



Quarterly Update on Carbapenem-Resistant Enterobacteriaceae and Other Carbapenemase-Producing Organisms for Washington State

ISOLATES REPORTED TO THE DEPARTMENT OF HEALTH AND TESTED AT THE PUBLIC HEALTH LABORATORIES, BY DATE OF COLLECTION, **APRIL - JUNE 2019**

This update summarizes reports of carbapenem-resistant Enterobacteriaceae (CRE) isolates and other carbapenemase-producing organisms (CPO) from April through June, 2019. CRE and other CPO isolates are counted from any person diagnosed in-state or from Washington residents diagnosed out-of-state and reported to the department. Since surveillance began in 2012, only the first unique genus/species/carbapenemase profile from each patient is counted. Isolates producing more than one carbapenemase are counted once for each novel carbapenemase.

CRE

The CRE case definition since May 2015, is:

E. coli, *Klebsiella* spp., and *Enterobacter* spp. resistant to any carbapenem, according to Clinical Laboratory Standards Institute (CLSI) breakpoints: minimum inhibitory concentrations of ≥ 4 mcg/ml for meropenem, imipenem, and doripenem or ≥ 2 mcg/ml for ertapenem.

See the 2010-2015 CRE Surveillance Summary (<http://www.doh.wa.gov/portals/1/Documents/Pubs/420-163-CRE-Summary2015.pdf>) for details about the case definitions prior to May 2015.

Testing performed at PHL on CRE includes confirmation of identification and antibiotic sensitivity (AST), a phenotypic test to detect carbapenemase activity using the Modified Carbapenem Inactivation Method (mCIM), and PCR for the following five common carbapenemase genes:

- *Klebsiella pneumoniae* carbapenemase (KPC)
- New Delhi metallo- β -lactamase (NDM)
- Oxacillin-hydrolyzing β -lactamase-48 (OXA-48)
- Verona integron-encoded metallo- β -lactamase (VIM)
- Imipenem-hydrolyzing β -lactamase (IMP)

Any CRE isolate that is positive by mCIM test but negative by PCR for the five carbapenemase genes is suspicious for novel carbapenemase and these isolates are submitted to Centers for Disease Control and Prevention for further testing. PHL can test other CR-genera within the family Enterobacteriaceae by special request, or through a sentinel surveillance agreement.

Other CPO

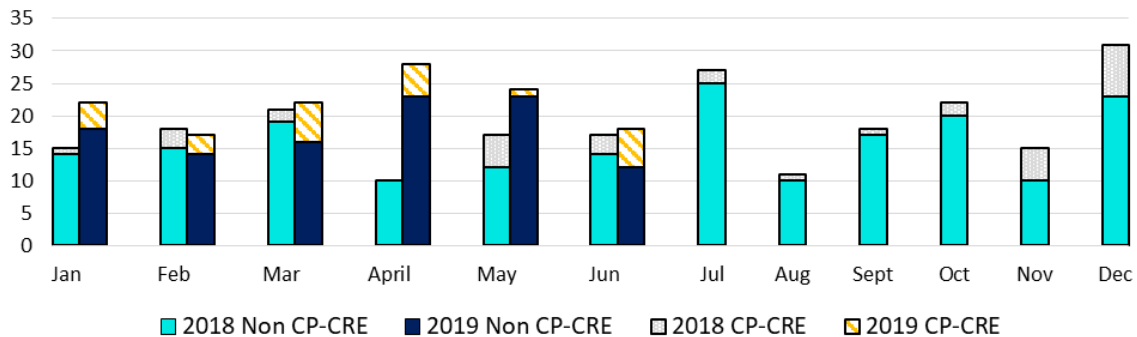
PHL solicits and tests other Gram-negative organisms. CR-*Pseudomonas* isolates are submitted by 22 sentinel laboratories in Washington. The department requests that CR-*Acinetobacter* isolates be submitted by all laboratories in the state. Carbapenem-resistance in other genera of bacteria is determined by CLSI breakpoints.

PHL began testing CR-*Acinetobacter* isolates with the following carbapenemase targets in March 2019:

- Oxacillin-hydrolyzing β -lactamase-23 like (OXA-23)
- Oxacillin-hydrolyzing β -lactamase-24/40 like (OXA-24/40)
- Oxacillin-hydrolyzing β -lactamase-58 like (OXA-58)

The bar graph shows CRE and carbapenemase-producing Enterobacteriaceae isolates collected in 2019, compared to those submitted and tested in 2018 (Figure 1).

Figure 1. Carbapenem-Resistant Enterobacteriaceae Isolates, Washington, 2018 and 2019



Quarter 2 2019

CRE surveillance:

- Seventy (70) CRE isolates were reported statewide in the second quarter of 2019. The contrasting color/pattern at the top of each bar represents the number of CRE isolates that were confirmed by PCR testing to carry a carbapenemase gene (Figure 1).
- Of 70 CRE isolates, 56 (80%) were “big-three” genera isolates that are required to be reported: 33 (47%) *Enterobacter* spp., 14 (20%) *E. coli*, and 9 (13%) *Klebsiella* spp. Other Enterobacteriaceae genera submitted and tested were: 3 (4%) *Morganella* spp., 3 (4%) *Citrobacter* spp., 4 (6%) *Serratia* spp., and 4 (6%) *Proteus* spp. (Figure 2).
- Of 70 CRE isolates, 12 (17%) isolates from 12 individual patients tested positive for carbapenemase: 2 KPC, 1 OXA-48 like, 5 NDM, 1 VIM, and 3 presumed *Serratia marcescens* Enzyme (SME). (Figure 2)
- Two of 9 (22%) of *Klebsiella* isolates were carbapenemase-positive, as were 5 of 14 (36%) *E. coli* isolates and 1 of 33 (3%) *Enterobacter* isolates. One *Proteus mirabilis* isolate was positive for VIM carbapenemase. (Figure 2)
- Three *Serratia* isolates tested positive for carbapenemase activity by mCIM or CarbaNP test, all were presumed SME based on having the SME resistance phenotype. SME is common in *Serratia* spp. and is usually located on a chromosome rather than on a plasmid. As such, isolates with SME carbapenemases are not targeted for public health investigation. (Figure 2)
- The likely source of acquisition for 4 of the 10 patients with plasmid mediated CP-CRE was healthcare in Washington or another US state, fourcases likely acquired the carbapenemase during international travel or healthcare and two case sources were unknown. (The SME cases are not included.) (Table 1)
- We offer a breakdown of cases by county to inform local public health, facilities, and providers of recent carbapenemase activity in their region. The quarter 2 map of cases by county of residence or diagnosis (non-WA residents) is shown in Figure 3.

CRPA/CRA surveillance:

- Seventy-six (76) CR-*Pseudomonas* and seven (7) CR-*Acinetobacter* isolates were submitted for carbapenemase testing in the second quarter of 2019. (Figure 2)
- One of 67 (1.5%) *Pseudomonas* isolates were positive for carbapenemase: 1 unidentified carbapenemase (mCIM+).
- One of 7 (14%) *Acinetobacter* isolates were positive for OXA-34/40 carbapenemase in quarter 2.

Figure 2. CRO isolates by genus and carbapenemase, Washington, April through June 2019

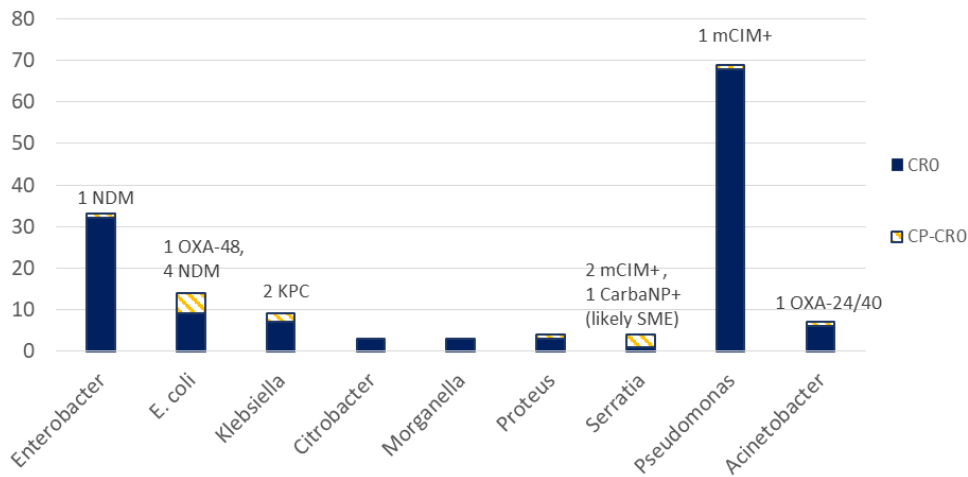


Figure 3. Number of Patients with Carbapenemase-producing Organism(s) Reported in Washington, by County of Residence or Diagnosis (non-WA residents), April through June 2019 (Quarter 2)

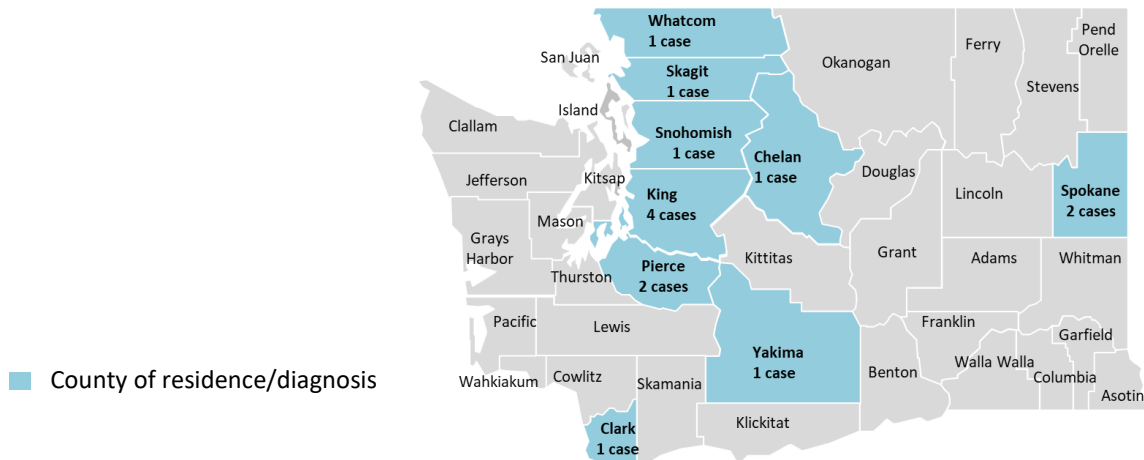


Table 1. Carbapenemases Identified and Likely Source, Washington State, Quarter 2, 2019

Carbapenemase	Number of cases	Likely Source
KPC	2	Healthcare in Washington
NDM	2	Healthcare in Washington (1), Healthcare in Arizona (1)
NDM	3	International healthcare or travel
OXA-24/40	1	Healthcare in Washington
OXA-48	1	Unknown
VIM	1	Unknown

*SME cases are not included in this table

The Public Health Laboratories accepts and tests other carbapenem-resistant Gram-negative organisms, such as other genera in the family Enterobacteriaceae, upon request, or if specialized screening tests (e.g., Metallo-B-lactamase test, modified Hodge test (MHT) (for *E. coli* and *Klebsiella* species only), CarbaNP, Carbapenem Inactivation Method (CIM) or modified CIM (mCIM) indicate suspicion for carbapenemase production.

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