



An electron micrograph shows H5 avian influenza viruses in gold. Penn State's Animal Diagnostic Laboratory annually tests tens of thousands of samples for the presence of avian flu.

Image: CDC/Cynthia Goldsmith

Penn State Animal Diagnostic Lab among first lines of defense versus avian flu

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Patty Dunn and Eva Wallner-Pendleton are veterans in the never-ending fight to keep Pennsylvania poultry flocks free of serious diseases. As avian pathologists in Penn State's [College of Agricultural Sciences](#), their task requires constant vigilance under any circumstances. But Dunn, Wallner-Pendleton and their colleagues in the Penn State [Animal Diagnostic Laboratory](#) are now in a heightened state of alert.

More than 48 million turkeys and laying hens in 21 states, mostly in the Midwest, have died this year following an outbreak of [highly pathogenic H5N2 avian influenza](#). And as wild waterfowl, which can

carry the virus, begin their autumn migration from Canada to warmer climes for the winter, Pennsylvania is in the crosshairs.

Of the four migratory flyways in North America, the Atlantic flyway, which includes Pennsylvania, is the only one that hasn't seen an avian flu outbreak this year. But after wild birds from all four flyways spent the summer co-mingling up north, many experts think it's just a matter of time until the virus reaches the Keystone State.

Although implementing strict biosecurity measures may be a poultry producer's best defense against avian flu, disease surveillance is critical in nipping an outbreak in the bud and protecting the state's \$1.4 billion poultry industry. And that's where the Animal Diagnostic Lab comes in.



Avian pathologist Patty Dunn

Image: Penn State

"Typically, 10 to 20 percent of our time year-round is spent on diagnostic case investigations or testing for avian flu," said Dunn. "But since the current outbreak began, we've seen a big increase in submissions for testing. If the virus reaches Pennsylvania, those numbers will go up even more."

In the 12 months from April 2014 to March 2015, the lab looked for avian flu in more than 62,000 samples submitted by large commercial producers, small-flock owners, government agencies and others. This disease-monitoring capability has proven highly valuable.

During a 2001 Pennsylvania outbreak of low-pathogenic H7N2 avian flu, researchers in the lab used a test developed by Penn State avian virologist Huaguang Lu to make a quick diagnosis, which helped

state agriculture officials to contain the outbreak and limit losses to 140,000 birds and about \$350,000 in direct costs.

An outbreak of the same virus a few months later in Virginia took about seven days to diagnose with a different test, giving the virus more time to spread. As a result, poultry producers in that state lost almost 5 million birds at a cost of more than \$100 million. Lu today continues to make key contributions to the lab's avian flu surveillance efforts.



Avian virologist Huaguang Lu

Image: Penn State

The last time a so-called "high-path" avian flu struck Pennsylvania was in 1983, when 17 million chickens died, costing the state's poultry industry an estimated \$65 million.

"The 1983 outbreak started as a low-path H5 virus that may have originated in urban live-bird markets in the Northeast and was allowed to spread," Dunn said. "At the time, we didn't know that low-path H5 and H7 viruses, when allowed to circulate among poultry, can mutate into a high-path strain. Since then, we've treated low-path outbreaks almost as if they were highly pathogenic."

But monitoring for high-path and low-path strains requires different procedures, explained Wallner-Pendleton. "Most birds infected with low-path avian flu can survive, so testing is based on the presence of antibodies in their blood or eggs," she said. "With high-path varieties, survival is low, and the birds

don't have time to develop antibodies, so we use PCR [polymerase chain reaction] testing, which detects components of the virus."

If a test comes back positive for avian flu, it would set off a series of actions. The lab immediately would notify the Pennsylvania Department of Agriculture and USDA, and state officials would establish a quarantine zone surrounding the affected premise.

The infected flock would be euthanized, and carcasses likely would be composted in place to kill the virus before they are removed and the house is disinfected. Affected producers may not get approval to repopulate the facility for six months or more. Flocks within a certain radius also would undergo testing.



Avian pathologist Eva Wallner-Pendleton

Image: Penn State

What sets the current outbreak apart from those in the past is the origin of the virus, the researchers noted. "This virus is considered a 'foreign animal disease' because most of its components originated in Asia, then it mixed with strains from North America," said Wallner-Pendleton. "It's unlike anything the United States has experienced.

"But this is not a super virus," she said. "It's not hard to kill, but an outbreak would cause great disruption and financial loss to producers."

Preventing such disruption and economic loss -- and protecting animal and human health -- is the goal of the Animal Diagnostics Lab, according to its director, Bhushan Jayarao, professor of veterinary and biomedical sciences.

He pointed out that the Penn State lab is part of the state-funded [Pennsylvania Animal Diagnostics Laboratory System](#), which also includes labs at the Pennsylvania Department of Agriculture in Harrisburg and at the University of Pennsylvania's New Bolton Center in Kennett Square. Together, the three labs performed more than 575,000 tests for all diseases in 2013-2014.

"In addition to submissions by producers, we have a standing contract with USDA's Animal and Plant Health Inspection Service to test samples, including from live-bird markets in Philadelphia," Jayarao said.

A member of the USDA-sponsored National Animal Health Laboratory Network, the lab employs a dozen veterinary diagnosticians and 25 technicians, with the capacity to handle as many as 800 samples per day, he said. Scientists at the lab also consult with clients, perform on-site visits and conduct animal-health educational programs.

"Our biosecurity level 3 lab is capable of safely handling exotic and highly pathogenic bacteria and viruses," Jayarao said. "In addition, we've added equipment and developed operational plans for dealing with highly pathogenic avian flu, and we have 10 people trained and certified to handle samples. We are ready to respond to any disease outbreak as part of our mission to protect animal health, human health and food safety."

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