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, **OCTOBER - DECEMBER 2017**

Washington State Department of Health has performed surveillance and testing for CRE since October 2012. This update summarizes reports of carbapenem-resistant Enterobacteriaceae (CRE) isolates and other carbapenemase-producing organisms (CPO) collected from October through December, 2017. We include all CRE and CPO isolates diagnosed in-state and isolates from Washington residents diagnosed out-of-state and reported to the department. Isolates were included if they were the first unique genus/species/carbapenemase profile reported from an individual patient since surveillance began in 2012. If an isolate produced more than one carbapenemase, it was counted once for each novel carbapenemase.

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 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 five most common carbapenemase genes.

The Washington State Public Health Laboratories (PHL) test CRE isolates for the following carbapenemase genes:

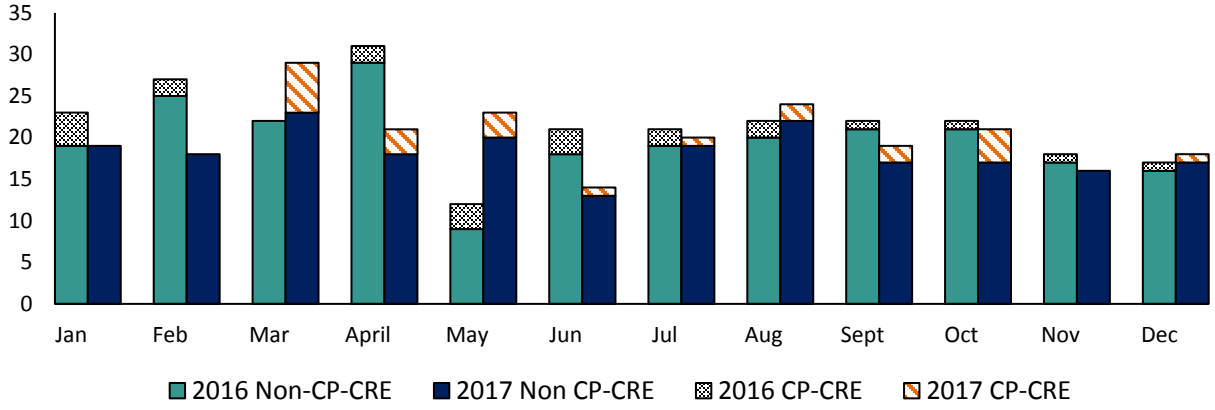
- *Klebsiella pneumoniae* carbapenemase (KPC)
- New Delhi metallo-β-lactamase (NDM)
- Oxacillin-hydrolyzing β-lactamase-48 (OXA-48)
- Verona integron-encoded metallo-β-lactamase (VIM)
- Imipenem-hydrolyzing β-lactamase (IMP)

The Modified Carbapenem Inactivation Method (mCIM) is a phenotypic test used at the Public Health Laboratory to confirm production of carbapenemase. If PCR at WAPHL is negative for the five most common carbapenemase genes (KPC, NDM, VIM, IMP or OXA-48) but mCIM positive, we suspect an unknown variant or a novel carbapenemase.

In addition, PHL solicits and tests other Gram-negative organisms using the same methods. 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. Other CR-genera within the family Enterobacteriaceae may be submitted and tested by special request. Carbapenem-resistance in other genera of bacteria is determined by CLSI breakpoints.

The bar graph shows CRE and carbapenemase-producing Enterobacteriaceae isolates collected in 2017, compared to those submitted and tested in 2016 (Figure 1).

Figure 1. Carbapenem-Resistant Enterobacteriaceae Isolates, Washington, 2016 and 2017



Quarter 4 2017

- Fifty-six (56) CRE isolates were reported statewide in the fourth quarter of 2017. 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 56 CRE isolates, 33 (59%) were *Enterobacter* spp., 17 (30%) *E. coli*, 4 (7%) *Klebsiella* spp., and 2 (4%) *Proteus* spp. (Figure 2). *Proteus* spp. are not included in the case definition, but were tested on special request.
- Of 56 CRE isolates, 5 (9%) isolates from 4 individual patients tested positive for carbapenemase: 1 KPC and 4 NDM. (Figure 2)
- Two of 33 (6%) *Enterobacter* isolates were carbapenemase-positive, as was 1 of 4 (25%) *Klebsiella* isolates. No *E. coli* isolates were positive for carbapenemase. The two *Proteus* spp. isolates, from the same patient, were positive for carbapenemase. (Figure 2)
- The likely source of acquisition for 1 of the 4 patients with CP-CRE was healthcare in Washington. Three of the CP-CRE cases likely acquired the carbapenemase during international travel or healthcare. (Table 1)
- We offer a breakdown of cases by county to inform local health, facilities, and providers of recent carbapenemase activity in their region. The quarter four map of cases by county of residence is shown in Figure 3.

CRPA/CRA surveillance testing:

- Sixty-six CR-*Pseudomonas* and 9 CR-*Acinetobacter* isolates were submitted for carbapenemase testing in the fourth quarter of 2017. (Figure 2)
- One of 66 (2%) *Pseudomonas* isolates was NDM positive and 1 of 9 (11%) *Acinetobacter* isolates was positive for KPC. Both cases had international healthcare exposure. The patient with NDM-positive *Pseudomonas* also had a carbapenemase-positive CRE.

Figure 2. Submitted CRO isolates by genus and carbapenemase, Washington, October through December 2017

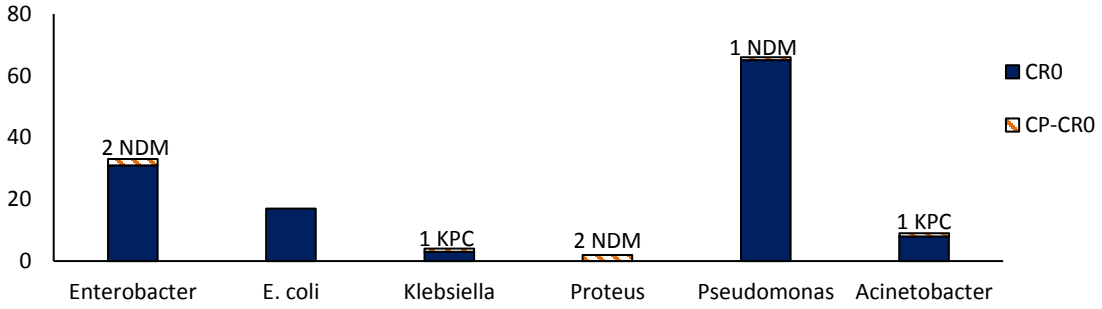


Figure 3. Number of Patients with Carbapenemase-producing Organism(s) Reported in Washington, by County of Residence, October through December 2017 (Quarter 4)

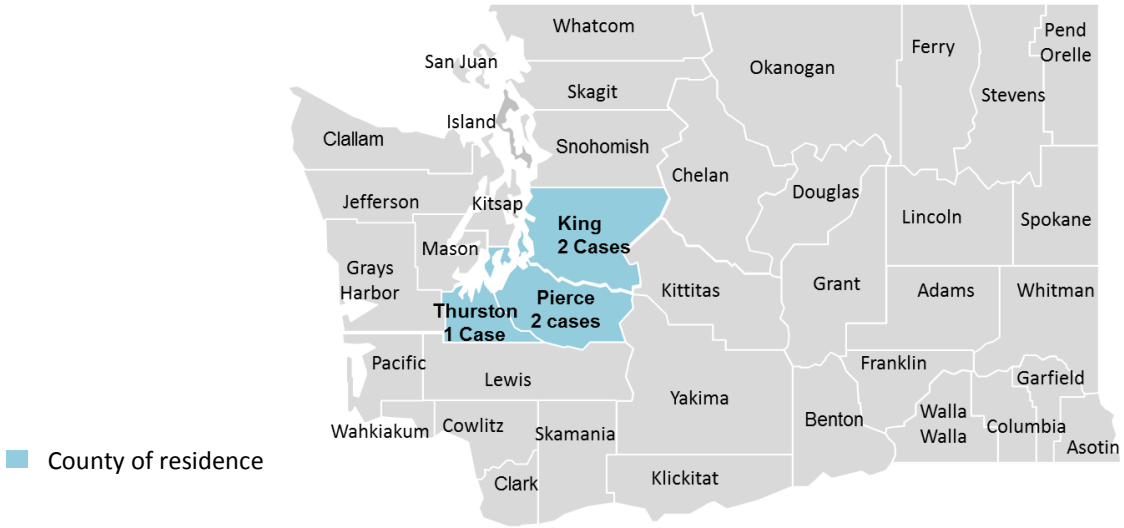


Table 1. Carbapenemases Identified and Likely Source, Washington State, Quarter 4, 2017

Carbapenemase	Number of cases	Likely Source
KPC	1	Healthcare in Washington
KPC	1	International Healthcare (North America)
NDM	3	International Healthcare (Asia)

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., RAPIDEC® Carba-NP or Rosco Diagnostica Neo-Sensitabs) indicate suspicion for carbapenemase production.

Please contact Kelly Kauber at 206-418-5500 or kelly.kauber@doh.wa.gov for any questions or comments about this report, or for information on becoming a sentinel lab.