New Flu Virus in Pigs Exhibited at Fairs in Ohio

[Announcer] This program is presented by the Centers for Disease Control and Prevention.

[Mike Miller] Hello, I'm Dr. Mike Miller and today I'm talking with Dr. Andrew Bowman, a graduate research assistant in the Department of Veterinary Preventive Medicine at The Ohio State University. Our conversation is based on his study about flu virus at agricultural fairs, which appears in CDC's journal, *Emerging Infectious Diseases*. Welcome, Dr. Bowman.

[Andrew Bowman] Thanks, Dr. Miller, it's great to be with you today.

[Mike Miler] Well, what happened in Ohio that prompted this study?

[Andrew Bowman] With the emergence of the 2009 influenza A H1N1 pandemic virus we discovered that influenza A virus surveillance in swine populations was lacking. This project, which began in the summer of 2009, was started to actively monitor the antigenic and genomic properties of influenza A viruses which were circulating in pigs at locations where people have the opportunity to interact with pigs.

[Mike Miler] You discuss 'bidirectional, interspecies transmission of influenza virus A between humans and pigs' in your article. What does that mean?

[Andrew Bowman] Good question! So, while most people focus on the swine-to-human transmission, human-to-swine transmission is also important. Bidirectional, interspecies transmission refers to both swine-to-human and human-to-swine transmission.

[Mike Miler] Why are pigs considered a threat for emergence of novel influenza virus A?

[Andrew Bowman] So, pigs can be infected with human, swine, and avian origin influenza A viruses, and if they are infected with influenza A viruses from different species at the same time it is possible for the eight genes segments from each of these viruses to mix and then create a novel virus that could impact human or animal health.

[Mike Miler] Well, what is it about agricultural fairs that create an environment that seems to lead to this kind of pig-to-human transmission?

[Andrew Bowman] Well, unlike other swine and human interactions, agricultural fairs have a high people-to-pig ratio. It's estimated that approximately 150 million people attend agricultural fairs in North America each year. Many of these people don't normally have exposure to swine and the pathogens they may harbor. Pigs at fairs are different from commercial swine in that they usually come from multiple locations and are then comingled for an extended period of time,

three to ten days. This prolonged mixing of pigs and people provides ample opportunity for pathogens to spread among pigs and possibly to humans. This setting is also conducive for human-to-swine transmission.

[Mike Miler] Are pigs inspected for infections or diseases at these fairs?

[Andrew Bowman] Yes. All animals at agricultural fairs participating in our study were visually inspected upon arrival and then daily by veterinarians for clinical signs of contagious diseases. This inspection is mandated by Ohio law.

[Mike Miler] Then how are people catching the flu from these pigs?

[Andrew Bowman] We don't fully understand the zoonotic transmission that has been occurring at these fairs. What we *do* know is that the majority of the people who have become infected have had significant direct or indirect contact with pigs at the fairs.

[Mike Miler] Well, do you think people should avoid pigs at these kind of fairs?

[Andrew Bowman] Pig-to-person transmission of influenza A virus is still believed to be a relatively uncommon event. People at high risk for complications from flu include children younger than five years of age, people 65 years of age and older, pregnant women, and people with certain long-term health conditions, like asthma, diabetes, heart disease, chronic respiratory disease, weakened immune system, and neurologic and neurodevelopmental conditions. People in these high risk groups should limit their exposure to animals and to other sick people.

[Mike Miler] Could people be giving the flu to pigs?

[Andrew Bowman] We didn't detect any human-origin influenza A viruses in the pigs at the fairs in our study; but in 2009, human-to-swine transmission of pandemic H1N1 influenza A virus was documented in the United States and Canada. Human-to-swine transmission of flu is recognized as a source of the incredible diversity of influenza A viruses circulating in North American swine populations.

[Mike Miler] Can pigs be vaccinated?

[Andrew Bowman] Yes. There are commercially available swine flu virus vaccines. Just like human flu vaccines, the swine vaccines need to be periodically updated. However, there are multiple strains of influenza A viruses circulating in swine populations making swine flu vaccine strain selection difficult. In general, flu vaccines for pigs are not updated as frequently as human

flu vaccines and therefore may have limited effectiveness against contemporary strains of influenza A virus.

[Mike Miler] Well, let's go back to your study. What were you looking for when you began the study?

[Andrew Bowman] We were looking to conduct active surveillance for influenza A viruses in swine so we could monitor the genetic diversity among swine-origin influenza A viruses over time. We hypothesized that fairs commingle pigs from multiple sources for an extended period of time, and influenza A virus infections in swine were occurring at agricultural fairs.

[Mike Miler] Well, how was the study conducted?

[Andrew Bowman] We visited fairs at the end of the exhibition period and visually examined the pigs for signs of respiratory illness. We collected individual nasal swabs from 20 pigs representing all areas of the swine exhibits. Nasal swabs were placed in a liquid broth designed for the long term storage of viruses; they were transported to the laboratory, and frozen until testing was initiated. We performed molecular tests on the nasal swabs to detect RNA from the influenza A viruses and used cell culture inoculation to recover live virus from the swabs.

[Mike Miler] Before the exhibition, were pig owners required to vaccinate their pigs or test for viruses or bacteria that could be transmitted to people?

[Andrew Bowman] We didn't record this information during the three years of our study. Each fair has different entry and animal health requirements that can vary year to year. As mentioned earlier, all animals are inspected upon arrival by a veterinarian. Vaccination is problematic for these settings due to the diversity of circulating influenza A virus strains. Testing for bacteria and viruses would be difficult to accomplish in a timely and efficient manner.

[Mike Miler] Why did the study collect the samples only at the end of pig exhibition period, not both at the beginning and the end?

[Andrew Bowman] We were simply interested in if influenza A virus infections were occurring in the pigs at the fairs and monitoring the genomics of the influenza A viruses we found. We assumed that if one or two pigs came to the fair infected with influenza A virus it would spread through the pig population during the exhibition. Sampling at the end of the fair, after amplification in the population, would allow us to efficiently and cost-effectively answer our research question by only sampling 20 pigs instead of hundreds of pigs.

[Mike Miler] Well, please tell us what you found from doing the study.

[Andrew Bowman] Sure. We had several important findings. First, subclinical influenza A virus infections were more common than expected among swine at agricultural exhibitions in Ohio during 2009-2011.

[Mike Miler] Let me stop you for a moment. Tell us what subclinical means?

[Andrew Bowman] Subclinical infections are infections where the host, in this case pigs, don't show any outward signs of illness, which for flu usually include fever, nasal discharge, cough, loss of appetite, and lethargy. In other words, the pigs did not appear to be sick.

Because of this, we cannot fully rely upon visual examination to identify pigs infected at agricultural fairs. While no human cases of variant influenza were associated with any of the fairs in this study, subclinical flu infections in pigs at the swine-human interface like those reported here are a likely explanation for human cases of variant influenza documented in other states where there were no sick pigs reported.

A second major conclusion was that subclinical influenza A virus infections in pigs are going unreported in traditional swine flu surveillance programs. This means that additional active, ongoing, targeted surveillance of healthy, as well as sick, pigs is needed.

[Mike Miler] Well, since the samples were collected only once, could you determine whether or not the pigs testing positive for influenza virus A recovered?

[Andrew Bowman] Our sampling protocol only provided us with a one-point-in-time view of the animals so we cannot determine the clinical outcome of each pig sampled in our study. It's important to note that very few pigs showed clinical signs of disease. Much like humans, healthy pigs typically recover from uncomplicated influenza A virus infections in three to five days.

[Mike Miler] Should people be afraid of pigs?

[Andrew Bowman] No, people should not be afraid of pigs. Pigs have been an important part of the world's food supply for thousands of years. Pork is the most widely consumed meat in the world and accounts for over 36 percent of the world's meat intake. But people caring for sick animals should use precautions to minimize the risk of flu transmission to other swine or to people.

[Mike Miler] Along the same lines, can people get the flu form eating pork?

[Andrew Bowman] Pork is considered to be safe to eat. There's no evidence to show that people can become infected with influenza A viruses from eating properly handled and prepared pork.

[Mike Miler] Are there ways that people can prevent catching the flu from a pig - any pig - not just ones at agricultural fairs?

[Andrew Bowman] Well, it's not practical to prevent all transmission of flu viruses, but there are steps people can take to decrease their risk of contracting a disease from an animal. People coming into contact with any animal should practice good personal hygiene, including hand washing, along with no eating or drinking in the animal areas. Those caring for sick animals should use precautions to minimize the opportunity for flu transmission to other swine or people. People in the high-risk groups that I mentioned earlier should avoid exposure to infected or potentially infected swine.

Likewise, people should understand that pigs can become infected from sick people. People with flu-like illness should stay away from pigs and other people until they are fever-free for at least 24 hours without the use of fever-reducing medication.

[Mike Miller] Well, thank you, Dr. Bowman. I've been talking with Dr. Andrew Bowman about his study, *Subclinical Influenza Virus A Infections in Pigs Exhibited at Agricultural Fairs, Ohio, USA, 2009-2011*, funded by the National Institutes of Health, which appeared in the December 2012 issue of CDC's journal, *Emerging Infectious Diseases*. The article is available at cdc.gov/eid.

If you'd like to comment on this podcast, send an email to eideditor@cdc.gov. I'm Dr. Mike Miller, for *Emerging Infectious Diseases*.

[Announcer] For the most accurate health information, visit www.cdc.gov or call 1-800-CDC-INFO.