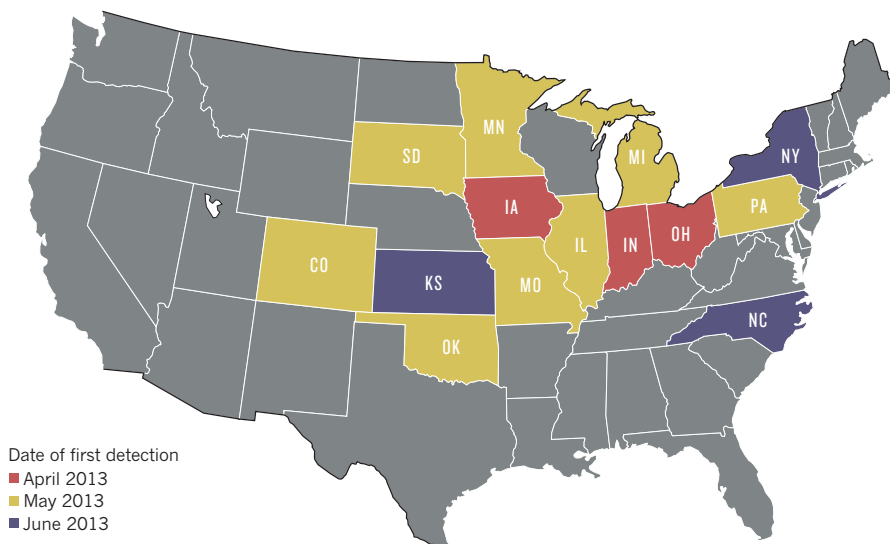


## PIG VIRUS ON THE WING

Porcine epidemic diarrhoea virus, a type of coronavirus that can kill piglets, has been detected in 14 US states.



## ANIMAL DISEASE

# Deadly pig virus slips through US borders

*Researchers race to track spread of coronavirus.*

BY BETH MOLE

A lethal virus that causes diarrhoea and vomiting in pigs has entered the United States and has been found in 14 states. With the country's US\$97-billion pork industry standing to lose millions of dollars in the event of a mass outbreak, scientists are working to track the virus and prevent its spread, even as they try to understand how it passed through biosecurity defences in the first place.

"How this virus got here, that's the million-dollar question," says James Collins, director of the Veterinary Diagnostic Laboratory at the University of Minnesota in St Paul.

The pathogen, a type of coronavirus called porcine epidemic diarrhoea virus (PEDV), was first identified in the United Kingdom in 1971, and it caused mass epidemics in Europe in the 1970s and 1980s. As pigs there developed immunity, the virus petered out and now causes only occasional, isolated outbreaks. It has since spread to Asia, where it has been considered endemic since 1982, causing substantial economic losses to pork producers. The virus can spread quickly by a faecal-oral route and infect entire herds. And although adult pigs typically recover, PEDV can kill 80–100% of the piglets it infects. The virus poses no health threat to humans.

The US Department of Agriculture (USDA)

had tried to keep PEDV and other diseases out of the country by restricting imports of pigs and pork products from certain nations, such as China. But on 10 May, the Veterinary Diagnostic Laboratory at Iowa State University in Ames confirmed that PEDV had infected pigs in Iowa, the leading producer of US pork. The lab then screened samples taken earlier from other states and found a case from Ohio submitted on 16 April that is now the earliest known US detection of PEDV, according to Gregory Stevenson, a pathologist at Iowa State. The fact that the virus has now spread to 14 states in total is a sign that the outbreak is still flaring and could become an epidemic (see 'Pig virus on the wing').

"It's a real threat," says Lisa Becton, a veterinary surgeon and director of swine health information at the National Pork Board, an industry group in Des Moines, Iowa.

To understand the virus's enigmatic US entry, scientists are sequencing viral DNA isolated from pigs and comparing it with PEDV variants from elsewhere in the world. Researchers are also trying to create rapid diagnostic tests and vaccines to prevent the virus from spreading. The National Pork Board has approved \$800,000 to fund research and education.

But PEDV must first be grown in labs — a notoriously difficult exercise because the pathogen thrives in the specific conditions found in

pig guts. Researchers in Europe and Asia have already managed to infect cells, but only after years of working with the virus. In the United States, the same import restrictions that were set up to help prevent PEDV from entering the country have made it difficult to import the necessary lab materials for working with the virus, such as vaccines, infected cells and pig antibodies.

"What's hampering the research is that we don't have reagents," says Linda Saif, a virologist at Ohio State University in Wooster. Access to the virus and good tests in hand "would have helped us identify which herds have been exposed, and one could have imposed more stringent control measures", she says.

The USDA's National Veterinary Services Laboratories in Ames is one of just a few US facilities to have grown the virus successfully. But it had a head start: the lab imported the virus around 15 years ago from Asia, after a lengthy security-clearance process, in preparation for just such an outbreak. Lab scientists have spent recent months tweaking cell-culture protocols, and plan to distribute the virus to researchers on request in the coming weeks.

In the meantime, other research groups have focused on detecting viral DNA in sick pigs and on sequencing viral genes. In August, a team led by Douglas Marthaler, a scientist at the University of Minnesota's Veterinary Diagnostic Laboratory, will publish the sequence of a virus genome taken from a Colorado farm. They found it to be 99.4% identical to a Chinese strain of PEDV. On the basis of that sequence, many researchers suspect that the virus originated in China, but Marthaler says that he is surprised by the level of similarity, because he would have expected the US virus to have evolved more in the time since it arrived.

In any case, he says, the potential origin of the virus does not say anything about the route that it took to reach the United States. Canada, the main source of pigs entering the United States, does not import pigs from China either. And although researchers know that the virus can be transported in faeces, they do not know how long it can survive outside pigs' intestines, so it is unclear if a dirty boot, a contaminated package or an illegal import carried PEDV into the country.

Vets say that pig farmers are now restricting access to farms, and are cleaning pig manure more carefully off their clothes and trucks as they move between barns. And researchers still hope that they can elucidate the virus's international and domestic path by looking for subtle evolutionary changes in viral genome sequences of samples from Asia and different US states.

Saif, who has feared such an outbreak for decades, wonders what the virus will do next. Agriculture experts speculate that it may be more stable in cooler temperatures, and thus more dangerous, making the current outbreak a mild precursor to what could come in the winter. "We have to be vigilant," says Saif. ■

SOURCE: US DEPARTMENT OF AGRICULTURE