

Carbapenem-resistant Organisms in Alameda County, 2023

Background and Approach

Carbapenem-Resistant Organisms (CROs) are bacteria resistant to the carbapenem class of antibiotics, which are the last line treatment for bacterial infections. Some CROs are also Carbapenemase-Producing Organisms (CPOs), which facilitate resistance by encoding enzymes that break down Carbapenems. These organisms have been identified as [urgent health threats](#). Since 2017 Alameda County Public Health Department (ACPHD) has required reporting of Carbapenem-Resistant *Klebsiella* spp, *Enterobacter* spp, and *Escherichia coli*, and isolate submissions to the Public Health Lab. CROs of other species are encouraged to be reported and isolates submitted. The [Health Officer Order](#) (HOO) precedes State reporting mandates which do not include isolate submission.

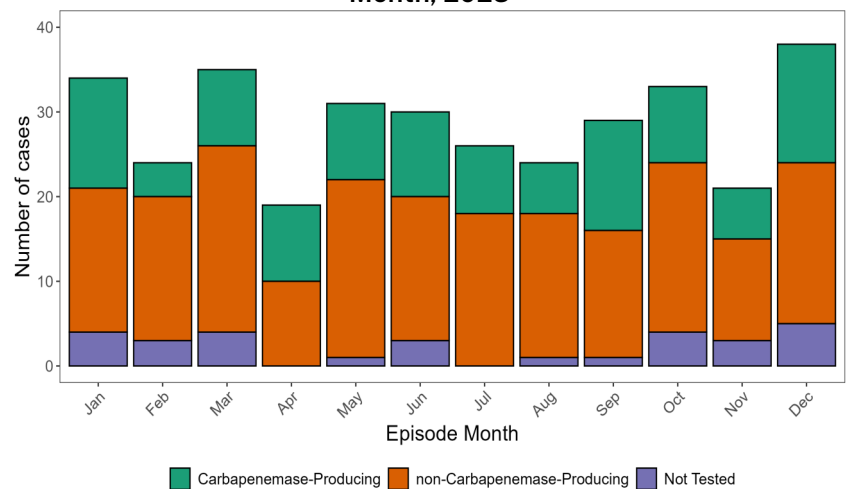
ACPHD works with facilities experiencing multidrug-resistant organism (MDRO) outbreaks to limit spread and provide education regarding prevention and control. Key strategies include root cause analyses using risk-based epidemiology and acquiring genomic data to inform investigations; closure of affected units pending review and implementation of mitigation and prevention measures; admission screenings and improved resident cohorting strategies; and reinforcing interfacility communication as required by the HOO.

Carbapenem-Resistant Organism Cases and Case-Patients

In 2023 there were 344 CRO cases reported among 311 patients, less than the 380 cases reported in 2022. From January to December 2023 there was no overall increase or decrease in cases (Figure 1).

The majority of case-patients were over 60 years old (68%), and male (58%, Table 1). Of patients with known race and ethnicity, over half were White or Asian (57%). One-fifth of case-patients were residents of other counties but were identified in Alameda County facilities, 75% in long-term care facilities (LTCFs).

Figure 1. Carbapenem-Resistant Organism Case Counts by Month, 2023



Case Clinical and Epidemiologic Data

Of the 344 CRO cases in 2023, 110 (32%) were Carbapenemase-producing (Table 2), the same percent as 2022. Most Carbapenem-Resistant *Acinetobacter baumannii* (CRAB) cases (72%) were Carbapenemase-producing, while most Carbapenem-Resistant *Pseudomonas aeruginosa* (CRPA) cases were not (85%).

Fifty percent of cases (172) occurred among LTCF residents or patients with a history of long-term care.

The most commonly associated risk factors for CROs were previous healthcare admission (82%), indwelling device (73%), and totally dependent on others for daily activities (71%); 19% of interviewed patients had international travel prior to testing positive for a CRO, and of those, 64% received care while travelling.

Provider Recommendations:

- Contact ACPHD if CRO transmission is suspected or if you need infection prevention and control guidance
- Fill out the [interfacility-transfer form](#) when transferring patients
- Perform Carbapenemase testing on Carbapenem-Resistant isolates and submit isolates to the public health lab as mandated
- Screen high-risk patients (admitted from long-term acute care hospitals, ventilator-equipped SNFs, outbreak facilities, patients with healthcare exposure abroad, epidemiologically linked to a case) on admission
- Do not re-screen patients with prior CPO detection; implement appropriate infection control measures based on known history of CPO colonization/infection

Table 1. Demographic Characteristics of Carbapenem-Resistant Organism Case-Patients, 2023

Demographic	N = 311 ¹	5-Year Case Rate per 100,000
Age Group		
30 or younger	14 (4.5%)	2.3
31-40	15 (4.8%)	6.6
41-50	25 (8.0%)	12.1
51-60	45 (14%)	22.4
61-70	77 (25%)	47.0
71-80	75 (24%)	80.2
81+	60 (19%)	126.9
Gender		
Female	132 (42%)	16.8
Male	179 (58%)	23.6
Race/Ethnicity		
African American/Black	38 (12%)	25.1
Asian	50 (16%)	9.9
Hispanic/Latino/a/x	29 (9.3%)	8.2
Pacific Islander, Native American, or Multirace	7 (2.3%)	8.6
White	73 (23%)	16.2
Other	20 (6.4%)	—
Unknown	94 (30%)	—
County Residence		
Alameda	251 (81%)	16.25
Other	60 (19%)	—

¹n (%)

Table 2. Carbapenemase Status by Organism Group, 2023

	Organism				
	CRAB	CRE*	CRPA	Other CRE/CRO	Total
Carbapenemase-Producing	31 (72%)	65 (45%)	11 (8.3%)	3 (14%)	110 (32%)
non-Carbapenemase-Producing	6 (14%)	73 (50%)	113 (85%)	13 (59%)	205 (60%)
Not Tested	6 (14%)	8 (5.5%)	9 (6.8%)	6 (27%)	29 (8.4%)
Total	43	146	133	22	344

*CRE includes reportable CREs — *Escherichia coli*, *Klebsiella spp.*, and *Enterobacter spp.*

Abbreviations: CRAB: Carbapenem-Resistant *Acinetobacter baumannii*, CRE: Carbapenem-Resistant Enterobacterales, CRPA: Carbapenem-Resistant *Pseudomonas aeruginosa*, CRO: Carbapenem-Resistant organism

Isolates

533 isolates were collected for the 344 cases. Of those, 392 (74%) were tested for at least one CP gene (Table 3). The most commonly identified genes were NDM and KPC (in 16% and 10% of isolates tested, respectively).

The majority of KPC (89%), VIM (80%), and OXA-237 (78%) genes were identified among case-patients currently or with a history of residing in LTCFs. The majority of OXA-48 (75%) and NDM (65%) genes were identified among cases with no LTCF history.

Table 3. Genes Identified by Organism Type, 2023

Gene	CRAB N = 60 ¹	CRE N = 212 ¹	CRPA N = 233 ¹	Other CRE/ CRO N = 28 ¹	Overall N = 533 ¹
KPC	0/44 (0%)	34/143 (24%)	3/180 (1.7%)	1/15 (6.7%)	38/382 (9.9%)
IMI	0/44 (0%)	0/140 (0%)	0/180 (0%)	0/15 (0%)	0/379 (0%)
VIM	0/44 (0%)	0/140 (0%)	5/182 (2.7%)	0/15 (0%)	5/381 (1.3%)
OXA-48	0/41 (0%)	16/143 (11%)	4/180 (2.2%)	0/15 (0%)	20/379 (5.3%)
NDM	22/45 (49%)	36/143 (25%)	3/180 (1.7%)	1/15 (6.7%)	62/383 (16%)
OXA-181	0/33 (0%)	2/116 (1.7%)	0/162 (0%)	0/13 (0%)	2/324 (0.6%)
OXA-237	17/39 (44%)	0/116 (0%)	1/162 (0.6%)	0/13 (0%)	18/330 (5.5%)
OXA-24/40	1/38 (2.6%)	0/116 (0%)	0/162 (0%)	0/13 (0%)	1/329 (0.3%)
OXA-23	4/39 (10%)	0/116 (0%)	0/162 (0%)	0/13 (0%)	4/330 (1.2%)
GES	0/33 (0%)	0/116 (0%)	0/162 (0%)	0/13 (0%)	0/324 (0%)
Not Tested for any genes	14/60 (23%)	63/212 (30%)	51/233 (22%)	13/28 (46%)	141/533 (26%)

¹Denominator for each cell indicates the number of isolates tested for each gene, percent is by cell

Summary

In 2023, 344 cases of CROs were reported, a 9.5% decrease from the previous year. There was no overall trend of CRO incidence in 2023. About 1/3rd of the cases were CPOs. Case rates were highest among the elderly population and half of cases were among patients currently or with a history of residing in LTCFs. ACPHD continues to work with facilities to encourage infection control and prevent ongoing transmission.