Preparedness and response to SARS-CoV-2

Volker Gerdts, Director & CEO
Scientists from 25 countries

45+ PhD level scientists

Certified to ISO 9001

>$225M in biocontainment infrastructure

10 commercialized vaccines...6 world firsts

LOCATED IN Saskatchewan, Canada

>150 members of staff
56% female
44% male
38% visible minorities
Canada’s largest high containment lab

- One of the world’s largest CL3Ag facilities
- Collaborative research facility ("Research Hotel")
- Building in-house GMP vaccine manufacturing
- Upgrade to containment level 4
- Operating funding:
  - Canada Foundation for Innovation (CFI)
  - Government of Saskatchewan,
  - University of Saskatchewan
How do we respond to EID?

Immediate tasks:
- National & international coordination
- Surveillance
- Diagnostics
- Contact tracing
- Modeling
- Prevention
- Mass campaigns

Immediate tasks for Research:
- Global coordination & collaboration
- Isolation of pathogen
- Animal models
- Diagnostic tests and reagents
- Pathogenesis and transmission
- Host reservoirs and susceptibility (wildlife, livestock)
- Correlates of immunity, duration
- Protection against disease
- New variants, etc.

Immediate tasks:
- Decision making (e.g. public health measures, lock down, schools, travel, etc.)
- New policies, monitoring & adjustment
- Procurement of vaccines and drugs
- Communication

& Development
- Countermeasures (vaccines, antivirals, therapeutics)
- Mass production
- Global coordination
- Specific target groups
- Age, ethnicity, gender, etc.
VIDO’s response to COVID-19

- 1st in Canada to isolate virus (collaboration with Sunnybrook Health Centre and NML, PHAC)
- 1st in Canada to establish animal model
- 1st University in Canada to have vaccine candidate in clinical development
- Worked > 80 companies since Jan. 2020
- WHO expert groups on vaccines, animal models and reagents
Helping our communities

Working with hospitals in Saskatchewan

Sterilization of Personal Protective Equipment (PPE)

N95 masks, face shields, etc.

In partnership with Saskatchewan Health Authority

Approved by Health Canada

• Participated in SHA “Immunity Guidance Group” (Dr. John Froh).
• Advised communities on role of pets (cats, ferrets, dogs) and farm animals, etc.
Financial support

**COVID-19 research:**
- $11.3 Million to enhance research capacity (CFI, MSI, 2020)
- $>2.5 Million CIHR grants (2020)
- $>10 Million in contract research (2020/2021)

**COVID-19 vaccine:**
- $31 Million for vaccine (Gov’t Canada, 2020/2021)
- $4.2 Million for COVID-19 research (Gov’t SK, 2020)

**Infrastructure:**
- $12 Million for manufacturing facility (Gov’t Canada, 2020)
- $66 Million for Centre for Pandemic Research (Federal, Provincial and Municipal Governments, private donors, 2021)
Darryl Falzarano, Jocelyne Lew, Swarali Kulkarni, Robyn Ralph, Vinoth Manoharan, Shirley Hauta, Ken Lai, Jill Van Kessel, Yurij Popowych, Robert Brownlie, Yao Liu, Kristen Kindrachuk, Sylvia van den Hurk, Qiang Liu, Hai Nguyen Trong, Colette Wheler, Alain Fafard, Hollie Lemieux, Jan Erickson, Sherry Tetland, Brock Evans, Ken Bock, Kayla Anglos, Tiffany Matejka, Carla Noreen, Paul Hodgson, Scott Napper, Lorne Vanin, Trenna Brusk, Neil Rawlyk, Kylee Drever, Kezia Fourie, Pooja Choudbari, Trina Racine, Andrew van Kessel, Rachelle Buchanan, Cynthia Swan, Paul Pennington
Natl. and Intl. Collaborations....

**Canadian Government:**
- NML (PHAC) Winnipeg, NCFAD (CFIA)
- Winnipeg; Alberta Health Services
- National Research Council

**Canadian Universities:**
- University of Saskatchewan; Prairie Diagnostic Services; Dalhousie University; McMaster University;
- University of Alberta; University of Manitoba;
- Sunnybrook Health Sciences Centre; University of Toronto: University of British Columbia; Queens University

**Canadian Industry:**
- Biodextris Inc.,
- Resillience (Therapure)
- Dalton Pharmaceuticals
- Nucor

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**International partners:**
- Vaccine Formulation Institute (Switzerland)
- Seppic (France)
- Institute Pasteur Dakar (Senegal)
- VBI (U.S)
- CEPI (Norway)
- University of Sunshine Coast (Australia)
- Bill & Melinda Gates Foundation (U.S.)
- Resilience Inc. (U.S.), Atum (U.S.)

> 40 international companies

>40 Canadian companies
VIDO’s COVID-19 Vaccine

Vaccine design completed (Jan. 2020)
Produced at lab scale (Jan. - Feb.)
Proof-of concept (March - June)
GMP Manufacturing (March - November)
Toxicology studies (Sept - November)

**Human clinical trials (Jan 2021)**

Presentations to:
Canada’s Vaccine Task Force, Parliamentary Health Committee, Standing Committee for Innovation, Technology and Science, Research Canada, GLOPID, CIHR, Gairdner, NRC, CSI, etc.
COVID-19 Contract Research

Total > 80 contracts ($ >13 Million)
- 50% Canadian
- 50% International

Testing of:
- novel antivirals
- therapeutics
- vaccine candidates

ISO 9001, dedicated contract research group, certified project managers, etc.

Supported by MSI (CFI) and Gov’t of Saskatchewan
Vaccine manufacturing facility

- Human and animal vaccines
- 20-40 million doses per year
- Construction completion (Dec. 2021)
- Production runs (2022)
Construction

Feb 12, 2021
Some of the challenges....

• **10 x volume of contract research**
  • Reallocation of resources
  • Shortage of trained workers & manpower
  • Fatigue, burn-out

• **Focus on COVID-19 research**
  • Increase capacity
  • Recruitment (hired > 35 additional staff members)
  • Training and ensuring worker safety
  • Working remotely
  • Public health measures

• **Reduction of non-COVID research**
Lessons learned.....

- Emerging diseases affect human and animal health ("One Health")

- Quick response is critical
  - Vertically-integrated, in-house access to
    - High containment facility
    - In-house manufacturing
    - Animal housing

- Establishment of national centers focused on emerging diseases
Canada’s Centre for Pandemic Research

- Focus on emerging diseases
- R&D: from discovery to manufacturing
- Animal and human diseases
- Access to exotic species (bats, insects, reptiles, and non-human primates)
- In-house manufacturing
- Recruit and train the next generation of scientists
- Partnerships with industry
VIDO’s COVID-19 Vaccine

- **Lab phase**
  - VIDO
  - NML (Winnipeg)
  - NRC (Montreal)

- **Animal testing**
  - Biodextris (Montreal)
  - Nucro (Montreal)

- **Manufacturing of clinical grade material**
  - SEPPIC (France)
  - Dalton Pharmaceuticals (Toronto)
  - Biodextris (Montreal)
  - Nucro (Montreal)
  - NRC (Montreal)
  - Nucro (Montreal)
  - CCfV Halifax

- **Safety testing**
  - Nucro (Montreal)

- **Clinical trials (phase I-III)**
  - CCfV Halifax

- **Commercial manufacturing**
Enhancing Canada’s (and the world’s) Preparedness

Proactive - specific funding for EID research:

1. **Expand Infrastructure** (high containment labs, GMP manufacturing, etc.)
2. **Provide operating funding** (to keep centers fully functional)
3. **Build scientific capacity** (training & recruitment, fellowships of global experts)
4. **Establish rapid response networks** (national and international collaborations)
5. **Fund separate RFPs** (containment level 3 & 4 research expensive)
Future vaccine development

Outbreak

Future vaccine development

Traditional vaccine development

10-15 years

Immediately available

Accelerated 1-2 years = still accounts for $$ trillions in losses

Structural virology

Bioinformatics

Animal models

Vaccine for next disease

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