

## Exercise 4

### A Public Health Investigation of Poultry on a Farm

#### Objectives:

- Assess clinical symptoms among poultry for index of suspicion of AI infection
- Prioritize response actions with partner agencies
- Evaluate biosecurity measures during an outbreak

#### 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: 30 minutes

#### The Situation

You are a public health officer in a rural part of the country. This is an area where there are many moderate and large poultry operations. You get a courtesy call from the local office of the State Agriculture Department saying that a particular layer operation of 30,000 chickens has recently experienced a large number of die-offs. Over a 6 day period of time, over 20% of the poultry have been found dead. This farm has an excellent record for vaccinating its flock for the recommended diseases. The office is concerned that this illness could be something unusual and potentially hazardous not only to other poultry farms, but to poultry workers and possibly the public as well.

**Question 1** – What types of diseases, for which poultry are not typically vaccinated, cause large die-offs in a short period of time?

**Suggested answer** – *Avian influenza and Exotic Newcastle Disease of chickens and turkeys with various levels of pathogenicity are frequently indistinguishable on clinical and post-mortem examination from: mycoplasmosis; fowl cholera; Escherichia coli cellulitis of the head; acute pasteurellosis; infectious laryngotracheitis; infectious coryza; avian chlamydiosis; acute poisoning;*

*or misadventure causing high mortality (for example smothering, heat stress, or dehydration). HPAI should be considered as a rule-out disease whenever sudden bird deaths occur with severe depression, loss of appetite, nervous signs, watery diarrhea, severe respiratory signs and/or a drastic drop in egg production, with production of abnormal eggs. The likelihood of AI is increased by the presence of facial subcutaneous edema, swollen and cyanotic combs and wattles, and petechial hemorrhages on the internal membrane surfaces.*

### Additional Background

The symptoms include a large decline in egg production, swollen wattles and combs, and strange hemorrhages under the skin. The farmer also reports that some poultry were found dead with no apparent symptoms. The farmer has said that this illness has seemed to come on very swiftly with no previous illness in the flock within the last month. The symptoms were first reported by the farmer to his veterinarian; the veterinarian contacted the State Agriculture Department. The State Agriculture Department, in turn, contacted the Area Veterinarian in Charge (AVIC) and that office's Foreign Animal Disease Diagnostician (FADD).

**Question 2** – Would you be worried about HPAI at this point?

*Suggested answer* – Yes. Given the symptoms and the rapid onset of disease, there is definitely a potential for HPAI to be the etiologic agent involved.

### Current Conditions

Of the animals at this particular operation, approximately 95% of the visibly ill layers have died. The farmer is worried about continued die-offs and asks for help trying to figure out what to do. He is worried about the rest of his flock, as well as the potential income loss from any type of outbreak situation.

**Question 3** – How would you begin your public health investigation, and how would your investigation overlap with that done by State Agriculture and the AVIC/FADD?

**Suggested answer** –This is probably premature but if you were aware from recent events or surveillance data of the presence of other avian influenza virus subtypes known to cause human illness you would probably start by talking to state and federal officials to coordinate interviewing the farmer. You are all likely to have many of the same questions. The interview could be done jointly, or State Ag/AVIC/FADD could conduct the interview and pass the information on to Public Health. If further information is need for public health purposes, you could then arrange an additional short interview with the farmer. Some key questions to ask would include:

- Are any of his workers or family members sick with flu-like symptoms?
- Since 72 hours prior to the onset of clinical disease in the poultry, who has had contact with the poultry, poultry carcasses or other poultry products that may be infected?
- How extensive is that contact for each person?
- What is the contact information (address and phone number) for every person who has had contact with the poultry (for continued follow-up if necessary)?
- What types of routine procedures or PPE were used by workers when working with the poultry?
- Who has been to the farm to provide ancillary services during this time (such as the veterinarian)? What other farms have they visited since that time and have any of those farms had any clinical signs?

*It is important for agricultural and public health responders to also be aware of the kinds of questions each may be asking on the farm.*

*Questions of concern to agricultural investigation:*

- Where does he get his birds?
- When was his last shipment of new layers?
- Do his birds have access to the outside of the facility (including any potential shared water sources, holes in building structure). Do his poultry have any access to wild birds?
- How are dead poultry handled?
- Have any other birds or animals on the farm been sick or died unexpectedly in the 72 hours prior to onset of clinical disease in the poultry?
- Does he operate any other poultry facilities?
- Where does he get his feed?
- Does he share equipment with any other farmers?
- How and where are poultry and eggs sold, and when did the last transaction occur?
- Does he practice all-in, all-out management?

*You should also inquire as to any active HPAI surveillance in poultry or wild birds in the area and any positive findings.*

*Both Public Health and Agriculture/AVIC/FADD will need to ask these types questions to assess types of exposures and the biosecurity practices in place on the farm. The first set of questions is more specific to Public Health. Public Health would also have the responsibility of educating the farmer about symptoms of the disease and appropriate personal protective equipment.*

**Question 4** – If you were to visit the farm to participate in the investigation, what biosecurity measures should you take to ensure that the virus is not spread off the farm (by you)?

***Suggested answer** – Some measures include spraying car tires with bleach, washing and changing boots, and washing hands. Often health professionals are unaware that these measures need to be taken. Avian viruses are typically much hardier than human influenza viruses. They can remain viable in the environment for several days to weeks and can be spread from place to place on contaminated objects like tires and egg crates.*

**Discussion Question** – In your jurisdiction, is there a protocol or understanding in place between the Departments of Public Health and Agriculture as well as federal veterinarians for investigations concerning avian influenza on a poultry farm?

***Suggested answer** – It is critical that public health workers not inadvertently break the biosecurity of a farm under quarantine for infectious poultry disease. Therefore it is very important to coordinate any plans to visit premises. Because all of these entities will want much of the same information, coordination between agencies is also essential to prevent individuals associated with the farm from answering the same questions twice. Information collection could be done by a team with representatives from both agencies, or one agency could gather the information and share it with the other.*

*Have the group identify appropriate mechanisms for sharing information, communicating results, discussing PPE, and assuring the health and safety of workers and response personnel. Encourage participants who can identify key players in the poultry industry, public, veterinary professional community, and USG regulatory community to share their protocol. Keep in mind that some investigations of human risk associated with poultry outbreaks would be research and require the necessary human subjects and IRB approvals.*

### Additional information

You, a representative from the Department of Agriculture, and the Foreign Animal Disease Diagnostician talk to the farmer. He tells you that he recently (in the last 2 weeks) obtained some new stock from a company that he has been using for over 10 years. His operation is not all-in all-out. The building where the poultry live is well constructed with no access possible to the outside environment. The flock is fed and watered with no possible contamination from wild birds outside the premises. No one in his family or crew appears to be ill at this time. You also inquire into the human, poultry, and wild bird HPAI surveillance and there has been no reported activity in your immediate area. There have, however, been reports of a confirmed case of HPAI H5N1 in a duck in another nearby part of the country.

**Question 5** – What does this information tell you?

*Suggested answer* – This information is helpful because it does suggest that H5N1 HPAI has been detected at least in a nearby part of the country. Since H5N1 HPAI can be carried by wild birds, you cannot rule wild birds out as a potential source of this outbreak, even if there are currently no other reports of HPAI H5N1 in the country.

**Question 6** – At this point, would you involve other national organizations in your investigation?

*Suggested answer* – Yes. It is clear that this is an agent that exhibits very high morbidity and mortality among poultry. There is a very short list of diseases that do this in vaccinated poultry flocks, most of which are reportable. Since there has been some H5N1 HPAI activity at least in a nearby part of the country, it would be best to involve national organizations in your search for the cause, due to potential economic consequences, the need for coordinated risk communication efforts, and also due to expanded networking and laboratory facilities. Although only confirmed H5 is reportable, the state veterinarian's has contacted USDA already with the details on this situation. Contacting CDC and FDA would be advisable. Note that when any foreign animal disease is probable (highly suspect symptoms, suggestive or presumptive screening test, etc), the state veterinarian is already in consultation with USDA. This occurs before final confirmation and formal announcement of a "Positive FAD" case.

## Testing

The State Department of Agriculture is assisted by the USDA to institute quarantine and movement control procedures on the farm in question. They immediately begin testing of the flock for foreign animal diseases of concern.

**Question 7** – You are to be involved in carrying out testing and quarantine, if necessary. What are your suggestions to the farmer and his family as to their risk of infection? What other individuals should you be concerned about testing and/or counseling?

***Suggested answer** – Since the cause of the disease is not yet known and there is the possibility of HPAI, you could suggest to the farmer that he and his family institute standard PPE measures when working with the poultry, including face masks/respirators, latex gloves, and basic infection control (washing hands, etc) especially after coming into contact with any live or dead chickens, or any potentially contaminated materials. You could also suggest that workers and family members should monitor themselves for signs and symptoms of AI for 10 days following their last exposure to any potentially infected poultry. If they become sick with a fever, respiratory symptoms, or other clinical signs and symptoms of AI during this time, or if they have a fever without respiratory symptoms, they should notify you or another public health official immediately. You should interview all workers and family members to determine their exposure to the infected poultry and to institute antiviral prophylaxis among exposed persons.*

*It is important to note that public health workers are also responsible for safeguarding the health of those who respond to the outbreak. This includes farm employees and State Ag employees, as well as veterinarians, public health officials, and anyone else who has entered the premises to work on the investigation. It is important to build a collaborative relationship with these individuals – State Ag would be lead in the investigation, and you can assist them by ensuring that their workers are appropriately followed up.*

*USDA/APHIS Directive 6800.1, dated 5/10/06, states ...*

*“The following summarizes recommendations for protecting at-risk workers developed by the Centers for Disease Control and Prevention (CDC), the World Health Organization, and the Occupational Safety and Health Administration. Employees involved in HPAI control and eradication activities must take these precautions. Workers also are highly encouraged to receive an influenza antiviral drug daily (that is approved for use as prophylaxis), for the duration of time during which direct contact with poultry, their secretions, or contact with contaminated surfaces occurs and continuing 5-7 days after the last day of*

*potential virus exposure.” Also note that in general, industry has incorporated the CDC/OSHA guidance for protecting their workers against AIV infection/disease during a suspected or confirmed outbreak, including the use of antivirals.*

**Question 8** – As a public health responder, what other activities should you undertake immediately, before conclusive test results come back from the laboratory?

***Suggested answer** – Many responses need to occur at the same time. The on-site response has primarily been discussed here. Additional response activities would involve getting prepared to take immediate action should H5N1 HPAI be confirmed. This includes getting lists of people on the farm and their contacts and crafting communication messages aimed at the community, industry, and other groups that may be affected.*

### Conclusion

The next day, the results come back. The illness in question is determined to be Exotic Newcastle Disease. Several other farms in the area have become infected also at this point. The affected flocks are being depopulated. The USDA determines that the index case occurred in an animal shipped to the farmer from his supply company. Since this disease is not a threat to humans, you are relieved for the farmer and his family (and, if necessary, recommend discontinuation of oseltamivir). However, you wonder about the one positive case of H5N1 HPAI that had been found in another part of the country.

**Question 9** – If the disease in question had turned out to be H5N1 HPAI, how do you think that the investigation would have continued?

***Suggested answer** – Quarantine/isolation of the affected farm would have remained in place, and the entire flock would have been depopulated and disposed of using approved techniques. Testing for HPAI would have continued through virus isolation or PCR. The quarantine and testing area would have expanded to include the surrounding area. Movement restrictions for poultry and poultry products would have been placed in a zone around this area with increased surveillance for H5N1 HPAI. Wild birds in the area may have been tested as well. Continued monitoring and prophylaxis of farm workers and family would have been instituted. Any contacts that developed respiratory symptoms would have been immediately treated as suspected cases, isolated and treated appropriately. They would be given supportive care and anti-virals such as Oseltamivir as well as having contacts followed. Specific procedures for contacts may depend on the state – some states may ask asymptomatic contacts to limit*

*their exposure to others ('self-quarantine'). Surveillance would also expand into the community, to monitor for potential spread of the virus.*

# 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).<sup>\*</sup> 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 3 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](http://www.cdc.gov/travel/other/avian_influenza_se_asia_2005.htm).

More Information:

Department of Health and Human Services at [www.pandemicflu.gov](http://www.pandemicflu.gov)  
World Health Organization at  
World Organization for Animal Health (OIE) at [http://www.oie.int/eng/en\\_index.htm](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](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](http://www.oie.int/eng/en_index.htm); and the WHO website at  
[http://www.who.int/csr/disease/avian\\_influenza/en/](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/bmbl4/bmbl4s3.htm>.

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