

QUARTERLY MDRO UPDATE #9

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC HEALTH
3/31/22

HIGHLIGHTED IN THIS ISSUE

- Carbapenemase Testing Primer coming soon
- Newer Resources for AST
- *Candida auris* update

SUMMARY

Management of carbapenem-resistant infections can be challenging. It is particularly important to know when and how to identify carbapenem-resistant organisms in order to contain their spread.

KEY RESOURCES

[LA County N-MDRO Home Page](#)

[LA County Reportable Disease List](#)

[CDPH CRAB&CRPA Quicksheet](#)

[CDC MDR *P. aeruginosa* data](#)

[CDC Urgent AR Threats Report \(2019\)](#)

[CDC HAI Lab Resources Home Page](#)

Note: When calling 213-240-7941 to report MDROs (which is currently routed to a COVID-19 Call Center), please state that you are calling to report an MDRO to the Acute Communicable Disease Control (ACDC) Program.

MESSAGE FOR CLINICAL LABORATORIES

The goal of this newsletter is to inform clinical laboratorians and other stakeholders in Los Angeles County (LAC) about multidrug resistant organisms (MDRO) in general and concerns with MDRO in the county. The previous eight issues included data related to the prevalence of resistance and recommendations for detecting resistance in a variety of pathogens. All issues have included an update of *Candida auris* in LAC.

We have dedicated recent issues to carbapenem-resistance in *Acinetobacter baumannii* and *Pseudomonas aeruginosa*. Carbapenem resistance, particularly that due to carbapenemase production remains a significant concern worldwide for these species as well for members of the Enterobacterales. We have seen some confusion with reporting:

- Carbapenem resistance due to carbapenemase production
- Carbapenem resistance NOT due to carbapenemase production
- Carbapenem resistance where carbapenemase production testing is not performed

We also have an exciting announcement for this first issue of 2022. We will soon be releasing a resource: “**Carbapenemase Testing for Carbapenem-Resistant Gram-Negative Bacteria - A Primer for Clinical and Public Health Laboratories**” to summarize basic concepts related to testing for carbapenemases. We are also providing a brief summary of the prevalence of carbapenem-resistant organisms (CRO) in LAC. Look out for these exciting resources from us soon!

We welcome feedback on this Newsletter, previous Newsletters or any other issue related to MDROs (mail hai@ph.lacounty.org).

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HAI@PH.LACOUNTY.GOV OR 213-240-7941**

CARBAPENEM-RESISTANT ORGANISMS IN LAC AND CALIFORNIA

CRO in LAC

LAC does not investigate every case of CRO and it is difficult to know the exact numbers of patients infected or colonized with CRO. However, estimates can be obtained from routine antibiogram reports that hospitals are required to submit annually to LAC. Table 1 lists estimates from 2020 based on percent susceptible (%S) data provided for meropenem for five commonly encountered species. Although the overall %S remains at 97-99% for members of the Enterobacterales group, this translates into a significant number of isolates considering the large numbers of isolates tested. In contrast, the %S is considerably lower for *P. aeruginosa* and much lower for *A. baumannii*. Nevertheless, these data emphasize the fact that CRO are not uncommon in LAC. These data are unable to convey the extent of carbapenemase production among the CRO.

Table 1. Approximate Numbers of Carbapenem-Resistant Organisms in Los Angeles County – 2020 (Based on Meropenem Data Provided in Routine Antibiograms from 68 Hospitals)

Organism	Number Isolates with Meropenem Results	% Susceptible Meropenem	Approximate Number of Isolates NOT Susceptible to Meropenem ¹
<i>Acinetobacter baumannii</i>	2179	37%	1373
<i>E. coli</i>	174563	99%	1746 ²
<i>Enterobacter cloacae</i> complex	6792	99%	68 ²
<i>Klebsiella pneumoniae</i>	32617	97%	979
<i>Pseudomonas aeruginosa</i>	23771	87%	3090

¹ percentage of isolates with “intermediate” vs. “resistant” results not known

² based on 99% susceptible encompassing up to 1.0% that are NOT susceptible

California CRO Data Available from the Antibiotic Resistance Laboratory Network (ARLN)

CDC has published data obtained from CRO isolates submitted to the ARLN 2017-2020. Data from California are shown in Table 2.

These data include:

- Numbers of CRO reported nationwide and sorted by state
- Percentages of CRO that are carbapenemase-producing (CP)
- CP genes identified among carbapenemase-producing isolates

Table 2. Genes Detected from CRO Submitted from Laboratories in California to ARLN 2017-2020

Gene Detected	CRE (N=2582) ¹		CRPA (N=1411) ¹		CRAB (N=384) ^{1,2}	
	N	%	N	%	N	%
KPC	1069	41.4%	2	0.14%	3	0.78%
NDM	129	5%	4	0.28%	9	2.34%
IMP	2	0.08%	8	0.57%	0	0
VIM	4	0.15%	51	3.61%	0	0
OXA-48	45	1.74%	0	0	4	1.04%
Total with CP gene detected	1249	48.3%	65	4.6%	16	4.2%

CRE, carbapenem-resistant Enterobacterales; CRPA, carbapenem-resistant *P. aeruginosa*; CRAB, carbapenem-resistant *A. baumannii*

¹ number of isolates of CRO tested

² includes isolates from western states (CA, NV, OR, WA)

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Summary of data in Table 2:

1. CRE – nearly 50% of CRE contained a carbapenemase gene and KPC was most common
2. CRPA – fewer than 5% of CRPA contained a carbapenemase gene and VIM was most common
3. CRAB - fewer than 5% of CRAB contained a carbapenemase gene and NDM was most common

Data Source:

<https://arpsp.cdc.gov/profile/arIn/cre>

<https://arpsp.cdc.gov/profile/arIn/crpa>

<https://arpsp.cdc.gov/profile/arIn/cra>

NEWER RESOURCES FOR ANTIMICROBIAL SUSCEPTIBILITY TESTING:

Webinars / Educational Programs

Using M100: Performance Standards for Antimicrobial Susceptibility Testing, Interactive Program (2021)

<https://clsi.org/standards/products/microbiology/companion/using-m100/>

CLSI, M100 32nd Ed. Performance Standards for Antimicrobial Susceptibility Testing. Annual Webinar (2022)

<https://clsi.org/standards/products/webinars/education/>

Clinical and Public Health Laboratory Perspectives on Antifungal Resistance Webinar (2022)

https://aphl.zoom.us/webinar/register/WN_vi9c01nmSX2BciyLHSq7og

ASM, CLSI, CAP updated IQCP documents for MIC and disk diffusion tests (2021)

<https://asm.org/Protocols/Individualized-Quality-Control-Plan-IQCP>

Standards

CLSI, M39 5th Ed. Analysis and Presentation of Cumulative Antimicrobial Susceptibility Test Data. (2022)

<https://clsi.org/standards/products/microbiology/documents/m39/>

CLSI, M100 32nd Ed. Performance Standards for Antimicrobial Susceptibility Testing (2022)

<https://clsi.org/standards/products/microbiology/documents/m100/>

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CP-CRE

CP-CRE IN LA COUNTY

Between January 2015 to July 2019, isolates of CRE, including *Klebsiella pneumoniae*, *Escherichia coli*, and *Enterobacter* spp., were submitted from 35 participating LA County laboratories. A total of 1,859 CRE isolates and 502 CRPA were received. Approximately 84% (n=1,563) of CRE isolates were identified as *Klebsiella pneumoniae*. The KPC carbapenemase gene was detected in approximately 75% (n=1,403) of CRE isolates, and 119 CRE isolates had more than one gene identified. Several non-KPC carbapenemases were detected during the surveillance period among CRE and CRPA isolates, mostly OXA (n=30). Most isolates (72%) came from acute care settings. Note that the specific OXA gene detected is unknown, but the instrument used captured variants like OXA-23, OXA-40, OXA-48 and OXA-58.

Table 3. CP-CRE Isolates Detected in LAC 2015-2019

	ESBL		Carbapenemases				Combinations										No Marker
	CTX-M	KPC	NDM	VIM	OXA	IMP	KPC + CTX-M	KPC + NDM	KPC + NDM + CTX-M	KPC + OXA	KPC + VIM	NDM + CTX-M	OXA + CTX-M	OXA + NDM	OXA + NDM + CTX-M	VIM + IMP	
<i>E. coli</i> (n=152)	59	35	5	0	1	0	10	2	0	0	0	8	5	0	0	0	27
<i>Enterobacter</i> spp. (n=144)	4	7	1	0	0	0	1	0	0	0	0	3	0	0	0	0	128
<i>K. pneumoniae</i> (n=1,563)	29	1,341	1	0	5	0	60	0	1	2	1	12	10	3	1	0	67
<i>P. aeruginosa</i> (n= 502)	2	1	1	8	0	1	0	0	0	0	0	0	0	0	0	6	483
Other (n=94)	6	19	0	1	24	1	1	0	0	0	1	2	0	0	0	0	39
TOTAL (n=2,455)	130	1,403	8	9	30	2	72	2	1	2	2	25	15	3	1	6	744

The specific OXA gene detected is unknown but among those included in the test system used (OXA-23, OXA-40, OXA-48 and OXA-58).

WHAT CAN WE DO ABOUT CONTAINING CRE IN LA COUNTY?

What should clinical laboratories do to contain the spread of CP-CRE in LAC?

- Use appropriate AST methods, including current breakpoints (see CLSI M100 32nd ed.) to identify and report CRE.
- Consider confirming AST results for CRE if uncommon in your facility (see CLSI M100 32nd ed Appendix A).
- If carbapenemase testing is not performed on all CRE, consider at minimum testing CRE that are resistant to beta-lactam combination agents (e.g., ceftazidime-avibactam, imipenem-relebactam and/or meropenem-vaborbactam) to detect non-KPC-CRE.
- Communicate results of all CRE to infection preventionists ASAP. Discuss with supervisor/director any potential communication delays due to retesting to confirm/expand results.
- Maintain ability to test agents beyond those on routine test panel (in-house or refer out) on CRE upon request.
- Report CP-CRE and suspect PDR CRE to LACDPH (see *Table 4* below).

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What is the LAC Public Health Laboratory and the AR Lab Network doing to monitor CRE in LA County?

- Tests screening swabs related to outbreak investigations and regional response activities
- Collects and analyzes CRE isolates obtained from select laboratories
- Informs stakeholders about the CRE situation in LAC

Analyses includes testing for carbapenemases and incorporates whole genome sequencing, when indicated.

What is LAC Healthcare Outreach Unit doing to detect and prevent the spread of CRE, particularly CP-CRE, in LAC?

- Generates County-level data on the prevalence of CRE using the LAC antibiogram to target interventions
- Lists CP-CRE as a reportable condition as of 2019 to enhance surveillance and response activities
- Investigates reports of non-KPC-CRE, including screening of high-risk contacts
- Provides guidance to healthcare providers and laboratorians on how to detect and contain CRE
- Educates providers on antimicrobial stewardship activities to slow the onslaught of MDROs

TABLE 4. REMINDER OF REPORTING MDROS TO LACDPH

As a reminder, the following organisms are reportable to LACDPH as of November 2019:

Organism	Disease categories	Criteria	Who reports
<i>Candida auris</i> (<i>C. auris</i>)	<i>C. auris</i>	<i>Candida auris</i>	Lab and provider
	Presumptive <i>C. auris</i>	Commonly misidentified organisms per laboratory instrument (Refer to https://www.cdc.gov/fungal/candida-auris/recommendations.html)	Provider only
Carbapenem-resistant Enterobacterales (CRE)*	CRE	Enterobacterales that are resistant to one or more carbapenems (independent of any carbapenemase testing)	Provider only (hospitals via NHSN)
	CP-CRE	<ul style="list-style-type: none"> • Carbapenemase positive (CP)-CRE by phenotypic or molecular test OR • Carbapenemase unknown (no carbapenemase test performed) 	Lab only
Carbapenemase-producing <i>Acinetobacter baumannii</i>	CP- <i>Acinetobacter</i> spp.	<i>Acinetobacter</i> spp. positive for carbapenemase by phenotypic or molecular test	Lab only
Carbapenemase-producing <i>Pseudomonas aeruginosa</i>	CP- P. <i>aeruginosa</i>	<i>P. aeruginosa</i> positive for carbapenemase by phenotypic or molecular test	Lab only
Vancomycin-resistant <i>Staphylococcus aureus</i> (VRSA)	VRSA	<i>S. aureus</i> with a vancomycin MIC ≥ 16	Lab only
Pan-resistant organisms (Suspect PDR)	Suspect PDR	Gram negative bacteria that are non-susceptible to all antibiotics tested	Lab only

**E. coli*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, *Enterobacter* spp.

For additional guidance on how to report MDROs, please visit the following links:

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- [MDRO Compliance Instructions](#)
- [MDRO Reporting FAQs](#)
- [MDRO Reporting Webinar Slides \(2.5.20\)](#)
- [MDRO Reporting Webinar Recording \(2.5.20\)](#)

When ELR is not set up, laboratories may submit reports via the LACDPH MDRO RedCAP Reporting Portal:

<https://redcap.link/LACMDROPortal>. All reports submitted to the LACDPH MDRO Reporting Portal will be received in a secure format. The Healthcare Outreach Unit (HOU) will follow-up on reports as needed. Reporters will have the options to save their progress, upload lab reports, and download a PDF copy of what was submitted to LACDPH.

CANDIDA AURIS UPDATE

Candida auris continues to pose a threat to persons residing in LAC healthcare facilities (HCFs) and is now considered to be endemic in LAC. LACDPH encourages all clinical laboratories in LAC to employ the following protocols:

- *C. auris* admission screening
- Identification of yeast isolates from non-sterile sites to species level to rule out *C. auris*

If performance of these tests is not possible for all patients/residents, LACDPH advises laboratories work with their clinical/IP staff to test patients at high-risk for *C. auris* which includes:

- Persons being admitted from an HCF with ongoing *C. auris* transmission, any long-term acute care hospital (LTACH), any subacute unit of a skilled nursing facility (aka ventilator-capable SNFS (vSNFs)) – see [2022 CAHAN](#)
- High-risk contacts of new *C. auris* cases (i.e., roommates) -use [CDPH Screening Decision Tree](#)
- Persons on a mechanical ventilator or with presence of tracheostomy
- Persons who are colonized with MDROs, especially rare [carbapenemase-producing organisms](#)
- Persons who have had a recent overnight stay in a healthcare facility outside of the US

If your laboratory cannot conduct *C. auris* testing on-site, refer to the LACDPH [List of Laboratories with *C. auris* Testing Capacity](#) to find a suitable reference lab for send out testing. Note that the LAC Public Health Laboratories (PHL) will only accept confirmed or presumptive *C. auris* isolates for final species confirmation. **Please do not send *C. auris* isolates or swabs to LAC PHL without first contacting the HOU.** For additional information, please call 213-240-7941 or email to hai@ph.lacounty.gov.

If you have not yet completed our *Candida auris* testing survey (emailed to all IP and clinical laboratories in early March), please take 3-5 minutes to so now so we can better understand the status of *C. auris* surveillance in LAC.

- For facilities, Infection Preventionists: <https://www.surveymonkey.com/r/XKWN2HY>
- For laboratories: <https://www.surveymonkey.com/r/3FY2XTC>

For more details, please see our new [Mitigating the Spread of *C. auris* in Los Angeles County](#) document.

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C. AURIS BY THE NUMBERS (Updated 3/31/22)

To date, 95 bloodstream infections have been reported in LA County (7.4% of total LAC *C. auris* cases).

Table 5. *C. auris* cases in Los Angeles County by facility and case type, 2020-2022 (n=1280)

HCF Type	Number of Cases			
	Surveillance*	Clinical^	Surveillance-to-clinical†	Total
General Acute Care Hospital (GACH)	77	59	12	148
Long Term Acute Care Hospital (LTACH)	906	42	114	1062
Skilled Nursing Facility (SNF)	60	0	7	67
Other	2	1	0	3
Total	1045	102	133	1280

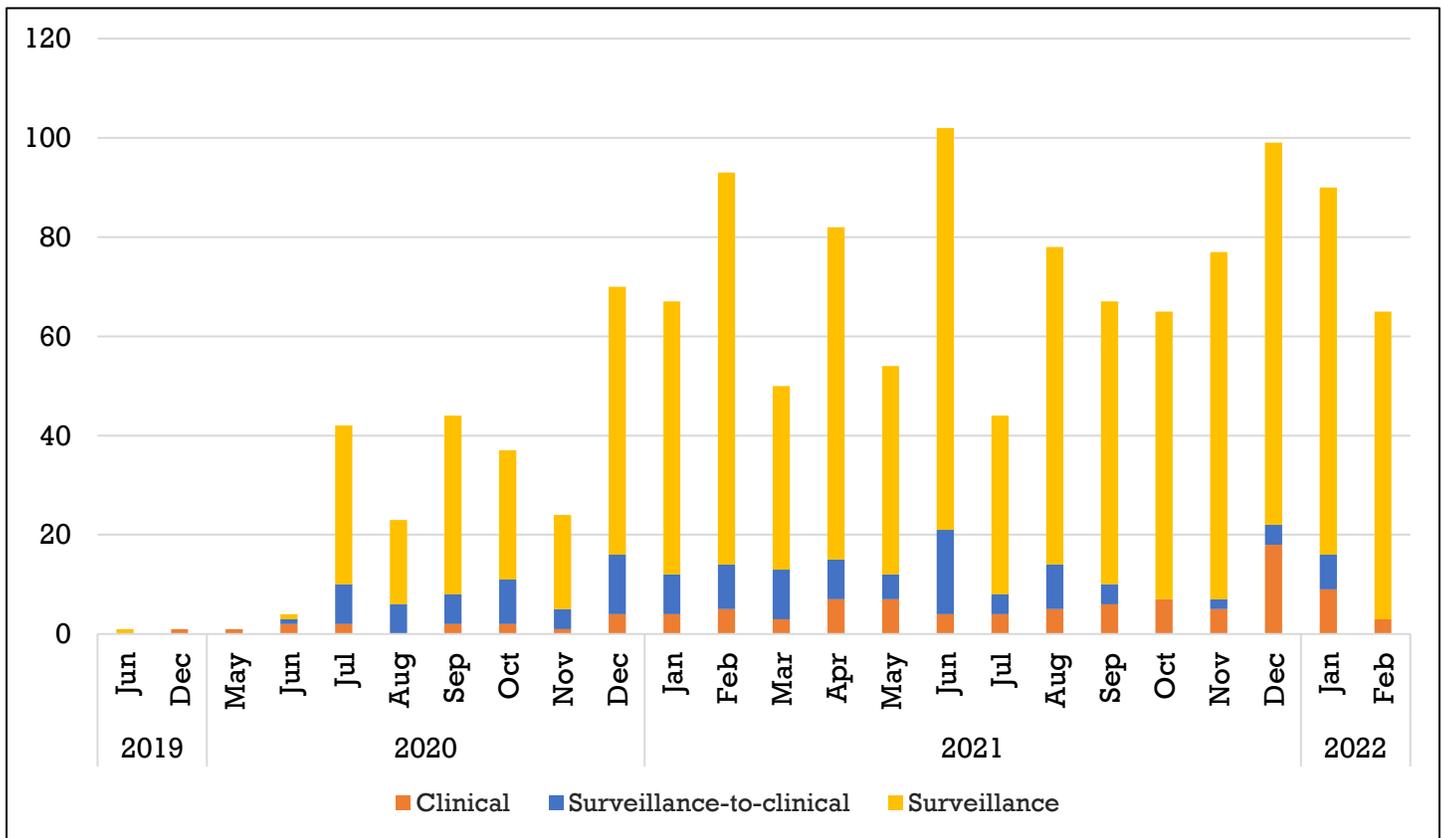
Note that all cases are counted by facility type and case type at time of first positive specimen collection.

* Swab collected for the purpose of screening for *C. auris* colonization.

^ Specimen collected for clinical purposes.

† Cases who were first identified via screening swab and later had one or more positive clinical specimen(s).

Figure 2. *C. auris* cases in Los Angeles County by month, 2020-2022 (n=1280)



See footnotes from Table 5 above.

A webinar, “Clinical and Public Health Laboratory Perspectives on Antifungal Resistance” presented 2/16/22 by APHL is available on demand until 2/16/23. There is no fee and PACE credit is available. To access the archived webinar, please register here: <http://www.aphl.org/602-22>.

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PREVIOUS NEWSLETTERS

Previous Newsletters can be found by clicking the links below:

Issue	Featured Content
1 (link)	<ul style="list-style-type: none">• Identifying and Reporting <i>C. auris</i>• Resources for testing for <i>C. auris</i>
2 (link)	<ul style="list-style-type: none">• Antifungal susceptibility testing of <i>C. auris</i>• Validating MALDI-TOF for <i>C. auris</i>
3 (link)	<ul style="list-style-type: none">• Case Study: A team approach to containing <i>C. auris</i>• The Antibiotic Resistance Lab Network
4 (link)	<ul style="list-style-type: none">• Passive surveillance systems for <i>C. auris</i>• Updated resources for testing for <i>C. auris</i>
5 (link)	<ul style="list-style-type: none">• Multi-Drug Resistant Organisms
6 (link)	<ul style="list-style-type: none">• Carbapenem-resistant <i>A. baumannii</i> (CRAB)• NDM-CRAB outbreak in Northern California• Testing methods for carbapenemases
7 (link)	<ul style="list-style-type: none">• <i>C. auris</i> update
8 (link)	<ul style="list-style-type: none">• Carbapenem-resistant <i>Pseudomonas aeruginosa</i> (CRPA)

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