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Limited Human-to-Human Transmission of Novel Influenza A (H3N2) Virus — Iowa, November 2011

On November 20, 2011, CDC confirmed three cases of swine-origin triple reassortant influenza A (H3N2) (S-OtrH3N2) virus infection in children in two counties in Iowa. None of the children were hospitalized, and each has recovered from a mild episode of febrile respiratory illness. All three were in contact with one another, and none had a known recent exposure to swine. No additional human infections with this virus have been detected in Iowa, and no evidence of sustained human-to-human transmission of this S-OtrH3N2 virus exists; surveillance is ongoing.

Eighteen human infections with swine-origin influenza A (H3N2) viruses have been identified since 2009 (*1*,*2*). The most recent 10 cases, including the three Iowa cases described in this report, were infections with S-OtrH3N2 viruses containing the matrix (M) gene from the pandemic 2009 influenza A (H1N1) virus (pH1N1). These viruses are considered reassortant viruses between a swine-origin influenza A (H3N2) virus circulating in North American swine and a pH1N1 virus. All cases of human infection with S-OtrH3N2 virus containing the M gene from the pH1N1 virus have occurred in 2011 and have been reported from four states: Pennsylvania (three cases), Maine (two), Indiana (two), and Iowa (three) (*3*).

Case Reports

Patient A. In the second week of November 2011, patient A, a previously healthy female child, experienced acute onset of influenza-like illness (ILI). Three days after her illness onset (illness day four), she was seen by a health-care provider, who obtained a respiratory specimen and performed a rapid influenza diagnostic test, which was positive. As part of routine influenza surveillance, the respiratory specimen was forwarded to the University of Iowa State Hygienic Laboratory (SHL) for further evaluation. Patient A's brother experienced onset of ILI 1 day before patient A's date of illness onset. Patient A's brother was not tested for influenza but was treated with oseltamivir by a health-care provider and has recovered. During her illness days two and three, patient A was in contact with her father, who subsequently developed ILI 2 days after his most recent contact with patient A. He was not tested for influenza. No other household member has reported respiratory illness. No family member reported exposure to swine before their illness onset. On her illness day one, patient A attended a small gathering of children.

Patients B and C. Patient B is a previously healthy male child who developed ILI 2 days after patient A's first day of illness. He is the sibling of patient C, a previously healthy male child who developed ILI 1 day after patient B's illness onset. Both children were seen by a health-care provider 2 days after patient B's illness onset; rapid influenza diagnostic testing was positive for both patients. As part of routine influenza surveillance, respiratory specimens were forwarded to SHL for further evaluation. The mother of patients B and C reported that no other household member had a respiratory illness and none had been exposed to swine before patient B became ill. On patient A's illness day one, patients B and C attended the same small gathering of children as patient A.

Epidemiologic and Laboratory Investigations

An investigation by the Iowa Department of Public Health (IDPH) determined that the families of patients A, B, and C reported no recent travel or attendance at community events. To date, the only epidemiologic link among patients A, B, and C that has been identified is attendance at a gathering of children on patient A's illness day one. No illnesses were reported among adults or among the five other children who were present at this gathering on that day. No swine exposures have been identified among adults or children attending this gathering. IDPH has detected no increase in absenteeism or reports of respiratory illness in the community where patients A, B, and C reside or in the schools in the community. Enhanced surveillance for ILI has been implemented in health-care facilities in the

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communities where patients A, B, and C reside. IDPH has instructed health-care providers to obtain respiratory specimens from patients with ILI for influenza diagnostic testing at SHL. Thus far, no additional cases of S-OtrH3N2 infection have been identified, and surveillance data from the state have shown low levels of influenza activity currently and at the time of all these patients' illnesses.

Eight days after patient A's illness onset, real-time reverse transcription–polymerase chain reaction (rRT-PCR) testing of respiratory specimens from patients A, B, and C at SHL indicated possible S-OtrH3N2 influenza virus. At CDC, preliminary rRT-PCR diagnostic results were inconclusive but indicated probable infection with a swine-origin influenza A (H3N2) virus. Subsequent complete genome sequencing at CDC confirmed all three specimens as S-OtrH3N2 with the M gene from the pH1N1 virus. The viruses from these three patients are resistant to amantadine and rimantadine but are expected to be susceptible to the neuraminidase inhibitor drugs oseltamivir and zanamivir based on their genetic sequence. Because these viruses carry a unique combination of genes, little information currently is available regarding the capacity of this virus to transmit efficiently in swine, humans, or between swine and humans.

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Editorial Note

Since July 2011, a total of 10 cases of human infection with S-OtrH3N2 viruses have been identified in the United States, all containing the M gene from the pH1N1 virus. Seven of these 10 cases resulted in mild illness, but three of the infected persons were hospitalized for influenza; all patients have recovered. In all seven earlier cases, exposure to swine was identified in the patient or in a close contact of the patient (*4*). The lack of known exposure to swine in the three cases described in this report, combined with the known epidemiologic links, suggests that limited human-to-human transmission of this novel influenza virus might have occurred. Transmission of swine-origin influenza A (H3N2) viruses not containing the M gene from the pH1N1 virus to humans from close contact with an infected person has been reported previously and has not resulted in sustained human-to-human transmission (*5*). Preliminary evidence from the investigation of these cases in Iowa shows no evidence of ongoing transmission among humans. Swine influenza viruses are spread from pig to pig but are not known to spread through human contact with pork or pork products.

Although the vast majority of human infections with animal influenza viruses do not result in human-to-human transmission (*6*), each case should be investigated fully to ascertain if these viruses are transmitted among humans and to limit further exposure of humans to infected animals, if infected animals are suspected. Such investigations require close collaboration among state, local, and federal public and animal health officials. As part of routine preparedness measures to counter possible pandemic threats posed by novel influenza viruses in the event that they gain the ability to spread easily from person-to-person, CDC has developed a candidate vaccine virus that could be used to produce a human influenza vaccine against these S-OtrH3N2 viruses and has provided this candidate virus to manufacturers.

Although swine exposure was not associated with the three cases described in this report, because most previous cases of human infection with S-OtrH3N2 viruses have occurred in patients who reported swine exposure before illness

What is already known on this topic?

Swine influenza viruses have been reported sporadically to infect humans. In the United States, seven cases of swine-origin triple reassortant influenza A (H3N2) (S-OtrH3N2) virus infection have been reported in 2011. Cases usually occur after exposure to swine.

What is added by this report?

This report summarizes an investigation of three confirmed cases of human infection with S-OtrH3N2 virus in Iowa associated with limited person-to-person transmission. Cases occurred among children in contact with one another, and all cases were mild and self-limited. No child had known exposure to swine. The viruses identified are similar to seven previous cases reported in 2011, but these are the first cases reported from Iowa.

What are the implications for public health practice?

State health departments are advised to report suspect novel influenza viruses detected through influenza surveillance promptly to CDC. Persons with influenza-like illnesses who have had contact with swine are encouraged to be tested for influenza.

onset, clinicians should consider swine-origin influenza A virus infection in the differential diagnosis of patients with febrile respiratory illness who have had contact with swine. It is anticipated that commercially available diagnostic tests, including point-of-care rapid tests, will detect infection with the S-OtrH3N2 virus; however, these tests will not differentiate S-OtrH3N2 from seasonal influenza A viruses. Clinicians who suspect swine influenza virus infections in humans should treat with oseltamivir when indicated (*7*), obtain a nasopharyngeal swab from the patient, place the swab in viral transport medium, and contact their state or local health department to facilitate transport and timely diagnosis at a state public health laboratory, using the CDC RT-PCR assay cleared by the Food and Drug Administration. CDC requests that state public health laboratories send all suspected novel influenza A specimens, such as these S-OtrH3N2 viruses, to the CDC Influenza Division's Virus Surveillance and Diagnostics Branch Laboratory.

The 2011–12 seasonal influenza vaccine is expected to provide limited protection from this virus for adults but none for young children. Enhanced surveillance, including surveillance for ILI and diagnostic testing of respiratory specimens, is being conducted in Iowa and surrounding states as part of the ongoing investigation of these cases. Additional information about swine influenza is available at http://www.cdc.gov/flu/swineflu.

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