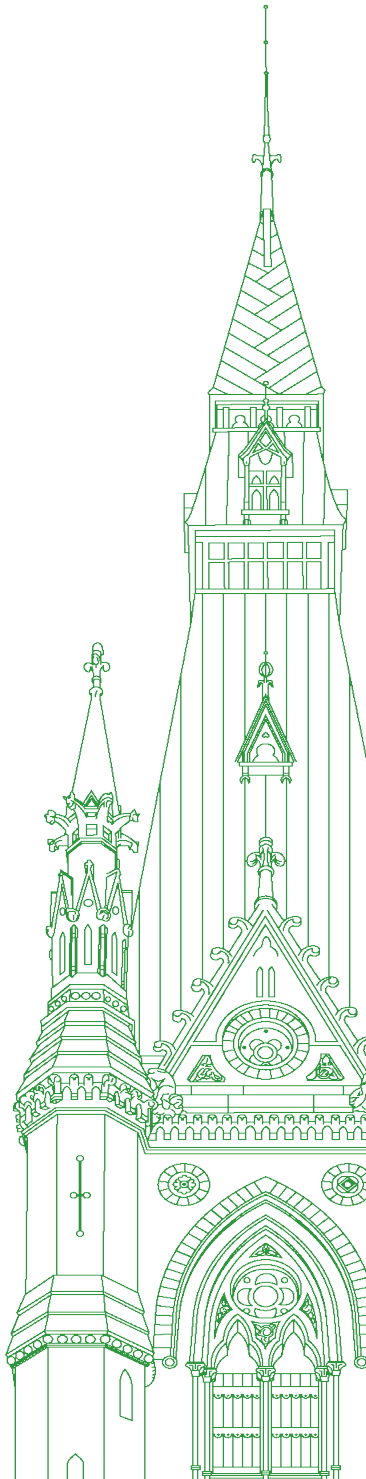

Chair: Mr. Ron McKinnon

Standing Committee on Health

Thursday, April 30, 2020

● (1710)

[*English*]

The Chair (Mr. Ron McKinnon (Coquitlam—Port Coquitlam, Lib.)): I call this meeting to order.

Welcome, everyone, to meeting number 16 of the House of Commons Standing Committee on Health. Pursuant to the orders of reference of April 11 and April 20, 2020, the committee is meeting for the purpose of receiving evidence concerning matters related to the government's response to the COVID-19 pandemic.

In order to facilitate the work of our interpreters and ensure an orderly meeting, I would like to outline a few rules to follow.

Interpretation in this video conference will work very much like it does in a regular committee meeting. You have the choice, at the bottom of your screen, of the floor or English or French. If you will be speaking in both official languages, please ensure that the interpretation is listed as the language you will speak before you start. For example, if you are going to speak English, please switch to the English feed before you speak. This will allow for better sound quality for interpretation.

Before speaking, please wait until I recognize you by name. This, of course, will vary once we get into questions. When you are ready to speak, click on the microphone icon to activate your mike. Should members need to request the floor outside of their designated time for questions, they should activate their mike and state that they have a point of order. I remind everyone that all comments by members and witnesses should be addressed through the chair.

When speaking, please speak slowly and clearly. When you're not speaking, please ensure that your microphone is on mute. If you have ear buds with a microphone, please hold the microphone near your mouth when you're speaking.

Should any technical challenges arise, please advise the chair or clerk immediately, and the technical team will work to resolve them.

Before we get started, can everyone click on the screen in the top right-hand corner, if in fact you're on a PC, and ensure that you are on gallery view? With this view, you should be able to see all of the participants in a grid-like fashion. It will ensure that all video participants can see one another.

Before we go to the witnesses, I understand that Mr. Jeneroux has a bit of committee business.

Mr. Jeneroux.

Mr. Matt Jeneroux (Edmonton Riverbend, CPC): Thank you, Mr. Chair.

I have a brief question, through you to the clerk, and then a bit of a statement, if you don't mind. I'll be as brief as I can.

First of all, Mr. Chair, is a motion to summon a witness in order in this committee?

The Chair: Thank you for the question.

When this came up before, I indicated hesitation on the matter and took it under advisement. I later asked the clerk and the law clerk for a determination on whether the motion was in order, since there was some discussion on it last time. I will now ask the clerk to respond to the committee.

Madam Clerk, please go ahead, if you would.

Ms. Erica Pereira (Committee Clerk): Thank you, Mr. Chair.

As members are aware, paragraph (n) of the order adopted on April 11 states the following:

> (n) in addition to receiving evidence, the committees enumerated in paragraphs (l) and (m) of this order, while meeting by videoconference or teleconference, may also consider motions requesting or scheduling specific witnesses, and these motions shall be decided by way of a recorded vote;

In addition, the motion agreed to on April 20 further extends this order in subparagraph (f)(iii), which includes the following:

> (f) for greater certainty, the following provisions remain in effect:
>
> ...(iii) paragraphs (k) to (n) and (p) to (t) of the order adopted on Saturday, April 11, 2020....

As the the order states clearly that this committee may consider motions requesting or scheduling specific witnesses, a motion to summon a witness is therefore admissible, as it is a logical extension of the parameters outlined in paragraph (n) of the order adopted on April 11 and in subparagraph (f)(iii) of the order adopted on April 20.

However, I would also like to bring the committee's attention to the following passages from *House of Commons Procedure and Practice*, third edition. On page 981, it states that, “The Standing Orders place no explicit limitation on this power. In theory, it applies to any person on Canadian soil.” It goes on to say, a few lines later, “In practice, certain limitations are recognized on the power to order individuals to appear. Because committee powers do not extend outside Canadian territory, a committee cannot summon a person who is in another country.”

Thank you.

Mr. Matt Jeneroux: Thank you, Mr. Chair.

As the clerk has just explained, Dr. Aylward has again turned down our invitation to appear at this committee. I would just like to point out that Dr. Aylward is a Canadian and represents Canada at the WHO. This committee was tasked unanimously with studying the Government of Canada's response to COVID-19. I don't think anyone would argue that the WHO has not played a key role in that response. The government has been relying on data from the WHO and has been implementing measures here in Canada based on the WHO's recommendations. That is why it is important that Dr. Aylward and the WHO partake in our study on the government's response.

I therefore move that:

> That, upon the Chair being informed of his return to Canada, the Standing Committee on Health summon Dr. Bruce Aylward to appear before the Committee at a date and time to be determined by the Chair.

Thank you.

● (1715)

The Chair: I would like to inform the committee that the World Health Organization has agreed to answer written questions to the best of their abilities, which could provide us a possible alternative method of getting the required information.

I will now open debate on the motion. I believe, Mr. Jeneroux, you've already made your statement.

If anyone wishes to enter debate on this motion, please use the “raise hand” feature by clicking on “Participants” at the bottom of your screen and then clicking on your name.

Does anyone wish to speak on this motion?

Mr. Davies, go ahead, please.

Mr. Don Davies (Vancouver Kingsway, NDP): Thank you, Mr. Chair.

I'd like to speak in support of the motion by Mr. Jeneroux. I endorse all of the reasons that he indicated so clearly. I would just point out that responding to written questions is helpful, but it's not as helpful as having Dr. Aylward appear by video conference to hear and respond to live questions from the committee. I would note, for the record, that Dr. Aylward has done interviews in exactly that format with media outlets, so clearly he has been willing, and the WHO has been willing, to make Dr. Aylward available to answer questions to the media. I don't see any principled reason that they would not make Dr. Aylward available to this committee to answer similar questions. I would also point out that Canada is a member of the WHO, and I think the WHO ought to operate with transparency and accountability to its members.

As Mr. Jeneroux pointed out, I think the Minister of Health and this government, and Canada's chief public health officer, Dr. Tam, have repeatedly invoked the World Health Organization as a source of guidance and background information to inform the decisions made in Canada. This committee is tasked with assessing the validity, usefulness and effectiveness of the government's response. I can't see how hearing from the WHO wouldn't help us in carrying out the task that's been given to us unanimously by Parliament.

I will conclude by saying that I appreciate that Dr. Aylward is in Geneva, so the summons can't be executed at the moment. However, if we do issue this summons, then if and/or when Dr. Aylward does return to Canada, the summons will be in place and in a position to be executed at that time. I would endorse this motion accordingly.

Thank you, Mr. Chair.

The Chair: I will call the question, and I would ask the clerk to do a recorded vote on this.

(Motion agreed to: yeas 11; nays 0)

● (1720)

Ms. Helena Jaczek (Markham—Stouffville, Lib.): I have a point of order, Madam Clerk.

You did not call my name.

The Clerk: Thank you, Ms. Jaczek.

I do not have you substituted in. Only members of the committee will have their votes counted.

Ms. Helena Jaczek: Thank you.

The Chair: The motion has passed. We will arrange for the summons to be created.

I don't recall if a date or time was specified, but I think it will be a time determined by the chair. We will get that under way and report back to the committee when that occurs.

I would now like to welcome our witnesses.

As an individual, we have Dr. Robert Fowler, professor of medicine and program director of clinical epidemiology and health care research at the Dalla Lana School of Public Health, University of Toronto. From the Canadian Society for Molecular Biosciences, we have Dr. Tarik Möröy. From Genome Canada, we have Dr. Rob Annan and Dr. Cindy Bell. Dr. Annan is president and CEO. Dr. Bell is executive vice-president, corporate development. From VIDO-InterVac, we have Dr. Volker Gerdts, director and chief executive officer, and Dr. Paul Hodgson, associate director, business development.

We will start with Dr. Fowler for 10 minutes. Please, go ahead with your statement.

Dr. Robert Fowler (Professor of Medicine and Program Director, Clinical Epidemiology and Health Care Research, Dalla Lana School of Public Health, University of Toronto, As an Individual): Thank you very much.

I would like to thank the honourable members, and Mr. Davies in particular, for the invitation.

As stated, I am a critical care physician. I work at Sunnybrook Hospital in Toronto, where I am now. I've had the opportunity also to engage in graduate studies at the Dalla Lana School of Public Health, and I chair the Canadian Critical Care Trials Group, a world-leading group of interprofessional academic researchers and patient partners who study the best care for our sickest patients.

My own personal and academic interests, clinically, are around the care of critically ill patients. That is directly relevant to the COVID pandemic. I've had an opportunity to examine other health care systems in well-resourced settings first-hand and academically. Also, my work with the WHO and various non-governmental organizations during SARS and different outbreaks and pandemics over the years includes avian influenza, Middle East respiratory syndrome, and a couple of years of Ebola outbreaks in western Africa and, last year, in the DRC. I have helped the WHO and the Public Health Agency in most of these outbreaks in one capacity or another through guidelines or clinical care on the ground.

In terms of disclosures, I don't have any financial relationships with industry or pharmaceutical companies. I have received peer-reviewed funding from CIHR, and I am supporting the Canadian response to WHO's solidarity trial, which examines and evaluates medications for COVID-19.

The context I'll speak from otherwise is more specific to COVID-19.

As we know, it has spread rapidly over the last four months to many countries around the world. The infection rate is unknown but estimated at over three million people, causing 200,000 deaths, and well over 50,000 cases in Canada with approximately 3,000 deaths. Despite this most commonly causing mild illness, the temporal concentration of infections among susceptible populations has, at times, overwhelmed seemingly robust health care systems and their capacities, specifically too few intensive care beds and ventilators for patients and too little personal protective equipment for health care workers. That's been seen prominently in other jurisdictions, and we have been worried about it in Canada. We have prepared for it, but have been just on the precipice.

Probably people are very familiar with this by now through their own knowledge or reading, this being a very common topic in the lay press. It typically presents as a mild illness, respiratory in nature, but can progress to cause severe pneumonia, the need for oxygen, administration of mechanical ventilation and on rare occasions sometimes beyond that, we need circulation of the blood outside the body to provide oxygen and carbon dioxide removal and some assistance for the heart and lungs with dialysis and pump function. These patients can get very ill. Therefore, care in a hospital ICU is one of the direct elements of this outbreak, more so than others we have experienced, by the numbers of patients who have been infected and presented at hospitals.

In many of the publications to date, the mortality rates among those requiring intensive care has been shockingly high for me, as someone who treats patients in an ICU all the time.

● (1725)

The Chair: Dr. Fowler, the interpreters have noted that the sound quality is not good enough for interpretation. Could you try very hard to speak a little more loudly and more directly into the mike? Thank you.

Dr. Robert Fowler: I'll try, and I appreciate the interruption.

We're fortunate that this has only occurred intermittently in Canada. The Public Health Agency's leadership and social distancing messaging have so far mitigated the impact on certain elements of the health care system that would be overwhelmed, although the aged who are living in long-term care homes—and I've visited a number of them in my local area in the past week—have not been protected. This is a big issue for this outbreak. It's something that may invite questions.

On the response to learn more about this outbreak, CIHR has demonstrated some fairly strong leadership and made some tough decisions to support the early research response. I think we have an opportunity to work more collaboratively on the ground with respect to learning during this outbreak, and one of the main points—

The Chair: I'm sorry, Dr. Fowler. Again, we're having a problem with interpretation. The sound is very difficult for the interpreters. Interpretation is quite a challenging thing, particularly simultaneous translation, so the better the sound quality, the better off we are.

Dr. Robert Fowler: Let me try again and we'll see if it is any better for the interpreters.

The Chair: Please carry on. If the interpreters are having a problem they'll step in and let us know.

Dr. Robert Fowler: Thanks.

On the ground, we would benefit from a greater pan-Canadian collaboration and better public health knowledge of existing resources and gaps—for instance, how many ICU beds and ventilators exist in hospitals and regions—and from a stronger, better coordinated structure for clinical research and quality improvement to characterize, to learn and to quickly improve care delivery for an otherwise unknown illness.

These shortcomings are understandably more apparent in the context of COVID-19, but they exist in usual times as well.

The 13 provincial and territorial health care systems have a lot in common but also differ in ways that should enable more constant cross-learning, and we don't always share insights from those natural experiments in health care delivery at the federal, provincial and territorial governments. We've not really created, I would say, an adequate pan-Canadian machinery to support a more systematic innovation and evaluation that would create some more nimble systems that promote higher-quality care in the context of an outbreak like this.

I'm going to speak just a bit about the clinical treatments and knowledge gaps that exist. As of today, there are still, I would say, no proven effective medical treatments against COVID-19. There are a number of pre-existing antiviral medications, anti-inflammatory medications and immune modulating drugs that are under investigation. Treatments with plasma from recovered patients, anticipating a high concentration of antibodies to COVID-19, are being investigated. Monoclonal antibodies manufactured and directed against specific aspects of the virus are under development. I think Canadian-led science in this field has been very impressive in the past, particularly so for other viruses such as Ebola.

Our best treatment options to date remain the best supportive care, including oxygen, mechanical ventilation and organ support as needed. We have knowledge gaps in the ideal ways to do these things, including how to move from oxygen supplementation to nasal prongs to masks to mechanical ventilation, and whether certain forms of our therapies may aerosolize the virus and place health care workers at increased risk. That's been a prominent concern for us in hospitals when treating patients and being part of that risk circle. In addition to medication trials, I would say that we should study the safety and effectiveness of those elements of supportive care.

So far, there have been many clinical trials, frequently examining a single treatment and typically enrolling too few patients to convincingly determine whether a treatment is effective or not, and they have been concluded oftentimes without necessarily helping the next generation of patients. Clinical treatments and research performed in one jurisdiction with one treatment are usually inconclusive. This is another call for mechanisms for collaborative pan-Canadian and international initiatives that draw upon more durable research infrastructure to examine treatments in parallel with one another and to reach a conclusion on one medication and not have to stop a single treatment trial before moving on to the next evaluation, which is typical of many of the ways that we fund and undertake trials.

One of the early and valid concerns of the pandemic, I think, has been the risk of a sustained situation of overwhelmed hospitals and ICUs with too few ventilators and an excess of preventable deaths. This has occurred in many developed health care systems, including most recently throughout many parts of the U.S. We've come very close to this possibility—I think probably really for the first time in our modern history—of explicitly planning on how to deny care to those in need because of a lack of commonly available resources.

While social distancing has flattened the curve of infections, the frail, vulnerable and aged Canadians living in long-term care homes who cannot partake in social distancing have been at continued high risk of contracting the illness and dying once COVID has taken hold. This has been recognized for a long time, and I think it's an important element of this outbreak, which is much more prominent and visible to the population and is one that we should not lose sight of as we go through it.

Similarly, I would say that health care workers in long-term care facilities have not been adequately prepared and supported. This is something that we can do better in the future.

I wanted to comment on other jurisdictions and what we might learn from others' examples. While many highly resourced countries have been pushed beyond their existing capacity by this pandemic, some have shown a much greater ability to respond quickly and to learn from the experience.

I want to highlight a particular example in the United Kingdom, which has a similar burden of infection by population as the U.S. does, but they have done very well with responding with respect to research and a learning health care system, and I think we might draw on some lessons there.

● (1730)

It's underpinned by a couple of decades of political commitment to medical research with a goal of driving value into the system, improving care through innovation, and evaluating that innovation and adopting it when appropriate.

The U.K., at one-fifth the size of the U.S. and about one-twentieth the size of China, has been the first to develop and take a vaccine for COVID into clinical trials, and at the clinical front lines it's leading the world with a longitudinally supported research network in NHS hospitals across lots of specialty areas. This is something that in my own field of critical care we've seen for a number of years, and we are envious of their ability to support longitudinal research in a durable way through funding from their national funder and then to the coalface at NHS hospitals.

The Chair: Dr. Fowler, could you wrap up, please?

Dr. Robert Fowler: Yes. I want to wrap up with a few key messages.

I think that these sorts of outbreaks, and indeed this pandemic, are likely to occur with increasing frequency. We have a deep knowledge base and expertise in basic science, public health and clinical medicine to counter transmissible infectious diseases. I think we're still challenged a bit by a lack of a collaborative pan-Canadian sort of at-the-ready clinical research infrastructure, and this results in some delays and inefficiencies in our ability to characterize. I think this is something that there are concrete ways to improve upon in the future.

Thanks very much for your time, attention and any questions that might be relevant.

● (1735)

The Chair: Thank you, Dr. Fowler.

We go now to Genome Canada, with Dr. Annan or Dr. Bell to present a 10-minute statement, please.

[*Translation*]

Dr. Rob Annan (President and Chief Executive Officer, Genome Canada): Thank you, Mr. Chair.

Thank you for the opportunity to speak to the committee.

[*English*]

I am here on behalf of Genome Canada and I am joined today by Dr. Cindy Bell, who has been with Genome Canada since we were founded 20 years ago. It played an important science leadership role during the SARS outbreak in 2003 and is doing so again today.

We're very pleased today to join colleagues from the University of Toronto, the Canadian Society for Molecular Biosciences, and the Vaccine and Infectious Disease Organization based at the University of Saskatchewan, to share insights from Canada's bioscience community and to engage in dialogue with committee members.

[*Translation*]

I want to pay tribute to the front-line workers in hospitals, in grocery stores, in pharmacies, at truck stops and at take-out counters.

I'm also thinking of the millions of Canadians who make sacrifices every day to help fight COVID-19.

[*English*]

Mr. Tony Van Bynen (Newmarket—Aurora, Lib.): On a point of order, Mr. Chair, I'm not getting the translation.

Mr. Don Davies: Mr. Chair, neither am I.

The Chair: I'm having problems myself.

Dr. Annan, could you ensure that when you're speaking French that you're on the French channel, and when you're speaking English, you're on the English channel? I think that might help.

Of course, everyone else, make sure you're on the channel that you want to listen to. Thank you.

Please carry on.

[*Translation*]

Dr. Rob Annan: I'm also thinking of the millions of Canadians who make sacrifices every day to help fight COVID-19. We're all facing extreme uncertainty, but we're showing a great deal of strength and resilience.

[*English*]

The challenges facing our world—in human health and disease, climate change and food security—do not involve inanimate objects but the living world and living systems, the world of biosciences. At the heart of these living systems lies DNA, the blueprint of life. DNA is the basis of the science of genomics. At Genome Canada, we believe genomics, responsibly applied, will change the world for the better. That is especially true now as Canadians are in the grip of a terrible biologic pandemic.

Today I will begin with a brief description of genomics and underscore how it is driving immense advances in biosciences. Then I will provide an overview of how genomics is helping us understand and address the current outbreak. Finally, I will introduce you to CanCOGeN, a new national genomics network launched to coordinate and amplify Canada's efforts.

Today Canada is a world leader in genomic research and the knowledge coming out of genomics is transforming our world for the better, but how did we get here?

Genomics is, at its core, the study of DNA, of genes, and how those genes interact with each other and the environment. It's about reading the blueprint of life and using that knowledge to understand how things work, or in the case of infectious disease, don't work.

Genomics is about data—the generation of molecular data about our health, our diseases, our food, our environment—and then using that data to improve our health, support the environment and improve our standard of living. Genomics really came to prominence during the human genome project completed in 2003. That international effort took 13 years and about $1 billion to complete, the equivalent of a biological moon landing.

Since then, we've gained powerful knowledge, technologies and tools, including the ability to read and interpret an organism's DNA, its genome. We can now sequence a human genome practically overnight and for a few thousand dollars, which we are increasingly doing, as genomics begins to find its way into our clinics, our public health labs, our companies and our research institutes. Genomics is producing massive datasets, which, through the application of AI and other tools, are opening our eyes to new understandings, innovative products and groundbreaking therapies.

Canada has some of the world's best researchers working across many sectors from health to agriculture, forestry to energy. They are world leaders in data production and analysis, genome sequencing, gene editing, synthetic biology, novel diagnostics and more.

The Chair: Dr. Annan, maybe speak a little slower. It might make it a little easier for the translators.

Dr. Rob Annan: I am happy to do it. Sorry about that.

Why are we able to do this? It's because since 2000, the Government of Canada has made forward-looking investments to build Canadian genomics excellence through Genome Canada.

I'll say a few words about who we are. Genome Canada is a unique, collaborative national model that has leveraged over $1.5 billion in strategic federal support into 3.6 billion dollars' worth of research through partnerships with provincial governments, industry and other partners. Our federated network of six regional Genome Centres, from Genome B.C. to Genome Atlantic, ensures that Canada's genomic enterprise has national breadth and regional depth.

Moreover, our partnerships with industry, especially small and medium-sized enterprises, and other end-users in the public and not-for-profit sectors ensure that genomics research results have real-world applications. For example, we've helped create 82 start-ups and promoted the growth of 230 other companies. Canadian genomics patents are second worldwide after only the U.S. We help bring research to life.

Let me move to our role in health care and the mandate of this committee. With an aging population and increasing chronic disease rates, the imperative to bring genomic innovations to Canada's health care systems is clear.

Through Genome Canada investments in human health, genomics research has already led to saving lives and improving health outcomes and disease management for patients touched by cancer, heart disease, autism, epilepsy and rare diseases. These investments are at the intersection of genomics and health care and are leading the shift from a disease-oriented system to one that is—

● (1740)

The Chair: Dr. Annan, I'm sorry, but could you slow down a little more again? It's really hard for the interpreters.

Thank you.

Dr. Rob Annan: These investments at the intersection of genomics and health care are leading the shift from a disease-oriented system to one that is more precise, personalized, predictive and preventative. Genome Canada has been laying the foundation for its implementation in clinics across Canada through All for One, Canada's precision health partnership. This strong health genomics foundation has been the engine driving our rapid response to COVID-19 today.

In mid-December, scientists identified and sequenced the genome of SARS-CoV-2, the virus that causes COVID-19, in just 10 days. Scientists around the world, including Canadians, have since been working around the clock to understand what that genome tells us, how it interacts with people and who may be most at risk. They've started to use the viral genome and the mutations it accumulates like a series of fingerprints, so we're able to track the virus's spread and transmission patterns within communities and around the world.

Genomics can also help us understand why some people get very sick while others do not, and identify risks of disease severity and potential health outcomes. This is where CanCOGeN comes in. Announced by the Prime Minister on April 23, CanCOGeN is part of a new national medical and research strategy to combat COVID-19. It is a grassroots effort, led by Genome Canada but driven by Canadian scientists, public health labs and genomics institutions to use genomics to unlock understanding and help shape effective policy.

With the $40 million in federal support announced last week, the network will scale up sequencing of up to 10,000 patients and 150,000 viral genomes from individuals who have tested positive for the virus in order to generate large-scale datasets. CanCOGeN's members include the National Microbiology Lab and provincial public health labs, major genome sequencing centres through CEGn, hospitals, universities, the private sector and the six regional genome centres.

The network will be a coordinated and decentralized model, working with standard protocols for sample collection, data sharing and data analysis across provinces. Results will be shared with public health leaders and deposited in global databases. CanCOGeN will connect with national genomics initiatives around the world, the U.K., the U.S. and elsewhere. It will also align with Canada's national medical and research strategy on COVID-19, including the new Canada immunity task force and national serology study.

The data we collect today will help shape and inform public health policies, including test and trace plans, and will be available to researchers for years to come, enabling studies for future novel viruses to quickly determine how they spread and how to stop them. We are building a sustainable national genomics infrastructure to combat both the current pandemic and the next one.

Beyond the immediate health crisis, we need to think about Canada's future recovery. We know that Canada is not in this fight alone. Countries everywhere have implemented unprecedented health control measures, and how and when we will fully recover economically, socially and psychologically is still unknown. Genomics will make crucial contributions to Canada's economic and social recovery across all regions of the country and key sectors like agriculture, national resource management, advanced manufacturing and public health. It's clear there will be an imperative to develop industrial strategy with an eye to ensuring greater national self-sufficiency, and having made-in-Canada solutions based on genomics and the biosciences will be essential.

This experience has shown us that while we can't predict precisely where science will be needed, it is certain that scientific capacity is essential in a crisis like this, an important lesson we must remember as we emerge from this crisis.

I'll be happy to discuss these ideas further in the question and answer period.

● (1745)

The Chair: Thank you, Dr. Annan.

We go now to the Canadian Society for Molecular Biosciences and Dr. Tarik Möröy.

Please go ahead, sir. You have 10 minutes.

Dr. Tarik Möröy (President, Canadian Society for Molecular Biosciences): Thank you very much.

Good afternoon, everyone.

I would like to thank you on behalf of the members of the Canadian Society for Molecular Biosciences for inviting me to speak before this committee. Many of our members have been at the forefront of the response to COVID-19, and we welcome the opportunity to speak to our experience.

[*Translation*]

Good afternoon.

Thank you for the invitation to appear before the committee today to speak about Canada's response to the COVID-19 outbreak.

Our members have been at the forefront of the response. We welcome the opportunity to speak about our experience this afternoon.

[*English*]

I am a molecular biologist and biochemist by training. I am also a professor at the Université de Montréal and an adjunct professor at McGill University. I have a lab with graduate students, postdocs, and so on. I work on the biology of blood cells and leukemia and lymphoma. I was also president of my own institution and scientific director for over a decade, so I have experience in science administration.

I'm also president of the Canadian Society for Molecular Biosciences. Again, I'm honoured to be here on behalf of our members. The society was founded in 1957, and recruits researchers and professors, mostly from university and research centres involved in biochemistry, cell biology, molecular biology and genetics. We are the group that does the investigator-driven research in the labs all over the country. This laboratory work is mostly basic and fundamental research that generates the knowledge that fuels innovation and trains the next generation of scientists.

We have a four-part mission. We want to promote biomolecular sciences. We would like to foster our younger colleagues, the trainees, the graduate students and the early career researchers. We organize scientific meetings with international visibility and give younger scientists the opportunity to speak and to make their science known. We support the implementation of EDI principles—equity, diversity and inclusion—in academic institutions. We have a strong willingness to do advocacy for science and research towards the federal government. Of course, we support a strong scientific and health research community in Canada and would like to ensure that Canada remains a world leader in innovation and scientific discoveries.

Most of what we know about viruses—how a virus enters the cells, docks into the cells, goes into the cells and replicates all the enzymes and proteins that play into the mechanisms—comes from basic research and fundamental research over many, many years. I have done a Ph.D. thesis on the—

The Chair: Excuse me, Dr. Möröy, but the interpreters are having a problem again. It's a little fast.

Do you not have a headset? Did we sort that out earlier?

Dr. Tarik Möröy: No, the sound was good when we tested it.

The Chair: Okay, just try to speak very clearly and a little more slowly, if you will. Thank you so much.

Dr. Tarik Möröy: My point was that most of what we know about the biology of viruses—and SARS-CoV-2 is just one example—comes from the basic science and knowledge of the biology of cells and how viruses interact. This has become important for all Canadians in this time of pandemic, and the basic science and fundamental research brings the basis to make innovative treatments and cure diseases that affect millions of Canadians. Without the investments—

● (1750)

The Chair: Dr. Möröy, I think we have a problem. We're going to suspend the meeting and we'll sort out this interpretation problem. We'll just suspend for a few minutes to see if we can sort this out. Thank you.

● (1750)

_____(Pause)_____

● (1755)

The Chair: Very well. We shall resume the meeting at this point.

Dr. Tarik Möröy: Do you want me to continue now?

The Chair: Yes, please carry on.

Dr. Tarik Möröy: Thank you very much.

This is by the grace of my daughter Claudia, who has all the equipment needed.

I was saying that most of what we know about viruses—how the virus enters the cell, how it replicates and what the known effects and the known responses are—comes from basic and fundamental research.

With fundamental and basic research, we have all the tools in hand for treatment and for innovative new drugs. We can confront the issues that we face today and that our children will face in the future. We feel strongly that without the investments that have been made by governments, both provincial and federal, to support the scientific community, Canada would have fared far worse in the face of this pandemic.

We would also like to acknowledge the strong and coordinated response of the Canadian government and granting agencies to combat COVID-19. We appreciate the fact that this response has been led by science and the scientific insight provided by the best and brightest scientists from across the country. We also appreciate that the communication has been of high quality in accordance with the difficult circumstances. It's based on the best possible available scientific data. This is also a consequence of science long being identified as a priority for the health and security of Canadians. We will uphold this in the days that come during the pandemic.

We also appreciate the ongoing communications from governments. Here I speak of the Quebec government and the federal government, including Canada's chief public health officer. They have all been guided by science. We acknowledge that this is a difficult task and that adjustments have been made, since situations sometimes change from day to day.

Many of our members have engaged in promising research and have been at the forefront of efforts to address this pandemic. I can give an example from my own institution. Within weeks, we were able to set up a testing lab with our RNA biology experts and with the PCR machines that are in the institute and the level 2 containment facility we have. We are now helping the local hospitals do clinical trials. We will also set up an antibody lab and will soon have a level 3 containment lab, which we already had, but it had to be recertified by Health Canada to do antiviral research with live human viruses.

The fact that we were able to react quickly is due to the government-financed infrastructure of personnel and equipment for fundamental science, such as biochemistry, genetics and so on. I would like to underline that without this, we would not have been able to react so quickly.

The positive aspect, if there is anything positive to say about COVID-19, is how quickly researchers in universities have come together to collaborate and to respond to the new CIHR funding line that has been offered. I can give many examples. Colleagues of mine from McGill University are collaborating with people from Alberta and people from Université Laval with others across the country. It brings scientists together like nothing before. It's really nice to see.

On the other hand, whereas many in the scientific community were preparing for the CIHR spring competition, we have noticed that CIHR has cancelled that competition. When we were ready to evaluate the already-submitted grants, I was on a panel and was notified that the spring competition had been cancelled. As a society, our members and my colleagues are very worried that this will do damage to early career researchers because they have put in their first grant application and are worried about how to finance their research. It is to be noted that Canada is the only country to have a major national financing agency cancel its competitions for funding health research. We worry that this is at the expense of other health research that will still be necessary after the pandemic is over. Cancer research and cardiovascular and diabetes research and many other problems need attention.

We appreciate the quick response of the CIHR, but we would like to underline that we need to maintain support for health research at the same level or an even higher level after the COVID-19 pandemic is over.

● (1800)

As I said, the excellent infrastructure that we have in Canada and the funding have enabled us to respond quickly. This is very paradigmatic.

However, even before the pandemic, there were warning signs that Canada's commitment to its researchers was starting to slip behind that of other countries, and I just want to give a few numbers here.

Canada is only spending 1.5% of its GDP on research and development, whereas the OECD average is around 2.4%. We as a society pointed that out in meetings with members of Parliament and other persons on the Hill early this year. We are no longer in the top 20 countries, and we are lagging behind countries such as the Czech Republic and Slovenia in terms of total research intensity.

Our first recommendation—and I would like to give three recommendations to the Canadian government or to this committee—is that the government enact policies and programs to get our funding on health and research up to the OECD average of 2.4% of the GDP.

We also recognize that in budget 2018 the Canadian government made significant investments in research, following the recommendations of a report of a panel that the government itself established, the fundamental science review, and this was very welcome. However, for fundamental research, I would like to cite one number. It only put into place 60% of what was recommended by the panel and the fundamental science review, putting in place $708 million over four years in budget 2018, while the fundamental science review panel recommended $1.2 billion over four years.

Our second recommendation would be to follow the guidelines of this panel—the Naylor report or the Naylor panel, the fundamental science review—and install $500 million over the next four years to maintain health research at a highly competitive level to keep Canada ready for health challenges that certainly may come.

Finally, our third recommendation is that we believe it is essential to collect data on a wide range of demographics. We have already seen that the pandemic plays out differently in different areas of Canada. We need to ensure that we collect information and data on how different demographics across the country are experiencing the pandemic differently, both to inform our response and other global health crises to come. The data should be collected through a multidisciplinary approach enlisting our social scientists, bioethicists and more to ensure that we gather the breadth of our research, that we quite appropriately analyze how Canadians were affected by the pandemic and how we were effective in our response.

Thank you very much for this invitation. Again, I'd be happy to answer your questions and I look forward to them.

● (1805)

The Chair: Thank you, Dr. Möröy.

We go now to VIDO-InterVac, with Dr. Gerdts or Dr. Hodgson. Please go ahead for 10 minutes.

Dr. Volker Gerdts (Director and Chief Executive Officer, VIDO-InterVac): Good afternoon. Thank you, Mr. Chair.

Thank you very much to the committee for giving us the opportunity to address the committee this afternoon.

My name is Volker Gerdts. I'm the CEO and director of VIDO-InterVac. I'm joined by Dr. Paul Hodgson, who is our director of business development. Both of us have been with the organization for more than 20 years, and personally, I'm still a researcher. I still run a lab and I'm also a professor here in Saskatoon at the University of Saskatchewan, at the local veterinary college.

This afternoon we were invited to talk to you about the ongoing efforts here in Saskatoon at the University of Saskatchewan, so I thought I would start by quickly giving you an introduction to VIDO-InterVac, which stands for the Vaccine and Infectious Disease Organization - International Vaccine Centre, a very long name. It's one of Canada's largest research organizations and is focused on infectious disease research and vaccine development.

We are truly a national facility, collaborating with researchers all across the country. Our InterVac facility, our high-containment lab, which I'll speak about in a second, is really designed to facilitate research in Canada by bringing in collaborators from all across the country to use our facilities and take advantage of the unique infrastructure that we have here.

VIDO-InterVac is a global leader in infectious disease research. We have more than 45 years of experience working in both the animal and human health sectors. We have developed 10 vaccines over the years, six of which were world firsts, so that really speaks to the type of research that's going on here. We have quite a bit of experience working with coronaviruses as we develop vaccines in animals, as well as currently also working on MERS, another coronavirus.

I'll give you an example. Just a few years ago, Canada was facing a coronavirus in pigs that was very similar to what we're seeing now. We responded to it as quickly as we're doing now. We made a vaccine in 18 months, and the vaccine for pigs is being licensed now to commercial producers.

Our research here at VIDO-InterVac is really addressing the threat of emerging diseases. We're one of the few labs in Canada right now that is equipped and has the infrastructure available to work on these emerging diseases, including both emerging human diseases such as the Zika virus, the new COVID-19, MERS or others, and animal health threats such as African swine fever, a very important disease that is currently threatening the Canadian pork industry. That is also being researched here at VIDO-InterVac.

To speak directly about our activities on COVID-19, we started our work immediately when the World Health Organization recognized on January 9, I think it was, that there was a new virus in China, a potential new problem. The same afternoon, we decided that we would start working on a vaccine for it. As soon as the sequence for the virus became available, we designed our vaccine and immediately started to work on it.

I also reached out to Dr. Matt Gilmour, who is the director general of the National Microbiology Lab in Winnipeg, to ask whether there was anything that we needed to do together, anything that VIDO could help him with. I'm proud to say that in collaboration with our colleagues at Sunnybrook and in Winnipeg, VIDO-InterVac was the first lab in the country to isolate the virus from a patient sample. We were the first lab in Canada to have an animal model developed, using ferrets for this. Now we have a second model in hamsters, and we're even working on a third model in cats. We are currently the first lab in Canada to have its own vaccine, which we started to develop right in January, and it is already in animal testing.

We call that the proof of concept stage. We already have animals vaccinated with our vaccine. Next week, these animals will be challenged with the virus and we will see whether the vaccine actually works.

All of that work is happening in our InterVac facility, the International Vaccine Centre. It's one of Canada's and the world's largest high-containment facilities, which speaks to the foresight that the government had several years ago in building a facility that allows us to address emerging diseases when they arise. We can house in there hundreds, if not thousands, of animals right now for our COVID-19 research, and we can host researchers from all around the world to perform this research. For example, Dr. Alyson Kelvin and her group from Dalhousie University are currently running a ferret trial here at VIDO-InterVac. There is a lot of interaction and research going on in collaboration with others right now.

● (1810)

In fact, we now have more than 100 requests from partners all around the world, including big organizations like the Bill & Melinda Gates Foundation, as well as large industry and academic collaborators that want to use these animal models to look at antivirals and drugs and to even test other vaccines. In response, we have ramped up our capacity, and essentially our whole organization is now focused on COVID-19 research. We're using all the infrastructure that we have available right now to run as many studies as we can in parallel.

That initiative was recognized by the government, and we received generous support to do some of this work, which I'd like to acknowledge. You all may have seen the Prime Minister speaking directly about the $23 million for VIDO-InterVac to accelerate our vaccine development. That money will help us to take our vaccine directly into clinical trials.

The prototype of the vaccine has been manufactured already. Over the summer we will do the necessary safety testing—it is very important that we not take any shortcuts there—and we're looking forward to starting our clinical trials in the fall.

There was also an announcement of $12 million for our manufacturing facility. We have been working on this for a few years. Establishing a manufacturing facility right here at VIDO-InterVac in Saskatoon would allow us to essentially take prototype vaccines like the ones we have right now into clinical development to fast-track the process and make it more effective. With the $12 million, we will be able to do this. We're establishing a GMP manufacturing facility right here in Saskatoon, and that will enable us to not only develop or manufacture prototype vaccines for clinical testing, but also, in the long term, manufacture vaccines like the COVID-19 vaccine.

There was also funding from CFI to operate our InterVac facility, and we gratefully acknowledge that it was great support for us. It helps us to operate the facility and has helped us ramp up our research capacity for this work.

It is also important to mention that the Province of Saskatchewan, through Innovation Saskatchewan, provided $4.2 million to help us in our COVID-19 research.

Where are we right now? We're doing a lot of studies currently that address antivirals, as you heard earlier. Other producers and other manufacturers in the world have a lot of promising candidates. There are also some new compounds that hold great promise. We're testing them in our animal models and are offering that testing service to everybody around the world, including the World Health Organization. We're participating in three expert groups with the World Health Organization, and we were part of the expert meeting in Geneva that was organized in February. A lot of our contract requests come from international partners that are asking us to help with their antivirals and therapeutics.

On our own vaccine, as I mentioned, the safety testing will continue over the summer, and we will be able to do the clinical testing early in the fall. One of the highest priorities for us—and that's why I'm saying it again—is to make sure that this vaccine will be available to Canadians. It's a Canadian effort. We have partners in Canada involved in Montreal and we have collaborators from all across the country. The clinical testing will be done at Dalhousie. This is truly a Canadian effort, and the goal is to make sure that this vaccine will be available to Canadians all across the country.

We were asked to quickly address what vaccines are and the differences in these different vaccines.

The technology we are using is called a subunit vaccine, so only a piece of the virus is being used. We're using one of the structures, one of the proteins the virus has.

Other vaccines that are currently being developed globally use the whole virus. That's what we call an inactivated virus. We're just using the viral genome, which in this case will be RNA, although we can also have DNA vaccines.

Last, you may have heard about vectored vaccines. With these, we're using another virus, a viral vector, to deliver just a part of the genome of the virus as a vaccine vector.

● (1815)

Finally, I want to mention our efforts in helping our local communities.

Two weeks ago, we reached an agreement with the Saskatchewan Health Authority. We are using our facility to sterilize and decontaminate N95 masks and other protective equipment. We had this process approved by Health Canada. These masks are now being collected in the hospitals and are being shipped here to VIDO-InterVac, where we now essentially decontaminate them with vaporized hydrogen peroxide, or VHP, which we use here routinely for our processes. We can now decontaminate thousands of masks every week and ship them back to the hospitals to be reused.

My take-home message or summary is that at VIDO-InterVac, we're proud to be part of the national emergency response. We're proud to be part of Canada's response to this COVID-19 outbreak. As an organization, we are very uniquely positioned to rapidly respond to these emerging diseases. We very much acknowledge and are thankful for the support from the federal government as well as the provincial government. While this is helping us a lot in our efforts, and there's a lot of money available now, I think the real message is that we will continue to see these emerging disease outbreaks in the future, so it's very, very important for a country like ours to provide long-term support to organizations like ours, which are uniquely positioned to quickly address these challenges when they come.

Thank you very much.

The Chair: Thank you, Dr. Gerdts.

We'll go now to our questions. As normal, we will go through three rounds of questions.

We will start our first round of questions with Mr. Jeneroux.

Mr. Jeneroux, please go ahead. You have 10...or, sorry, six minutes.

Mr. Matt Jeneroux: Oh, I'd take the full 10 minutes, Mr. Chair.

As well, Mr. Chair, just so you know, I was following the progress of the puzzle that was in the last background you had. I can't do that now with your new background, so you'll have to keep us verbally updated on the progress.

Thank you to all the witnesses for taking the time today. Thank you as well for what you're doing on the ground in the fight against COVID-19. I think it's certainly important to recognize that.

I'd like to start my questions with you, Dr. Möröy, from the Canadian Society for Molecular Biosciences.

The funding from the Naylor report seems to have been stuck at the 60% level for a while now. Are there any indications that we'll see some additional funding to get that Naylor report fully funded?

Dr. Tarik Möröy: Yes, I think you make the right point. We spoke to a number of your colleagues on the Hill in February and made this point. I hope it will make the agenda of budget 2021. Certainly it won't be for this year, as it's already gone. It's important, because otherwise, we will lose our competitiveness with other countries that we have built over the years. In particular, the CIHR or NSERC tri-council open operating grants that fund basic research are very necessary.

I heard from the persons that I and my colleagues from the CSMB board spoke to that 2021 may be a good year for this to be back on the agenda, but this was at a time when COVID-19 was not yet on everyone's agenda, in the early February phase. I hope that budget 2021 will recognize the value of basic science for reacting to pandemics like this and the value of training people. Grants that come in the lab pay Ph.D. students, technicians and post-docs, and it trains them in this way. They will end up in all kinds of biomedicine and biotechnology professions. They may even go to Saskatchewan and develop vaccines with Volker Gerdts, so this is very valuable.

I don't have to underline that the Naylor report was commissioned by the government. It was a very high-level panel, and the recommendations were very well thought through. We would just advocate that we really implement these recommendations.

● (1820)

Mr. Matt Jeneroux: Thank you.

I recall when Minister Ambrose commissioned the study back in a previous Parliament before me.

Would you agree with me, then, that the underfunding of $700 million has had a significant effect on the development of antivirals and a vaccine?

Dr. Tarik Möröy: I would not make a direct line from the underfunding of the $500 million. The $500 million is the sum that has not come up to the $1.2 billion. Making a direct line to not having a vaccine today would be difficult.

What effect it had was that some labs had to be closed. Some junior researchers didn't get the money that they were hoping for or had been trained for, and investments to put into these junior researchers by many institutions and universities were not available. This is the impact that the underfunding had and that it will have in the future—

Mr. Matt Jeneroux: Sorry. I just have a couple of minutes left.

Obviously, in basic research and fundamental research, we don't know what we'll come up with. I guess we don't know whether it could have had a significant impact on antivirals and vaccines.

I want to quickly move over to Dr. Fowler, if I may, and get his comments.

We heard a lot about the splitting of ventilators. They're doing it in hospitals in New York. Could I get your experience on the ground as to whether the splitting of ventilators would significantly help on the ground today?

Dr. Robert Fowler: That's a very specific question around caring for very critically ill patients. It's something that has had a bit of attention in the media. I'll say briefly and to the point that it's probably a bit of a risky practice. It's not one that health care professionals, respiratory therapists, physicians, nurses, etc. would generally endorse as a very good strategy. The specifics we could get into, but it's not a safe practice to undertake as a plan A through F, I would say.

Mr. Matt Jeneroux: It's interesting. We've heard either through testimony or just through a number of other individuals about how it's either working or not working in other countries. Hearing your caution on the ground, I think is probably fair and is something this committee should certainly consider.

Mr. Chair, my time is up, so I'll cede back my five seconds. Thanks.

The Chair: I got you at 30 seconds.

Mr. Matt Jeneroux: You just want to hear my voice for 30 seconds longer. It's fine. I'll give you back 30.

The Chair: Thank you.

We go now to Mr. Fisher. Mr. Fisher, you have six minutes, please.

● (1825)

Mr. Darren Fisher (Dartmouth—Cole Harbour, Lib.): Thank you very much, Mr. Chair.

As usual, thank you so much to all of our witnesses. The amount of expertise that we have in this room blows me away.

Dr. Gerdts, you spent an awful lot of time speaking about the work that your organization is doing. I want to thank you for that. It's incredible and it gives us hope. However, the question I'm going to ask is what I think most Canadians and what most of us in the room are wondering: Exactly how close are we to a coronavirus vaccine?

We've heard a lot from Dr. Gerdts, so I'll start with Genome Canada, then go to Dr. Möröy and then come back to VIDO-InterVac to finish it off.

How close are we to a coronavirus vaccine? Who will vaccines be tested on? How will that be determined?

Dr. Rob Annan: Thank you for the question.

To be totally honest, I am going to defer to the experts at VIDO-InterVac. The work we're doing will no doubt and hopefully support their very important and very good work, but we at Genome Canada are not in vaccine development in anything like the way they are. I'll just defer.

Dr. Tarik Möröy: I think it's very difficult to give you a number of months or years.

I'll give you two examples. HIV has been there for 35 years. We have excellent antivirals, molecules, but no vaccine. The virus is more complicated. There will be a vaccine maybe sometime, but it is difficult. Hepatitis B had a very early vaccine with an attenuated virus and then a recombinant vaccine, which has now been used for decades. Somewhere in between these two it will be.

Now the issue is testing, and Volker Gerdts is the most competent here to answer. You need to test controlled cohorts during the course of an infection, and that takes time. Even antiviral clinical trials can be faster than clinical trials for the vaccine.

There you have hepatitis B and HIV, and we're somewhere in the middle. Predictions are very hard to make.

Dr. Volker Gerdts: I just want to echo that I think it's very hard to exactly predict right now when this vaccine will be available. As you can imagine, we have people here who are working essentially around the clock to get this done as quickly as possible. I think what we might see, though—and this is what I want to alert the committee to—is that some of these vaccine candidates, our own or others from around the globe, might get approval under what is called an emergency authorization. Essentially, after completion of a phase II trial in humans, it may get approval from the regulators to be used in individuals who are facing a higher risk of being infected, for example. Under that scenario, I could see that under an emergency authorization, the first vaccines might become available within the next 12 months.

Mr. Darren Fisher: All right. Thank you very much.

I will say it's amazing that Canadian know-how is playing such a huge part incoming up with a vaccine for coronavirus.

I want to go over to Genome Canada for a quick second.

Dr. Annan, you spoke about the $40-million investment in the genomics network. What is the role that genomics plays in finding a treatment or a vaccine for this virus?

Dr. Rob Annan: The $40 million, broadly speaking, that is going to go to CanCOGeN is split into two pieces. There's a viral sequencing element and a human sequencing element.

On the viral sequencing element, it's really designed to do two major things. One is to use the mutations that accumulate in the virus as it's being transmitted to be able to, in effect, track its spread. It becomes a very useful tool as we start to reduce some of our social distancing to monitor how it's spreading. It also allows us, by looking at regions that are more mutated and less mutated, to perhaps home in on some candidates for these vaccines. That genomic information can be useful to the people who are actually doing the vaccine development.

On the human side, the other $20 million is really to look at the genetic variations between patients and at how those inform their reactions, because what that might do is identify specific genes that are, for instance, more common in low-symptom patients. That could help point at potential therapeutic drug interventions, and so on, that aren't necessarily a vaccine but are rather small-molecule interventions. There are a couple of different strategies in that way.

● (1830)

Mr. Darren Fisher: I guess I'll guide this last question to anyone who feels that they might have insight into this issue.

We know that Canadian companies are working very, very hard to come up with a vaccine, and we know that countries all around the world are doing the same thing. Is there a complete sharing, or is there a feeling of protectionism among these groups, these businesses that are coming forward with perhaps future vaccines for coronavirus? Are they sharing all of this information with every country that's working on this?

Dr. Volker Gerdts: Maybe I can take that question.

As part of these expert group meetings that the World Health Organization is organizing weekly—and we're part of that—many of the vaccine manufacturers are actually presenting their data. They're sharing their data publicly. There is willingness to share the information, the results, with each other.

We have also now seen in the news—and details are just starting to come out—that some of the larger manufacturers, including AstraZeneca, for example, that may have access to certain technologies are considering approaches to make them globally available to other countries, and maybe, under a licence, to allow manufacturing in specific countries. That is something that is currently being looked at and is currently in the process of maturing, so I can't really speak to details, but I think we're seeing that there is a global approach to this.

The Chair: Thank you, Mr. Fisher.

Mr. Fisher's time is up. Is there anyone else who wishes to give a quick answer?

Seeing none, we will go now to Mr. Thériault.

Mr. Thériault, please go ahead. You have six minutes.

[*Translation*]

Mr. Luc Thériault (Montcalm, BQ): Thank you, Mr. Chair.

I want to thank all the witnesses for their important contributions.

I'll pick up from the last question. It was my first block of questions, by the way, this issue—

[*English*]

The Chair: Mr. Thériault, could you bring your mike down in front of your mouth, please? Mr. Thériault, your mike is not—

[*Translation*]

Mr. Luc Thériault: My question is for Dr. Fowler, who participated in the World Health Organization's solidarity clinical trial. Earlier, Dr. Gerdts said that the WHO set up an expert group so that we could strengthen our efforts to work together and share information. You said earlier that you had no conflict of interest in terms of research and grants.

Some people are concerned that intellectual property rights may impede access to treatments and vaccines. They're suggesting alternatives. I gathered from the response earlier that this is still ongoing. How should we manage intellectual property when it comes to the development of treatments and vaccines? In addition, could the traditional marketing contingencies affect the availability of a potential vaccine? Lastly, I want to know what you think about the possibility, which Dr. Gerdts touched on briefly earlier, of the public and private sectors working together on basic research.

[*English*]

Dr. Robert Fowler: Thank you very much. I can take the first stab at this, but I think it's likely a shared response.

I have been helping the WHO with the Solidarity trial. It's a trial that focuses on looking at medications for the treatment of patients with COVID-19 and isn't likely to engage vaccine testing. That's possible, but that's not part of the current layout of the trial. It's very much focused on treatments for patients who right now are hospitalized and sick with COVID.

I'll stop there and maybe turn it over, if you wish, to others working on the vaccine.

● (1835)

Dr. Volker Gerdts: From my perspective, while intellectual property is certainly important for the commercial manufacturers in making sure their technologies are protected, and while these expert groups with the WHO are confidential in nature, I would also say that in a situation like this, intellectual property cannot stand in the way of developing a vaccine for people who are dying on the streets.

I think that is being globally recognized by everybody who is in the business and currently is involved in trying to make a vaccine available as quickly as possible. Speaking for our own organization, it is certainly something that needs to be addressed, but we are not actually addressing it at the moment. At the moment, we're really focused on the science and getting a vaccine as quickly as possible.

Dr. Rob Annan: Perhaps I'll add a perspective from Genome Canada. We're not on the vaccine development side, but the network we're leading is going to be developing and generating an immense amount of data around both the virus and the number of the patients.

Everybody who is involved, from public health labs all the way through to individual researchers, is signing on to commitments to make that data publicly available and deposit that both into national efforts and also international databases that then can support worldwide efforts. It's really very much about open science in terms of the data.

[*Translation*]

Mr. Luc Thériault: I gather from your responses that you don't anticipate that marketing activities will delay the distribution of a vaccine. You don't anticipate any delays in this area. You believe that everyone will work together to make a vaccine available as quickly as possible.

Do I have time for a brief question, Mr. Chair?

[*English*]

The Chair: You have a minute and 15 seconds.

[*Translation*]

Mr. Luc Thériault: Perhaps we could look at this issue from another angle. There's currently no vaccine for HIV, hepatitis C or other coronaviruses because research stopped after the respective epidemics were over. We also don't yet know whether people can develop natural immunity to COVID-19 after contracting the virus.

What makes you think that it's possible to discover and distribute a vaccine for COVID-19, especially since we don't know whether we can develop natural immunity? In addition, if we can't develop immunity, could this factor affect the quick development of an effective vaccine?

[*English*]

Dr. Volker Gerdts: I think you're correct. There are a lot of questions that we simply don't know the answer to at the moment. There are a lot of scientific questions that need to be addressed, such as whether you're susceptible to reinfection or not, if pre-exposure makes you less responsive to vaccination or not, how long vaccine immunity will last, and so on. There are a lot of questions that need to be addressed. Overall, though, comparing this coronavirus to HIV, for example, the chances of getting a vaccine for this one are better than for HIV.

The Chair: Thank you, Mr. Thériault.

We go now to Mr. Davies.

Mr. Davies, please go ahead. You have six minutes.

Mr. Don Davies: Thank you, Mr. Chair.

Thank you to all the witnesses for sharing your expertise and time with us today.

Dr. Fowler, if I may begin with you, in an April 16 article from CBC News, you were quoted as saying:

> There is substantial risk people will see the numbers levelling off and will receive the message that this is time to breathe a sigh of relief. If we hadn't instituted public-health measures, there is not necessarily a lot to separate us from other parts of the world.

In your view, is now an appropriate moment in the outbreak for provinces and territories to contemplate easing public health measures?

Dr. Robert Fowler: I think it probably is a reasonable place to start to plan for easing of the public health measures, but I think the principle of a lot of caution going into easing them is very important. People are not used to this kind of public health measure, the weather is getting better, people are naturally looking to get out and congregate a bit more, and I think that we are still in a very risky period. Even though the numbers have levelled off, it doesn't take very long to find a place where we're having outbreaks. The most obvious example is in our long-term care homes.

I think it's reasonable to start, but I would say we have to start very cautiously and very slowly and be reactive to what we find. It's not as though there's a lot of history to draw upon here, but I think the population is likely to do it anyway, and it's probably good to try to take a very measured approach and to react to what we see.

● (1840)

Mr. Don Davies: Thank you.

Dr. Gerdts, the World Health Organization recently published a brief stating, “There is currently no evidence that people who have recovered from COVID-19 and have antibodies are protected from a second infection.”

The WHO subsequently clarified that it expects that most people who are infected with COVID-19 will develop an “antibody response that will provide some level of protection.” When do you believe we will have some clarity with respect to whether or not COVID-19 infection confers immunity and gives us an indication of the depth of that immunity?

Dr. Volker Gerdts: That's unfortunately still going to take a little while. I can tell you that some of the animal studies to look at reinfection are under way. You infect some animals, then you wait for a little while, let them develop immunity, and you reinfect them. In humans, this is something that is now a part of the Solidarity study and others that are going to address those questions, but it's going to take a little while before we have those results.

Mr. Don Davies: Thank you.

Dr. Annan, in an April 24, 2020, op-ed in The Hill Times, you wrote about scientists that:

> ...they've started to use the viral genome and the mutations it accumulates like a series of fingerprints, tracking the virus' spread and transmission patterns within communities and around the world.
>
> Genomics tracks these changes so we may also determine if new, potentially more severe strains are emerging.

Have any “new, potentially more severe strains” of SARS—CoV-2 been identified to date?

Dr. Rob Annan: Not to my knowledge, no, but of course, one of the themes here is that there is still lots we don't know. No, at this point here, it's my understanding there—

The Chair: Dr. Annan, could you speak more carefully into your microphone?

Dr. Rob Annan: Absolutely.

At this point here, I'm not aware of any of what we call more severe strains caused by mutations, but if one were to emerge, we'd want to catch it pretty fast.

Mr. Don Davies: Are you aware of how many strains of SARS—CoV-2 have been identified globally at all?

Dr. Rob Annan: It's gets into a little bit of a definitional problem, I guess, and what you call a strain. There are thousands of variants now that you can distinguish, based on these mutations. I don't know whether they've been classified into distinct strains. I would defer to my colleagues, who may be a little bit more familiar with the viral phylogeny.

Mr. Don Davies: Thanks.

Dr. Gerdts, I know that VIDO-InterVac has received at least $23 million in public funding from the federal government to develop a COVID-19 vaccine. Were there any conditions attached to that funding you received from the Canadian government that would require you to make that vaccine available to Canadians or to implement a specific funding structure?

Dr. Volker Gerdts: Those negotiations are still under way. I don't know if there is anything at the moment in the contract, but, as I stated publicly, we're making it a high priority to ensure that our vaccine is available to Canadians.

Maybe I'll let Paul Hodgson, our director for business development, jump in, as he is the one who is really spearheading that specific contract.

Mr. Don Davies: Before Dr. Hodgson answers, I'll just throw in a second question for him to consider.

Who will own the vaccine in the end, if you are successful in developing one?

Dr. Paul Hodgson (Associate Director, Business Development, VIDO-InterVac): Those are two easy questions, aren't they?

I think one of the key things, as Volker said, is that our goal is to bring us forward for Canadians. There is nothing in the current funding agreement that would stipulate that, but we received Bill & Melinda Gates Foundation funding years ago, and part of our overall strategy in the organization is global access and ensuring that things are made available. At this point we own the, we could say, intellectual property, but it will be a fundamental aspect for us, as per most of our grants, to ensure that Canada has first rights, I guess, or first ability to receive the vaccine.

● (1845)

Mr. Don Davies: Okay, if I can throw one last question in—

The Chair: I'm sorry, Mr. Davies. Your time is up.

Mr. Don Davies: I guess I can't. Thanks. I will wait for the next round.

The Chair: Thank you, Mr. Davies.

That ends round one. We'll go now to round two and start with Dr. Kitchen.

Dr. Kitchen, you have five minutes, please.

Mr. Robert Kitchen (Souris—Moose Mountain, CPC): Thank you very much, Mr. Chair.

Thank you, everybody, for being here today. It's greatly appreciated that you are taking the time to be here and present to us.

I have a bunch of questions for around the table, but I'm going to start with home field advantage and give it to a place I still have very fond memories of from when I did my residency at Royal University Hospital. I do appreciate your being here.

Dr. Gerdts, I'm taking it that at this point in time, you haven't yet received the funding that was announced. Is that correct?

Dr. Volker Gerdts: I believe that's correct.

Mr. Robert Kitchen: Okay, thank you.

I was very interested to hear you talk about the PPE, and in particular what you've done on the sterilization of N95 masks and the decontamination of them. We've asked the government many times how many masks are being made by Canadians. Can you tell me how many masks every week or every day you would be able to sterilize?

Dr. Volker Gerdts: There are probably thousands per week. I think the estimate is between 6,000 and 7,000 if we use some of our rooms that are currently being used for our research. This is where we might be getting into a little bit of trouble. If we were to use the whole facility just for this purpose, we could certainly decontaminate tens of thousands a week, but we would limit the space we can use for our research. It has to be a good compromise in working with the Saskatchewan Health Authority, and between 6,000 and 7,000 is the number we came up with.

Mr. Robert Kitchen: That's fantastic. We actually have a number, and that's great to hear. Thank you for that.

You talked a little bit about antivirals. From what I'm hearing not only from you and the researchers here today but also from others is that because the emphasis has gone to COVID-19, it's taken away from all the other viruses and all the other research out there. A lot of research, the bioscience, etc., is being left behind while everything is focused on COVID-19. Can you tell me whether you have any idea of how many antivirals we need?

Dr. Volker Gerdts: How many specifically do we need? I think we need to find a few that really work. At the moment, I think the most promising candidates are showing partial efficacy. They are somewhat helpful in this, but we haven't, as of yet, really found a molecule that completely clears infections. The use right now is really limited to getting people more quickly or sooner out of the hospital, but it's not really controlling infection at the moment.

Mr. Robert Kitchen: Where would those antivirals be stored once they were developed?

Dr. Volker Gerdts: Again, they would be developed by commercial partners who have facilities to manufacture them. They follow the same regulations as vaccine manufacturing. They have to be produced in very specific facilities, GMP facilities, that are specifically designed for this purpose, and they would be stored, I'm assuming, with these manufacturers.

Mr. Robert Kitchen: Thank you.

On that same subject, the Public Health Agency of Canada was developed after SARS, and as it came about, a lot of the talk was about storage of antivirals. Are you working with PHAC on developing antivirals?

Dr. Volker Gerdts: We have lots of collaborations with the Public Health Agency. That also includes testing of compounds that might act as antivirals.

Mr. Robert Kitchen: Okay. That's great. Thank you very much. I appreciate that.

Dr. Fowler, I appreciate your being here. Thank you for everything you're doing.

You talked a little about clinical signs. I'm wondering if you could comment briefly, because there are a lot more clinical signs that we're hearing about. Besides the basic respiratory ones, we're now starting to hear issues of clotting, small strokes; children who might present with discoloration of their toes, etc. Can you comment on those for us, please?

Dr. Robert Fowler: Yes. I think that as we learn more about this, we're appreciating the spectrum of presentations that are maybe not the most common but that you notice when you see many patients. Predominantly it starts with a febrile illness of a respiratory nature, a cough. Often you just feel very unwell systemically. Respiratory illness is still the most common presentation to hospital, but we are seeing, as you've mentioned, possibly an increased rate of both venous and arterial clots. I think it's not entirely clear that this is different from baseline severe illness, but there is the suspicion that it seems to be.

● (1850)

Mr. Robert Kitchen: Would a lot of these clots be in the lungs?

The Chair: Thank you, Dr. Kitchen. Your time is up.

We'll go now to Dr. Jaczek. Please go ahead for five minutes.

Ms. Helena Jaczek: Thank you, Chair.

Thank you also to all the witnesses. I'm certainly very pleased to know that the funding the government has announced will be put to excellent use through all the ways you've described to us.

Dr. Fowler, you talked about pan-Canadian collaboration and the need for improvement. I was wondering if you could make some suggestions as to whether some specific mechanisms or structures need to be strengthened in some way. This seems to be a bit of a theme that we've heard from other witnesses through the course of this committee's deliberations. Could you elaborate on what you might see as ways to improve that pan-Canadian collaboration?

Dr. Robert Fowler: Sure. I'll give you two ways. One speaks a little more to the interface between public health and acute care.

One question at the beginning of the outbreak concerned capacity for care in ICUs, because we didn't know how many ventilators or how many ICU beds there were. We had done a study to try to do this brute force accounting by going hospital to hospital a few years ago, and we did come up with probably our best estimates, but there's no obvious mechanism for hospitals to talk to regions or provinces or the Public Health Agency to have this information on a contemporary basis. A mechanism to allow that to feed up at a national level would be helpful.

Second, while I think there have been very good investments from CIHR into this response, one point I wanted to make is that we often fund projects as isolated projects, clinical projects, that then have a shelf life. They tackle one question and then they're done. Not a lot of infrastructure on the ground is ready to go in the clinical research environment. For instance, there aren't research coordinators, nurses, etc., who exist longitudinally, so the start-up time is a little longer. It's hard to get that going in all parts of the country. We find ourselves trying to play catch-up.

Ms. Helena Jaczek: Thank you.

Dr. Fowler, my second question relates to the Solidarity trial. Could you describe which particular drugs are being tried—antivirals, hydroxychloroquine—or what they might be?

You made reference to the fact that some trials have been done, although not in very large numbers, and they were discontinued too soon. How is the Solidarity trial going to be different? Maybe you could elaborate on the numbers you're looking at for each of the medications that will be tried. Will the assignment of the particular medication to the patient be randomized? Will there be a placebo—in other words, no treatment? Could you give us a description of how that is all going to work?

Dr. Robert Fowler: This trial is one that's happening in over a hundred countries around the world, and Canada was one of the early folks to sign on to it. In fact, we helped design a lot of it.

It's a randomized trial, so patients are assessed for eligibility. Then they get one of the treatment arms or the standard of care.

The current treatment arms in Canada include one medication called Kaletra, or Lopinavir/ritonavir, which is typically used for HIV, and very successfully so. It was evaluated in a relatively small trial in China without the ability to be confident in its effect, and it therefore needs to be tested in a large number of people. There are a number of trials happening that will have larger numbers, and this is one of those. The numbers of randomized patients are in the many thousands, as opposed to many hundreds.

Ms. Helena Jaczek: Thank you very much.

Do I have time left?

The Chair: You have one minute.

● (1855)

Ms. Helena Jaczek: My final question is for Dr. Annan.

You've described Genome Canada's work in looking at viral mutations and also at human genetics to see if there are particular tendencies to be susceptible to various viral mutations, etc. You're obviously doing this for COVID-19. Have you done similar work for other viruses, and has it led to some sort of clinical outcome that was successful?

Dr. Rob Annan: Perhaps I'll ask my colleague, Dr. Bell, to answer that. She has extensive experience with clinical research and the medical application of work—

The Chair: Dr. Annan, move your microphone, please.

Dr. Rob Annan: Sorry. I was just passing it to Dr. Bell, who is better positioned than I am to answer the question.

Dr. Cindy Bell (Executive Vice-President, Corporate Development, Genome Canada): We really have not done any significant research on virals before. We did some work in the past with VIDO in our early years in developing vaccines etc., but nothing that would compare to what is needed in this particular case.

The Chair: Thank you, Dr. Jaczek.

We go now to Mr. Webber. Please go ahead for five minutes.

Mr. Len Webber (Calgary Confederation, CPC): My first line of questioning will go toward VIDO-InterVac and Dr. Paul Hodgson.

In his presentation. Dr. Gerdts talked about the development of the 10 vaccines that your organization has developed so far, one being for pigs. It took 18 months to get that vaccine, but it is currently out there and being used.

I want to talk a bit more about the mechanics of who owns the rights to these vaccines and who will have access. I know this was asked earlier by a few others, but I would like some further clarification.

If a company like yours develops a vaccine, is this a licence to print money, or are there regulations about how it can be sold and how it can be distributed? Are there any international agreements or is there a framework in place for the sharing and the distribution of these future vaccines? Will there be a mad rush from all nations, or is there an orderly distribution process to follow? There are a number of questions here in anticipation of a vaccine being developed.

If a company such as yours develops this vaccine here in Canada, is it up to the—

The Chair: Len, I think you cut out there.

Mr. Webber?

Mr. Len Webber: Okay, I don't know what happened there. I froze. I don't know why, but I'm back.

The Chair: Okay.

I think the actual question at the end of your preamble was missed, so please ask it and—

Mr. Len Webber: Okay.

A company such as yours at VIDO, Dr. Hodgson, hopefully will soon develop a vaccine here in Canada. Is it up to you to determine how it will be distributed, or is it the federal government? Do they have a say on how this would be distributed out there worldwide? Maybe you could give us some indication of how it was with the 10 vaccines that you developed in the past.

Dr. Paul Hodgson: Thank you very much for the question.

There's actually a very long and complex answer. The previous vaccines we've developed have been for animals, which is a much simpler regulatory process. The human vaccines generally take 10 years to develop, and the estimates now suggest up to a billion dollars. For clarity, we are not a company. We're a part of the University of Saskatchewan, and even with the contributions from the federal government, we do not have the pocketbooks to bring this all the way up to a full regulatory licence.

That being said, one of the other things that's come up is that we don't know the market demand for this, but given the current population of the world, there is no single vaccine manufacturer that would be able to actually produce enough vaccine to satisfy world demand. I think what we're seeing now, even on the World Health Organization calls, is a fairly open dialogue around how knowledge translation will happen around the world if there is a technology that seems to be the frontrunner.

One of the things that you've potentially heard Dr. Gerdts say on CBC and on other news outlets is that it's a priority for us to ensure that Canada, if it's our technology, has the vaccine. Again, we do not have the capacity to bring this all the way through, but when we work with partners, we never give up ownership of it. We license the technology to be able to have a company produce that. We have clauses in there to ensure that they meet milestones and that the development proceeds as aggressively as possible. There is also usually a clause in there that Canada will get some sort of preferential treatment, either preferential pricing or preferential distribution. It is always a concern of ours as we try to move these technologies forward to licensed products.

● (1900)

Mr. Len Webber: Thank you for that.

As I understand it, whoever does develop a vaccine will certainly cater to their country first, I would think, before the international community would have access to that. It's unknown, but it's something to think about in the future of course, with optimism that a vaccine will be developed.

The World Health Organization has established an international expert working group on the research and development of a vaccine for COVID, and this expert working group has issued a statement. The statement highlights the importance of "efforts to strengthen the unprecedented worldwide collaboration, cooperation and sharing of data already underway. We believe these efforts will help reduce inefficiencies and duplication of effort, and we will work tenaciously to increase the likelihood that one or more safe and effective vaccines will soon be made available to all."

Dr. Fowler, in your testimony here today, you talked about... Of course, it was brought up earlier today—

The Chair: Mr. Webber, please wrap it up.

Mr. Len Webber: Okay.

You talked about the pan-Canadian and international collaboration. You were saying that there's limited collaboration, whereas the World Health Organization says otherwise. I'd like to know. Is there collaboration out there? Is it sufficient?

Dr. Robert Fowler: I think there's a lot of collaboration around the world these days on this topic. I think we could still do better within our country at collaborating longitudinally, yes.

Mr. Len Webber: Thank you for that.

The Chair: Thank you, Mr. Webber.

We go now to Mr. Kelloway, for five minutes, please.

Mr. Mike Kelloway (Cape Breton—Canso, Lib.): Thank you, Mr. Chair.

Hello, colleagues. It's great to see and hear from the witnesses today.

I have two questions. The first question is for Dr. Fowler.

My understanding is that you provided clinical care to patients with SARS in 2003, and I believe that in 2014 you did the same with Ebola. I'd like to hear about how the COVID-19 pandemic compares and contrasts with those outbreaks, given your experiences. What are the key similarities and key challenges in the comparison?

Dr. Robert Fowler: Comparing coronaviruses, SARS-CoV and SARS-CoV-2, there are some similarities and differences. One of the differences I would say is that SARS was, in large part, an illness that we saw in hospital settings. Although it was in the community to be sure, we had outbreaks within our acute care facilities, and it was a very hospital-centric problem for the most part.

COVID has of course been through the community, and we've had very limited transmission within acute care institutions. I think we learned a heck of a lot from our experience with SARS in Canada, particularly in the Toronto area, and that, I think, is generalized across the country. Long-term care homes, however, are a very different story. Whereas it was not an issue back in 2003, one of the defining issues of this outbreak is how long-term care has been hit.

Ebola is very different, and I worked in Ebola treatment units with very few staff and a very different sort of clinical context. There are a lot of psychological similarities, and patients can get very sick, but there are a lot of differences in the clinical presentation. It's a very different kind of disease.

Mr. Mike Kelloway: Thanks very much.

I want to keep on with a different line of questioning with you, Dr. Fowler. You talked about the solidarity project during this session. I'm just wondering if you can go a little deeper in terms of the research with respect to the solidarity project. Are there any promising results from the treatments being used?

Basically, can you give a bit of an update on that project and elaborate on it?

● (1905)

Dr. Robert Fowler: The way this trial works is that there's a continual assessment of the outcomes of the patients who have enrolled around the world. We will have the ability to learn more quickly by participating than we ever would be able to by doing it alone in Canada.

We don't yet have any signal to say that we should stop any of our treatments because of efficacy or because of harm. We're still premature on that basis. You've seen this week that there have been a couple of announcements: one through peer-reviewed literature, and one through a press conference in the U.S. about one medication. I would say it's premature to make any judgment about that one medication.

Mr. Mike Kelloway: Thanks so much.

I'd like to switch my questioning to the witnesses from the University of Saskatchewan. Countries like the United States and Germany, they're exploring antibody testing for COVID-19. We hear there are pros and cons to that.

While we're working on a vaccine, I'm curious as to your thoughts, your opinion, your insight. Is antibody testing something that the federal government should consider?

Dr. Volker Gerdts: Are you referring to testing antibodies in people getting infected or the role of antibodies, or are you talking about antibodies as therapeutics?

Mr. Mike Kelloway: Let's go with the first two and see if we have time for the third one.

Dr. Volker Gerdts: Therapeutics is certainly an approach that is very promising. In fact, we're starting our study in ferrets next week to look at some prominent therapeutics there. There is great promise for therapeutics to act similarly like antivirals. I think there is real value in proceeding with that.

The antibody testing in the public is giving us really good information about the level of herd immunity out there, so testing in that sense, from a public health perspective, is very important to also prepare for or have a better estimate of what the next wave of this disease might look like.

The Chair: You have 30 seconds, Mr. Kelloway.

I think Dr. Möröy had wanted to speak to something you said earlier.

Mr. Mike Kelloway: Very good. Thank you.

Dr. Tarik Möröy: Thank you very much, Mr. Chair.

You mentioned the SARS epidemic. If I'm not completely mistaken, this epidemic just stopped without much being done. There were hundreds of deaths, not thousands or tens of thousands.

The interesting thing that happened after the epidemic was over, from a researcher's standpoint, was that a lot of the funding to study this virus dried up. It's not that nothing was done, but many things came to an end. We, the scientists, read papers from 2007 and so on in small journals that do groundwork in basic science, indicating how many other coronaviruses are out there in pets and how many other variants have been found.

This is the danger in funding research ad hoc and then letting it dry up. I don't want to say that if the research on SARS would have gone fully funded for the years after that we would not have been in this pandemic, but I think it's very dangerous to say, okay, this pandemic stopped so we don't need to fund anything anymore. SARS has shown that this may have been a mistake, with all careful consideration.

I wanted to make this point because when we discussed this on our board and among our colleagues, this was a point that was absolutely stressed. Thank you.

Mr. Mike Kelloway: Thank you so much.

The Chair: Thank you, Mr. Kelloway.

Mr. Thériault, we go now to you. You have two minutes and a half, please.

[*Translation*]

Mr. Luc Thériault: Dr. Fowler, you touched on the topic when you responded to a question.

Am I to understand that you prefer not to comment on the current status of clinical research on the effectiveness of the four medications chosen in the solidarity clinical trial? There has been a great deal of media coverage regarding chloroquine, hydroxychloroquine and remdesivir.

Can you talk about the progress of the research and your results, or would you prefer to stick to your earlier response?

● (1910)

[*English*]

Dr. Robert Fowler: I would say that we're hoping to get results that we can share as soon as possible. It's not that I don't want to give any results. It's just that we don't have an answer yet. It's going to take a little while longer to get a convincing answer for you; I'm sorry.

[*Translation*]

Mr. Luc Thériault: So how do you explain the high-profile media releases in the United States, for example, if the results aren't conclusive to date?

[*English*]

Dr. Robert Fowler: One of the things that I might like to highlight is that there are a couple of places in the world.... The U.K., probably more than any other country right now with this pre-existing network of clinical research ready to go, has been able to randomize about 8,000 patients into a trial that's similar to solidarity. I'm helping with that one and I think that will provide answers very quickly. I'm waiting, just as you are, to see what Anthony Fauci was talking about yesterday, but so far we haven't seen any real results.

[*Translation*]

Mr. Luc Thériault: Okay, thank you.

You said earlier that this type of pandemic should occur more often. I'd like you to explain why. I know that you have experience with various contagions and epidemics, so I also want to know your thoughts on this.

[*English*]

Dr. Robert Fowler: Looking back over the last not even 20 years, with the examples of SARS and pandemic influenza; another coronavirus different from SARS, different from this one, the Middle East respiratory syndrome; avian influenza that pops up time to time in China; and Ebola, all of those are happening at a frequency we never would have imagined 20 or 50 years ago. I think it's happening as we encroach upon the natural reservoirs, encroach upon animal reservoirs. Also we can spread things so much more quickly now because of travel, things that would never have come away from a rural area are now in a different part of the world within 24 hours.

The Chair: Thank you, Mr. Thériault.

We go now to Mr. Davies.

Mr. Davies, please go ahead. You have two and a half minutes.

Mr. Don Davies: Thank you.

Dr. Gerdts, on April 27, an article from Maclean's quoted you as saying:

> The World Health Organization will try to regulate it, but we're seeing already that President Trump is not willing to listen to them.... If an American company produces a vaccine, Trump will try to ensure that all of it goes to Americans—regardless of what the WHO recommends.

Does the WHO have any authority to manage global vaccine supplies? Are there any international safeguards in place to ensure that vaccine supplies are distributed based on need, rather than on national wealth or clout?

Dr. Volker Gerdts: What we have seen already is that certain countries will try to get access to technologies. You are probably aware that the American President tried to get access to a vaccine out of Germany, a technology that looks very promising. The WHO doesn't really have the authority to regulate this. I think what we will see now is that countries, as we discussed before, will try to ensure there is access to vaccines for their citizens.

Mr. Don Davies: Speaking of the WHO, they and multiple other governments have called for an international coordinating body to share access to the technology and know-how to develop COVID-19 vaccines and other medical tools free of patents and with fair pricing and accessibility conditions built in to ensure that people around the world can get access to these medical technologies. If your vaccine, which is being funded by the Canadian public, is shown to work, will VIDO-InterVac be making the technology available to governments and manufacturers around the world to be able to quickly scale up affordable production and access to it?

Dr. Volker Gerdts: As you mentioned, there are various organizations, including CEPI, an international organization, and the WHO. There are global access strategies that are currently being established, and as part of a publicly funded research institute, we think it is very important for us that we ensure, as Dr. Hodgson said before, that our vaccine is available not only to Canadians but also to other countries that are in need of it.

● (1915)

Mr. Don Davies: Thanks.

You've also said:

> We're...talking about a year before we have a vaccine ready. People are dying right now, and the cost to the global economy is already in the trillions. We need to have vaccines ready for whatever the next pathogen might be. And this is where we have to push the envelope.

Could you explain to this committee what you intended when you said "push the envelope"?

Dr. Volker Gerdts: We are doing research now here at VIDO-InterVac where the goal is to have vaccines ready for the next pathogen, the next disease, when we don't even know what that pathogen looks like. Our goal is to develop these technologies, these vaccines that essentially would cover groups or maybe even families of pathogens. You might have a vaccine that protects against all coronaviruses, for example.

The goal would be to have such vaccines available and stockpiled, sitting somewhere now, so that if we had an outbreak like we saw in Wuhan, we could then quickly utilize that vaccine—even if it's not a perfect vaccine—to contain the outbreak and the spread of the disease as much as possible. Advances in science have made that possible now. We can structurally look at the similarities between these viruses and identify areas we should focus on in developing vaccine candidates.

The Chair: Thank you, Mr. Davies.

That brings round two to a close. We start round three with Ms. Jansen.

Ms. Jansen, please go ahead for five minutes.

Mrs. Tamara Jansen (Cloverdale—Langley City, CPC): Thank you very much.

Dr. Fowler, in 2003 a report was released, "Learning from SARS: Renewal of Public Health in Canada". That report mentioned it was necessary to develop "a comprehensive and national public health surveillance system that will collect, analyze, and disseminate laboratory and health care facility data on infectious diseases...to relevant stakeholders."

Here we are in 2020 and we've heard from a number of witnesses today, yourselves included, that no such system for surveillance and data gathering exists within Canada. What grade would you give PHAC on pandemic preparedness?

Dr. Robert Fowler: I would give PHAC a very high grade, based on the resources at their disposal. I would put it in that context.

Mrs. Tamara Jansen: Okay. How would you go from here and make sure that a reporting system becomes a reality? You mentioned numerous times the difficulty of longitudinal information gathering.

Dr. Robert Fowler: Yes, I am a strong supporter of strong public health and strong funding for public health. Despite working in an intensive care unit, I see the value. It's a simple answer, but helping to fund PHAC a little more would be great work from the MPs and the community.

In terms of the sharing of information in the Canadian context through the different jurisdictions, I've encountered a lot of difficulties and red tape. Public health departments at a local level often share up to a provincial level, but those sharings don't often go to the federal level. Some work provincially and territorially with the federal government on facilitating that, I think, would go a great way to sharing.

Mrs. Tamara Jansen: Okay. What is the rate of recovery for those patients placed on respirators?

Dr. Robert Fowler: That's an excellent question.

In the early reports it looked pretty dismal, in that we saw from China and even from the United States that when people were overwhelmed, and only the sickest of patients were getting onto ventilators, the recovery rate was very low. Here at my hospital—it's not anecdotal because there's actually some data but it's a small sample—we haven't yet lost one patient who has been put on a ventilator. That speaks to the range of possibilities when you have the capacity to care for people.

Mrs. Tamara Jansen: Okay. Since the majority of coronavirus deaths in Canada appear to be happening in seniors care homes, should PHAC be looking at their current recommendations to ensure they are adequately dealing with the challenges those institutions are facing?

Dr. Robert Fowler: Yes, 100%.

Mrs. Tamara Jansen: Considering the fact that a vaccine is not a viable short-term solution to enable Canada to get back up and running, what will we need in place to safely loosen restrictions? What does a measured approach look like, practically speaking, in your opinion?

Dr. Robert Fowler: This is speaking population-wise, not long-term care?

Mrs. Tamara Jansen: That's right.

Dr. Robert Fowler: I am conscious that I work in a critical care unit so that's a pretty limited scope of population health. However, having some sense of this, again, a measured approach would be looking at essential services, possibly still ensuring physical distancing among people, still be considering measures like wearing masks when people are in close confines or need to be and very close attention to case counts on a daily basis. I think we will have to pull back and forth for many cycles over the next many months.

● (1920)

Mrs. Tamara Jansen: In regard to masks, that has been a real back-and-forth thing. I know in the very beginning when we were at health committee we heard a lot about not wearing masks. Would you say an integral part of opening restrictions is that all people are wearing masks because they do actually prevent infection?

Dr. Robert Fowler: It depends upon the background prevalence of the virus in the population. When it's very rare, then it probably doesn't make a lot of sense by the numbers. When things are much more common, or if you're still a bit uncertain, then it probably makes some sense. I think that change in the prevalence within the population was in part underlying the change in recommendations that came out from PHAC. We don't do it in the hospital on a daily basis, but as the prevalence changes then we start to do it.

I think we're still in a grey area about whether it's helpful or not, but I would be cautious in moving away from the current policies.

Mrs. Tamara Jansen: Did you know—

The Chair: Thank you, Mrs. Jansen.

We go now to Dr. Powlowski.

Dr. Powlowski, you have five minutes. Please go ahead.

Mr. Marcus Powlowski (Thunder Bay—Rainy River, Lib.): Dr. Fowler, I have one quick question. Did you say that all of the people you've put on a ventilator have lived?

Dr. Robert Fowler: With respect to COVID...?

Mr. Marcus Powlowski: Yes.

Dr. Robert Fowler: Yes, so far, but not everybody is out of the hospital yet.

Mr. Marcus Powlowski: That's fantastic. That's incredible. Fantastic job, Sunnybrook.

I had a question about the start-up times you talked about. I wanted to talk a bit about the use of convalescent serum. As you probably know, this is old technology. I think there were some studies, both with H1N1 and Ebola, suggesting that it might be helpful, but they weren't randomized controlled trials. There is some evidence or “studies” from China suggesting it's effective, again with no randomized controlled trials.

Now Canada has set up the Concord trial—I think Sunnybrook is part of that trial—but the newspaper article yesterday noted that they drew their first batch of convalescent serum yesterday to start this up. I would take it from that you have not yet been using convalescent serum. Why has it taken so long?

Four days ago, I read an article in the Milwaukee Journal Sentinel talking about 2,600 people in the United States having used convalescent serum and, at least anecdotally, it was showing pretty good results. Why is it taking us so long to get this trial up and running?

Dr. Robert Fowler: There are a couple of things. Luckily, we have had many fewer infections in the country and a bit of a delay with respect to the onset of the peak. That pushes us out a little further from the U.S. Also, people could donate plasma post-infection and it could be transfused back into potential recipients. One of the challenges in that is that, despite the potentially hundreds to thousands of different systems in the U.S. where that's been done, I would say that they've learned probably very little from the experience. They can't probably say that the treatment is better than not giving the treatment. Really, the only way to test this, to know for the next thousand patients, is to be able to compare it to the standard of care in a similar group of people.

That's what that study is trying to do, and I think that's the right approach.

Mr. Marcus Powlowski: I want to ask a different question. I throw it to a bunch of you. The witnesses are a very well-educated group who have all been dealing with some aspect of this problem, but we are all in this together, in that most of us have kids, parents or relatives who could potentially be affected by this. We have a foot in both camps: both working with it but also having to live a life involving the reality of COVID-19.

In light of that, both Quebec and British Columbia have announced recently their intention of reopening schools sometime in the next couple of weeks. I want to give you a quote, which I don't want to attribute to anybody, but I think it suggests what some people are saying. It was that there was no evidence that asymptomatic children can spread the disease and little evidence that children can spread the disease to adults.

I would like to hear from some of the witnesses as to whether you think it's time in the next couple of weeks to let our kids go back to school. Does anyone want to start?

I see Dr. Fowler shaking his head. Do you want to start, Dr. Fowler?

● (1925)

Dr. Robert Fowler: That is a very tough one, and I am not expert enough to really comment. I'll just say that I worry that large gatherings will invite transmission.

I might address one particular element, that asymptomatic kids can't spread to adults. I would not stand behind that comment. Kids are certainly more likely to be asymptomatic, less likely to have severe illness, but I think transmission to others is still quite possible.

Mr. Marcus Powlowski: Would Dr. Möröy, Dr. Gerdts, Dr. Annan or anybody else like to respond, please?

Dr. Tarik Möröy: Thank you for this question. I think it has been debated everywhere.

I'm not a public health expert, but you're looking at Quebec. Quebec has a very heterogenous number of infections and deaths in the regions and in Montreal, so I think it would be reasonable to think about or even to debate that you have some regions that could open up and other regions that should wait longer to open up. I think it is a fair consideration to be very careful.

The difference is so big between one of the northern parts of Quebec and the island of Montreal that the people who live in these very less infected areas could ask themselves whether they could send their kids back to school [*Technical difficulty—Editor*] precautions that Dr. Fowler was making—

The Chair: Dr. Möröy, your sound is not very good.

Dr. Tarik Möröy: That specific regional openings can be made, I think could be a consideration. On the island of Montreal, the situation is much different from the situation in the north of Quebec of very few cases. In Montreal and in the care homes in Montreal, I would say the situation is extreme. The debate I was following is regionally opening, yes, but not generally opening.

The Chair: Thank you, Dr. Powlowski. I'm going to have to put an end to it there.

We'll now go back to Dr. Kitchen.

Please, go ahead. You have five minutes.

Mr. Robert Kitchen: Thank you, Mr. Chair.

Dr. Fowler, I just want to follow up on the line of questioning that I was leading into, and Dr. Jaczek actually brought up the one I wanted to talk about regarding other drugs.

I'm interested in knowing whether you have seen, experienced or heard of lung issues, in particular, damage to the alveoli, in high-calibre athletes. Are high-end athletes who are completely physically fit and doing high performance at any greater risk to their lung mechanism?

Dr. Robert Fowler: I'm not sure that I could comment that they're at higher risk, but on the notion that it is only the elderly or only those who have comorbidities who are getting ill, I would say that might be the average. However, I've certainly seen lots of younger people, and some very young people who were previously healthy, who have developed severe disease. That's not the most common presentation at all, the most common risk group, but there are definitely so-called “host factors” in ourselves that might predispose beyond the typical risk factors.

Mr. Robert Kitchen: My concern really would be more along the lines of hemorrhagic collapse and expiring from that.

Dr. Robert Fowler: Yes. It's a good question.

Although we have seen clotting in the blood vessels, we've not seen clinically a lot of hemorrhage, which we can see in other conditions but has not been a prominent feature.

Mr. Robert Kitchen: Great. Thank you very much.

Dr. Möröy, thank you for you presentation. You talked about a positive aspect, the fact that there's collaboration between researchers and scientists. That's great to see, and we're seeing that across the country.

However, one of the negatives you talked about was CIHR cancelling the spring science competition. I wonder whether you could comment on how you see that maybe affecting the basic sciences, and in particular how it might have an impact on viral research.

● (1930)

Dr. Tarik Möröy: When we heard of the cancellation of CIHR spring competition, we were very surprised and now worried, because the way it works in fundamental research is that the institutions, and also the CFI, make a lot of investment in new research. They set up the labs, they provide start-up funding for several years and there are a lot of things going on before the researcher is ready to submit his or her first request for funding. When they are ready and submitted and everything is done, and they are stopped cold like that, it creates a lot of frustration.

It's creating a lot of frustration when they're stopped after all these investments by the institutions have been done, so that's one element.

The second element is that we feel health research should not be at the expense of COVID research. The response was good and I don't want to take anything of that back, but if we are seeing the monies that are flowing into COVID-19 research being subtracted from future competitions, that would compromise what we have in health research.

The Chair: Thank you very much.

Dr. Kitchen, let me just pause your time for a moment here.

I believe Mr. Thériault has his hand up.

Did you have a problem, Mr. Thériault?

[*Translation*]

Mr. Luc Thériault: Sorry to interrupt you, Mr. Chair.

I want to ask the interpreters to make sure that their telephones aren't close to their microphones. We're having the same issue that arose during the audio tests at the start of the meeting. It's unbearable.

[*English*]

The Chair: Thank you, Mr. Thériault.

Mr. Kitchen, please go ahead.

Mr. Robert Kitchen: Dr. Annan, in a press release put out by Genome Canada following the announcement of further funding for COVID-19 research, you stated the following:

> Of critical importance, CanCOGeN will establish and manage a framework for cross-Canada safe data sharing, coordination and analysis.

> Data will be shared with national and international collaborators to enable additional research, including Canadian vaccine development efforts. This will ultimately help respond to the current COVID-19 emergency as well as build capacity to respond and manage future outbreaks of this virus, or other pandemics.

Are you aware of any national framework for information sharing during the outbreaks of SARS, H1N1 or Ebola?

Dr. Rob Annan: Thank you so much for the question.

Again, I'm going to pass to Dr. Bell, my colleague, who may be more familiar with those types of questions, especially with regard to SARS.

Dr. Cindy Bell: I think the model for sharing in these types of epidemics is that the available data can go into public databases that are accessible for use by public health and researchers. It has certainly been the case. There's constantly one that is available for informing the flu. Whether it was available at the time of SARS or not, I'm not sure, but it's certainly the mechanism that we are going to be using for the current work that we're doing on COVID.

Mr. Robert Kitchen: For how long afterwards would you expect an international framework?

The Chair: Pardon me, Dr. Kitchen. We're going to have to suspend for a brief moment. We're having trouble with the French interpretation. They have to reboot the PCs to resolve the issue.

The meeting is now suspended briefly.

● (1930)

_____(Pause)_____

● (1935)

The Chair: The meeting is now resumed.

Mr. Robert Kitchen: Thank you, Mr. Chair. I appreciate that.

I was asked by a reporter about your puzzle, so yes, do keep us informed about that.

Very quickly then, we're hearing that we don't really know whether there was a framework or not. How long would it take for a framework to be created? Do you think it would be best to establish a national framework for data sharing?

If we'd had that in place in December, would that have changed the situation for vaccine researchers?

Dr. Cindy Bell: I'm not aware of, and can't answer the question about all of the data that's needed for the vaccine research development. Maybe our VIDO colleagues could address that. I would say that the PHAC and the provincial health labs have been working together for a number of years and have created frameworks in which they make the data available, not only globally but across each other, and they share it on a very rapid basis.

Some of that, obviously, is important for the vaccine development. Certainly, genomics data has a long history of being made available publicly as quickly as possible. For instance, when the SARS sequence was done at the genome sciences centre in Vancouver, it was immediately released into the public. That is the model that is also proposed for our project in which we are sequencing the viral genomes from up to 150,000 individuals infected in Canada. That will go as rapidly as possible into the public domain, and certainly will be available for use by vaccine researchers.

Mr. Robert Kitchen: Do I have any more time, Mr. Chair?

The Chair: You have 10 seconds.

Mr. Robert Kitchen: I will defer that to your puzzle.

The Chair: Thank you very much.

We go now to Ms. Sidhu.

Ms. Sidhu, please go ahead for five minutes.

Ms. Sonia Sidhu (Brampton South, Lib.): Thank you, Mr. Chair.

Thank you to all the witnesses for being with us and thank you for your contributions.

My first question is for Dr. Volker Gerdts.

I recently had a discussion with Dynacare, a health care solution company, about once there is a vaccine ready to be distributed.

Dr. Robert Fowler, you can join in the answer, too.

What role do underlying health conditions and demographic factors play in the severity of COVID-19? How will this play into the effectiveness of a vaccine? Demographically, who will get the first access?

● (1940)

Dr. Volker Gerdts: There are a lot of questions that need to be addressed. Obviously, we want to make sure that the vaccine is available to the people who need it the most, but as you alluded to in your question, I think it's very important that we make sure that the clinicians are involved in this. Any underlying conditions that may affect the outcome of vaccination need to be addressed by the physician who is seeing the patients.

Ms. Sonia Sidhu: Dr. Fowler, you can answer the second part. I have seen severe impacts on individual families and the community as we battle COVID-19. I'm especially concerned about the vulnerable populations. Diabetics, you can say, is one of them.

What role do underlying health conditions and demographic factors play in the severity of COVID-19?

Dr. Robert Fowler: Sometimes we take more of a measured response in that kind of question, but there does seem to be some very clear signals with respect to age and comorbid conditions, the common ones being hypertension, diabetes, maybe COPD, etc. We've clearly seen that play out clinically, where the vast majority of deaths have been related to illness and older people, particularly those who have risk factors beyond themselves, because of where they live. I would think we would be looking very strongly at not just the individual patient's medical risk factors but the social conditions, and long-term care would play prominently in that.

Ms. Sonia Sidhu: Can you clarify this? When you said recovery rates are sometimes low when they go on ventilators, is that a special population or any particular demographic?

Dr. Robert Fowler: Like many illnesses, the more comorbid conditions you have and the worse your state of health might be before you get very sick with this, the worse you will probably fare in getting COVID.

To clarify the earlier statement, in some of the reports from China, and Wuhan specifically, where I think they were clinically very overwhelmed, the results they had with patients getting off of a ventilator were probably not going to be so generalizable to what we have seen in other health care systems that have been able to keep up with that demand, such as our own.

Ms. Sonia Sidhu: Yesterday I spoke with an exceptional local company, Medtronic, in my riding, Brampton South. This is one of many companies leading the way when it comes to global research. They simply announced that they were releasing their ventilator design to the public to speed up research and production.

I know my colleague asked that question before, but my question is for whoever can answer. What other examples of international and Canadian collaboration can you list, and how can we speed up global research corporations? I know funding is one way, but can you elaborate?

Dr. Robert Fowler: I think on the clinical research side—I'm a bit biased because it's a lot of what I do every day—there is, I would say, tremendous global collaboration on clinical research right now. I think people have realized that in order to get answers most quickly, we are going to need to collaborate across the world on trying to figure out what treatments work and don't work.

Dr. Rob Annan: Certainly I'll say from Genome Canada's perspective that the researchers as individuals are used to collaborating internationally. What we're seeing now is a more systematic approach to this and we're having a lot of international tools. For instance, there is something called the Global Alliance for Genomics and Health, which serves to have set standards and share best practices. Its secretariat is actually based here in Canada but it is operating internationally. They do a lot of coordination work to support that on-the-ground collaboration.

Then we've had a number of companies, data companies in particular but also other biotech companies, reaching out to us just to offer to help and not for their own personal intellectual property development but to offer their services. I think we're certainly seeing a motivation like we haven't seen before.

The Chair: Thank you.

[*Translation*]

Mr. Martin Champoux (Drummond, BQ): Thank you, Mr. Chair.

I want to thank the witnesses for being available and for sharing their knowledge. It's very informative, and I appreciate it.

My question concerns an important factor for the future, which is the immunization acquired after contracting and beating the disease. To date, approximately one million people worldwide have recovered from COVID-19, including over 21,000 people in Canada. I don't think that we have any data to date that would lead us to believe that people have contracted the disease a second time.

My question is for Dr. Möröy and Dr. Gerdts.

How long must we wait before we have a good idea of the level of immunity acquired after fighting the virus? On that note, could more concrete tests be carried out on people who have recovered to ensure a faster verification of this factor? For example, can they return to a high-risk environment or can we "test" them in a laboratory by exposing them to the virus?

● (1945)

[*English*]

Dr. Volker Gerdts: Some of this work is ongoing already. There is work, studies, going on with some individuals who have had an infection and recovered from the infection. What we are learning from them is how long immunity lasts, what effective mechanisms play a role in protection and how those can be built into the vaccine research we are doing.

In terms of how long one would have to wait, you essentially develop a very strong immune response after infection. Typically within a few weeks you have a good adaptive immune response and that typically lasts months and hopefully longer. That is what we don't know at the moment. Certainly it would be great to study some of this. I think ethically it will have to be specifically addressed whether you can expose these individuals to the virus or put them in a higher-risk situation, but certainly those things are very important. We can learn a lot from people who have recovered from this infection.

Dr. Tarik Möröy: In the research community there are ongoing efforts to build biobanks of patient samples, and to test the serum antibodies to see whether these antibodies are neutralizing antibodies; you require these. For this we have many research institutions that are building up infrastructure to test and to come to a conclusion as to when these neutralizing antibodies appear and whether they can be used. There is still upstream research to be done. I'm not certain that you can take plasma from anyone who had the disease and use it as a therapy. Some research has to go on before you can do this.

The Chair: Thank you, Mr. Champoux.

We go now to Mr. Davies, for two and a half minutes, please.

Mr. Don Davies: Thank you.

Dr. Hodgson, in a recent article you noted that Canada's capacity to manufacture a vaccine domestically is concerning. You were quoted as saying "From a national security or emergency preparedness perspective, the manufacturing capacity we have has really started to go down". Should the federal government take steps to expand Canada's vaccine manufacturing capacity and, if so, do you have any specific recommendations in that regard?

Dr. Paul Hodgson: I should qualify that. Canada has some fantastic vaccine manufacturers, but a lot of these facilities are built for specific vaccines. Basically, Sanofi Pasteur's largest investment ever was to enhance a facility in downtown Toronto, but that's for a specific vaccine. I think you've already seen the federal government do that. They awarded us $12 million to increase our vaccine manufacturing in the level 3 facility as well as NRC.

I think the side effect of this is that companies have looked at this again and are going to bring up their own capacity. For sure, there are two sites already from the government announcements, our own and NRC's, that are now going to be GMP production facilities, I'm assuming, for emergency response. That's one of the key ones for our facility.

Mr. Don Davies: Dr. Hodgson, this article was from April 25, five days ago. What were you thinking about when you were expressing your concern?

Dr. Paul Hodgson: I have been working on vaccine manufacturing capacity in VIDO-InterVac for over a decade. The federal government put an initial amount of money in to help build this in 2018, but it's a general consensus from emergency preparedness. It's not a hard calculation. If we have 35 million people, and we need a rapid-response vaccine, what capacity do we need in Canada, assuming the border is shut down for whatever reason and we're not able to get it?

I think you have seen a response to that. One of the questions we were asked a lot before the money was awarded was this: If we fund this, how many vaccines can you produce? That's a very tough question because efficiency of production changes for every vaccine.

● (1950)

Mr. Don Davies: Finally, to you, Dr. Fowler, recently Canada's first ministers released a joint statement again defining the criteria that need to be in place in order to begin to take steps to reopen the economy, including ensuring that expanded health care capacity exists to support all needs, including COVID-19 patients and non-COVID-19 patients. From your experience, do we currently have sufficient capacity to support the needs of all patients? If not, how long do you think it will take to develop that capacity?

Dr. Robert Fowler: We usually run our hospital over 100% occupied, and the ICU similarly. On a good day, I would say I worry about capacity. Right now we're looking in hospitals to slowly ramp up on procedures that we think we can do safely and not stress the system.

It's a bit of a wishy-washy answer, but I'd say it's a very delicate balance right now. I think we have to be very careful over the next couple of weeks.

The Chair: Thank you, Mr. Davies. That wraps up round three.

I'd like to thank all of our great witnesses for their information and for sharing their expertise and so much of their time with us. I certainly wish you well as you proceed along this very important trajectory that you're on in this quest for solutions.

I'd also like to thank the interpretation people and the staff for all their efforts today.

To the members, thank you very much for your time, and I look forward to the next meeting, which will be Tuesday.

Thank you. The meeting is adjourned.