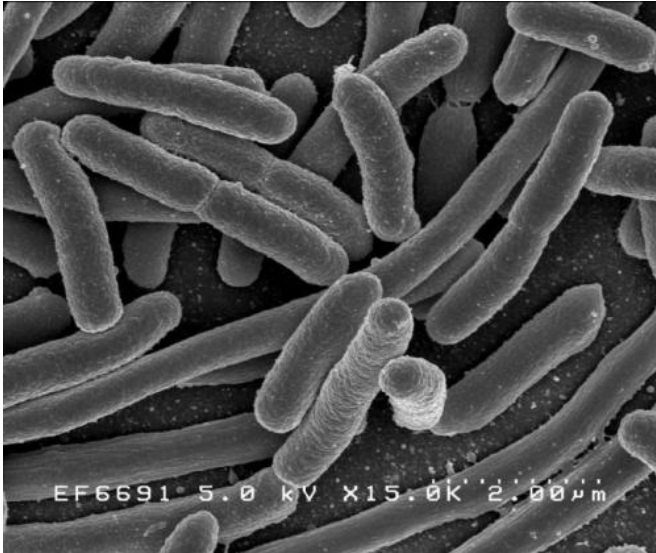


# Researchers identify multidrug-resistant *E. coli* bacteria from New Jersey patient

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*Escherichia coli*. Credit: Rocky Mountain Laboratories, NIAID, NIH

New Jersey researchers have identified what is believed to be the first strain of *Escherichia coli* bacteria from a patient in the United States that harbored two mobile genes making it resistant to both broad spectrum carbapenem antibiotics as well as colistin, an older antibiotic increasingly used as a last resort for multidrug-resistant infections. Their report is published this week in *mBio*, an online open-access journal of the American Society for Microbiology.

The strain of bacteria, isolated in 2014 from a 76-year-old man with a complicated [urinary tract infection](#) but further analyzed in 2016, was found to carry the genes *mcr-1* and *bla<sub>NDM-5</sub>*, which confer resistance to colistin and carbapenems, respectively. These genes exist on plasmids, small segments of DNA that are capable of moving from one bacterium to another, potentially spreading antibiotic resistance to other bacterial species. While this strain did respond to other antimicrobial

agents and was treated successfully, investigators say the case presents a sound reminder to monitor and track multidrug-resistant organisms.

"The good news is that this did not cause a major outbreak of drug-resistant infection," said senior study author Barry N. Kreiswirth, Ph.D., founding director of the Public Health Research Institute (PHRI) Tuberculosis Center at New Jersey Medical School, part of Rutgers University in Newark, N.J. "The bad news is that since this occurred two years ago, there are clearly other strains out there we haven't detected yet. Both the carbapenem resistance and the colistin resistance genes are on separate plasmids, which means in principle they could spread to other bacteria."

In August 2014, the patient presented to University Hospital in Newark, N.J., with fever and pain in his side. He had emigrated from India to the United States a year prior to experiencing these symptoms. The man had a history of prostate cancer treated with radiation therapy and subsequently developed recurrent [urinary tract](#) infections. He had recently undergone a procedure called cystoscopy to examine the bladder. The procedure was complicated by a bladder perforation, requiring surgery to place rubber tubes to help drain the kidneys. Laboratory testing suggested the man had pyuria, or pus in the urine.

The man was started on the antimicrobial drugs piperacillin/tazobactam and vancomycin. A [urine sample](#) tested positive for the bacteria *Pseudomonas aeruginosa*, *Citrobacter koseri*, and *Enterococcus faecium*; another urine sample from the tube tested positive for *P. aeruginosa*, *E. coli*, *Klebsiella pneumoniae*, *Enterococcus* spp., and methicillin-resistant *Staphylococcus aureus* (MRSA). After six days of antimicrobial therapy, a urine sample was clear of bacteria; the man returned home after another procedure to create a new conduit for urine flow.

Kreiswirth's lab, which analyzes bacterial isolates from University Hospital, used various molecular techniques to identify and compare bacteria in the man's urine samples. Investigators found that the *E. coli* strain from the man's urine sample carried both *mcr-1* and *blaNDM-5* and harbored resistance to several classes of antibiotics, including aminoglycosides, beta-lactams, chloramphenicol, fluoroquinolones, rifampin, sulfonamides, and tetracycline. Additional testing found that the plasmids isolated were highly similar to others that have been reported to be associated with clinical infection in China. The lab identified the *E. coli* strain as a variant of ST405, one of the main disease-causing strains of the bacteria. "Worrisomely, ST405 has frequently been associated with community-onset urinary tract infections," Kreiswirth said.

Most *mcr-1* cases appear to be happening in *E. coli*, the most common cause of urinary tract infections, said lead study author José R. Mediavilla, MBS, MPH, a research teaching specialist at PHRI.

"These strains are probably already in the community and could spread further, essentially building toward a situation where you're going to have difficult if not impossible to treat urinary infections," he said. "Active surveillance efforts involving all colistin- and carbapenem-resistant organisms are imperative to determine *mcr-1* prevalence and prevent further dissemination."

Provided by American Society for Microbiology

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