California Department of Public Health

Carbapenem-Resistant Organisms (*Pseudomonas*, *Acinetobacter* species) Quicksheet

CDPH recommends a coordinated approach among healthcare facilities and public health to contain carbapenem-resistant organisms in California. This includes *Pseudomonas* and *Acinetobacter* species (spp.) (most commonly *Pseudomonas aeruginosa* and *Acinetobacter baumannii*), as well as Enterobacterales (CRE; see CRE Quicksheet).[1] Local health departments (LHD) should be aware of carbapenemase-producing *Pseudomonas* and *Acinetobacter* incidence in healthcare facilities and communities in their regions, understand prevention measures, and provide guidance to healthcare facilities when responding to carbapenemase-producing *Pseudomonas* or *Acinetobacter* reports.

Background

- The Centers for Disease Control and Prevention (CDC) Antibiotic Resistance (AR) Threats report includes carbapenem-*resistant Acinetobacter baumannii* (CRAB) and carbapenem-resistant *Pseudomonas aeruginosa* (CRPA) as urgent and serious global public health threats, respectively.[2]
- Carbapenemase-producing (CP)-CRPA and -CRAB make carbapenemase enzymes (e.g., KPC, NDM, OXA-48, VIM, IMP).* These enzymes inactivate carbapenem antibiotics, such as meropenem.
- Carbapenemase genes can be transmitted within and between bacterial species on mobile genetic elements, making containment of CP-CRPA and CP-CRAB a public health priority to prevent further spread of these multidrug-resistant organisms (MDRO).

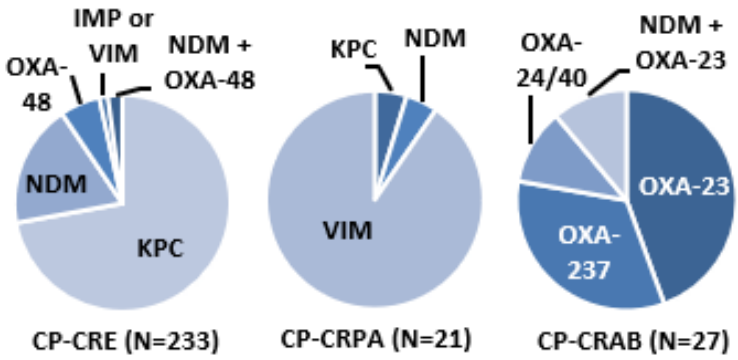
CRPA and CRAB Epidemiology

- CRPA and CRAB can be found in the healthcare environment (e.g., water, environmental surfaces, devices), and are naturally resistant to many antimicrobial drugs.[2-4]
- CRPA and CRAB are highly transmissible in healthcare settings. Infected and colonized patients, as well as the environment can serve as sources of transmission.[2-4]
- Infections caused by CRPA and CRAB can be very difficult to treat and have high mortality rates.[2-4]

Comparing Enterobacterales, *P. aeruginosa*, and *Acinetobacter* spp.

Characteristic	Enterobac-teriaceae	*P. aeruginosa*	*Acinetobacter* spp.
% CR† in CA	3%	13%	43%
% CR in the US	3%[5]	14%[5]	39%[5]
% CP‡ among CR isolates	48%[6]	2-3%[2]	50-90%[7-9]
Common clinical specimen source	Gastro-intestinal tract[10]	Respiratory secretions, urine, wounds[4]	Respiratory secretions, urine, wounds[3]
Screening specimen	Rectal	Rectal, respiratory, wound	Rectal, respiratory, axilla/groin

Carbapenemases Identified in California CP-CRE, CP-CRPA, and CP-CRAB Isolates, 2018-2020



* Klebsiella pneumoniae carbapenemase (KPC), New Delhi Metallo-β-Lactamase (NDM), Oxacillinase (OXA-48), Verona Integron Metallo- β-Lactamase (VIM) and Imipenemase (IMP)

† Carbapenem-resistant (CR), from years 2016-2019

‡ Carbapenemase-producing (CP)

For more information or consultation, contact HAIProgram@cdph.ca.gov or call 510-412-6060.

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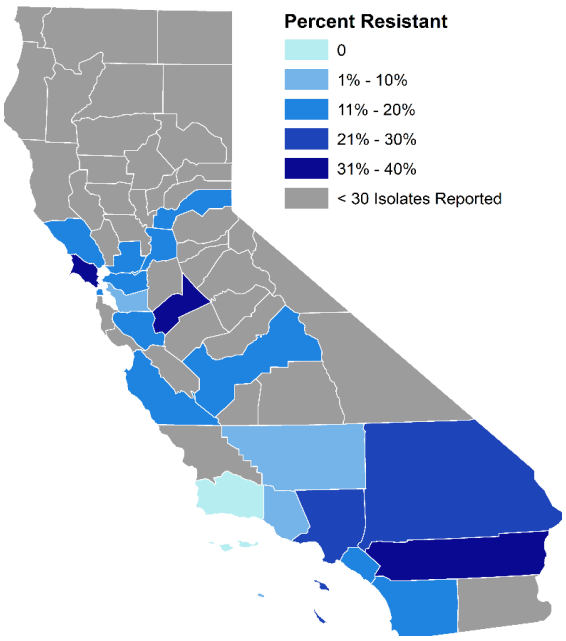
CRPA among CLABSI and CAUTI Isolates Reported to the National Healthcare Safety Network (2016-2019)[§]



- Risk factors for CRPA and CRAB acquisition include prior inpatient hospitalization and healthcare exposure, mechanical ventilation, and presence of indwelling medical devices such as urinary catheters and endotracheal tubes.[3,4]
- Outbreaks of CRAB have been reported in acute care hospital settings and often in intensive care units.[3]
- CRAB tends to be hardy and can persist for long periods of time in the environment, including surfaces and shared medical equipment.[3]

CP-CRPA and CP-CRAB Epidemiology in California

- Outbreaks of VIM-producing CRPA have occurred in Southern California after patients received medical care in Tijuana, Mexico.[11]
- The unusual carbapenemase, OXA-237, has been reported in CP-CRAB isolates in the state.
- In 2020, a rare combination of NDM and OXA-23 carbapenemases was identified in a cluster of CP-CRAB isolates, conferring high levels of antimicrobial resistance.
- Some CP-CRPA and CP-CRAB isolates have been identified as pan-nonsusceptible to all tested antimicrobial drugs.
- Identifying and responding to CRPA and CRAB that are **carbapenemase producing**, in particular, are crucial for preventing transmission of these organisms among vulnerable patients.

Facility Actions

1. Routine Surveillance

- Perform or access carbapenemase testing for carbapenem-resistant *Pseudomonas* and *Acinetobacter* spp., particularly for the following isolates[12]:
  - nonsusceptible to cefepime or ceftazidime (CRPA only)
  - pan-nonsusceptible to all antimicrobial drugs tested
  - part of a cluster/outbreak
  - from a patient meeting criteria for active surveillance (see below).
- Carbapenemase testing for CRPA is available at some local public health labs and CDPH MDL.[13]
- Carbapenemase testing for CRAB and other carbapenem-resistant *Acinetobacter* spp. is available through the CDC Antibiotic Resistance Laboratory Network (AR Lab Network) in consultation with the CDPH HAI Program.[14]
- Clinical labs should immediately notify clinicians and infection prevention staff when CP-CRPA or CP-CRAB is identified.

2. Active Surveillance

- Screen (or access screening resources) for CP-CRPA and CP-CRAB and implement preemptive Contact precautions for individuals at risk for CP-CRPA or CP-CRAB, including those:
  - epidemiologically linked to a newly identified CP-CRPA or CP-CRAB case
  - with history of receiving healthcare outside the United States during the past 12 months
  - admitted from facilities known to have ongoing CP-CRPA or CP-CRAB transmission

[§] Central line-associated bloodstream infection (CLABSI), catheter-associated urinary tract infection (CAUTI).

- admitted from long-term acute care hospitals (LTACH) or ventilator-equipped skilled nursing facilities (vSNF)

3. Investigation and Reporting

- Establish baseline CP-CRPA and CP-CRAB incidence at the facility; e.g., determine the number of patients newly identified with CP-CRPA or CP-CRAB per month.
- Investigate all CP-CRPA or CP-CRAB reports.
- Report CP-CRAB or CP-CRPA as unusual infectious disease occurrences or outbreaks to public health under Title 17, and CDPH Licensing & Certification if in licensed healthcare facility per All Facilities Letters 19-18.[15,16]

Public Health Response to CP-CRPA or CP-CRAB Reports[**]

1. Initial Response and Recommendations

LHD makes recommendations to the facility for information gathering, surveillance, and infection control measures.

- Complete relevant information in the CalREDIE case report form[***], including:
  - Previous/subsequent healthcare facilities
  - Date of admission/discharge
  - Locations (e.g., units, wings)
  - Indwelling devices/procedures
  - Specimen collection dates, sources and results
  - Healthcare exposures outside the United States in the previous 12 months.
- Recommend placing patient in a single-bed room on Contact precautions.
- Ensure transferring facilities inform receiving facilities of patient's CP-CRPA or CP-CRAB status at time of transfer.

2. Retrospective and Prospective Lab Surveillance

- Conduct retrospective surveillance to identify additional cases during the previous 6 months.
- Request clinical labs retain all CRAB or CRPA isolates for further characterization for at least 3 months.
- Recommend facility perform or access carbapenemase testing if not already done.

3. Contact Investigation

- In consultation with CDPH HAI Program, recommend CP-CRPA or CP-CRAB colonization testing of epidemiologically-linked patient contacts, including those[17]:
  - who shared a bathroom and roommates
  - with shared primary healthcare personnel (HCP) (e.g., nursing assistant) or exposed to the same device
  - not previously identified with CP-CRPA or CP-CRAB residing on unit(s) where transmission is suspected (point prevalence survey (PPS)).
- Facilities flag the medical record of patients identified as contacts, but who were discharged prior to screening; if discharged to another facility, consider screening the patient(s) there.
- If one or more additional patients are identified with CP-CRPA or CP-CRAB, conduct serial PPS at 2-week intervals until 2 consecutive PPS are completely negative.
- If one or more CP-CRPA or CP-CRAB patients reside long-term in a healthcare facility, consider performing periodic follow-up PPS (e.g., monthly or quarterly PPS).
- CP-CRPA or CP-CRAB colonization testing of respiratory (if ventilated), axilla/groin (CP-CRAB only), and wound (CP-CRPA only) swab specimens is available at no cost to facilities via the CDC AR Lab Network.[14,18] Rectal swabs are also tested, but are typically lower-yielding since these bacteria don't naturally inhabit the gut.

4. Infection Control Recommendations for Facilities

Room Placement

- Place patients infected or colonized with CP-CRPA or CP-CRAB in a single-bed room whenever possible and implement Contact precautions.
- In facilities with multi-bed rooms, only place patients with CP-CRPA or CP-CRAB with the same carbapenemase type (e.g., VIM) in the same room, whenever possible. Also consider other concurrent

[**] Local health departments can choose to carry out investigations for non-CP-CRPA and non-CP-CRAB at their discretion, particularly if there is a cluster or suspected outbreak.

[***] CalREDIE Other Disease Condition - Carbapenemase-producing Organism (excluding Enterobacterales).

communicable disease status (e.g., COVID-19, *Clostridioides difficile*, etc.) when determining room placements.
- In multi-bed rooms, HCP must treat each bed space as a separate room, and change gown and gloves and perform hand hygiene between contact with patients in the same room.

Hand Hygiene
- Follow and audit standard hand hygiene practices, including the use of alcohol-based hand sanitizer as the preferred method for cleaning hands if not visibly soiled. If hands are visibly soiled, wash with soap and water.

Transmission-based Precautions
- Contact precautions consist of HCP donning gowns and gloves upon entry to the patient room; patients may only leave room when medically necessary.
- Continue Contact precautions for the duration of admission in acute care hospitals, including LTACH.
- In SNF, once there is no longer evidence of transmission (e.g., two consecutive negative PPS and no new clinical cases), continue Contact precautions, or transition to Enhanced standard precautions for residents with risk factors for transmission.[19]
- Do not perform repeated bacterial cultures to demonstrate CRPA or CRAB "clearance" for the purposes of discontinuing transmission-based precautions, as these organisms may be shed intermittently and patients may remain colonized for months, and possibly indefinitely.

Dedicated Staff and Equipment
- Dedicate daily care equipment as much as possible, and consider using single-use, disposable, non-critical devices.

Cohorting

If multiple CP-CRPA or CP-CRAB-infected or -colonized patients are present in a healthcare facility:
- Place them in rooms in the same geographic area of the facility whenever possible.
- Dedicate primary HCP (e.g., nursing) to care only for CP-CRPA or CP-CRAB patients.
    - HCP who cannot be dedicated to CP-CRPA or CP-CRAB patients should care for non-CP-CRPA or non-CP-CRAB patients before CP-CRPA or CP-CRAB patients, whenever feasible.

Environmental Cleaning
- Regularly clean and disinfect non-dedicated equipment after use, and high-touch surfaces with an Environmental Protection Agency (EPA)-approved healthcare grade disinfectant effective against *Pseudomonas* or *Acinetobacter* spp.

Adherence Monitoring
- Evaluate implementation of infection control measures using adherence monitoring tools and provide feedback to HCP.[20]

5. Onsite Assessment
- LHD may consult with CDPH HAI Program to determine need to conduct onsite infection control assessment.

6. Communication
- When transferring a CRPA- or CRAB-infected or -colonized patient to another healthcare facility, the transferring facility must communicate the patient's CRPA or CRAB status and information to determine necessary infection control measures to the receiving facility at time of transfer.[21]
- When receiving transferred patients, facilities should actively inquire about MDRO status.
- Facilities with ongoing CRPA or CRAB outbreaks should inform facilities to which they transfer patients. Receiving facilities may screen such patients for CRPA and CRAB and place them in preemptive Contact precautions and single-bed rooms pending the culture result.
- If patient has had previous healthcare exposure and date of collection is within 3 days of admission, notify the previous facility of CP-CRPA or CP-CRAB status. The previous facility may also consider conducting a contact investigation.
- Flag the medical record of patients with CRPA or CRAB to ensure infection control precautions are implemented upon readmission.
- Provide education materials to patients, their families, and HCP as needed.[22]

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