Swine Influenza Virus Surveillance – Canada

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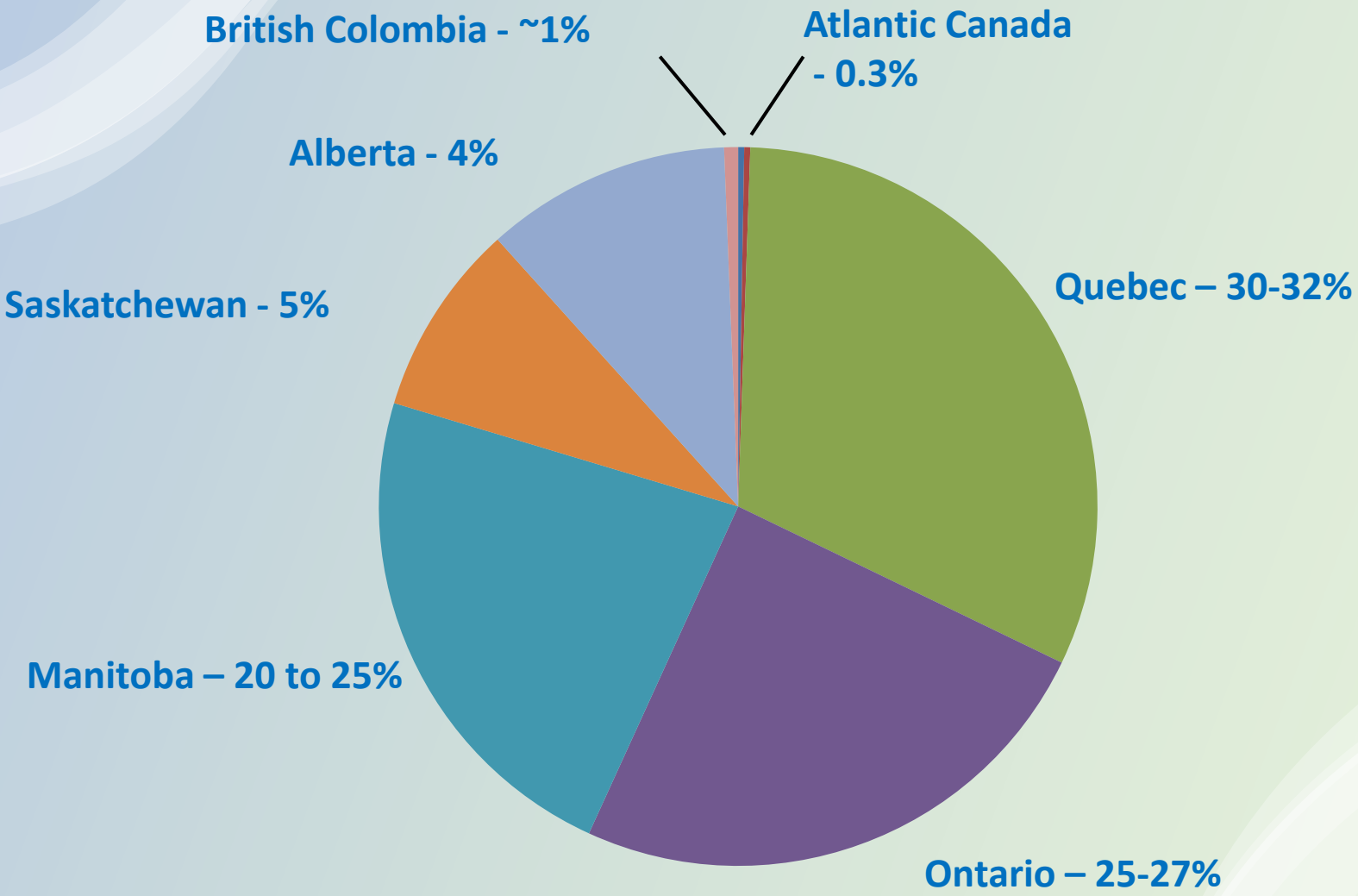
OFFLU SWINE INFLUENZA EXPERTS TECHNICAL MEETING
28 – 29 April 2026
WOAH Headquarters, Paris

Influenza A virus - swine surveillance in Cananda

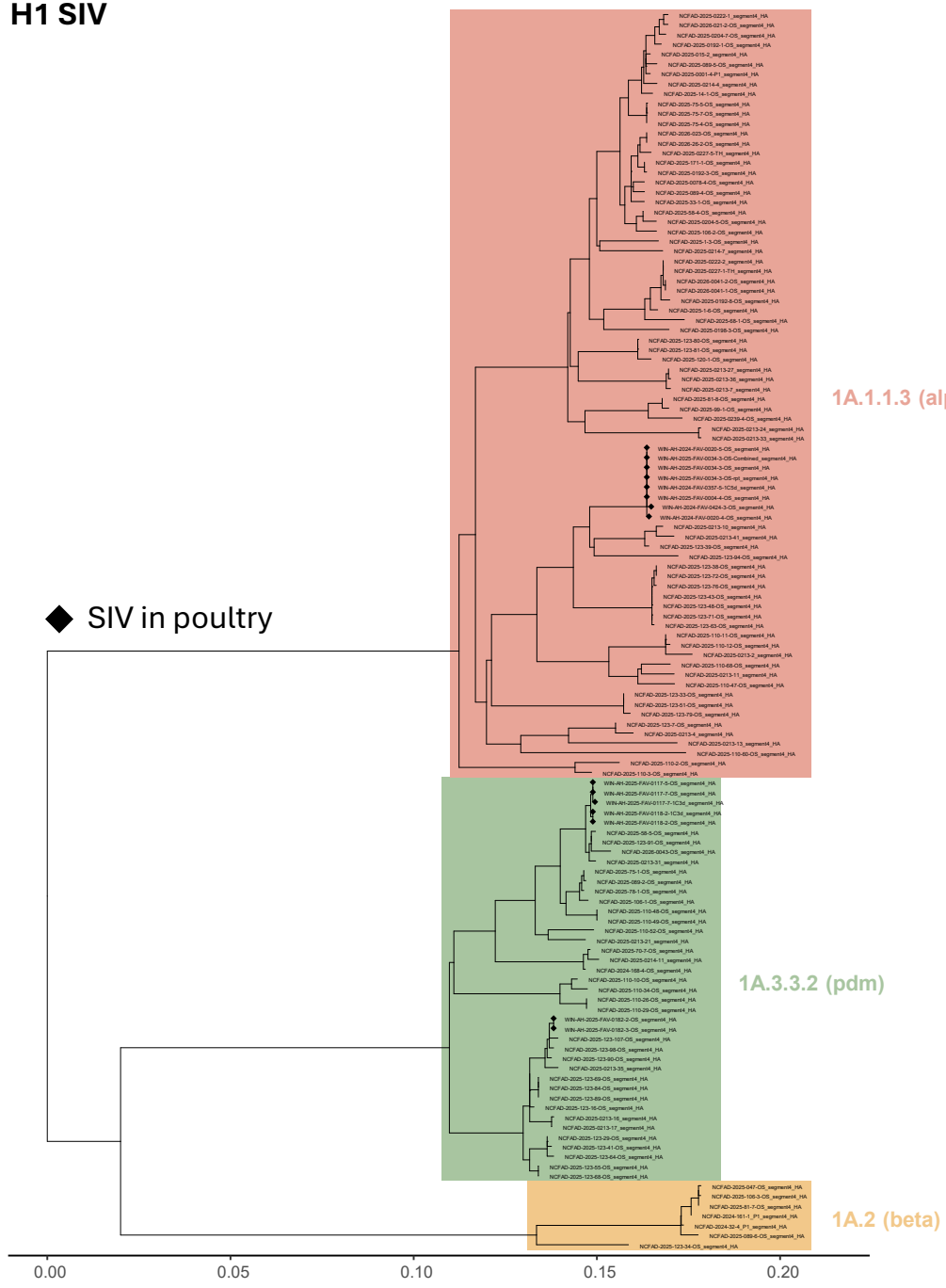
- Swine influenza is not a federally reportable disease in Canada
- No active surveillance of swine influenza
- Surveillance is passive and relies on:
  - Veterinarians submit samples when pigs show respiratory signs, reproductive issues, or reduced performance
  - Provincial labs (especially in Ontario, Quebec, and Manitoba) perform initial testing
  - The National Centre for Foreign Animal Disease conducts further characterization when needed
- Surveillance project used to be funded by PHAC and CFIA
- We conduct joint risk assessment studies with PHAC when variant strains are detected
- We also conduct surveillance of swine influenza in domestic poultry and fur breading domestic animals such as mink

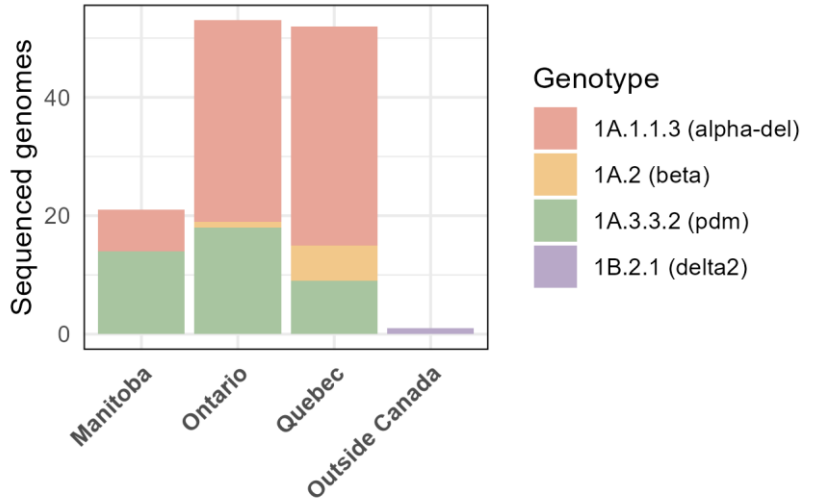
Canadian Pig Inventory 2025

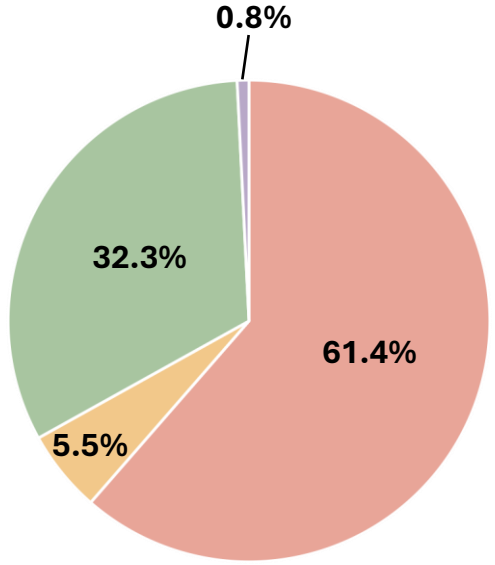


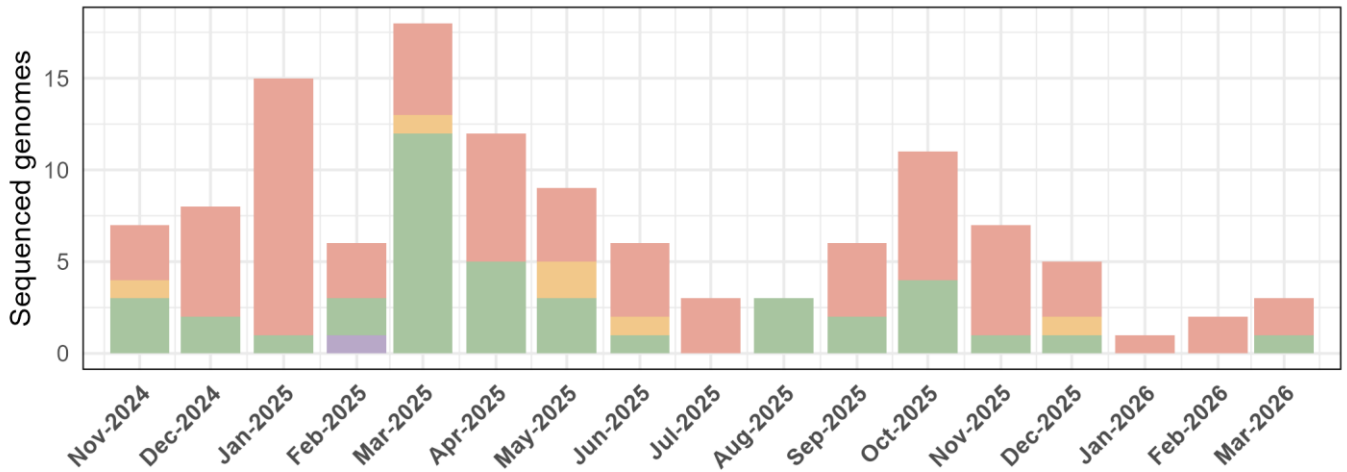
14 million and >7000 farms

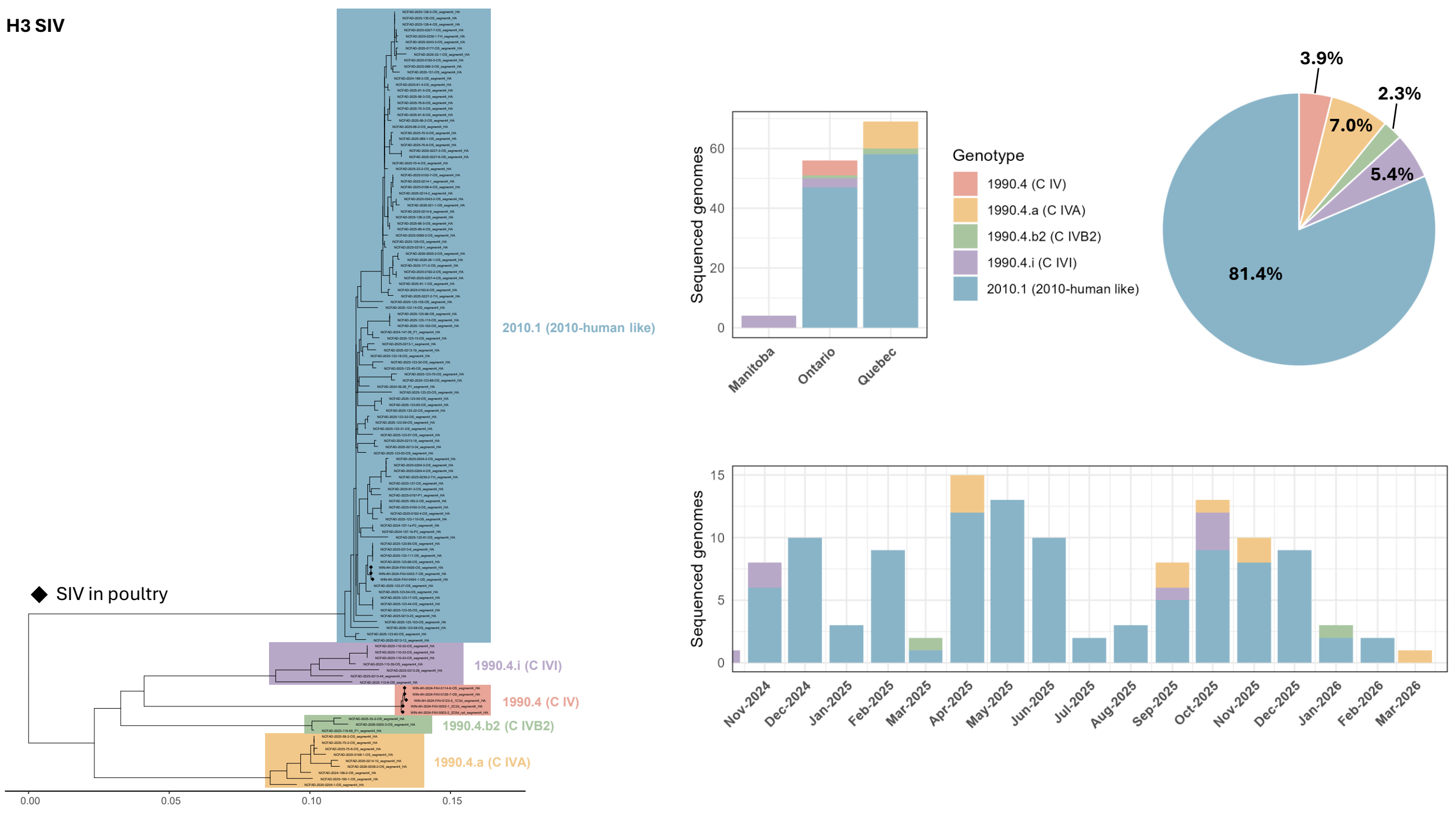
H1 SIV


1A.1.1.3 (alpha-del)
SIV in poultry
1A.3.3.2 (pdm)
1A.2 (beta)
0.00
0.05
0.10
0.15
0.20


Sequenced genomes
0
20
40
Manitoba
Ontario
Quebec
Outside Canada
Genotype
1A.1.1.3 (alpha-del)
1A.2 (beta)
1A.3.3.2 (pdm)
1B.2.1 (delta2)


0.8%
32.3%
61.4%
5.5%

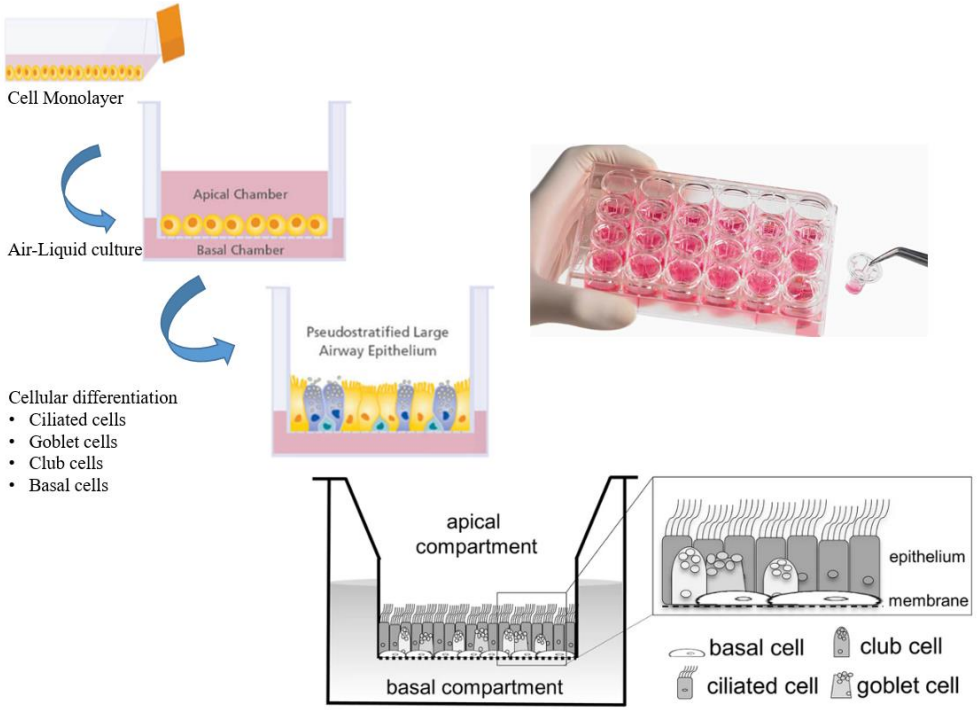

Sequenced genomes
0
5
10
15
Nov-2024
Dec-2024
Jan-2025
Feb-2025
Mar-2025
Apr-2025
May-2025
Jun-2025
Jul-2025
Aug-2025
Sep-2025
Oct-2025
Nov-2025
Dec-2025
Jan-2026
Feb-2026
Mar-2026


H3 SIV
2010.1 (2010-human like)
SIV in poultry
1990.4.i (C IVI)
1990.4 (C IV)
1990.4.b2 (C IVB2)
1990.4.a (C IVA)
0.00
0.05
0.10
0.15
Sequenced genomes
0
20
40
60
Manitoba
Ontario
Quebec
Genotype
1990.4 (C IV)
1990.4.a (C IVA)
1990.4.b2 (C IVB2)
1990.4.i (C IVI)
2010.1 (2010-human like)
3.9%
2.3%
7.0%
5.4%
81.4%
Sequenced genomes
0
5
10
15
Nov-2024
Dec-2024
Jan-2025
Feb-2025
Mar-2025
Apr-2025
May-2025
Jun-2025
Jul-2025
Aug-2025
Sep-2025
Oct-2025
Nov-2025
Dec-2025
Jan-2026
Feb-2026
Mar-2026

Research activities in Cananda

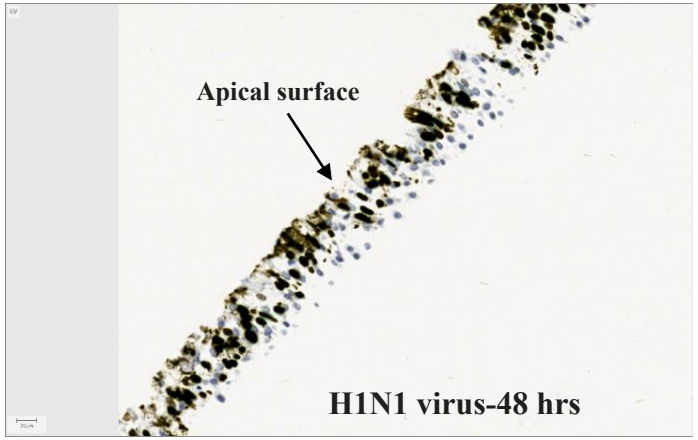
- SA Receptor Profiling Porcine Mammary and Respiratory tissues - VIDO
- Assessing IAV Receptor Binding in Swine Mammary and Respiratory Tissues – VIDO/NCFAD
- Assessment of IAV Replication in Swine Primary and Organoid Cultures – VIDO/NCFAD

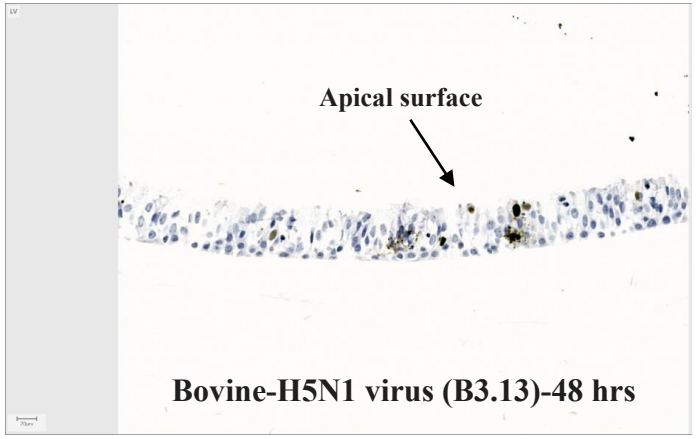
Air-Liquid Interface culture: respiratory epithelial cells



Nasal

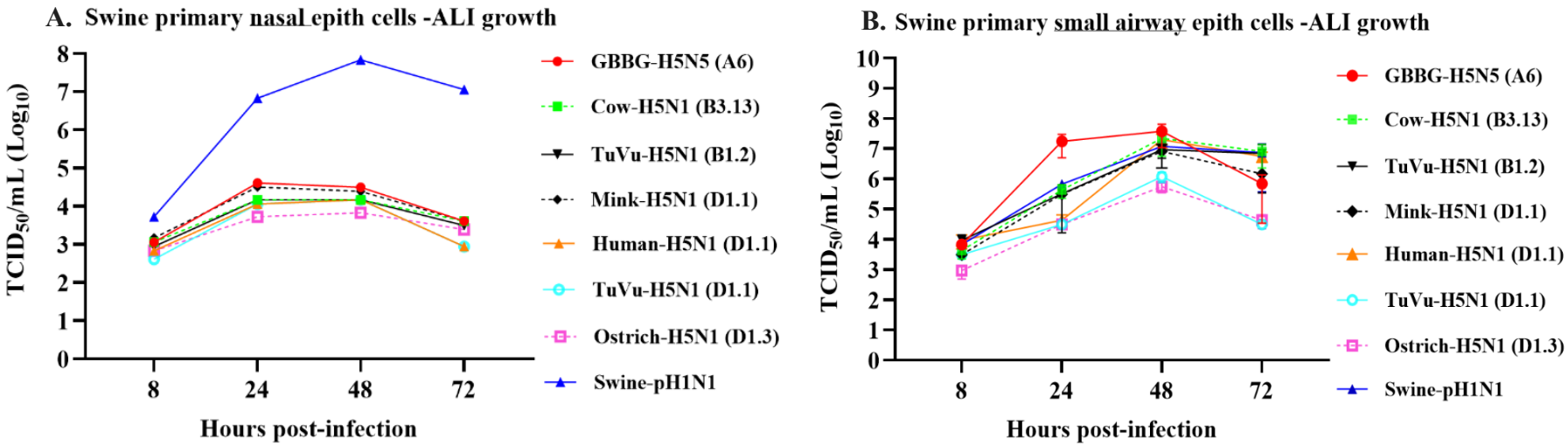
Small Airway





Differentiated nasal epithelial cells

Replication of IAVs in fully differentiated swine primary respiratory epithelial cells



A. Nasal epithelial cells; **B**. Small airway cells

Primary respiratory epithelial cells derived from piglets were induced to differentiate into mucociliary phenotype by air-liquid interface (ALI) culture systems. Cells were infected from the apical surfaces at MOI of 0.02. Experiment had n = 3–4 biological replicates. Viruses collected from the apical washes were titrated in MDCK cells and expressed as mean $TCID_{50}$/mL (±S.E.).

Conclusion

- ALI cultures provide a powerful platform for studying host–pathogen interactions in a way that closely resembles the pig respiratory tract.
- H5 viruses replicate in both swine nasal and small airway ALI cultures, but replication is generally stronger in small airway epithelium, indicating greater permissiveness in the lower airway

Future studies

- Inoculation of pregnant sows 3 days prior to farrowing via intramammary route
  - Can sows develop clinical signs such as mastitis like syndrome as in dairy cows, sheep and goats
  - Can virus-contaminated milk or secretions cause disease in newborn piglets
- Inoculation of sows oro-nasally 3 days prior furrowing
  - Can sows become infected with H5N1 develop respiratory signs, shed virus and transmit infection to newborn piglets?
- Concurrent infection with secondary porcine respiratory pathogens increases the susceptibility of pigs to H5N1 HPAI by compromising the respiratory mucosal barrier and suppressing local innate immune responses, thereby lowering the minimum infectious dose required for viral establishment

Thank you