

The Emergence of Mobile Colistin Resistance (*mcr*) Genes among Enteric Pathogens in the United States — 2008–2019

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BACKGROUND

- Colistin has resurged as a “last resort antibiotic” for the treatment of multidrug-resistant infections.
- Colistin is still used in animal agriculture in countries outside the United States despite recommendations by the World Health Organization.
- Ten plasmid-mediated, mobile colistin resistance genes (*mcr-1* to *mcr-10*) have been found in one or more clinical, animal, food, and environmental bacterial sources.

METHODS

- State public health laboratories have performed whole-genome sequencing on enteric bacterial pathogens since 2015.
- We screened sequences of isolates collected from 2008–2019 for *mcr-1* through *mcr-8* using a workflow based on ResFinder 3.0.
- State health officials interviewed patients for clinical and epidemiologic information, including demographics, hospitalization, and travel history.

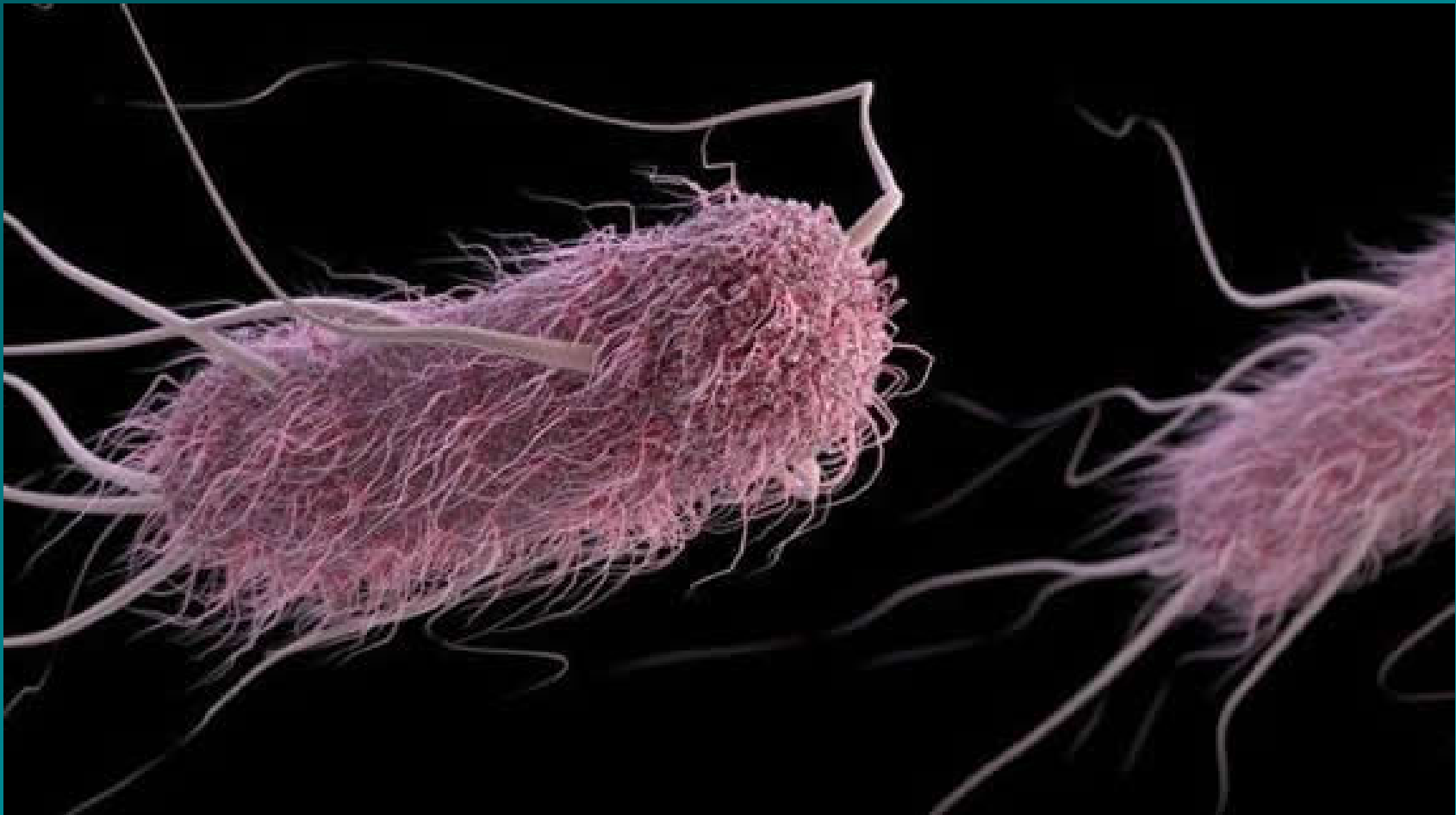
RESULTS

- We identified 41 patient isolates with *mcr* genes (1, 3, and 4) collected from stool, urine, and blood during 2008–2019.
 - 37 nontyphoidal *Salmonella* (31 *mcr-1*, 6 *mcr-3*), 2 *Vibrio* (both *mcr-4*), and 2 Shiga toxin-producing *E. coli* (both *mcr-1*).
- Median patient age was 34 years (interquartile range: 24–54) and 54% were female.
- Six patients (26%) had underlying conditions.
- Patients sought care at doctor’s offices (46%), emergency rooms (35%), and urgent care clinics (19%).
 - 24% were hospitalized for their enteric illness.
- Of those with available data, thirty-five of 36 patients (97%) travelled internationally in the 12 months before illness; 30/32 (94%) traveled in the 7 days before (Figure 1).
 - Common destinations: Dominican Republic (35%), Vietnam (24%), Thailand (15%), and China (12%).
 - Cases reported eating a variety of foods while abroad (Figure 2)

CONCLUSION

- The data strongly suggest that most patients acquired infection with *mcr*-containing enteric pathogens abroad.
 - Foods most commonly consumed while traveling have been found to contain the *mcr* gene outside the U.S.
- Nearly 1 in 4 were hospitalized, raising concerns that plasmids carrying *mcr* genes could spread to other hospitalized patients infected with multidrug resistant pathogens.

Most patients infected with an enteric pathogen containing an *mcr-1*, *mcr-3*, or *mcr-4* gene likely acquired their infections abroad.



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Figure 1. Map of Countries Visited

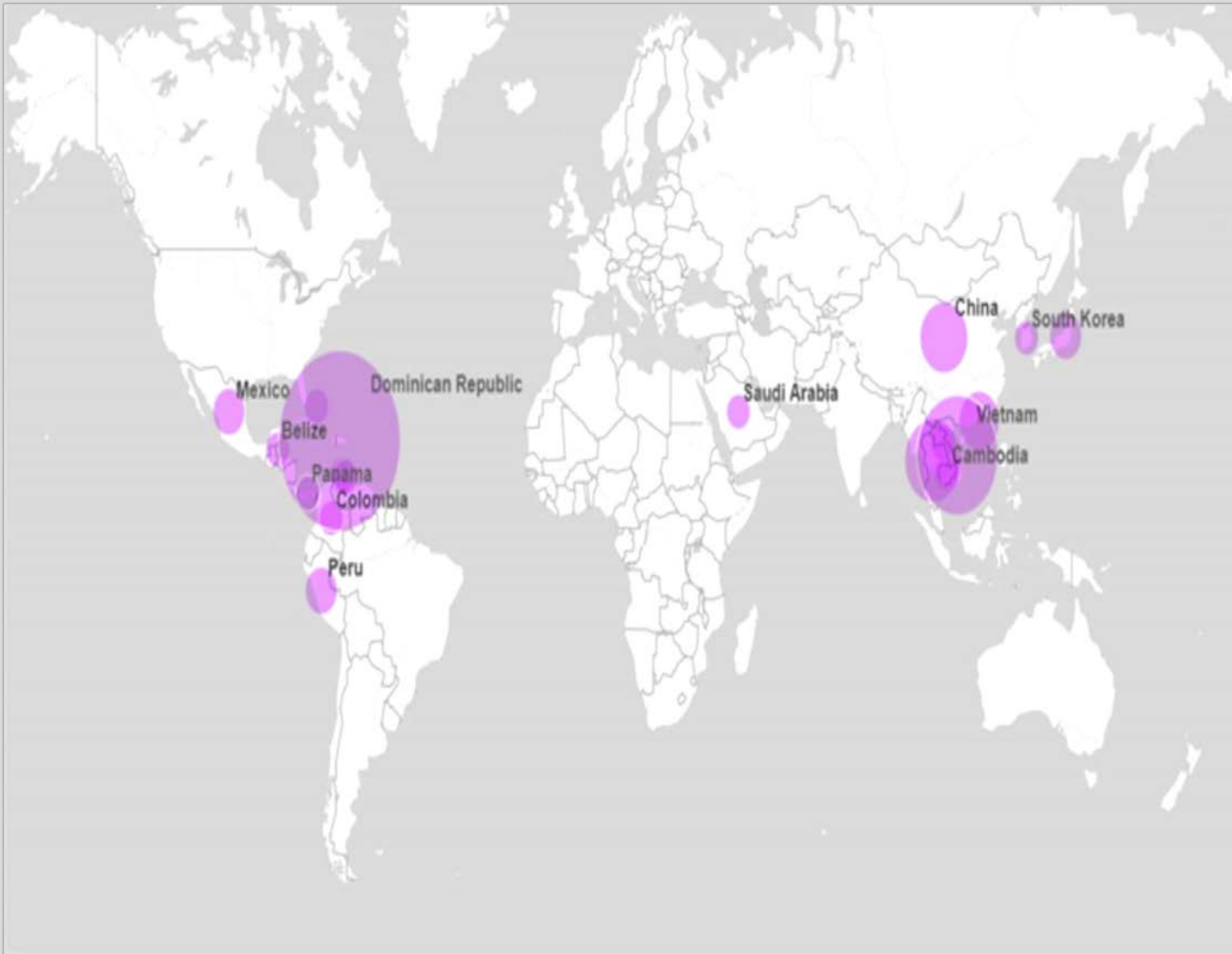
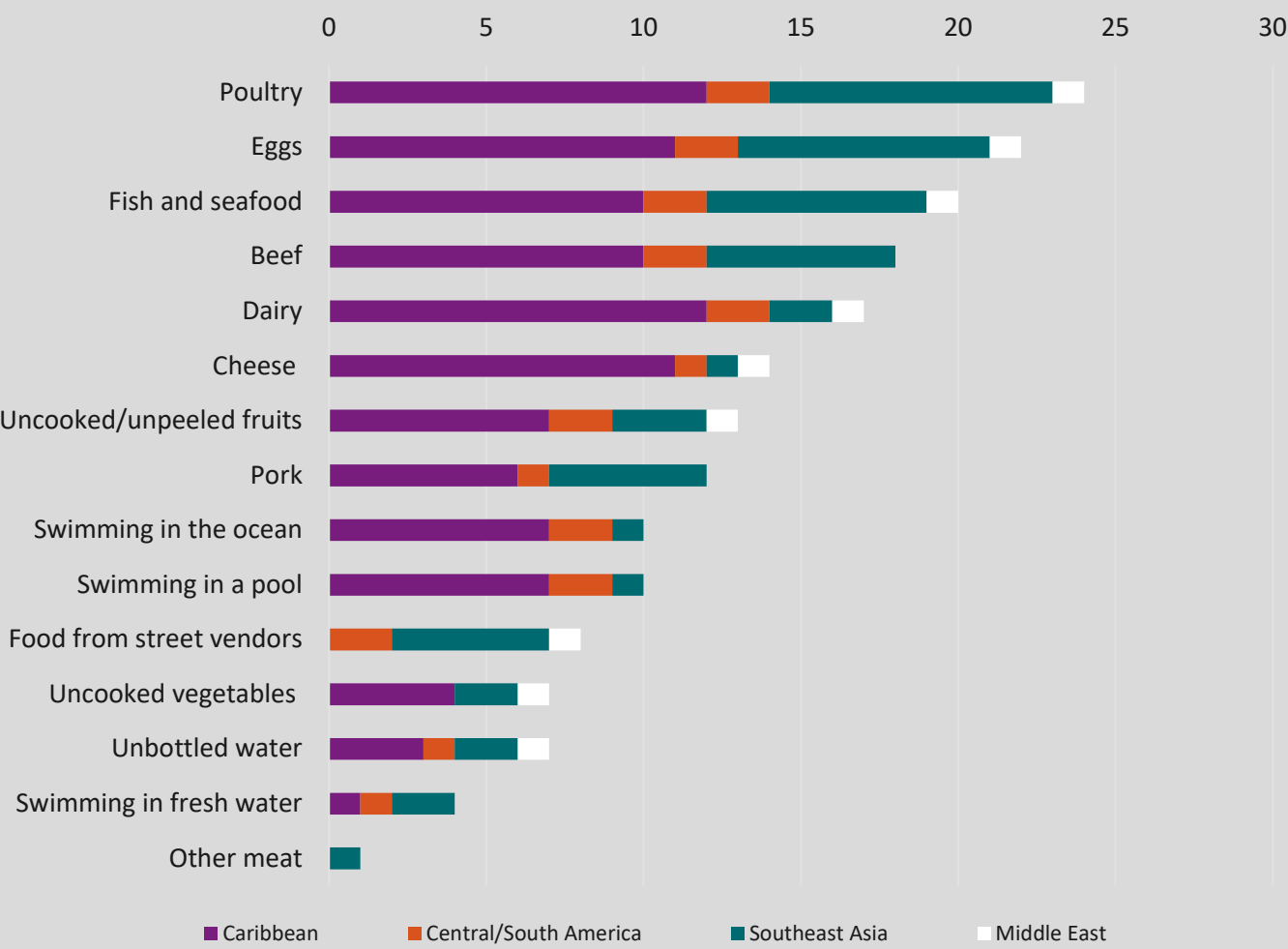


Figure 2. Food and Water Exposures During Travel (n=36)



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