Emerging Infectious Respiratory Diseases: Avian influenza A(H7N9)

Anne Winter RN, BScN, MHSc, CIC
Epidemiologist Specialist,
Public Health Ontario
Objectives:

• Review the significance of emerging infectious respiratory diseases (EIRDs)
• Review current status of avian influenza A(H7N9)
• Discuss agency-specific roles and responsibilities in the response to a scenario about the detection of influenza A(H7N9) in Ontario
Emerging Infectious Respiratory Diseases

• Incidence has increased over the last three decades and expected to increase in the future
  • New organisms → SARS, MERS-CoV
  • Many novel influenza strains have evolved from known strains → H5N1, H1N1pdm09, H7N9, H9N2 among others
  • Affect new geographies/populations → H5N2 (poultry)
  • Re-emerging/increasing rates of respiratory infectious diseases → multidrug resistant TB, EVD-68
Global impact of respiratory infectious diseases

Figure 1. Leading Causes of Global Deaths from Infectious Diseases.

Of an estimated 58.8 million annual deaths worldwide, approximately 15.0 million (25.5%) are believed to be caused by infectious diseases. Cause-specific mortality estimates are provided by the World Health Organization. The data do not include deaths from secondary infectious causes, such as rheumatic fever and rheumatic heart disease, liver cancer and cirrhosis, or other chronic diseases.
Percent positivity of respiratory viruses detected by all test methods, PHOL, September 1, 2016 to June 10, 2017

Source: PHO Laboratory-based Respiratory Pathogen Surveillance Report, weeks 22-23, 2017
Influenza – The Virus

Influenza A
- Influenza A- H1N1
- Influenza A- H3N2

Influenza B
- Influenza B- Yamagata
- Influenza B- Victoria
What is known about avian influenza A(H7N9)?

• Incubation period 1-10 days (6 days median)
• Most common symptoms: high fever, cough, shortness of breath and rapidly progressing severe pneumonia
• Case fatality ratio ~ 40%
• Seasonal pattern, with incidence usually peaking in January and November
• Most human infections have occurred after exposure to infected poultry or their environment (e.g. bedding)
Genetic Origins of Avian Influenza A(H7N9)

Lineage origins of gene segments:
- H7 – A/duck/Zhejiang/12/2011
- N9 – A/wild bird/Korea/A14/2011

Internal genes:
- A/brambling/Beijing/16/2012
Epidemiologic curve of influenza A(H7N9) cases in humans by date of symptom onset to June 12, 2017

Source: WHO, Influenza at the human-animal interface, June 15, 2017
Distribution of human cases of A(H7N9) and positive environmental samples to February 27, 2017

Spatial distribution of human influenza A(H7N9), China, March 2013 – June 13, 2017

Wave 1

Wave 2

Wave 3

Wave 4

Wave 5

Legend
A(H7N9) Confirmed Cases
- 0
- 1
- 2-3
- 4-8
- 9-17
- 18-27
- 28-150
Control measures for avian influenza A(H7N9)

• Vaccination
• Infection prevention and control measures
• Antiviral medications
Summary of Assessment of Public Health Risk to Canada Associated with Avian Influenza A(H7N9) Virus in China

The risk assessment is reviewed on a regular basis and updated as required.

30 May 2017

What's New?

- 81 new human cases of A(H7N9) were reported since the previous update (April 27, 2017)
- Two new administrative regions in China reported locally acquired cases of A(H7N9):
  Shaanxi (5 cases) and Shanxi (1 case).

Summary

Questions
Influenza A(H7N9)

Table Top Exercise

Prepared for PHO Exchange – SW Ontario
Ground Rules

This is an open and safe learning environment

Be receptive to the scenario - it is fictional, actual timelines have been compressed and some details have been deliberately left vague

The scenario is an opportunity for participants to become more familiar with roles, responsibilities and resources
Scenario 1: Identification of avian influenza A(H7N9) in an Ontario resident

- Many cases of influenza-like illness are being reported in Ontario

November 1-11, 2017
An individual travels to China on business

November 12, 2017
He departs China for Toronto and returns home to London, Ontario; there is a layover in England for which he does not leave the airport; he generally feels well while travelling

November 13-15, 2017
He starts feeling tired and has respiratory symptoms on November 13. Reports to work as a personal support worker at a long-term care home (LTCHH) and continues to work with mild influenza-like illness (ILI)

November 16, 2017
He goes to work, but leaves early and visits his GP in London. The physician takes a NPS and sends it to PHOL for influenza testing. A travel history is not taken. The physician sends the individual home to rest.

November 17, 2017
PHOL reports to the individual’s GP that the test results are positive for influenza A(H7N9) however the specimen has to be sent to NML for confirmatory testing. The local HU is also notified of the result. Later that day, the individual, whose condition has deteriorated, went to ER, was admitted to hospital with pneumonia and required intubation. Given his diagnosis, he was placed in an airborne infection isolation room (AIIR).
Scenario 1: For Discussion

1. What are your organization’s roles and responsibilities at this point in the scenario?

2. What types of coordination/communication activities (if any) should be taking place at this time between your organization and other health care / public health organizations?
## Scenario 1: Key Messages

| Laboratory testing | • Important to ask patients with ARI about a possible travel history  
|                    | • Documentation of travel history on requisition forms also ensures proper protection of laboratory staff |
| Infection prevention and control | • **FOLLOW ROUTINE PRACTICES AT ALL TIMES**  
| | • Droplet, Contact and Airborne precautions recommended for novel influenza viruses |
| Reporting | • Health care workers must contact their local public health unit to report a person under investigation (PUI), probable or (presumptive) confirmed case of avian influenza A(H7N9)  
| | • MOHLTCH reports case to PHAC, who then report to the World Health Organization |
| Coordination | • Importance of coordination and sharing of information between organizations  
| | • Collaboration in regards to media reporting, risk communication  
| | • PHO would test respiratory samples, consult with HU (e.g. use of antivirals, provide tools for contact follow up)  
| | • The Ministry Emergency Operations Centre (MEOC) facilitates requests for scientific and technical support to conduct case and contact management activities, such as:  
| | • Guidance on laboratory testing of close contacts  
| | • Support to implement case and contact management activities, etc. |
| Actions | • Identification and daily monitoring of close contacts, assess if prophylactic antivirals needed for contacts |
**Scenario 2: Identification of additional avian influenza A(H7N9) cases**

- As the HU follows up with contacts of the initial case, some individuals who had close contact with the initial case now report that they have ILI.

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 18, 2017</td>
<td>When the HU follows up with the family, they discover that two family members (case’s children) are ill with ILI. In addition, several staff from the LTCH who worked on the same shift as the case, also developed ILI. ILI is detected in 3 residents from the LTCH. ILI is also detected in 3 residents from the LTCH who the initial case cared for.</td>
</tr>
<tr>
<td>November 20, 2017</td>
<td>Laboratory testing at PHOL indicates that the 2 family members of the initial case also test positive for H7N9. In addition, one of the LTCH staff and two residents also test positive for the virus.</td>
</tr>
<tr>
<td>November 20, 2017</td>
<td>MEOC (activated on November 17) is coordinating and directing the provincial health system response, with assistance from PHO.</td>
</tr>
<tr>
<td>November 21, 2017</td>
<td>Sequencing by PHOL of the virus obtained from the initial case indicates a number of amino acid mutations. It is believed that these mutations may indicate enhanced virus transmissibility, however this is uncertain. Both LTCHH residents were admitted to a regional hospital with pneumonia. The initial case, who was in ICU, dies.</td>
</tr>
<tr>
<td>November 22, 2017</td>
<td>Two of six hospital HCWs that looked after the initial case have called in sick with ILI. Neither received the seasonal vaccine and both reported they wore N95 respirators at all times while caring for the case. Both assisted when he was being intubated.</td>
</tr>
</tbody>
</table>
Scenario 2: For Discussion

3. Given the expansion of this cluster, has your organization’s roles, responsibilities and activities changed and if so, how? Describe the activities you would be doing now.

4. Based on scenario #2, who from your organization (i.e. hospital, LTCH) would potentially be identified as a close contact that would require follow up? Question for PHUs and other organizations: who other than individuals with links to either the hospital or LTCH would require follow up?
Scenario 2: Key Messages

| Collaboration and Reporting | • Many cases have been identified from community, LTCH and hospital sectors  
|                           | • MOHLTC will report case to the Public Health Agency of Canada (PHAC) reporting to WHO as per IHR requirement  
|                           | • LTCH to conduct surveillance of exposed residents and staff  
|                           | • Hospital to follow up on patients and staff, HU to follow up with families, visitors and discharged patients  
|                           | • Collaboration (HU, LTCH, hospital, provincial and national public health officials) in regards to media reporting, risk communication, education of staff and others |
| Close contact identification | • Identification done by each organization, although not all contacts will be followed up by that organization |
| Scientific and technical support | • The MEOC will coordinate support  
|                               | • PHO will provide scientific expertise through its role in MEOC  
|                               | • MOHLTCH may issue directives as needed |