

# Carbapenem-resistant *Enterobacteriaceae* (CRE)

The *Enterobacteriaceae* are a large family of Gram-negative bacilli found in the human gastrointestinal tract. Commonly encountered species include *Escherichia coli*, *Klebsiella* spp., and *Enterobacter* spp. Carbapenem-resistant *Enterobacteriaceae* (CRE) are non-susceptible to carbapenem antibiotics. They are broadly categorized based on the mechanism of their resistance as carbapenemase producers (CP-CRE) and non-carbapenemase producers.

Carbapenems are broad-spectrum antibiotics typically used to treat severe health care-associated infections (HAIs) caused by highly drug resistant bacteria. Currently available carbapenems include imipenem, meropenem, ertapenem and doripenem. Although related to the  $\beta$ -lactam antibiotics, carbapenems retain antibacterial activity in the presence of most  $\beta$ -lactamases, including extended-spectrum  $\beta$ -lactamases (ESBLs) and extended-spectrum cephalosporinases (e.g., AmpC-type  $\beta$ -lactamases). Loss of susceptibility to carbapenems is a serious problem because few safe treatment alternatives remain against such resistant bacteria.

Infections caused by CRE occur most commonly among people with chronic medical conditions, through use of invasive medical devices such as central venous and urinary catheters, frequent or prolonged stays in health care settings, or extended courses of antibiotics. CP-CRE are most concerning and have spread rapidly across the nation and around the globe, perhaps because carbapenemases can be encoded on plasmids that are easily transferred within and among bacterial species.

In December 2011, CRE bacterial isolates became reportable statewide. The Oregon State Public Health Laboratory offers specialized testing to determine whether reported CRE are carbapenemase producers and the Oregon Public Health Division's HAI program performs detailed investigation of any reported cases.

Using the surveillance definition established in 2014,\* 113 cases of CRE infection or colonization were reported among Oregon residents since 2010. The median case age was 71 (range 7–96) years; 72 (64%) were female; 66 (58%) were hospitalized at the time of specimen collection. Urine was the most common source (67%) and *Enterobacter* spp. accounted for 50% of all isolates. In terms of case risk factors for CRE, 55% had surgery and 71% were hospitalized in the year previous. Fifty-five percent had medical devices in place within two days

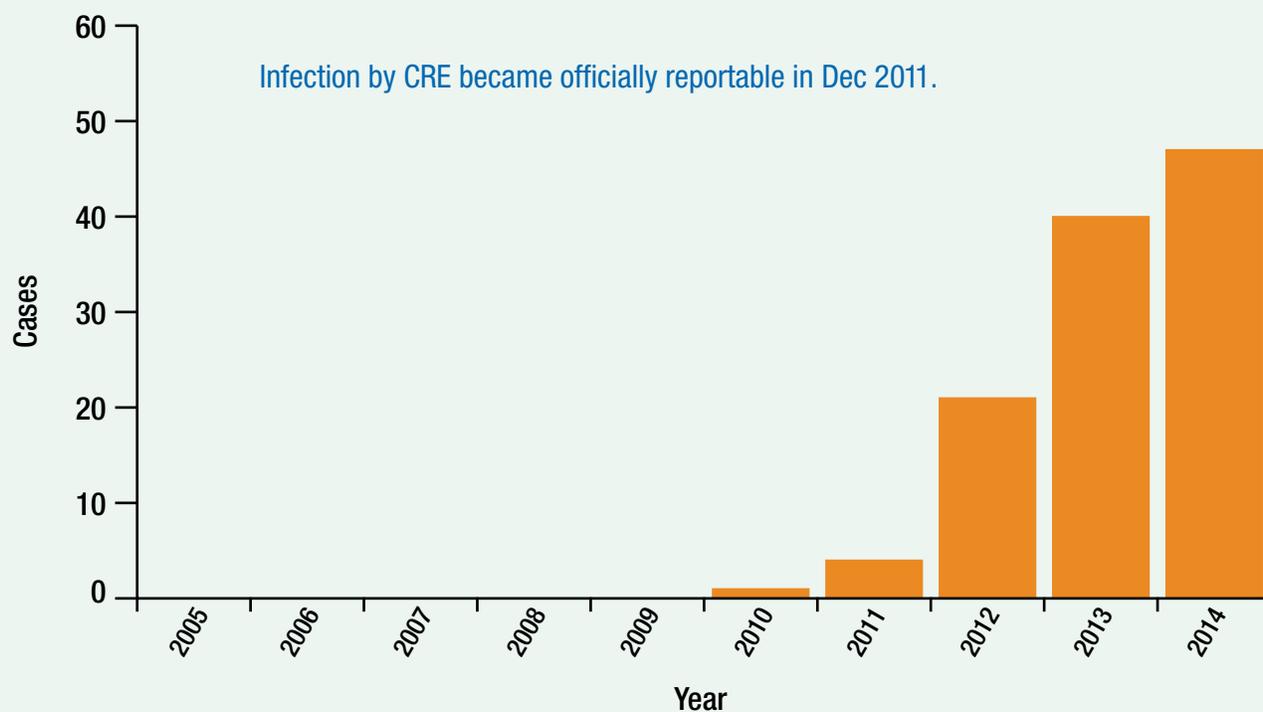
of culture collection and 75% had received antibiotics within 30 days before. By the end of 2014, Oregon had 7 CP-CRE; 5 *Klebsiella pneumoniae* carbapenemase (KPC), 1 New Delhi metallo- $\beta$ -lactamase (NDM), and 1 Oxacillinase-48 (OXA-48). Five of the CP-CRE were from patients with histories of health care exposure in other states or out of country.

Unlike much of the rest of the country, we have no indication CP-CRE are spreading in Oregon. We have instituted enhanced surveillance and prevention efforts and established the Drug-Resistant Organism Prevention and Coordinated Regional Epidemiology Network (DRO-ORE), a statewide network to rapidly detect, respond to, and prevent CRE.

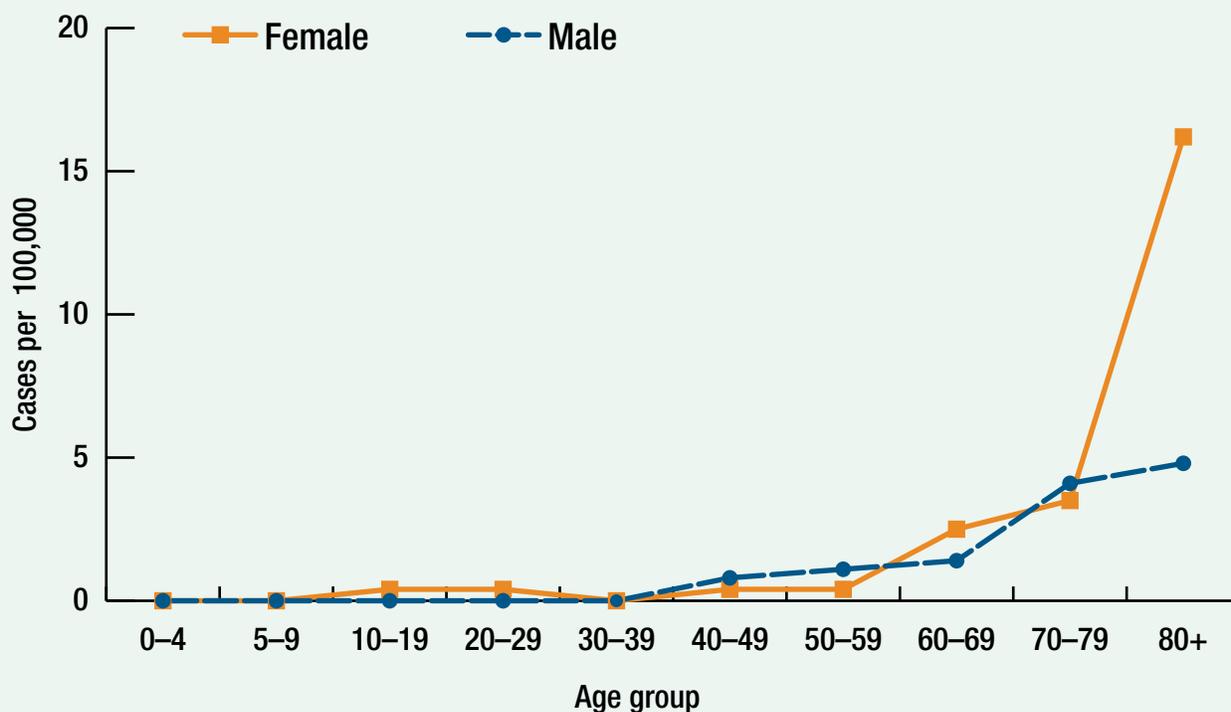
For more information, including our [CRE toolkit](#), please see [Carbapenem-resistant \*Enterobacteriaceae\*](#).

\*Definition changed in 2014 to *Enterobacteriaceae* that are non-susceptible (intermediate or resistant) to one or more carbapenem: doripenem, imipenem or meropenem and resistant to all of the third generation cephalosporins tested: cefotaxime, ceftriaxone or ceftazidime.

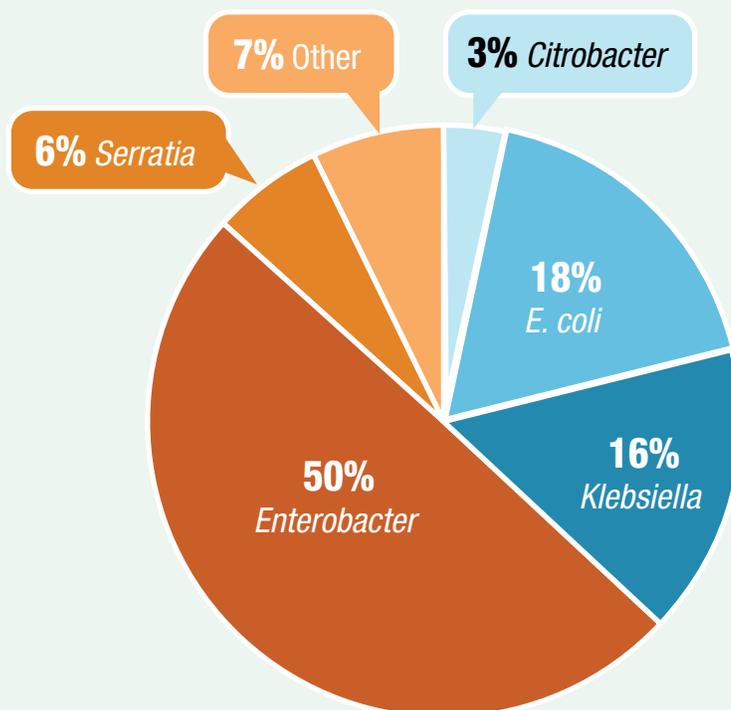
### Carbapenem-resistant *Enterobacteriaceae* by year: Oregon, 2005–2014



## Incidence of carbapenem-resistant *Enterobacteriaceae* by age and sex: Oregon, 2014



## Carbapenem-resistant *Enterobacteriaceae* by species: Oregon, 2014



## Prevention

Think “NICE” if you encounter CRE:

- **Notify** the county health department, pertinent clinical groups, and your antibiotic stewardship program that CRE has been spotted.
- **Intervene** in all cases with core infection control activities: hand hygiene, contact precautions, private rooms and optimized environmental cleaning. Reduce unnecessary antibiotics and use of invasive devices. Additionally, for CP-CRE, screen patient contacts, and cohort staff and patients.
- **Communicate** CRE infection or colonization status to the receiving facility upon patient transfer.
- **Educate** patients, staff and visitors about CRE.