

Exercise 2

Management of Human Cases of Avian Influenza A (H5N1)

Part 1: Background information on clinical features of human infection with avian Influenza A (H5N1)

Objectives:

- Identify clinical features of suspected avian influenza A (H5N1) infections in humans
- Assess exposure to avian influenza A (H5N1)
- Give recommendations to health-care providers in the management of suspected avian influenza A (H5N1) patients

Instructions:

For this exercise, you will work with your group to complete a case study investigation. Each segment of case study information will be followed by a series of questions. Your facilitator or one person in your group should read the information aloud to group members. Then, work as a group to generate one answer for each question asked.

Time allotted: 1.5 hours

The Situation

It is May 16, 2006. You are working at a county public-health department. Highly pathogenic avian influenza A (H5N1) has been identified among poultry flocks in the United States, including a farm in a neighboring state, State X. However, there have been no reported human illnesses. You learn during a meeting that a local farm, Wilson's Farm, reported a sudden die off among its flock to the State Department of Agriculture (State AG) on May 14. Preliminary PCR results from that state veterinary laboratory came back positive yesterday for avian influenza (H5). Samples have been sent to the National Veterinary Services Laboratory (NVSL) for confirmatory testing.

Question 1 – What action do you, as part of the public-health workforce, take as a result of this situation?

Suggested answer – It will be important for animal and public-health agencies to coordinate, including the State AG. Although HPAI (H5N1) has not been confirmed on Wilson's Farm, there is a high index of suspicion since preliminary testing identified avian influenza H5. In addition, HPAI (H5N1) is in circulation

in the United States, most notably in a neighboring state. Time will be of the essence to minimize the risk of human infection. Therefore public-health workers should actively work to identify and contact those who may have been exposed to the virus (suspected to be HPAI (H5N1)). The State AG may facilitate contact with poultry workers from the affected farm. Workers and their close contacts (i.e., household members) should be educated on the signs and symptoms of HPAI (H5N1) and instructed to contact their local health department should they begin experiencing symptoms. Other important information to share includes use of appropriate personal protective equipment, proper hygiene and other methods to reduce the risk of transmission. Public-health workers may also want to assist exposed individuals with obtaining appropriate care.

Public-health workers may need to visit the affected farm and/or nearby farms in coordination with the State AG. Educational messages may need to be distributed in print and through the media. Any communication to the public should be conducted in conjunction with State AG. Area physicians should also be reminded of the potential for human illness, educated on the signs and symptoms of disease, and the importance of reporting any suspect illnesses.

Public-health workers may also want to:

- *Establish active surveillance via telephone for human illnesses linked to the affected premise.*
- *Ensure timely reporting of any suspect, probable, or confirmed human illnesses through the normal reporting channels (i.e., from local public health to state authority to CDC). Any control measures that may be implemented (i.e., closing farms) should also be reported through normal reporting channels to ensure all parties are aware of on-going activities.*
- *Characterize human seasonal influenza strains currently circulating in or near the affected area(s) to differentiate HPAI (H5N1) and seasonal influenza (only appropriate if it is flu season).*
- *Should any workers reside outside of jurisdiction, be sure to notify public-health authorities in the appropriate jurisdictions. If any workers are out-of-state residents, be sure to notify the state health department so they may notify appropriate state health departments.*

Questions for Discussion – In your state, region or local area are there established channels of communication between the Departments of Public Health and Agriculture? Is there a protocol in place for sharing information and coordinating the workload between agencies in the event that a highly-pathogenic strain of influenza known to infect humans is detected among poultry?

Facilitator – *Encourage participants to share about what they know of these issues in their jurisdiction. Discussion may bring out whether or not there are clearly delineated boundaries for each agency, and whether members of one agency understand the responsibilities of the other.*

A Patient

Before you get a chance to call your contact at the State AG, you receive a phone call from Dr. Garvill at Community Hospital. He has just come on shift and describes a 39-year-old female named Maya Thomas who was admitted earlier in the day. She visited her primary care physician yesterday. Her symptoms included fever (38 C/100.4 F), nausea and cough. Her white blood cell count was below normal as well as her lymphocyte count. The platelet count was normal. An antibiotic was prescribed.

Question 2 – Based on this information, what illness would you suspect this patient has?

Suggested answer – The patient could have a number of illnesses, but viral respiratory infection is likely.

Additional Background

Dr. Garvill continues: Maya went back to her primary-care physician early this morning, as she began to have shortness of breath. Her physician recommended she be admitted to Community Hospital. The admitting physician ordered a chest radiograph. She had patchy infiltration in the lower region of both of her lungs.

Question 3 – Do you think the patient has influenza?

Suggested answer – Although she is now presenting with respiratory symptoms and other symptoms of influenza, you would probably not suspect the patient has influenza. The symptoms are not specific for influenza (human or avian) and may represent other respiratory illnesses. The timing of her infection, May, is not typical of seasonal influenza.

Maya's Current Condition

Shortly before Dr. Garvill contacted you, he checked Maya's stats again. She had a fever of 102.9F / 39.4C and a high respiratory rate of 44 breaths per minute. Her heart rate was also high at 140 beats per minute. Her blood pressure was 110/80 mm Hg. A follow up chest radiograph shows diffuse bilateral infiltrates and her arterial blood oxygen is 48 mm Hg. Dr. Garvill decided to intubate her. Laboratory tests on her blood found a drop in lymphocyte count. Platelet count was normal. The clinical profile indicated she was developing acute respiratory distress syndrome. Dr. Garvill gave her imipenem, azithromycin and doxycycline.

Dr. Garvill has heard on the news about the possibility of HPAI (H5N1) at Wilson's Farm. Because Maya's chart indicated her occupation was "poultry worker", he decided to contact you. He is concerned about the possibility that Maya is infected with avian influenza A (H5N1).

Question 4 – To date, do any symptoms indicate seasonal influenza infection? Which symptoms might indicate infection with avian influenza A (H5N1)?

Suggested answer –

- *Symptoms that might indicate seasonal influenza: fever, cough*
- *Symptoms that might indicate avian influenza A (H5N1): fever, diarrhea, vomiting and nausea. Maya also has respiratory symptoms of cough and shortness of breath. Her respiratory rate is high, her x-rays indicate respiratory distress, and her arterial blood oxygen level is low.*

Laboratory profile: drop in lymphocyte count also common in avian influenza A (H5N1) infections.

It is critical to re-emphasize that all of these symptoms are NON_SPECIFIC to avian influenza A (H5N1) in humans. This makes the rapid collection of laboratory specimens and epidemiologic information essential to any investigation.

Question 5 – Dr. Garvill asks you, "Could this be a human case of avian influenza A (H5N1)?" What is your reply? Why or why not? What other information would you like to know?

***Suggested answer** – Based on her signs and symptoms, and the possibility of HPAI (H5N1) at Wilson’s Farm (i.e., preliminary testing identified avian influenza H5), it cannot be ruled out. However, you need a respiratory specimen for confirmatory testing. Other information that may be helpful include any potential exposures within 10 days of her symptom onset, occupation as a poultry worker, direct contact with sick poultry, travel history to an area with known or suspected HPAI (H5N1) activity in poultry, and general travel history during the days prior to and during her illness.*

HPAI (H5N1) Activity

You tell Dr. Garvill you will need more information about Maya’s job as a poultry worker. Given her current status, you suggest he speak with Maya’s husband. After getting off the phone with Dr. Garvill, you call your State Ag. colleague for an update on the situation. Your colleague faxes you a notice sent to other animal health agencies earlier today.

STATE DEPARTMENT OF AGRICULTURE HIGHLY-PATHOGENIC AVIAN INFLUENZA A (H5N1) ALERT

UPDATE AS OF 12:00 p.m., MAY 16

USDA confirmed the first outbreak of Asian lineage highly pathogenic avian influenza A (H5N1) in U.S. poultry flock in State A. On April 26th, laboratory testing confirmed HPAI (H5N1) among poultry in State X. Avian influenza surveillance among poultry in State X:

- May 3: Precautionary HPAI (H5N1) testing begun among poultry farms and wild Birds.
- May 14: Poultry die-off reported, Wilson Farm. Investigation initiated at Wilson Farm and surrounding poultry houses. Specimens collected for testing.
- May 15: State A Veterinary Laboratory reports PCR results from Wilson’s Farm are positive for avian influenza (H5).
- May 16: National Veterinary Services Laboratory confirms positive PCR results for avian influenza (H5N1). Confirmatory testing, including genetic sequencing, is ongoing.

For technical questions regarding this alert, call 357-2236 and ask for Arch Green.
For interviews or public information, ask for Lydia Yang.

Question 6 – How is this information helpful for you concerning Maya? What is your index of suspicion for human infection with avian influenza A (H5N1)?

***Suggested answer** – Since NVSL results indicate the poultry die-off at Wilson’s Farm was due to HPAI (H5N1), a patient with severe respiratory illness consistent with clinical and laboratory profiles of avian influenza A (H5N1) who is a poultry worker should peak your suspicion of infection with avian influenza (H5N1). It’s essential to collect respiratory specimens for laboratory confirmation. It is also important to find out Maya’s specific exposure history. You would need to determine if Maya had any potential exposures to sick or dead poultry in the 10 days prior to her symptom onset, and whether Maya had any connection to Wilson’s Farm.*

If you have not already done so, you should establish contact with the state health department so that you can communicate with them immediately regarding recommendations for proper specimen collection and transport, and to update them quickly if it appears that transmission from poultry to humans has occurred. The state health department will be vital to communication as they can assist in notifying other local health departments in the state. In addition, they are the agency responsible for providing updates to the CDC.

Finally, one would hope in this scenario that the health department and other responding agencies have been on high alert since HPAI (H5N1) was first detected in the United States and have already taken additional steps for preparedness.

Exposure

Dr. Garvill calls you back with an update on Maya’s exposure history. He spoke with Maya’s husband, Daniel.

Maya and Daniel live in a rural area of the county. They have two children living at home, ages 2 and 7. No one else in the family is ill. Maya is employed at Wilson’s Farm where she is a farm-hand manager. Daniel noted that a few days before Maya became ill, she worked overtime because the farm was seeing more deaths than normal in the flock. She assisted in separating sick and dead poultry from apparently healthy poultry.

Question 7 – Do you think Maya is at risk for avian influenza A (H5N1) infection? If yes, what kind of exposures could she have had?

Suggested answer – *It is reasonable to think that the patient is at risk for avian influenza A (H5N1) infection. Maya was exposed to sick and dead poultry at Wilson’s Farm. She may have also been exposed to poultry blood or feces while working.*

Question 9 – What clinical and epidemiological evidence do you have that Maya may have avian influenza A (H5N1) infection? What are the differential diagnoses?

Suggested answer – *The patient has a number of symptoms that are consistent with avian influenza A (H5N1) infection: fever, nausea, cough, shortness of breath, high respiratory rate, and patchy infiltrates in the lungs consistent with respiratory distress, and low arterial blood oxygen. You know that this is not enough evidence to confirm avian influenza A (H5N1) infection because the symptoms can also be caused by other illness. However, you know Maya has been exposed to sick and dead poultry through her job at Wilson’s Farm. You also know preliminary results have identified the cause of the die off at Wilson’s Farm to be HPAI (H5N1).*

Differential diagnoses could include bacterial pneumonia, respiratory distress due to primary cardiac problems, ARDS and other viral pneumonias.

Question 10 – Would you recommend testing Maya for infection with avian influenza A (H5N1)? Why or why not? If yes, what specimens would you advise Dr. Garvill collect?

Suggested answer – *Although Maya has received a number of antibiotics, testing for infection with avian influenza A (H5N1) is still possible as viruses are not affected by antibiotics. If possible, collection of oropharyngeal swabs or any specimens from the lower respiratory tract (bronchoalveolar lavage, tracheal aspirate, pleural fluid tap or sputum) is preferred as these have the highest yield for H5N1. You may also want to collect nasopharyngeal specimens to rule out seasonal influenza. Acute and convalescent serum should also be collected for testing. Acute serum should be collected as soon as possible since Maya is already two days out from onset. Convalescent serum should be collected 2-4 weeks after symptom onset. Serial specimen collection over several days should also be recommended to improve the ability to diagnose avian influenza A (H5N1).*

Question 11 – Would you recommend treating Maya for avian influenza A (H5N1) infection at this point? Why or why not? If you would not recommend treatment, what information would you want before you recommend treatment?

Suggested answer –Begin treatment. You have assessed that Maya has symptoms compatible with avian influenza A (H5N1) infection and has probably been exposed to HPAI (H5N1) at Wilson’s Farm. Treatment with antivirals should be started within 48 hours of symptom onset or as soon as possible. Waiting for laboratory confirmation means a delay in treatment for Maya.

It would be best for Maya to begin treatment with antivirals immediately, preferably the neuraminidase inhibitor oseltamivir. If this is not possible, zanamivir should be given. However, before beginning treatment with either drug, be sure to confirm her pregnancy and nursing status. Neuraminidase inhibitors are not currently recommended for routine use during pregnancy or nursing. These drugs have not been evaluated in pregnant women, and researchers do not know the effects these drugs could have on the unborn child. However this should be weighed by a clinician against the severity of illness on a case by case basis. For zanamivir, be sure Maya has no chronic respiratory conditions as this is a contraindication.

Community Hospital

Before hanging up with Dr. Garvill, you ask if Maya is in an airborne isolation room. Dr. Garvill tells you that, although Maya is in a room by herself, she is not in an airborne isolation room. Standard precautions (e.g., handwashing) are followed for all patients.

Question 12 – What additional recommendations would you offer Dr. Garvill for infection control measures in Community Hospital?

Suggested answer – If possible, Maya should be placed in an airborne isolation room as a precautionary measure. At a minimum, airborne/droplet (N95 mask or more protective) precautions should be instituted as well as eye protection, and contact precaution (gloves and gown worn) among exposed health-care workers and family. Dedicated equipment should be used in caring for Maya. Finally, the room Maya has been in should be disinfected properly.

Case Study 1: Conclusion

Based on clinical features and information about exposure to poultry, you were able to appropriately suspect Maya may be infected with avian influenza A (H5N1).

Part 2: Public-Health Action

Objectives:

- Minimize the risk of spread or further human illness associated with highly pathogenic avian influenza A (H5N1) (HPAI (H5N1)) among poultry

Instructions

This exercise builds upon Case Study 1, focusing on the public-health actions you will need to undertake while following up on your investigation of Maya Thomas. Although many people will need to take action to prevent the spread of HPAI (H5N1) in poultry, this exercise will focus only on what public-health practitioners need to do to protect human health.

Please have Part 1 of this exercise and CDC guidelines available for quick reference. Each segment of information will be followed by a series of questions. Your facilitator or one person in your group should read the information aloud to group members. Then, work as a group to generate one answer for each question asked.

Time allotted: 1.5 hours

The Afternoon

You hang up the phone with the state Department of Agriculture (State AG) and head straight to the offices of the county health department director, Dr. Vaughn. You tell her what you know: 1) HPAI (H5N1) is in circulation in poultry at Wilson's Farm, and 2) the farm hand manager for Wilson's Farm, Maya, is in the hospital with symptoms compatible with avian influenza A (H5N1) infection. You and Dr. Vaughn begin to discuss the next steps that need to be taken.

Question 1 – According to the surveillance case definition for human infection with avian influenza A (H5N1), how would you classify Maya?

Suggested Answer – *Maya would be a suspect human case of avian influenza A (H5N1) because she meets the following criteria:*

Documented temperature ≥ 38 C (≥ 100.4 F) and one of the following: cough, sore throat, and/or respiratory distress AND

One of the following exposures within 10 days of onset

- *Direct contact with sick or dead domestic poultry*
- *Direct contact with surfaces contaminated with poultry feces*
- *Consumption of raw or partially cooked poultry or poultry products*
- *Close contact (within 1 meter or 3 feet) of an ill patient with confirmed or suspected H5N1 infection*
- *Work with live avian influenza A (H5N1) influenza virus in a laboratory*

Laboratory test for avian influenza A (H5N1) is pending, inadequate or unavailable

Question 2 – What public-health actions do you think are “next steps”?

Suggested Answer –

- *Case follow up*
 - *Complete case investigation form*
 - *Ensure that specimens are collected from Maya*
 - *Ensure that Maya is receiving antiviral treatment*
- *Contact follow up*
 - *Interview household contacts*
 - *Interview close contacts (within 1 meter or 3 feet)*
- *Communication*
 - *Notify state health department*
 - *Notify health-care providers in jurisdiction*
 - *Provide links to avian influenza information for health-care providers and the general public that is posted on the CDC web site.*
<http://www.cdc.gov/flu/avian/>
 - *Alert public through press release (with State AG officials)*
- *Exposure Assessment at the Farm*
 - *Identify staff who work at Wilson’s Farm and those who have been on the farm three days prior to signs and symptoms of illness in poultry*

Question 3 – What federal, state or local agencies should be involved in this investigation, and what are their responsibilities?

Suggested answer – *The exact roles of state and local agencies will vary by jurisdiction. Some examples are given below.*

Federal:

The U.S. Department of Agriculture (USDA) provides immediate response and investigation in the event of suspected highly pathogenic avian influenza among U.S. livestock. Personnel from local offices would be involved from the beginning to participate in the investigation in coordination with State AG. USDA will advise, coordinate or lead an investigation to trace infected animals to the

source; issue guidelines, advice and manpower to State agencies; and coordinate with State agencies to provide a contact for local farmers and veterinarians if avian influenza is suspected.

The CDC will assist states in conducting surveillance for human cases and provide consultative technical advice on any aspect of disease surveillance or outbreak investigation at the States' request. It will provide education to persons involved in the investigation, and to the public, on the use of preventive equipment and procedures. The CDC will also investigate and provide laboratory confirmation for humans exposed to animal influenza and may supply antiviral medication through the Strategic National Stockpile.

The CDC and FDA may assist states in investigating potential food borne exposures.

The Department of the Interior may assist in surveillance of wild birds and laboratory testing and investigation of sick or dead wild birds.

State:

The state Department of Agriculture may conduct surveillance among agricultural animals in the state; assess the need and issue orders for quarantine and/or culling of animals; participate in tracing infection among the food supply to its source; answer questions, provide guidelines and serve as a contact for local veterinarians. They will coordinate response and investigation activities together with USDA and will lead the public information effort.

The state health department will likely make recommendations on the use of antivirals and access the Strategic National Stockpile if needed. It will conduct and coordinate enhanced surveillance for avian influenza among humans, particularly those exposed to affected animals; coordinate the provision of health services to those exposed to affected animals; coordinate activities to ensure the health and safety of animal response workers; communicate and coordinate with federal and local agencies; and communicate with the public. For more information on State and Local preparedness and responsibilities during a pandemic go to: <http://www.pandemicflu.gov/plan/states/statelocalchecklist.html>

Natural resources/wildlife agencies will conduct surveillance among wild birds, in coordination with and assistance from federal agencies.

Local:

The health department will conduct surveillance for human cases in affected areas; work with educating area hospitals and physicians about signs, symptoms and methods of reporting; provide health services to affected populations; and coordinate with State and Federal agencies as needed.

Other agencies that may be involved include veterinary agencies, agencies involved in emergency management, transportation agencies, state or university

diagnostic laboratories, and hospitals. It may be helpful to form a joint incident command system (ICS) to coordinate the response among agencies.

Visiting Community Hospital

It is now the evening of May 16th, and Dr. Vaughn has asked you to continue to follow up with Maya, and also to follow up with her household and close contacts. You call Dr. Garvill and make arrangements to visit Maya at the hospital. Fortunately, Maya's husband, Daniel, is at the hospital so you make arrangements to talk with him as well. Dr. Garvill has been monitoring Daniel, who has no symptoms at present.

You arrive at the hospital and talk with Dr. Garvill as you review Maya's chart. Dr. Garvill has moved Maya to an airborne isolation room, taken tracheal aspirate specimens, and forwarded them to the state public-health laboratory for testing. In addition, he began treatment with oseltamivir.

Question 4 – Why do you want to assess Maya's household and close contacts for illness? How long should they be monitored for signs of illness?

***Suggested Answer** – You want to find out if any of them have any signs or symptoms of avian influenza A (H5N1) infection and to characterize their exposure. If there is any evidence of a cluster of suspect human cases of avian influenza A (H5N1) infection, you should be immediately concerned about the possibility that human-to-human transmission may have occurred. Human-to-human transmission is most likely to happen among close, frequent contacts, such as household members and children's playmates. The faster you can determine health status of contacts, the earlier that infected persons can be started on treatment. Close contacts, including health-care workers, should be monitored for 10 days to evaluate whether symptoms of influenza develop.*

Household Contacts

You also get a quick update on Maya's current status and learn that her condition continues to deteriorate. She is already on mechanical ventilation, and her kidneys are beginning to fail. Dr. Garvill is not sure she will make it through the evening.

You head over to Maya's room and see Daniel outside the room, waiting for you. The two of you find a quiet seating area and you begin to ask questions about Maya's household and close contacts.

There are only four individuals in the home: Daniel (40), Maya (39), Jacob (7), and Kayla (2). In the 10 days prior to her onset, Maya's only travel was to work or home. Daniel did not know of any other close contact outside of home and work. She had weekend plans to visit friends, but cancelled them because she was not feeling well. Neither of the children is sick.

Question 5 – What recommendations would you make for post-exposure prophylaxis?

***Suggested answer** –WHO guidelines state post-exposure prophylaxis should be offered to household and close contacts of confirmed or strongly suspected cases of HPAI (H5N1) infection. Given the current circulation of HPAI (H5N1) in poultry at Maya's job and her present status as a suspect case, it would be prudent to offer post-exposure prophylaxis to Maya's family.*

Question 6 – You provide Daniel with literature regarding infection control measures in the home and how to self-monitor for signs and symptoms of avian influenza A (H5N1). Why is it important that you (as a health-department employee) provide the information to Daniel?

***Suggested answer** – It is important to have up-to-date and consistent information provided to all contacts regarding proper infection control measures and how to self-monitor. Providing literature allows contacts to have the information at their fingertips around the clock. This also gives you the opportunity to answer any questions Daniel may have and to note any "frequently asked questions" from contacts that may need to be addressed in future literature. As an extra note, you should be sure that translations into languages appropriate for the local population, such as Spanish, are available if needed.*

Question 7 – What other close contacts should you follow up with?

Suggested answer – You should follow up with Dr. Garvill and the hospital staff who cared for Maya, as well as her primary-care physician and his staff to assess for potential exposure and symptoms of infection with avian influenza A (H5N1).

Tuesday Morning, May 17, 2006

You arrive at the office to learn Maya passed away during the evening. You contact Dr. Garvill and he informs you Maya went into multi-organ failure and died around 10:00 p.m. You recommend autopsy specimens be collected for testing, and Maya's husband agrees to the autopsy. You inform the state health department of Maya's death and alert them to the fact that autopsy specimens are being taken and will need to be forwarded to the CDC.

You head into a morning debriefing which involves an inter-agency conference call. You update the group with the news of Maya's death and inform them of your findings from yesterday evening's meeting with Daniel. You also note your follow up of Maya's health-care providers: two physicians and one nurse had close contact with Maya and all are symptom-free.

Question 8 –What specimens should you have recommended Dr. Garvill collect from Maya?

Suggested answer – Laboratory test results for avian influenza (H5N1) infection in Maya are still pending due to unforeseen challenges resulting from the poor quality of collected specimens. Irrespective of this it would be prudent to collect additional specimens for testing in case there are any further problems. A minimum of eight blocks or fixed-tissue specimens from each of the following sites should be collected for testing: central (hilar) lung with segmental bronchi; right and left primary bronchi; trachea (proximal and distal); and pulmonary parenchyma from both right and left lung. Samples from major organs with significant gross or microscopic pathology should also be collected. These specimens should be forwarded to CDC for testing. It is important to note that this level of testing will only occur with early cases, and if a pandemic were to occur, only a sample of all cases might receive testing.

Question 9 – Why is it important to report avian influenza A (H5N1) activity in humans to the state health department?

Suggested answer – Various answers may be given but normal reporting chain should be followed (local public health to state public health to CDC) as the information provided to CDC will be shared with the World Health Organization (WHO). This will help determine the pandemic phase of avian influenza (H5N1) in the US.

Wilson's Farm

At the debriefing you learn Wilson's Farm was quarantined yesterday once it was discovered that HPAI (H5) was circulating in its poultry. Local, state and federal officials were on the scene to help assist in depopulating and disinfecting activities. There are 14 employees at the farm, not including Maya. Interviews were conducted yesterday for 11 of the individuals. All are asymptomatic.

You are asked to help interview Lyle, one of the three pending interviewees. Lyle is one of the farm hands who helped remove the dead birds.

Discussion Questions –

- A. Who has the authority to close down a potentially infected farm?
- B. Do you think closing the farm was the appropriate action to take?
- C. What role, if any, does public health play in the closure of the facility?
- D. What should public health recommend for the 14 employees of the farm?

Suggested answers –

- A. *USDA and state officials*
- B. *Yes. The decision may be easy to make from a health perspective. Although closing the farm has an economic impact on the owner and the community, it is necessary to contain the virus.*
- C. *Public-health officials are responsible for interviewing anyone potentially exposed to the disease. According responders in close contact with exposed and symptomatic persons should wear personal protective equipment (PPE) and assist in assuring that proper disinfection procedures take place for anyone entering or exiting the farm. This risk can be avoided by conducting interviews over the phone. Public health will probably take a role in communicating to the public about the reasons for the closure of the farm, especially as the message should contain information on the level of risk to community members and how they can help prevent infection.*
- D. *Post exposure prophylaxis should be recommended for all 14 employees of the farm.*

Lyle

You are finally able to speak with Lyle in the late afternoon. While on the phone you notice he has a cough. You learn he was on holiday visiting his girlfriend's family in another state before returning to work on May 13. That day he stayed at the farm late to help dispose of the dead chicken carcasses. He continued to dispose of the dead poultry for a couple of days wearing a simple face mask and leather gloves. After Mr. Wilson reported the deaths to the State AG on May 14, Lyle began to use appropriate personal protective equipment under the advice of the State AG.

You ask Lyle about his cough. He tells you it started yesterday. He mentioned he had a headache as well but the symptoms are nothing since he has allergies. The reason he was not at work yesterday was because it was his day off.

Lyle lives with his girlfriend in a house near Wilson's Farm. His girlfriend is still at her parent's home. He has only socialized with his coworkers since returning from his holiday and has had no other close contacts.

Question 10 – According to the case definitions, what would Lyle be classified as? What recommendations would you give Lyle?

***Suggested answer** – You should treat Lyle as a “report under investigation”. Since Lyle was exposed to dead birds without proper protective equipment on May 13 and has a cough (and had a headache), you should recommend he seek medical treatment immediately regardless of allergies. If possible, you should be sure to make his physician aware of his current situation and to take proper precautions while examining Lyle. He should also be advised to receive treatment with a neuraminidase inhibitor, preferably Oseltamivir, pending results of testing for H5 (since he is exhibiting symptoms, giving Lyle the treatment dose, as opposed to the post-exposure prophylaxis dose, is advisable.)*

Question 11 – Lyle asks you what he should do with his work clothes and boots. Which guidelines should you reference to answer this question?

***Suggested answer** – Although USDA officials may have already collected Lyle's work clothes and boots, you can use any of the following references to answer Lyle's question:*

- *CDC Interim Guidance for Protection of Persons Involved in U.S. Avian Influenza Outbreak Disease Control and Eradication Activities, updated January 14, 2006 (<http://www.cdc.gov/flu/avian/professional/protect-guid.htm>)*
- *Occupational Safety and Health Administration (OSHA) document Avian Influenza Protecting Poultry Workers at Risk (<http://www.osha.gov/dts/shib/shib121304.html>)*
- *Animal and Plant Health Inspection Service (APHIS) Directive 6800.1, Ensuring the Protection of Employees Involved in Highly Pathogenic Influenza Control and Eradication Activities (May 10, 2006; http://www.aphis.usda.gov/library/directives/pdf/APHIS6800_1.pdf).*

Wednesday Morning, May 18, 2006

You are in the morning debriefing when you learn Maya's PCR results have come back positive for avian influenza A (H5). Specimens are being forwarded to CDC for confirmation and subtyping.

Question 12 – Does this information have any bearing on Maya's case classification? What about your follow up of her close contacts?

***Suggested answer** – Although Maya is deceased, she would be defined as a confirmed human case of human avian influenza (H5N1).*

If her close contacts (those who Maya had close contact with starting one day before symptom onset through 14 days after symptom onset) had not already received post-exposure prophylaxis, they should begin immediately.

Question 13 – Based on the positive result, are there any additional steps that should be taken in your investigation or control measures?

***Suggested answer** –A confirmed human case of avian influenza A (H5N1) infection should be investigated as an outbreak, especially since this is the first confirmed case in the United States. Contacts of the confirmed case should be carefully monitored for 10 days for potential human-to-human spread, **and** surveillance among those with exposure to affected poultry should remain meticulous due to proven transmission from poultry to humans. The state health*

department should provide an update to all necessary parties, including other state health departments and CDC.

Case Study Part 2 Conclusion

Of the 15 employees at Wilson's Farm, 12 had direct exposure to sick or dead birds. Five developed symptoms and had respiratory specimens collected; three were laboratory confirmed by PCR. One case ended in death. Lyle survived. Testing of paired serum specimens for H5 antibody from all 15 persons did not reveal any additional cases.

The outbreak of avian influenza A (H5N1) spread to other jurisdictions before it could be contained. By the end of the outbreak, 12 confirmed cases (laboratory and epidemiologically-linked) of avian influenza A (H5N1) transmitted from poultry to humans were identified.

This is an official **CDC HEALTH UPDATE**

Distributed via Health Alert Network
Wednesday, June 07, 2006, 19:50 EDT (7:50 PM EDT)
CDCHAN-00246-2006-06-07-UPD-N

Updated Interim Guidance for Laboratory Testing of Persons with Suspected Infection with Avian Influenza A (H5N1) Virus in the United States

This update provides revised interim guidance for testing of suspected human cases of avian influenza A (H5N1) in the United States and is based on the current state of knowledge regarding human infection with H5N1 viruses. The epidemiology of H5N1 human infections has not changed significantly since February 2004. Therefore, CDC recommends that H5N1 surveillance in the United States remain at the enhanced level first established at that time. However, this revised interim guidance provides an updated case definition of a suspected H5N1 human case for the purpose of determining when testing should be undertaken and also provides more detailed information on laboratory testing. Effective surveillance will continue to rely on health-care providers obtaining information regarding international travel and other exposure risks from persons with specified respiratory symptoms as detailed in the recommendations below. This guidance will be updated as the epidemiology of H5N1 changes. Note: CDC is revising its interim guidance for infection control precautions for avian influenza A (H5N1). These will be issued as soon as they are available.

Current Situation:

The avian influenza A (H5N1) epizootic (animal outbreak) in Asia has expanded to wild birds and/or poultry in parts of Europe, the Near East and Africa. Sporadic human infections with H5N1 continue to be reported and have most recently occurred in China, Egypt, Indonesia, Azerbaijan, Cambodia and Djibouti. In addition, rare instances of probable human-to-human transmission associated with H5N1 viruses have occurred, most recently in a family cluster in Indonesia. So far, however, the spread of H5N1 virus from person to person has been rare, inefficient, and unsustainable. The total number of confirmed human cases of H5N1 reported as of June 7, 2006, has reached 225. The case fatality rate for these reported cases continues to be approximately 50 percent. As of this date, H5N1 has not been identified among animals or humans in the United States.

The epizootic in Asia and parts of Europe, the Near East and Africa is not expected to diminish significantly in the short term and it is likely that H5N1 infection among birds has become enzootic in certain areas. It is expected that human infections resulting from direct contact with infected poultry will continue to occur in affected countries. Since no sustained human-to-human transmission of influenza H5N1 has been documented anywhere in the world, the current phase of alert, based on the World Health Organization (WHO) global influenza preparedness plan, remains at Phase 3 (Pandemic Alert).^{*} In addition, no evidence for genetic reassortment between human and avian influenza A virus genes has been found. Nevertheless, this expanding epizootic continues to pose an important and growing public health threat. CDC is in communication with WHO and other national and international agencies and continues to monitor the situation closely.

Reporting and Testing Guidelines:

CDC recommends maintaining the enhanced surveillance efforts practiced currently by state and local health departments, hospitals, and clinicians to identify patients at increased risk for avian influenza A (H5N1). Guidance for enhanced surveillance was first described in a HAN update issued on February 3, 2004 and most recently updated on February 4, 2005.

Testing for avian influenza A (H5N1) virus infection is recommended for:

A patient who has an illness that:

- requires hospitalization or is fatal; AND
- has or had a documented temperature of $\geq 38^{\circ}\text{C}$ ($\geq 100.4^{\circ}\text{F}$); AND
- has radiographically confirmed pneumonia, acute respiratory distress syndrome (ARDS), or other severe respiratory illness for which an alternate diagnosis has not been established; AND
- has at least one of the following potential exposures within 10 days of symptom onset:

A) History of travel to a country with influenza H5N1 documented in poultry, wild birds, and/or humans,[†] AND had at least one of the following potential exposures during travel:

- direct contact with (e.g., touching) sick or dead domestic poultry;
- direct contact with surfaces contaminated with poultry feces;
- consumption of raw or incompletely cooked poultry or poultry products;
- direct contact with sick or dead wild birds suspected or confirmed to have influenza H5N1;
- close contact (approach within 1 meter [approx. 3 feet]) of a person who was hospitalized or died due to a severe unexplained respiratory illness;

B) Close contact (approach within 1 meter [approx. 3 feet]) of an ill patient who was confirmed or suspected to have H5N1;

C) Worked with live influenza H5N1 virus in a laboratory.

Testing for avian influenza A (H5N1) virus infection can be considered on a case-by-case basis, in consultation with local and state health departments, for:

- A patient with mild or atypical disease[‡] (hospitalized or ambulatory) who has one of the exposures listed above (criteria A, B, or C); OR
- A patient with severe or fatal respiratory disease whose epidemiological information is uncertain, unavailable, or otherwise suspicious but does not meet the criteria above (examples include: a returned traveler from an influenza H5N1-affected country whose exposures are unclear or suspicious, a person who had contact with sick or well-appearing poultry, etc.)

Clinicians should contact their local or state health department as soon as possible to report any suspected human case of influenza H5N1 in the United States.

Specimen Collection and Testing Guidelines:

- Oropharyngeal swab specimens and lower respiratory tract specimens (e.g., bronchoalveolar lavage or tracheal aspirates) are preferred because they appear to contain the highest quantity of virus for influenza H5N1 detection, as determined on the basis of available data. Nasal or nasopharyngeal swab specimens are acceptable, but may contain less virus and therefore not be optimal specimens for virus detection.

- Detection of influenza H5N1 is more likely from specimens collected within the first three days of illness onset. If possible, serial specimens should be obtained over several days from the same patient.
- Bronchoalveolar lavage is considered to be a high-risk aerosol-generating procedure. Therefore, infection control precautions should include the use of gloves, gown, goggles or face shield, and a fit-tested respirator with an N-95 or higher rated filter. A loose-fitting powered air-purifying respirator (PAPR) may be used if fit-testing is not possible (for example, if the person has a beard). Detailed guidance on infection control precautions for health care workers caring for suspected influenza H5N1 patients is available.||
- Swabs used for specimen collection should have a Dacron tip and an aluminum or plastic shaft. Swabs with calcium alginate or cotton tips and wooden shafts are not recommended.§ Specimens should be placed at 4°C immediately after collection.
- For reverse-transcriptase polymerase chain reaction (RT-PCR) analysis, nucleic acid extraction lysis buffer can be added to specimens (for virus inactivation and RNA stabilization), after which specimens can be stored and shipped at 4°C. Otherwise, specimens should be frozen at or below -70°C and shipped on dry ice. For viral isolation, specimens can be stored and shipped at 4°C. If specimens are not expected to be inoculated into culture within 2 days, they should be frozen at or below -70°C and shipped on dry ice. Avoid repeated freeze/thaw cycles.
- Influenza H5N1-specific RT-PCR testing conducted under Biosafety Level 2 conditions is the preferred method for diagnosis. All state public-health laboratories, several local public-health laboratories, and CDC are able to perform influenza H5N1 RT-PCR testing, and are the recommended sites for initial diagnosis.
- Viral culture should NOT be attempted on specimens from patients suspected to have influenza H5N1, unless conducted under Biosafety Level 3 conditions with enhancements.
- Commercial rapid influenza antigen testing in the evaluation of suspected influenza H5N1 cases should be interpreted with caution. Clinicians should be aware that these tests have relatively low sensitivities, and a negative result would not exclude a diagnosis of influenza H5N1. In addition, a positive result does not distinguish between seasonal and avian influenza A viruses.
- Serologic testing for influenza H5N1-specific antibody, using appropriately timed specimens, can be considered if other influenza H5N1 diagnostic testing methods are unsuccessful (for example, due to delays in respiratory specimen collection). Paired serum specimens from the same patient are required for influenza H5N1 diagnosis: one sample should be tested within the first week of illness, and a second sample should be tested 2-4 weeks later. A demonstrated rise in the H5N1-specific antibody level is required for a diagnosis of H5N1 infection. Currently, the microneutralization assay, which requires live virus, is the recommended test for measuring H5N1-specific antibody. Any work with live wild-type highly pathogenic influenza H5N1 viruses must be conducted in a USDA-approved, Biosafety Level 3 enhanced containment facility. Visit <http://www.cdc.gov/flu/h2n2bsl3.htm> for more information about procedures and facilities recommended for manipulating highly pathogenic avian influenza viruses.

Laboratory testing results positive for influenza A (H5N1) in the United States should be confirmed at CDC, which has been designated as a WHO H5 Reference Laboratory. Before sending specimens, state and local health departments should contact CDC's on-call epidemiologist at (404) 639-3747 or (404) 639-3591 (Monday – Friday, 8:30 AM - 5:00 PM) or (770) 488-7100 (all other times).

Travel Health Notice:

CDC has not recommended that the general public avoid travel to any of the countries affected by H5N1. However, CDC does recommend that travelers to these countries avoid poultry farms and bird markets or other places where live poultry are raised or kept. For details about other ways to reduce the risk of infection, see http://www.cdc.gov/travel/other/avian_influenza_se_asia_2005.htm.

More Information:

Department of Health and Human Services at www.pandemicflu.gov
World Health Organization at
World Organization for Animal Health (OIE) at http://www.oie.int/eng/en_index.htm

*For the current WHO Pandemic Phase, see
http://www.who.int/csr/disease/avian_influenza/phase/en/index.html.

† For a listing of influenza H5N1-affected countries, visit the CDC website at <http://www.cdc.gov/flu/avian/outbreaks/current.htm>; the OIE website at http://www.oie.int/eng/en_index.htm; and the WHO website at http://www.who.int/csr/disease/avian_influenza/en/.

‡ For example, a patient with respiratory illness and fever who does not require hospitalization, or a patient with significant neurologic or gastrointestinal symptoms in the absence of respiratory disease.

|| Interim recommendations for infection control in health-care facilities caring for patients with known or suspected avian influenza are available at <http://www.cdc.gov/flu/avian/professional/infect-control.htm>.

§ Specimens can be transported in viral transport media, Hanks balanced salt solution, cell culture medium, tryptose-phosphate broth, veal infusion broth, or sucrose-phosphate buffer. Transport media should be supplemented with protein, such as bovine serum albumin or gelatin, to a concentration of 0.5% to 1%.

Information regarding Laboratory Biosafety Level Criteria can be found at <http://www.cdc.gov/od/ohs/biosfty/bmb14/bmb14s3.htm>.

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