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Epidemiology of America

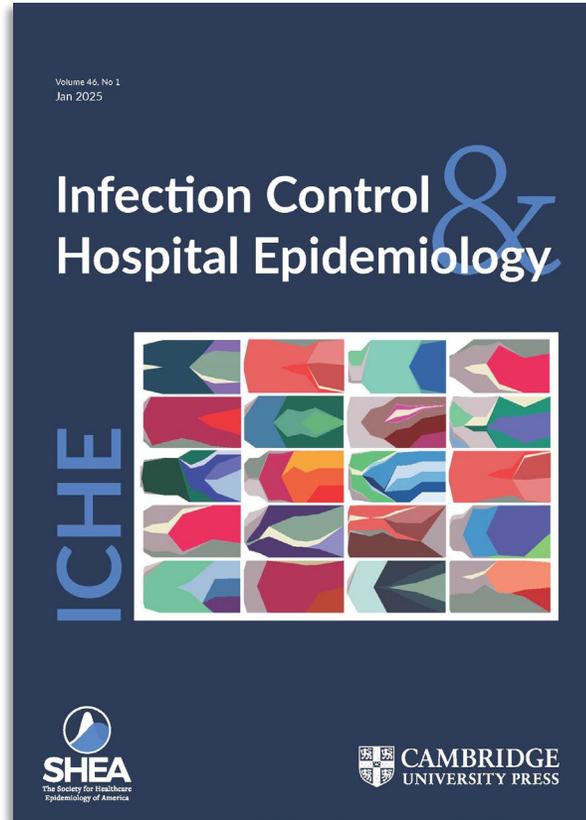
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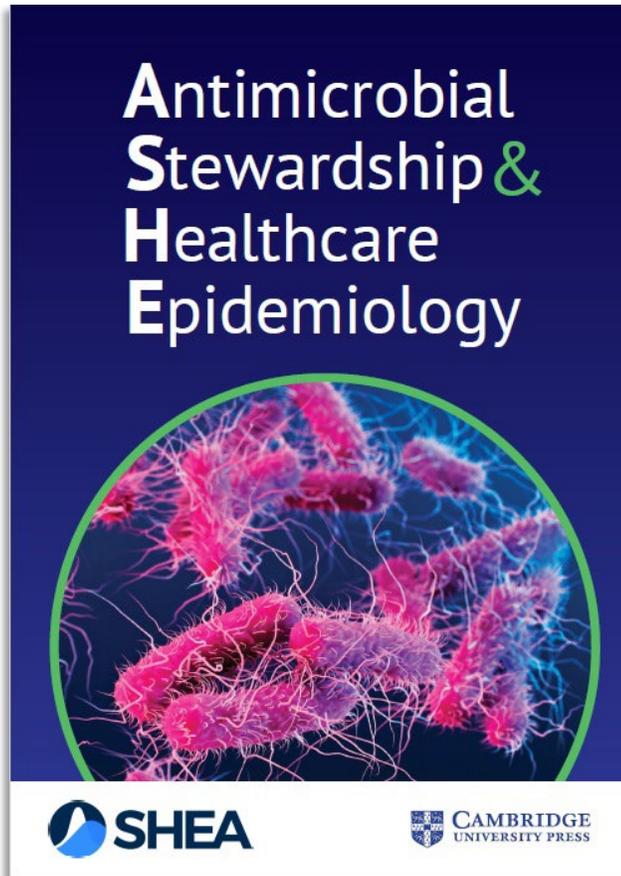
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TUNE IN TO SHEA'S PODCASTS



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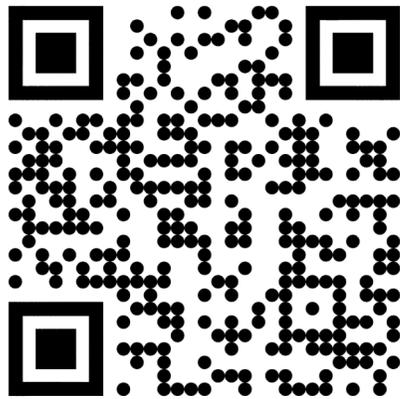




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SHEA SPRING

APRIL 27-30, 2025

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Town Hall 2025

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- Technical difficulties? Visit: <https://support.zoom.us>
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- Streaming Live on SHEA's Facebook page
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SAFE HEALTHCARE FOR ALL

Panelists:



Dr. Marci Drees
ChristianaCare



Dr. Matthew Linam
Emory University



Dr. Trish Perl
UT Southwestern Medical Center

Overview of HPAI H5N1 in North America

| | |
|------------------------|---|
| 1996-97 | Domestic bird die-offs H5N1 in China followed by first human cases in Hong Kong |
| 2003-05 | Outbreaks among wild and domesticated birds (Asia, Africa, Middle East, Europe); human infections |
| 2021→ | New clade 2.3.4.4b; spillovers leading to mammalian die-offs in the Americas |
| April, 2022 | Colorado poultry worker infected with H5N1 - first ever U.S. case |
| March 25, 2024 | Bovine infections reported when USDA detects live H5N1 in milk from sick cows |
| April 1, 2024 | Human H5N1 infection (conjunctivitis) reported in Texas dairy farm worker |
| April, 2024 | H5N1 viral fragments identified in pasteurized, commercial milk |
| September, 2024 | H5N1 infection in a Missouri adult with no known source of exposure |
| November, 2024 | H5N1 infection in a British Columbia child with no known source of exposure |
| November, 2024 | H5N1 infection in an Alameda County, CA child with no known source of exposure |
| December, 2024 | Fatal H5N1 infection in a Louisiana adult with a backyard flock |
| December, 2025 | Fatal H5N1 infections among big cats and domestic cats (latter from ingestion of raw milk/pet food) |
| January, 2025 | H5N1 infection in a San Francisco child with no known source of exposure |

Summary of U.S. 2024-25: 67 reported human infections*
928 reported dairy herds*

**as of January 17, 2025*

POLL: What is your organization's top priority when preparing for or managing H5N1 outbreaks?

- Ensuring rapid and accurate diagnosis of H5N1 patients
- Strengthening infection control precautions and protocols
- Securing adequate resources for outbreak preparedness (e.g., quantities of PPE, antivirals)
- Collaborating with public health authorities for coordinated response
- Establishing clear and effective communication strategies to disseminate critical information to staff, patients, and the public

Invited Panelists:

Dr. David Goldfarb MD, FRCPC

Medical Microbiologist and Pediatric Infectious Disease Physician

Interim Head

Dept of Pathology & Laboratory Medicine

BC Children's Hospital & BC Women's Hospital + Health Centre

Clinical Associate Professor

University of British Columbia

Lynne Li, MD, MSc, FRCPC

Medical Microbiologist, Division of Microbiology, Virology & Infection Control, B.C. Children's & Women's Hospital

Infection Prevention & Control Physician, PHSA

Clinical Assistant Professor, University of British Columbia



SAFE HEALTHCARE FOR ALL

SHEA Townhall: A Case of Severe H5N1 in Hospital

Dr. David Goldfarb, MD, FRCPC ^{1,2}

Dr. Lynne Li, MD, FRCPC, M.Sc.^{1,2}

January 22, 2025

1. Division of Medical Microbiology, Virology and Infection Control, BC Children's Hospital and BC Women's Hospital and Health Centre
2. Department of Pathology and Laboratory Medicine, University of British Columbia

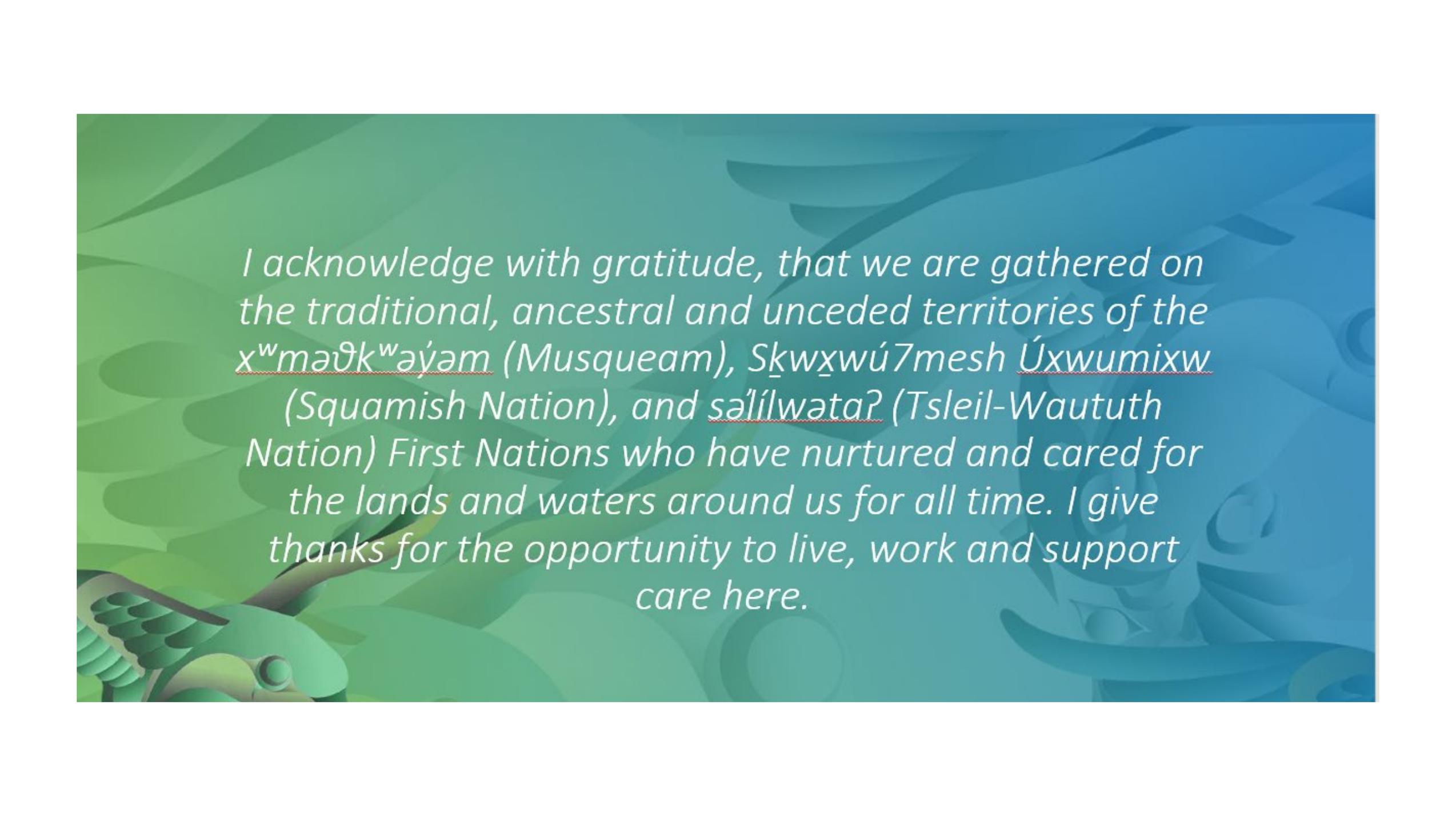
Disclosures

Dr. Goldfarb

- Speaker honorarium Roche

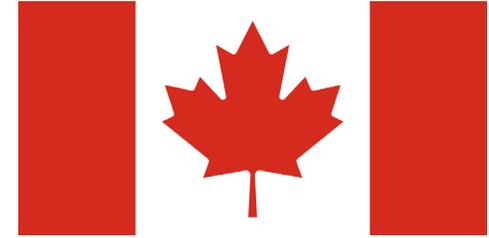
Dr. Li:

- None



I acknowledge with gratitude, that we are gathered on the traditional, ancestral and unceded territories of the x^wməθk^wəyəm (Musqueam), Sḵwxwú7mesh Úxwumixw (Squamish Nation), and səlílwataʔ (Tsleil-Waututh Nation) First Nations who have nurtured and cared for the lands and waters around us for all time. I give thanks for the opportunity to live, work and support care here.

Who we are and what we do



Medical microbiologists in Canada:

- *Laboratory physicians who are M.D.-trained and go through dedicated residency program*
 - Additional training in pediatric and adult infectious diseases (minimum 12 months), some are also licensed to practice pediatric or adult infectious diseases
- Offer clinical consultation for investigation, diagnosis, treatment, monitoring and prevention of infectious diseases; incorporate infection prevention and control (IPAC) and antimicrobial stewardship principles at patient-level for each case

At BC Children's and Women's Hospitals

- Medical microbiologists also practice IPAC while on-call for BC Children's and Women's Hospitals, BC Cancer, BC Emergency Health Services, BC Mental Health and Substance Use Services

Outline

- Case presentation
- Diagnostics and identification of our case patient with H5N1
- IPAC considerations:
 - Who to isolate on airborne + droplet + contact
 - When to stop isolation
- Will not cover: management and therapeutics, occupational health, and public health investigation

Case Presentation

The NEW ENGLAND JOURNAL of MEDICINE

CORRESPONDENCE

Critical Illness in an Adolescent with Influenza A(H5N1)
Virus Infection

Patient: 13-year-old girl with mild asthma and elevated BMI: 2-day bilateral conjunctivitis

- **Nov.4:** presents to community hospital with bilateral conjunctivitis x 2 days, and fever x 1 day, discharged without testing or treatment
- **Nov.7:** re-presented to community hospital with cough , vomiting, diarrhea, becoming increasingly unstable. FluA/B, RSV and SARS-CoV-2 were ordered and pending
- **Nov.8:** Transferred to BC Children's Hospital in critical condition, on airborne + droplet + contact pending results

H5N1 Outbreak North America, onset December 2021

Flocks in Canada where avian influenza has been detected

▼ Estimated number of birds in infected flocks

This table lists the estimated number of birds in flocks impacted by avian influenza subtype H5 by province.

To date, the HPAI virus found in U.S. dairy cattle has not been detected in domestic flocks in Canada.

| Province | Number of infected premises (current IPs) | Number of previously infected premises (released IPs) | Estimated number of birds impacted (as of 2025-01-11) |
|---------------------------|---|---|---|
| Alberta | 2 | 84 | 2,019,000 |
| British Columbia | 59 | 180 | 8,593,000 |
| Manitoba | 1 | 23 | 408,000 |
| New Brunswick | 0 | 2 | Under 100 |
| Newfoundland and Labrador | 0 | 2 | 400 |
| Nova Scotia | 0 | 8 | 12,000 |
| Ontario | 8 | 49 | 1,107,029 |
| Quebec | 1 [*] | 57 | 1,438,000 |
| Saskatchewan | 1 | 45 | 751,000 |
| Total | 72 | 450 | 15,306,158 |

^{*} Low pathogenic avian influenza



Slide credits: Dr. Jonathan Gubbay

Viral respiratory infection diagnosis

- In local guidance, the following patients are approved for extended respiratory panel testing using BioFire™ Respiratory Panel 2.1 assay
- Patients who don't meet criteria get a limited panel testing for influenza A/B and RSV

Indications for extended respiratory testing

1. Respiratory or infectious illness requiring **Hospitalization**
2. Infant < **3 months of age**
3. Patient is **immunocompromised**
4. A **medically complex** patient where viral diagnosis informs management decisions
5. Prolonged fever of ≥ 5 days
6. Febrile suspected viral illness in a **returned Traveller**

Targets on the BioFire™ Respiratory Panel

- Adenovirus
- Coronavirus 229E
- Coronavirus HKU1
- Coronavirus NL63
- Coronavirus OC43
- Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)
- Human Metapneumovirus
- Human Rhinovirus/Enterovirus
- Influenza A, including subtypes H1, H1-2009, and H3
- Influenza B
- Parainfluenza Virus 1
- Parainfluenza Virus 2
- Parainfluenza Virus 3
- Parainfluenza Virus 4
- Respiratory Syncytial Virus
- *Bordetella parapertussis* (IS1001)
- *Bordetella pertussis* (ptxP)
- *Chlamydia pneumoniae*
- *Mycoplasma pneumoniae*

Influenza A subtyping on Biofire™

Table 1. Possible Assay Results for Influenza A and the Corresponding Interpretation

| Result \ Assay | FluA-pan Assays (n=2) | FluA-H1-2 | FluA-H1-2009 | FluA-H3 | Action |
|---------------------------------------|-----------------------|------------|--------------|----------|---|
| Influenza A Not Detected | Negative | Negative | Negative | Negative | None |
| Influenza A H1 | ≥1 positive | Positive | Negative | Negative | |
| Influenza A H3 | ≥1 positive | Negative | Negative | Positive | |
| Influenza A H1-2009 | ≥1 positive | Any result | Positive | Negative | |
| Influenza A H1 Influenza A H3 | ≥1 positive | Positive | Negative | Positive | Multiple infections are possible but rare ^a , retest ONCE to confirm result ^b |
| Influenza A H1-2009 Influenza A H3 | ≥1 positive | Any result | Positive | Positive | |
| Influenza A (no subtype detected) | 2 positive | Negative | Negative | Negative | Retest (see below) |
| Influenza A Equivocal | 1 positive | Negative | Negative | Negative | |
| Influenza A H1 Equivocal | Negative | Positive | Negative | Negative | Retest once (see Result Summary section below for further instruction). |
| Influenza A H3 Equivocal | Negative | Negative | Negative | Positive | |
| Influenza A H1-2009 Equivocal | Negative | Any result | Positive | Negative | |

^a The BioFire RP2.1 can simultaneously detect multiple influenza viruses contained in multivalent vaccines (see Limitations).

^b Repeated multiple positives should be further confirmed by other FDA cleared Influenza subtyping tests.

- If the assay is unable to subtype, there are 2 possible scenarios:
- Scenario 1: “Equivocal” only 1 of 2 pan-fluA targets detected
 - Consistent with low positive
- Scenario 2: “No subtype detected” – 2/2 pan-fluA targets detected:
 - Low positive
 - Novel strain
 - Per company: Differentiate above via retesting

Reflexive influenza testing

- If unable to detect H1 or H3 subtype with “Equivocal” or “No subtype detected”, reflex testing of the specimen is done with the Xpert[®] Xpress Flu/RSV assay (Cepheid)
 - Provide a Ct value and gauge amount of virus
- If the Ct <35, then samples are sent to reference laboratory for subtyping upon medical microbiologist review
 - If patient has suspicious history for novel influenza, will send urgently and turnaround time is expedited, approximately within same day
 - If no suspicious history, then routine subtyping is batched 1-2x/ week

Case diagnostics

1. Nasopharyngeal swab was tested first on Biofire™ Respiratory Panel 2.1
2. When Influenza A resulted in “No subtype detected”, then reflexive testing initiated on Xpert® Xpress Flu/RSV assay
3. In this case, suspicion for novel influenza raised given “no subtype”, severe disease and history of conjunctivitis
4. Reflexive testing on Xpert® Xpress Flu/RSV assay locally provided a Ct value of 27.1 → Stat testing arranged for sample to be further subtyped at BC Centre for Disease Control (reference lab)

Notice: Interim recommendations for infection prevention and control of avian influenza in healthcare settings

Oct.30, 2024: National Advisory Committee on Infection Prevention and Control (NAC-IPC), part of Public Health Agency of Canada (PHAC) published interim recommendations for avian influenza

- In addition to routine (standard) precautions, patients suspected with probable or confirmed influenza should be placed on airborne, droplet and contact precautions, including placement in airborne infection isolation room if available.

The duration and discontinuation of additional precautions for an individual patient should be determined in consultation with the IPC program and in accordance with local, provincial or territorial public health guidance and organizational policies. All other guidance as per [RPAP](#) remains unchanged.

Case diagnostics and IPAC precautions

1. Nasopharyngeal swab was tested first on Biofire extended panel
2. When Influenza A resulted in “No subtype detected”, then reflexive testing initiated on Xpert
3. In this case, suspicion for novel influenza raised given “no subtype”, severe disease and history of conjunctivitis
4. Reflexive testing on Xpert locally provided a Ct value of 27 → Stat testing arranged for sample to be further subtyped at BC Centre for Disease Control (reference lab)

Airborne, droplet and contact due to pending syndromic testing and aerosol-generating medical procedure (AGMP)

1.5 hours without airborne precautions

Airborne precautions added to droplet and contact due to suspicion for novel influenza

Estimating incubation period and duration of infectiousness

Guidance:

- PHAC: incubation period range 1-9 days; consult IPAC and public health RE: infectiousness duration
- US CDC: “exposed visitors should monitor for 10 days after last exposure”

Prior studies:

- Yang et al., 2007 – described and modeled family cluster in Indonesia.
 - Incubation period range 3-7 days (mean 5)
 - Infectious period range 5-13 days (mean 9 days)

Hospital setting:

- Liao et al., 2013 – family cluster in Northern China, infectious period defined as “one day before illness onset to time of hospital discharge or death”

Yang et al., Emerg Infect Dis. 2007 Sep;13(9):1348-53.
Liao et al., PLoS One. 2013 Aug 13;8(8):e71765.

Drawing from recent pandemic experience

- Every 2 days, test endotracheal aspirate when intubated, then throat swab when extubated
- Deemed non-infectious when receive 2 consecutive negative throat samples
- Tracheal aspirate from Nov.14 onwards all negative on viral culture
- Similar approach at beginning of SARS-CoV-2 pandemic

| Serial respiratory specimens | | |
|---------------------------------|----------|------|
| Tracheal aspirate (November 12) | Positive | 17.6 |
| Tracheal aspirate (November 14) | Positive | 24.5 |
| Tracheal aspirate (November 16) | Positive | 27.1 |
| Tracheal aspirate (November 18) | Positive | 27.8 |
| Tracheal aspirate (November 20) | Positive | 27.1 |
| Tracheal aspirate (November 22) | Positive | 31.5 |
| Tracheal aspirate (November 24) | Positive | 33.0 |
| Tracheal aspirate (November 26) | Positive | 31.1 |
| Tracheal aspirate (November 28) | Positive | 39.9 |

- Nov. 27th: throat swab negative
- Nov. 29: throat swab negative, removed from airborne, droplet, contact precautions

Jassem et al., 2024. N Engl J Med. 2024 Dec 31.

Summary

- 2-part reflexive testing, and stat testing at reference lab enabled faster diagnosis: within 1 day instead of 3-7 days
- Good outcomes (defined as no secondary transmission, relatively little panic in hospital, and confidence in preventive measures) required, right at time of diagnosis:
 - Close collaboration of medical microbiology with hospitals teams (IPAC, infectious diseases and clinical teams), occupational health, public health teams (including animal health / veterinarians), reference lab (BCCDC)
 - Close collaboration of medical microbiologist/IPAC with family to communicate significance, risk and expectations

Discussion

- HPAI – we were lucky to subtype fast, but many reported human cases took days/weeks for subtyping, post-discharge or post-mortem.



DISPATCHES

Influenza A(H5N1) Virus Clade 2.3.2.1a in Traveler Returning to Australia from India, 2024

Yi-Mo Deng,¹ Michelle Wille,¹ Clyde Dapat, Ruopeng Xie, Olivia Lay, Heidi Peck, Andrew J. Daley, Vijaykrishna Dhanasakeran, Ian G. Barr



► *Emerg Infect Dis.* 2014 May;20(5):887–891. doi: [10.3201/eid2005.140164](https://doi.org/10.3201/eid2005.140164)

Full-Genome Analysis of Avian Influenza A(H5N1) Virus from a Human, North America, 2013

[Kanti Pabbaraju](#)^{1,2,3,4,5}, [Raymond Tellier](#)^{1,2,3,4,5}, [Sallene Wong](#)^{1,2,3,4,5}, [Yan Li](#)^{1,2,3,4,5}, [Nathalie Bastien](#)^{1,2,3,4,5}, [Julian W Tang](#)^{1,2,3,4,5}, [Steven J Drews](#)^{1,2,3,4,5}, [Yunho Jang](#)^{1,2,3,4,5}, [C Todd Davis](#)^{1,2,3,4,5}, [Kevin Fonseca](#)^{1,2,3,4,5}, [Graham A Tipples](#)^{1,2,3,4,5}



THANK YOU!

Questions?

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