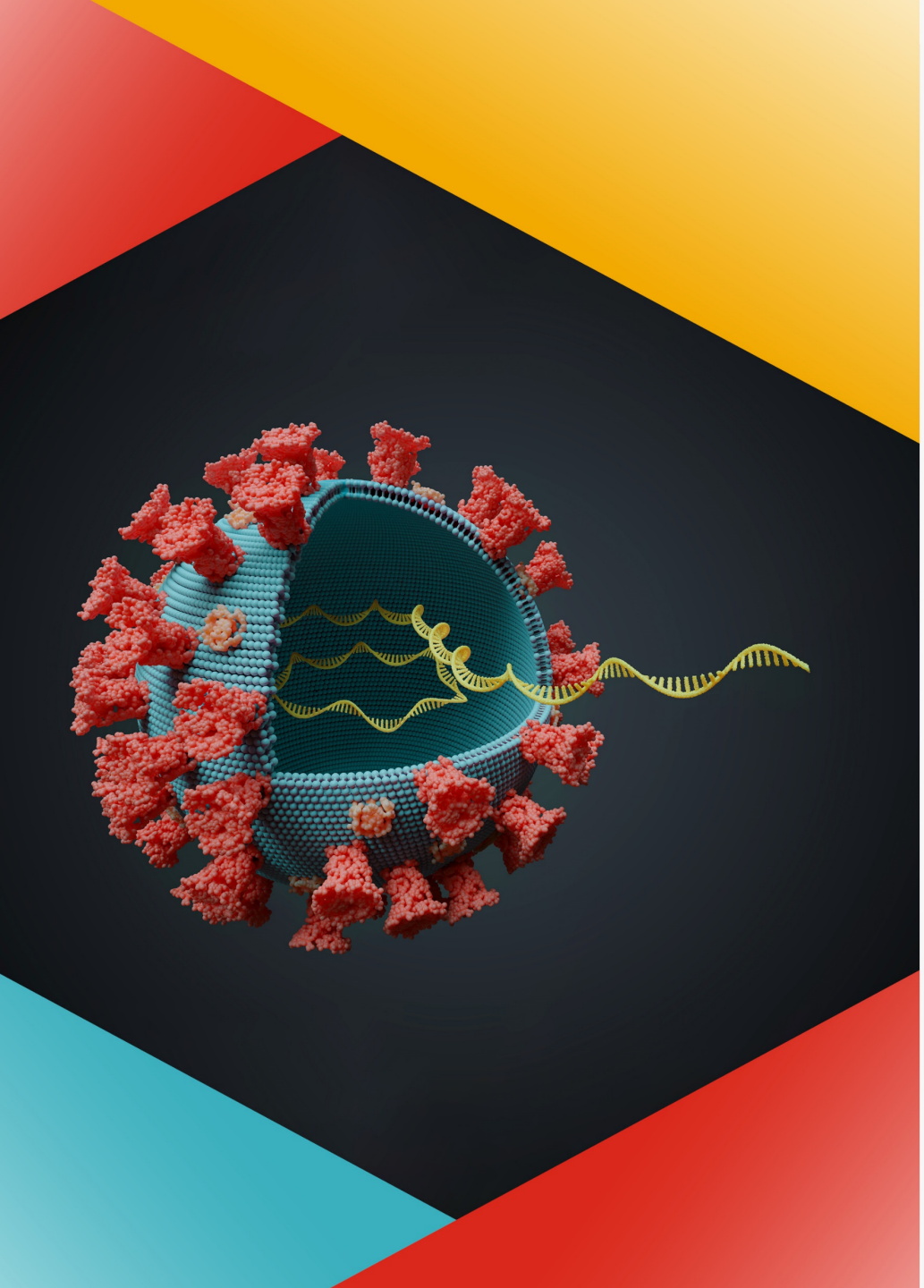


COVID-19 IMMUNITY TASK FORCE | GROUPE DE TRAVAIL SUR L'IMMUNITÉ FACE À LA COVID-19

CanCOVID

in partnership with CoVaRR-Net

Seminar Series | Panel Discussion

Omicron and other variants of concern: finding our way forward

February 23, 2022 | 11:30 a.m. – 12:30 p.m. EST

Moderator

Catherine Hankins, MD, PhD, FRCPC, CM

Co-Chair, COVID-19 Immunity Task Force

Professor of Public and Population Health, Faculty of Medicine and Health Sciences, McGill University

Speakers

Dr. Catherine Hankins, Introduction to CITF and to topic

Dr. Marc-André Langlois, Executive Director, CoVaRR-Net and Professor at University of Ottawa – Introduction to CoVaRR-Net and to variants of concern (VOCs)

Panelists: CITF-funded researchers focussing on variants of concern (VOCs)

Dr. Mark Brockman, Simon Fraser University; Immunology & Vaccine Protection Pillar Deputy, CoVaRR-Net

Dr. Anne-Claude Gingras, Lunenfeld-Tanenbaum Research Institute, University of Toronto; Functional Genomics & Structure-Function of Variants of Concern Pillar Lead, CoVaRR-Net

Dr. Jun Liu, University of Toronto

Dr. Ciriaco Piccirillo, Research Institute of the McGill University Health Centre; Immunology & Vaccine Protection Pillar Co-Lead, CoVaRR-Net

Dr. Jeff Wrana, Lunenfeld-Tanenbaum Research Institute, University of Toronto; Viral Genomics & Sequencing Pillar Deputy, CoVaRR-Net

Disclaimer

None of the panelists have conflicts of interest to declare related to this presentation.

COVID-19 Immunity Task Force mandate

Established by the Government of Canada in April 2020

Mandate:

Catalyze, support, fund, and harmonize knowledge on SARS-CoV-2 immunity for federal, provincial, and territorial decision-makers to inform their efforts to protect Canadians and minimize the impact of the COVID-19 pandemic.

CITF: Priority areas of research

SEROPREVALENCE STUDIES

Assess the extent of SARS-CoV-2 infection across Canada

IMMUNE SCIENCE

Understand the nature of immunity arising from infection

IMMUNE TESTING

Develop improved antibody testing methods

VACCINE SURVEILLANCE

Help monitor the effectiveness and safety of vaccines

BOOSTERS

Understand if and when different populations need booster shots

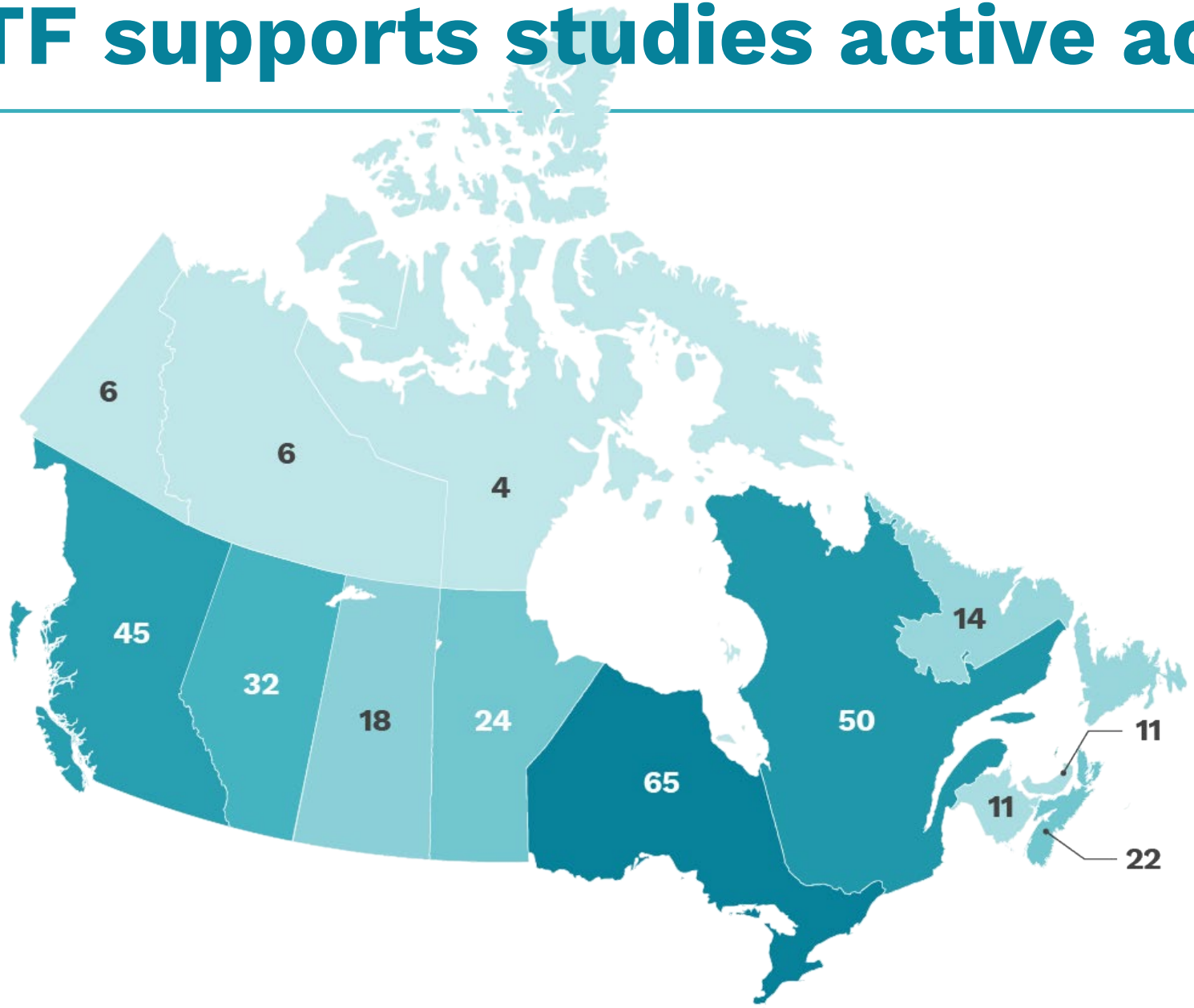
PEDIATRIC VACCINATION

Research safety, effectiveness and immunogenicity of vaccines in children under 21

IMMUNITY MODELLING

Model trends in overall immunity across Canada

CITF supports studies active across Canada



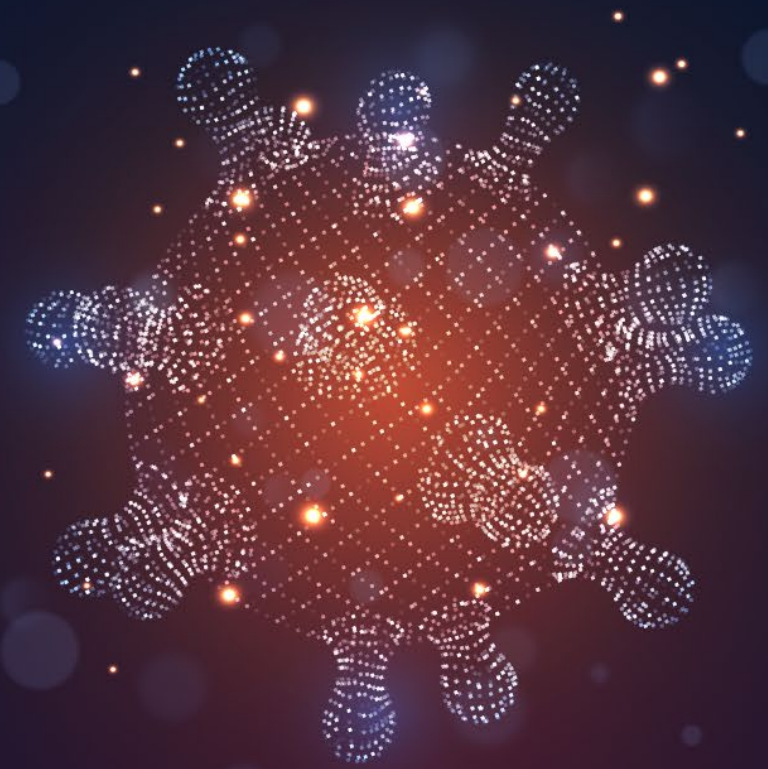
112 studies

Many of which include studies on **variants of concern** (VOCs)

Coronavirus Variants Rapid Response Network

Réseau de réponse rapide aux variants du coronavirus

CoVaRR-Net:
Its role in studying SARS-CoV-2 variants of concern and setting the stage for pandemic preparedness



Marc-André Langlois, PhD
Executive Director, CoVaRR-Net

February 23, 2022

FUNDED BY CIHR IRSC Canadian Institutes of Health Research / Instituts de recherche en santé du Canada

Coronavirus Variants Rapid Response Network

Réseau de réponse rapide aux variants du coronavirus

Overarching Goal:

Unite **Canadian** researchers* to understand and bring the SARS-CoV-2 pandemic to an end AND anticipate what is next.

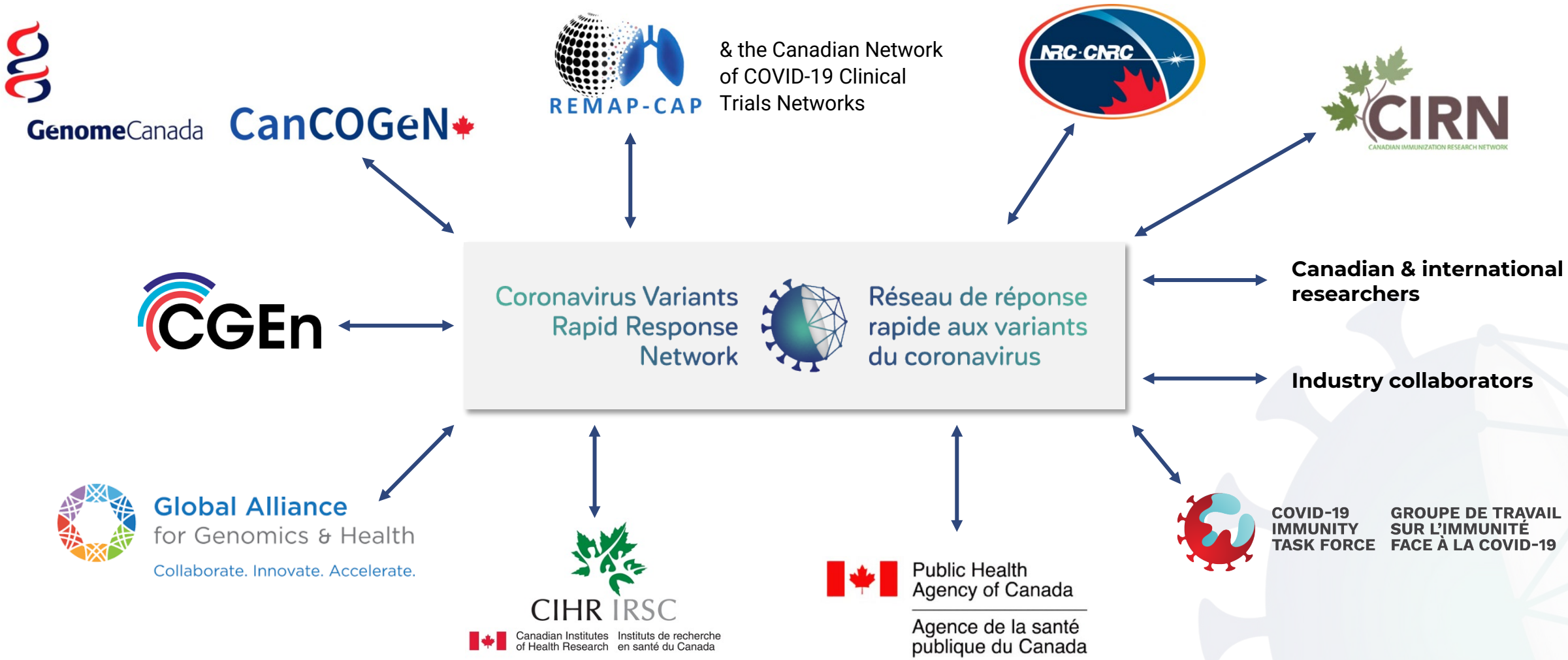
Our mission:

To **rapidly and efficiently** act on the emergence of new SARS-CoV-2 variants of concern (VOCs) by:

1. Functionally **characterizing current and emerging VOC features**, including the potential for vaccine resistance, breakthrough infections and immune escape;
2. Predicting **evolutionary trajectories** and testing features of possible future VOCs;
3. Creating new research tools and reagents, as well as **new data and sample sharing infrastructure** to facilitate and accelerate research; and
4. Communicating **new information in real-time** to Canadian public health officials and decision-makers, as well to the broader international scientific community and public.

*Academic & government; basic, clinical & applied

CoVaRR-Net is a Network of Networks



Coronavirus Variants Rapid Response Network

Réseau de réponse rapide aux variants du coronavirus

Communications

Timothy Caulfield
University of Alberta
Director of Misinformation Assessment and Response

Fatima Tokhmafshan
McGill University
Community and Patient Engagement and Outreach Director

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University of British Columbia
Director

Dr. Claire Betker
University of Saskatchewan
Associate Director

Dr. Cecilia L. Jenkins
University of Ottawa
Network Operating Officer

Dr. Nidhi Chaudhary
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Deputy

Dr. Mark Brockman
Simon Fraser University
Deputy

Dr. Hélène Decaluwe
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Deputy

Dr. Manish Sadarangani
BC Children's Hospital Research Institute
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Pillar 1
Immunology & Vaccine Protection

Dr. Ciriaco Piccirillo
McGill University
Pillar Co-Lead

Dr. Jen Gommerman
University of Toronto
Pillar Co-Lead

Dr. Jason Kindrachuk
University of Manitoba
Deputy

Dr. Arinjay Banerjee
University of Saskatchewan
Deputy

Pillar 2
Host-Pathogen Interactions

Dr. Selena M. Sagan
McGill University
Deputy

Dr. Samira Mubareka
University of Toronto
Deputy

Dr. Angela L. Rasmussen
University of Saskatchewan
Pillar Lead

Dr. Bradley Scott Pickering
Canadian Food Inspection Agency
Deputy

Pillar 3
Virology

Dr. Stephen Barr
University of Western Ontario
Deputy

Dr. Darryl Falzarano
University of Saskatchewan
Deputy

Dr. Silvia Vidal
McGill University
Deputy

Dr. Jennifer Corcoran
University of Calgary
Deputy

Dr. Louis Flamand
Université Laval
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Dr. Denis Leclerc
Université Laval
Deputy

Pillar 4
Functional Genomics & Structure-Function of VOCs

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Université de Montréal
Deputy

Dr. James Rini
University of Toronto
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University of Toronto
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Deputy

Pillar 5
Viral Genomics & Sequencing

Dr. Robert Delatolla
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Dr. Terrance P. Snutch
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Dr. Jeff Wrana
Lunenfeld-Tanenbaum Research Institute
Deputy

Dr. Ioannis Ragoussis
McGill University
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Dr. Caroline Quach
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Pillar 6
Computational Biology and Modelling

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Pillar Co-Lead

Dr. Jesse Shapiro
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Pillar Co-Lead

Dr. Morgan Langille
Dalhousie University
Deputy

Dr. Jörg H. Fritz
McGill University
Deputy

Dr. Caroline Colijn
Simon Fraser University
Deputy

Dr. Fiona Brinkman
Simon Fraser University
Deputy

Pillar 7
Indigenous Engagement, Development, and Research

Dr. Kimberly R. Huyser
University of British Columbia
Pillar Lead

Dr. Michelle Johnson-Jennings
University of Washington
Deputy

Dr. Katherine Anne Collins
University of Saskatchewan
Deputy

Pillar 8
Public Health, Health Systems and Social Policy Impacts

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Pillar Co-Lead

Dr. Cory Neudorf
University of Saskatchewan
Pillar Co-Lead

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Ottawa Hospital Research Institute
Deputy

Dr. Andrew Morris
Mount Sinai Hospital
Deputy

Brenda Andreas
Saskatchewan Health Authority
Patient Representative

Pillar 9
Knowledge , Implementation and Training Team (KITT)

Dr. Melissa Brouwers
University of Ottawa
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Dr. Jeremy Grimshaw
Ottawa Hospital Research Institute
Pillar Co-Lead

Dr. John Lavis
McMaster University
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Dr. Justin Presseau
Ottawa Hospital Research Institute
Deputy

Bioethics and Shared Resources

Bioethics

Dr. Raphael Saginur
Ottawa Hospital Research Institute
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Dr. James Robblee
University of Ottawa Heart Institute
Co-Director

Biobank

Dr. Angela M. Crawley
Ottawa Hospital Research Institute
Director

Dr. Curtis Cooper
Ottawa Hospital Research Institute
Clinical Associate Director

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Bruyère Research Institute
Director

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McGill University
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Susanne Kraemer
McGill University
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Coordinators

Laurie Seifried
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Pillars 1 & 4

Annie Gravel
Université Laval
Pillar 3

Kylie Tingley
University of Ottawa
Pillar 9

Laura Tamblyn
Ottawa Hospital Research Institute
Biobank

Traci Christianson
University of Saskatchewan
Pillar 7

Khatira Mehdiyeva
University of Saskatchewan
Pillar 8

Summary of Pillar Expertise and Research

Pillar 1 | Immunology & Vaccine Protection

Investigating how the immune system responds to emerging variants and assessing the effectiveness of vaccines against them.

- T cell epitopes and responses
- Vaccines

Pillar 2 | Host Pathogen Interactions

Exploring the interactions between SARS-CoV-2 variants and different host species to understand infection and disease, both in the laboratory and the field.

- Studying viral spillover in various animal hosts

Pillar 3 | Virology

Evaluating the virus' features in cells and animals. These include measuring infectivity, pathological effects, and vaccine and immune resistance in animals.

- Reverse Genetics and In Vivo & In Vitro Characterization of VOCs

Pillar 4 | Functional Genomics & Structure-Function of VOCs

Studying different areas of viruses & how they interact with cells

- High-throughput genetic interaction network mapping in human cells
- Structural investigation of cell membrane and secreted proteins
- Cell engineering, genome editing and computational biology

Pillar 5 | Viral Genomics & Sequencing

Reading each variant's genetic code and looking at the relationships between the sequences of the parent virus and the variants.

- Infectious diseases, epidemiology
- Genomics, sequencing technology

Summary of Pillar Expertise and Research

Pillar 6 | Computational Biology and Modelling

Using computer modelling and calculations to evaluate the genetic evolution of variants and how quickly they propagate in the Canadian population.

- Bioinformatics & modeling
- Immunogenomics

Pillar 7 | Indigenous Engagement, Development, and Research

Building partnerships with Indigenous communities and working collaboratively with the upcoming Indigenous Network for VOCs in multiple areas.

- International Indigenous engagement
- Culture, language, and identity

Pillar 8 | Public Health, Health Systems and Social Policy Impacts

Studying the impacts of the variants on public health, our healthcare system, and on social policy and reporting these findings to decision-makers and government officials.

- Social policy, public administration, governance
- Patient representation

Pillar 9 | Knowledge Mobilization

Connecting all activities from the other nine Pillars and quickly and efficiently sharing findings in order to best advance discoveries and inform decision and policymakers.

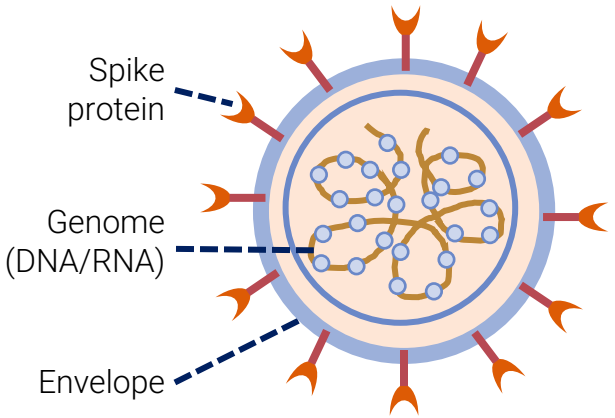
- Health research methods, evidence, and impact

Pillar 10 | Antimicrobial drug and treatments (New for 2022!)

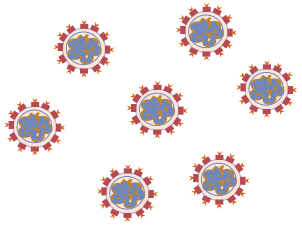
Identifying and profiling leading antiviral therapeutic candidates against emerging SARS-CoV-2 variants of concern and other viruses with pandemic potential.

- Identifying lead candidate antiviral compounds
- Prioritizing them for testing against emerging viruses of concern, including clinically approved and late-stage drugs in clinical trials

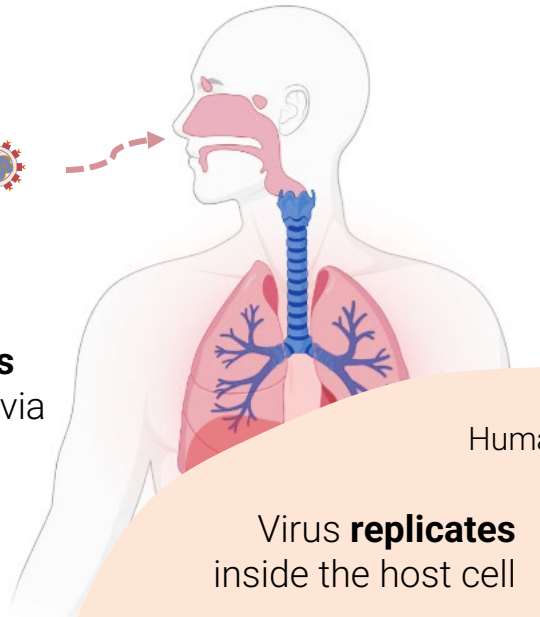
How a virus mutates to generate a new variant



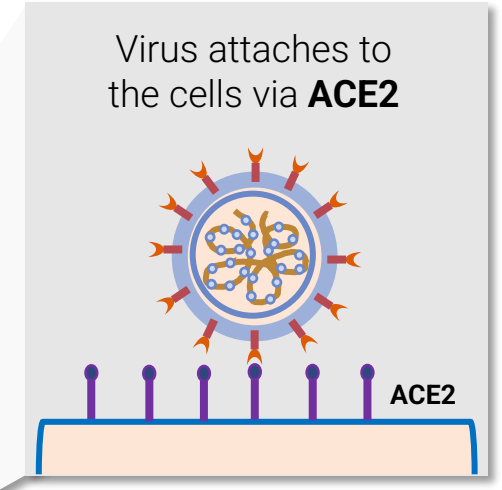
Simplified Virus Structure



Virus **enters human body** via airways

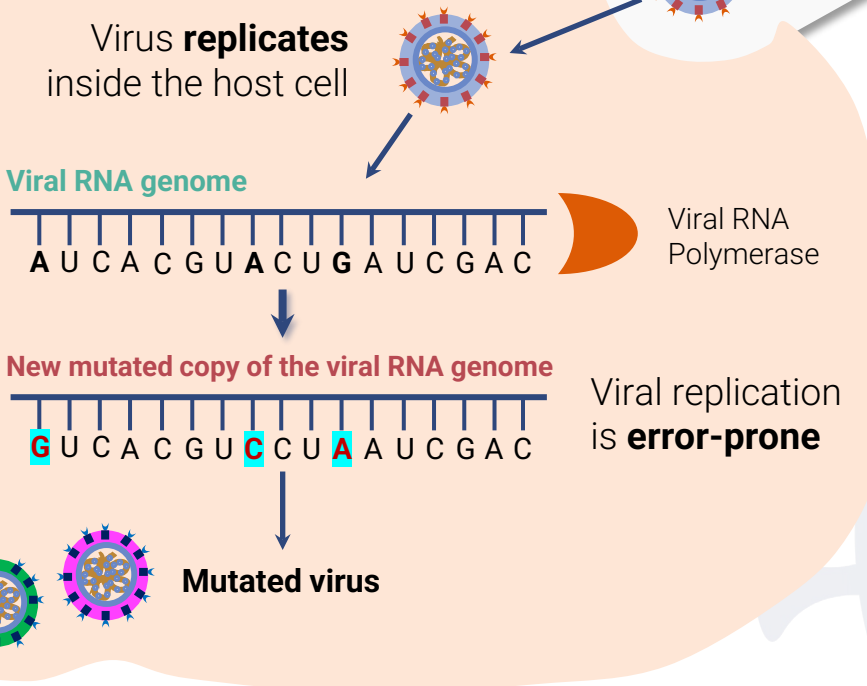


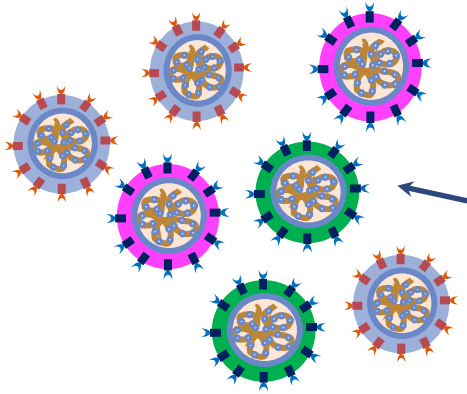
Virus **attaches and enters human cells** (infection)



Human cell

Virus **replicates** inside the host cell

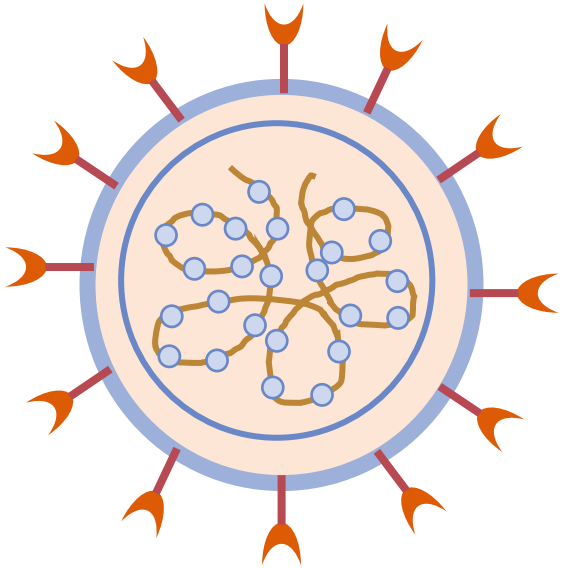




New variants exit the cell

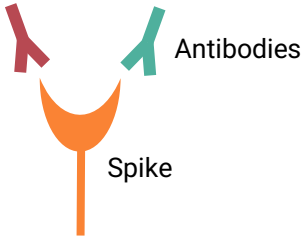
How new variants emerge:

Dominant circulating variant

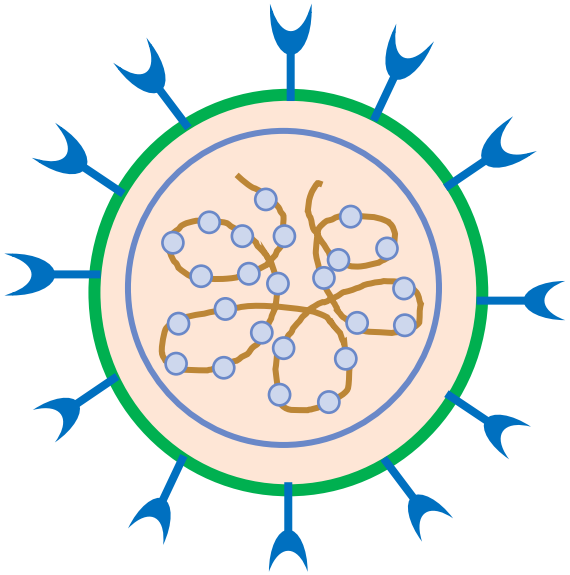


Replication errors (mutations)

Immune selection



Prior immunity, or lack thereof, influence the emergence of new variants



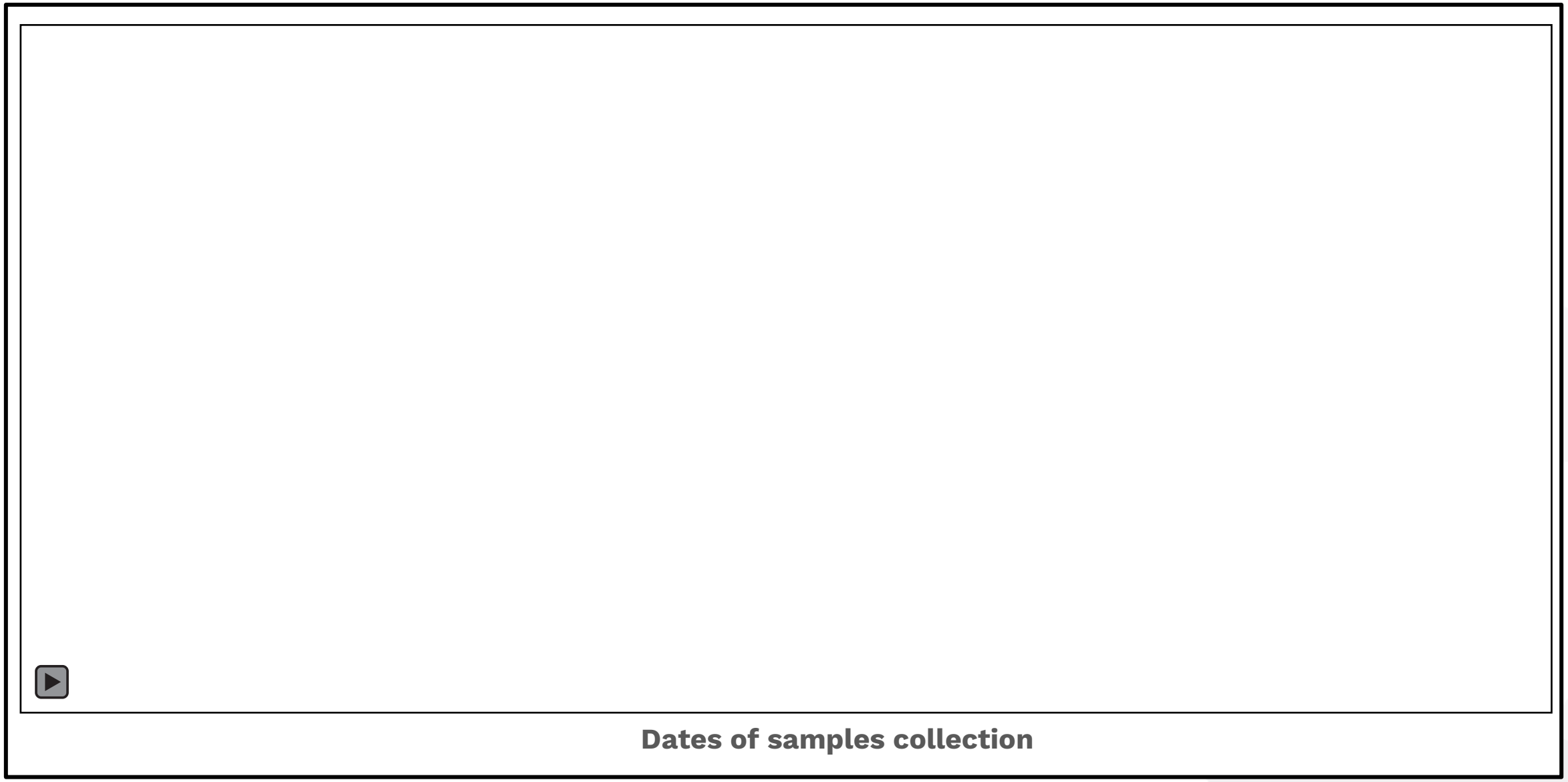
New variant (mutated virus)

Can be (but is not always):

- More transmissible
- Evades immune responses
- More virulent (cause more severe disease)

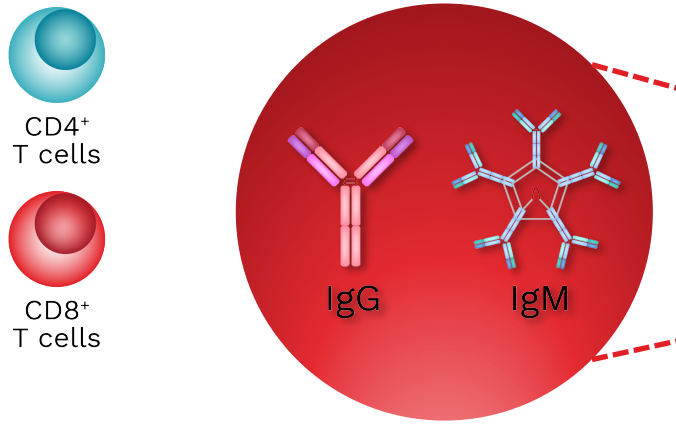
A more problematic variant can be generated, this is what we call a variant of concern (VOC)

Presence of variants of concern (VOCs) over time

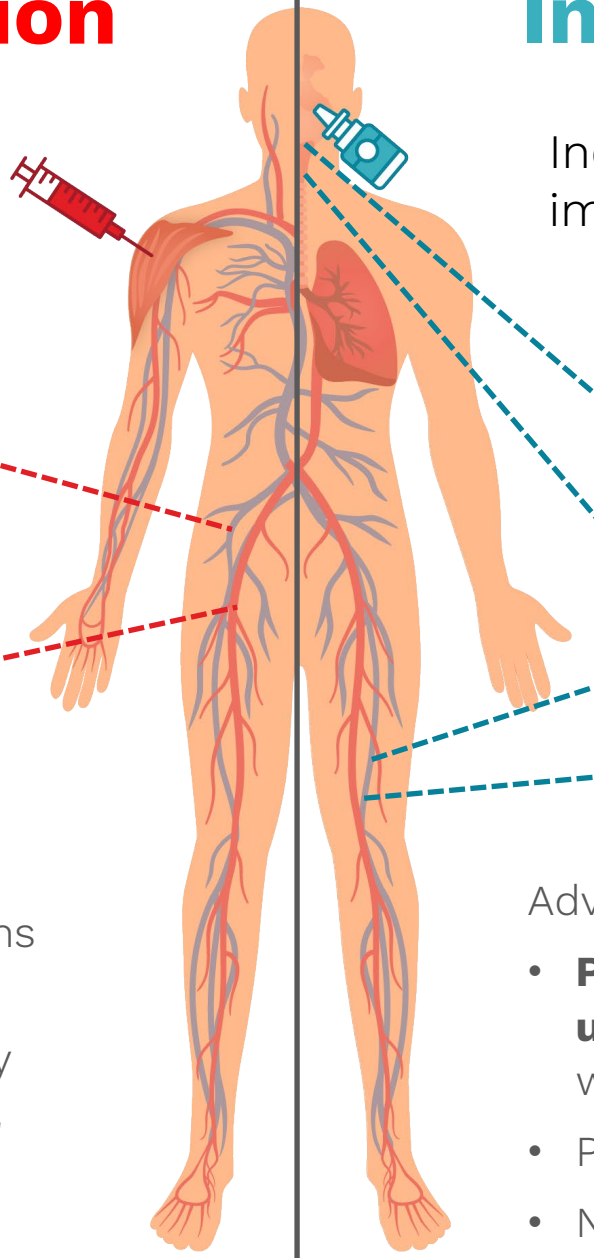


Intramuscular Injection

Induces **systemic immunity** (e.g., antibody and T cells in blood)

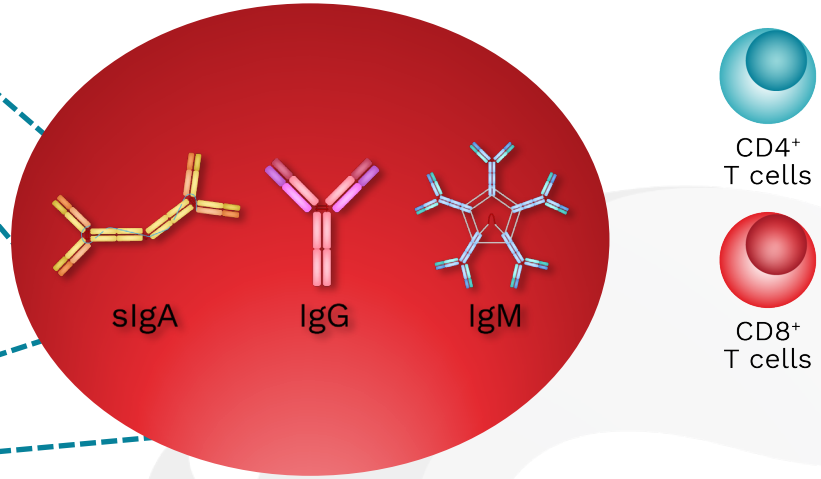


- Provides effective protection of vital organs (lungs, spleen, heart)
- Prevents lung inflammation and pathology
- **Unable to prevent infection in the upper airway**



Intranasal Inhalation

Induces **both systemic and mucosal** immunity (secretory IgA)

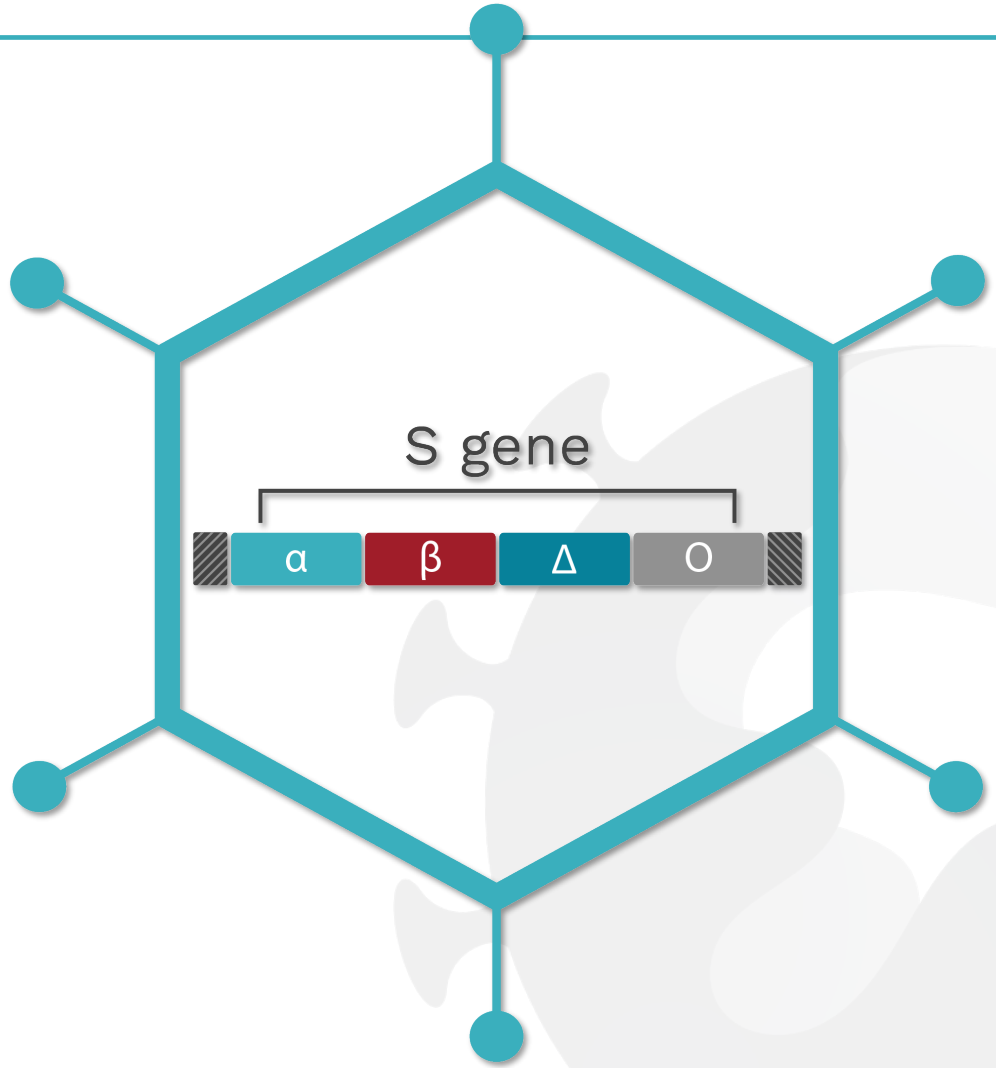


Advantages over intramuscular injection:

- **Provides effective protection of the upper respiratory tract** (mouth, nose), as well as the vital organs
- Prevents viral shredding and transmission
- Needle free

HD-Ad based multivalent intranasal COVID-19 vaccines

- Helper dependent adenoviral vector (HD-Ad) platform
- Devoid of adenoviral genes - high cloning capacity, allowing multiple transgenes in one vector
- Long-lasting capacity to produce effective antibodies and T cell response
- Targeting multiple variants
- Vaccine for all variants?: conserved epitopes of S protein and/or other antigens



Questions?

Thank you to panelists

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You'll find our summary of this seminar soon at

covid19immunitytaskforce.ca

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