

Investigation of *Escherichia coli* Harboring the *mcr-1* Resistance Gene — Connecticut, 2016

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The *mcr-1* gene confers resistance to the polymyxins, including the antibiotic colistin, a medication of last resort for multidrug-resistant infections. The *mcr-1* gene was first reported in 2015 in food, animal, and patient isolates from China (1) and is notable for being the first plasmid-mediated colistin resistance mechanism to be identified. Plasmids can be transferred between bacteria, potentially spreading the resistance gene to other bacterial species. Since its discovery, the *mcr-1* gene has been reported from Africa, Asia, Europe, South America, and North America (2,3), including the United States, where it has been identified in *Escherichia coli* isolated from three patients and from two intestinal samples from pigs (2,4–6). In July 2016, the Pathogen Detection System at the National Center for Biotechnology Information (Bethesda, Maryland) identified *mcr-1* in the whole genome sequence of an *E. coli* isolate from a Connecticut patient (7); this is the fourth isolate from a U.S. patient to contain the *mcr-1* gene.

The isolate was non-Shiga toxin-producing *E. coli* O157 from stool collected on June 16, 2016 from a pediatric patient with diarrhea. The patient traveled to the Caribbean for approximately 2 weeks to visit friends and relatives and developed fever and bloody diarrhea on June 12, 2 days before returning to the United States. The patient took paromomycin, an aminoglycoside antibiotic, from symptom onset until a pediatric outpatient visit on June 16, at which time a stool specimen was collected. The patient was not hospitalized and, in addition to the primary care visit, had one brief emergency department visit during the illness.

E. coli O157 harboring *mcr-1* was isolated from three stool cultures from the patient: the June 16 culture and follow-up cultures on June 18 and 23. Reference susceptibility testing by broth microdilution showed that the isolates had a colistin (also known as polymyxin E) minimum inhibitory concentration (MIC) of 2 µg/ml, and polymyxin B MIC of 4 µg/ml. The isolates also carried a plasmid *bla_{cmv-2}* gene, which encodes AmpC, an enzyme that confers resistance to third generation cephalosporins; the isolates were susceptible to carbapenems. Stool cultures on June 24 and July 1 were negative for *E. coli* O157.

The patient's parent and health care provider were interviewed to assess patient risk factors and close contacts who might be at risk for acquiring bacteria carrying *mcr-1*. The patient was typically healthy with no prior surgeries or hospitalizations. The patient's usual diet included fruit, dairy products, and meat (pork, chicken, and beef). While traveling, the patient ate chicken and goat meat from a live animal market that the patient did not visit. The patient stayed in a home with a pet cat and dog in the Caribbean but did not have any animal contact in the United States.

Persons with close contact with the patient, particularly those involved in bathing or diapering, were considered to be at risk for *mcr-1* acquisition. On July 19–20, perirectal swabs were obtained from all six identified household contacts; a perirectal swab and swab of a soiled diaper from the patient were collected approximately 24 hours apart. Bacteria with the *mcr-1* gene were not detected by real-time polymerase chain reaction in any specimen, indicating that the patient and family members were not colonized with bacteria carrying *mcr-1*. Sixteen environmental samples collected from surfaces in the kitchen and diaper changing area of the patient's home were negative for the presence of *mcr-1*. The patient did not have close contact with other persons after returning to the United States. Health care personnel had no direct contact with the patient's body fluids and were not screened.

In this investigation of potentially travel-associated *mcr-1* acquisition, no transmission beyond the index patient or persistent environmental contamination were identified, and the patient was transiently colonized. At this time, CDC recommends that Enterobacteriaceae isolates with a colistin or polymyxin B MIC ≥4 µg/ml be tested for the presence of *mcr-1*; testing is available through CDC (5).^{*} Prompt reporting of *mcr-1*-carrying isolates to public health officials allows for a rapid response to identify transmission and limit further spread.

^{*}<http://www.cdc.gov/laboratory/specimen-submission/detail.html?CDCTestCode=CDC-10223>.

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