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Veterinarians Play Key Role in Preventing Influenza Pandemic

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Dr. Sherrill Davison obtaining longitude and latitude coordinates for a farm location using GPS technology.

By Nancy West

The world is due—some say overdue—for an influenza pandemic. Based on historical patterns, pandemics occur three to four times each century on average, according to the World Health Organization (WHO). The last one took place in 1968–69.

Although Southeast Asia has reported outbreaks of avian influenza (AI) among poultry, pigs, Bengal tigers, and some humans directly involved in poultry production since December 2003, the highly pathogenic AI strains that infect people have not reached the United States. Veterinarians play a crucial role in ensuring the continued good health of humans as well as poultry flocks in this country.

“The veterinarian is all that stands in the way of an avian flu pandemic,” stated **Gary Smith, Ph.D.**, professor of population biology and epidemiology and chief of the Section of Epidemiology and Public Health. “The very best thing we can do is keep avian flu to a minimum among poultry by focusing intensely on dealing with birds that have low pathogenic avian influenza, a milder form of the disease. It’s critical to keep this milder virus under control so that it doesn’t evolve into a highly pathogenic strain that is much harder to control, carries a much higher mortality rate, and may, in some cases, be transmissible to humans.”

Pennsylvania is prepared

If avian influenza ever does reach this country, the Pennsylvania poultry industry is well prepared to control the outbreak, thanks to the efforts of the Penn School of Veterinary Medicine’s Laboratory of Avian Medicine and

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Pathology. As part of the Pennsylvania Animal Diagnostic Laboratory System, the School is actively involved in eradication and control of avian influenza in the Commonwealth, which ranks third in the nation in egg production, eighth in turkey production, and boasts an inventory of 129.6 million broilers.

Working with the Pennsylvania Department of Agriculture and the poultry industry, the School has been instrumental in developing and implementing a statewide avian flu surveillance program after an outbreak of highly pathogenic avian flu among Pennsylvania poultry in 1983–84 that resulted in the destruction of more than 17 million birds at a cost of nearly \$65 million.

Veterinarians Play Key Role in Preventing Influenza Pandemic

Ensuring That Pennsylvania Is Well Prepared

Sherrill Davison, V’83, associate professor of avian medicine and pathology, leads the School’s efforts to control the disease in Pennsylvania. “We have a comprehensive strategy that includes constant education and reminders about biosecurity practices, monthly surveillance testing of blood or eggs, regular reviews and updates to our response plans, and ensuring that we have the most advanced technology in our arsenal,” she explains. “This includes Geographic Information System (GIS) technology, which is one of the most powerful weapons we have to control diseases and minimize economic loss. Our state was one of the first in the poultry industry to develop GIS.”

Mapping the flocks

Since 1998, the School has been using GIS technology to map the location of commercial poultry flocks, feed mills, processing plants, rendering plants, hatcheries, and components of the live-bird market system throughout the Commonwealth. GIS also can be used to create buffer zones around infected flocks for increasing surveillance testing or possible quarantine purposes. The School has proven the value of this state-of-the-art technology.

“In 1997, just before we began using GIS, we had an outbreak of avian flu in Pennsylvania,” says Dr. Davison. “Even though we made a quick diagnosis, it took several months and cost the

Commonwealth of Pennsylvania \$3.5 million to control the outbreak.

“In 2001, we experienced another outbreak,” she continues. “With GIS in place and fully functional, we were able to quickly identify where the flock was, where surrounding flocks were, which ones we had to monitor, and which routes trucks should use to avoid infected flocks, among many other applications. GIS gave us the ability to respond very quickly and make very quick decisions. As a result, we had the outbreak under control within one month at a cost of only \$400,000, nearly 90 percent less than the cost of the 1997 outbreak.

“Since the events of September 11,” Dr. Davison adds, “it is also important to acknowledge that GIS technology would be a valuable defensive tool in cases of agroterrorism where animal infections were deliberately introduced.”

Rapid testing

The School’s ability to respond rapidly to avian influenza got another shot in the arm in December 2004 with certification by the National Veterinary Services Laboratory to use a new real-time preliminary chain reaction (PCR) test based on technologies similar to human DNA testing used in criminal cases. The real-time PCR takes just a few hours to complete in comparison to tests used previously that take several days. “This rapid test enables us to get on top of the situation much faster and, as a result, decrease the cost of outbreaks,” notes Dr. Davison.

The need for speed

“Rapid response is absolutely critical to control the spread of a virus,” Dr. Smith emphasizes. “Having everyone involved agree to a plan of action before an outbreak occurs is essential to ensure a speedy response. If you have an effective system in place, it usually takes one week from the time the flock becomes infected to the beginning of a quarantine. If you reduce this by just one day, you can cut in half the number of flocks affected.”

Dr. Davison concludes, “The state government and the citizens of Pennsylvania benefit from our avian influenza surveillance efforts in terms of decreased costs and protection of an important segment of our food supply.” ■

Avian Influenza: Making Its Way Around the World

International trade and travel make it easy for avian influenza to hitch a ride into many countries. In the past, the virus would have taken a year to spread worldwide; now it would take just weeks, according to WHO officials.

In addition to poultry and migratory birds, exotic birds and animals can transmit the disease. “A very lucrative market exists for smuggled exotic animals in the world today,” says **Gary Smith, Ph.D.**, professor of population biology and epidemiology and chief of the Section of Epidemiology and Public Health. “With these animals, there is a high risk of transmitting the highly pathogenic strain of avian influenza.”

Dr. Smith, who is internationally renowned for his expertise in epidemiology and population dynamics of infectious diseases, cites a recent smuggling incident in Belgium. “Customs officials discovered that a Thai man had smuggled two raptors on a flight from Bangkok. He carried them into the passenger cabin in his hand luggage. The birds were found to have the highly pathogenic strain.”

The birds never left the quarantine installations at the Brussels airport and did not pose any threat to the European poultry flock. However, the veterinarian who put down the two small mountain hawk eagles subsequently developed conjunctivitis, a common manifestation of avian influenza in people; he did not acquire the full-blown influenza syndrome seen in patients in Asia. Among other precautions taken to avoid the spread of the avian flu virus into Europe, Belgian authorities launched a search for all passengers who traveled on the same flight with the eagles, and advised them to seek medical assistance immediately if they experienced any flu-like symptoms.

“In addition to concerns about human health, the transmission of avian flu is turning into a conservation issue,” says Dr. Smith. “The raptors on the Belgian flight, for example, were an endangered species. In Thailand, 83 Bengal tigers, which are also endangered, have died or been culled after an outbreak that started when the animals were fed raw infected chickens.”

The question of vaccination

The scientific community is currently considering the question of continuing to control avian influenza strictly through culling or focusing efforts on vaccination. International trade makes this a complicated issue.

“If we had a completely effective vaccination, it would be much easier to make a choice about the best way to control the disease,” says Dr. Smith. “However, if the vaccination for the low pathogenic strain is ineffective, it could allow the virus to circulate among poultry undetected and, as a result, it could evolve into a highly pathogenic type that is more dangerous. As soon as you are dealing with the highly pathogenic strain, this becomes an issue that crosses social, political economic, and political health issues because it affects trade.

“The World Trade Organization and World Health Organization allow countries to make their own decisions about vaccination,” notes Dr. Smith. “Vaccination would be effective if every country made the decision to vaccinate, but that is unlikely. Overall, we must be guided in our decisions by the health and well-being of animals, people, the economy, and trade.”