

# The superbug that doctors have been dreading just reached the U.S.

For the first time, researchers have found a person in the United States carrying bacteria resistant to antibiotics of last resort, an alarming development that the top U.S. public health official says could mean “the end of the road” for antibiotics.

The antibiotic-resistant strain was found last month in the urine of a 49-year-old Pennsylvania woman. Defense Department researchers determined that she carried a strain of *E. coli* resistant to the antibiotic colistin, according to a study [published Thursday](#) in *Antimicrobial Agents and Chemotherapy*, a publication of the American Society for Microbiology. The authors wrote that the discovery “heralds the emergence of a truly pan-drug resistant bacteria.”

[\*\[How these biomedical detectives identified the dreaded new superbug in U.S.\]\*](#)

Colistin is the antibiotic of last resort for particularly dangerous types of superbugs, including a family of bacteria known as CRE, which health officials have dubbed “nightmare bacteria.” In some instances, these superbugs kill up to 50 percent of patients who become infected.

The Centers for Disease Control and Prevention has called CRE among the country's most urgent public health threats.

Health officials said the case in Pennsylvania, by itself, is not cause for panic. The strain found in the woman is still treatable with other antibiotics. But researchers worry that its colistin-resistance gene, known as mcr-1, could spread to other bacteria that can already evade other antibiotics.

*[Superbug known as 'phantom menace' on the rise in U.S.]*

It's the first time this colistin-resistant strain has been found in a person in the United States. In November, public health officials worldwide reacted with alarm when Chinese and British researchers reported finding the colistin-resistant strain in pigs and raw pork and in a small number of people in China. The deadly strain was later discovered in Europe and elsewhere.

"It basically shows us that the end of the road isn't very far away for antibiotics — that we may be in a situation where we have patients in our intensive care units, or patients getting urinary-tract infections for which we do not have antibiotics," CDC Director Tom Frieden said in an interview Thursday.

*[1 in 3 antibiotics prescribed in U.S. are unnecessary]*

"I've been there for TB patients. I've cared for patients for whom there are no drugs left. It is a feeling of such horror and helplessness," Frieden added. "This is not where we need to be."

Separately, researchers at the Agriculture Department and the Department of Health and Human Services reported that testing of hundreds of livestock and retail meats turned up the same colistin-

resistant bacteria in a sample from a pig intestine in the United States. USDA said it is working to identify the farm the pig came from.

CDC officials are working with Pennsylvania health authorities to interview the patient and family to identify how she may have contracted the bacteria, including reviewing recent hospitalizations and other health-care exposures. The CDC hopes to screen the patient and her contacts to see if others might be carrying the organism. Local and state health departments also will be collecting cultures as part of the investigation.

*[A nightmare superbug': What is it? And what are the risks?]*

The woman was treated in an outpatient military facility in Pennsylvania, according to a Defense Department [blog](#) post about the findings. Samples were sent to the Walter Reed National Military Medical Center for initial testing. Additional testing was done by a special Defense Department system that tracks multi-drug-resistant organisms.

Thursday's study did not disclose further details about the Pennsylvania woman or the outcome of her case. The authors could not be reached for comment. A spokesman at the Pennsylvania Department of Health was not immediately available to comment on the case.

Pennsylvania Gov. Tom Wolfe (D) issued a statement saying his administration immediately began working with the CDC and the Defense Department to coordinate "an appropriate and collaborative" response.

*[Feds ramp up efforts to deal with antibiotic resistance]*

"We are taking the emergence of this resistance gene very seriously," he said, adding that authorities will take all necessary actions to prevent it from becoming a widespread problem with "potentially serious consequences."

Sen. Robert P. Casey Jr. (D-Pa.) said he is concerned about the reports. In a statement, Casey said he supported legislation for and participated in hearings about antibiotic-resistant bacteria, which he said "present an urgent public health problem that we must focus on intensively." He said he planned to get a full briefing on the case in the coming days.

Colistin is widely used in Chinese livestock, and this probably led bacteria to evolve and gain a resistance to the drug. The gene probably leaped from livestock to human microbes through food, said Yohei Doi, an infectious-disease doctor at the University of Pittsburgh who has studied the problem.

"Food handlers may be at higher risk," he said. In places like China, where live animal markets are often in close proximity to food stalls, it may be more likely for the bacteria to spread from animals to humans.

He and other experts in infectious diseases called for speedier action to curb the overuse of antibiotics in livestock worldwide.

"It's hard to imagine worse for public health in the United States," Lance Price, director of the Antibiotic Resistance Action Center and a George Washington University professor, said Thursday in a statement about the case. "We may soon be facing a world where CRE infections are untreatable."

Scientists rang the alarm bells about the gene in November, but not enough attention was paid. "Now we find that this gene has made its way into pigs and people, and people in the U.S.," Price said. "If our leaders were waiting to act until they could see the cliff's edge -- I hope this opens their eyes to the abyss that lies before us."

Scientists and public health officials have long warned that if the resistant bacteria continue to spread, treatment options could be seriously limited. Routine operations could become deadly. Minor infections could become life-threatening crises. Pneumonia could be more and more difficult to treat.

Already, doctors had been forced to rely on colistin as a last-line defense against antibiotic-resistant bacteria. The drug is hardly ideal. It is more than half a century old and can seriously damage a patient's kidneys. And yet, because doctors have run out of weapons to fight a growing number of infections that evade more-modern antibiotics, it has become a critical tool in fighting off some of the most tenacious infections.

Bacteria develop antibiotic resistance in two ways. Many acquire mutations in their own genomes that allow them to withstand antibiotics, although that ability can't be shared with pathogens outside their own family.

*[Scientists discover why pancreatic cancer resists chemotherapy drug]*

Other bacteria rely on a shortcut: They get infected with something called a plasmid, a small piece of DNA, carrying a gene for antibiotic resistance. That makes resistance genes more dangerous because plasmids can make copies of themselves and transfer the genes they

carry to other bugs within the same family as well as jump to other families of bacteria, which can then “catch” the resistance directly without having to develop it through evolution.

The colistin-resistant *E. coli* found in the Pennsylvania woman has this type of resistance gene.

Public health officials say they have been expecting this resistance gene to turn up in the United States.

“This is definitely alarming,” said David Hyun, a senior officer leading an antibiotic-resistance project at the Pew Charitable Trust. “The fact that we found it in the United States confirms our suspicions and adds urgency to actions we need to work on antibiotic stewardship and surveillance for this type of resistance.”

Late last year, as part of a broader budget deal, Congress agreed to give hundreds of millions of dollars to the federal agencies engaged in the battle against antibiotic-resistant bacteria.

The largest chunk of that money, more than \$150 million, was slated to go to the CDC as part of an effort to build and strengthen capacity at state and local health departments to prevent and monitor superbug outbreaks.

Other funding went to the National Institutes of Health for research on combating antimicrobial resistance, as well as to an agency known as BARDA, which works on national preparedness for chemical and biological threats, including developing new therapies.