Washington State Department of Health

ELABORATIONS

News and Issues for Washington's Clinical Laboratories

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Inside This Issue

Washington State Department of Health Updates to Antimicrobial-Resistant Organism Surveillance 2025

The Washington State Department of Health performs surveillance for highly antimicrobial resistant organisms. Some of these isolate-types are mandated to be submitted statewide, and some are requested to be submitted by sentinel labs on a voluntary basis. This article describes updates to surveillance for antimicrobial resistant organisms, as of March 2025.

Since 2016, the Washington State Department of Health Public Health Laboratories (WA PHL) has served as the Antimicrobial Resistance Laboratory Network (AR Lab Network) West regional lab. The AR Lab Network is funded by Centers for Disease Control and Prevention (CDC) and performs multidrug resistant organism (MDRO) surveillance and advanced antimicrobial resistance testing. Isolates submitted by clinical labs to the AR Lab Network West Regional Laboratory undergo identification, mechanism testing, and susceptibility testing.

The AR Lab Network performs the following antibiotic resistance testing on isolates or samples. (Table 1)

Table 1: Isolates or Samples Solicited at Washington Antibiotic Resistance Lab and Testing Performed

Isolate/Sample Type	Testing Performed
Carbapenem-resistant Enterobacterales (CRE)	• Species identification (ID) • Carbapenemase testing (PCR) • Antibiotic susceptibility testing (AST) • Whole genome sequencing (WGS)*
Carbapenem-resistant *Acinetobacter baumannii* (CRAB)	• Species ID • Carbapenemase testing (PCR) • AST • WGS*
Carbapenem-resistant *Pseudomonas aeruginosa* (CRPA)	• Species ID • Carbapenemase testing (/PCR) • AST • WGS*
Non-*albicans Candida* species	• Species ID • Antifungal susceptibility testing (AFST)**
Carbapenemase-producing organism (CPO) colonization screening sample	• Mechanism testing • Species ID (only if a carbapenemase is detected)
Candida auris colonization screening sample	• *Candida auris* ID • AFST, by request only
Targeted surveillance colonization screening sample (i.e. culture-based screening for OXA-23-like, OXA-24/40-like, OXA-58-like, OXA-235-like in CRAB)	• Species ID • Carbapenemase testing (PCR)

*WGS is not done on all isolates, only isolates eligible for sequencing (based on CDC sequencing criteria).

** Effective January 2025, Candida isolates from sterile sites (blood, CSF, internal body, etc.) and urine will undergo AFST. Isolates from non-sterile sites (excluding urine) will not undergo AFST, unless requested.

Surveillance Reminders

All Washington labs should submit the following isolate-types to PHL:

- Carbapenem-resistant *E. coli*, *Klebsiella species*, and *Enterobacter species*
- Suspected or confirmed *Candida auris* isolates
- Carbapenem-resistant *Acinetobacter species*
- Carbapenem-resistant *Pseudomonas aeruginosa*

In addition to submitting the isolate-types above, volunteer **sentinel labs (and other interested labs) are encouraged to submit one or more of the following isolate-types to PHL**:

- Carbapenem-resistant *Citrobacter species*
- Carbapenem-resistant *Morganella*, *Proteus* and *Providencia species* (Note: These genera have intrinsic resistance to imipenem. Only submit those that are resistant to another carbapenem in addition to imipenem.)

- All *Candida species* EXCEPT *albicans*

Please contact ARLN@doh.wa.gov if you are interested in becoming a sentinel laboratory.

Table 2 summarizes species and resistance criteria for laboratories submitting isolates for MDRO surveillance.

Table 2: Species, Resistance Criteria, and Submitters for Washington State MDRO Surveillance

Family or Genus	Antibiotic Resistance Criteria	Submitters
CR-Enterobacterales: *E. coli* *Klebsiella* spp. *Enterobacter* spp.	Resistant to ≥ 1 carbapenem: Minimum inhibitory concentrations (MIC) ≥4 µg/ml for meropenem, imipenem, and doripenem, and ≥ 2 µg/ml for ertapenem **OR** Kirby-Bauer zone of inhibition diameter (ZID) ≤ 19 mm for meropenem, imipenem, and doripenem, and ≤ 18 mm for ertapenem	**All labs**
CR-*Acinetobacter* spp.	Resistant to ≥1 carbapenem: MIC ≥8 µg/mL for any carbapenem **OR** Kirby-Bauer ZID ≤ 14 mm for doripenem and meropenem, and ≤ 18 mm for imipenem	**All labs**
Candida auris (suspected or confirmed)	None	**All labs**
All Candida spp. *EXCEPT albicans*[1]	None	Sentinel labs
CR-*Pseudomonas aeruginosa* spp.[1](non-mucoid)	Resistant to ≥1 carbapenem, excluding ertapenem: MIC ≥ 8 µg/mL for any carbapenem **OR** Kirby-Bauer ZID ≤ 15 mm for any carbapenem **AND** Non-susceptible or resistant (I or R) to ceftazidime (MIC ≥ 16 µg/mL or Kirby Bauer ZID ≤ 17 mm) and cefepime (MIC ≥ 16 µg/mL or Kirby Bauer ZID ≤ 17 mm	Sentinel labs[2]
Carbapenem-resistant *Citrobacter* spp.	Resistant to ≥ 1 carbapenem: MIC ≥ 4 µg/ml for meropenem, imipenem, and doripenem, and ≥ 2 µg/ml for ertapenem **OR** Kirby-Bauer ZID ≤ 19 mm for meropenem, imipenem, and doripenem, and ≤ 18 mm for ertapenem	Sentinel labs[2]
Carbapenem-resistant *Morganella, Proteus* and *Providencia* spp. [3]	Resistant to ≥ 1 carbapenem <u>in addition to imipenem</u>: MIC ≥ 4 µg/ml for meropenem and doripenem, and ≥ 2µg/ml for ertapenem **OR** Kirby-Bauer ZID ≤ 19 mm for meropenem and doripenem, and ≤ 18 mm for ertapenem	Sentinel labs[2]

[1]If the number of each isolate-type for submission is too burdensome, sentinel labs may submit only a subset.

[2]All labs are encouraged to submit these isolate types but are not required to do so.

[3]Note: These genera may have intrinsic resistance to imipenem. Only those that are resistant to a carbapenem other than imipenem should be submitted.

Summary of Antimicrobial Resistance Mechanisms and Data

What is a carbapenemase-producing organism (CPO)?

A carbapenemase-producing organism (CPO) is a bacteria that produces the enzyme carbapenemase. CPOs break down carbapenem antibiotics. Carbapenem antibiotics include doripenem, ertapenem, imipenem, and meropenem. Carbapenems are broad-spectrum antibiotics used as a last resort to treat severe infections caused by multidrug resistant organisms (MDROs).

CPOs are often gram-negative bacteria such as *E.coli*, *Enterobacter cloacae*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa (CRPA)*, and *Acinetobacter baumannii (CRAB)*. They acquire resistance through genetic mutations or by picking up resistance genes from plasmids.

Tables 3 and 4 on the following pages display regional surveillance AR Laboratory Network's antibiograms for CPOs and *Candida*.

Table 3: West Regional Gram Negative Antibiogram, 2024

West Region AR Laboratory Network

AR Regional Surveillance Antibiogram[1]

January 1, 2024 - December 31, 2024

ARLABnetwork

Organism (% susceptible)[2] | (% susceptible-dose dependent)[3]	# of isolates	Amikacin	Ampicillin	Ampicillin - Sulbactam	Aztreonam	Cefazolin	Cefepime	Ceftazidime	Ceftazidime - Avibactam	Ceftolozane - Tazobactam	Ceftriaxone	Ciprofloxacin	Etrapenem	Gentamicin	Imipenem	Levofloxacin	Meropenem	Minocycline	Nitrofurantoin	Piperacillin - Tazobactam	Tetracycline	Tobramycin	Trimethoprim - Sulfamethoxazole
Carbapenem Resistant (CR) - *Enterobacter cloacae*	58	0	R	R	10	R	48	10	78	16	7	71	0	86	33	76	51	69	34	9 | 7	60	79	74
Washington State Carbapenem producing (CP)-CR E.cloacae	48	0	R	R	10	R	52	10	88	17	6	77	0	94	38	79	53	67	31	8 | 8	65	88	81
Carbapenem Resistant (CR) - *Escherichia coli*	88	0	0	0	16	0	3	6	40	8	5	10	0	66	24	13	14	67	74	3	27	44	11
Single carbapenemase gene CR *E.coli*	66	0	0	0	20	0	5	5	20	5	5	11	0	76	15	12	14	64	82	0	27	53	6
NDM CR *E.coli*	54	0	0	0	19	0	0	0	2	0	0	9	0	72	0	9	0	65	81	0	26	46	0
Washington State Carbapenem producing (CP) - CR E.coli	63	0	0	0	19	0	5	8	49	11	6	10	0	59	30	13	16	70	75	5	29	41	14
Washington State NDM CR E.coli	32	0	0	0	25	0	0	0	0	0	0	9	0	63	0	9	0	69	91	0	28	41	0
Carbapenem Resistant (CR) - *Klebsiella pneumoniae*	102	0	R	1	9	1	12 | 2	5	71	10	6	15	3	60	34	26	12	44	18	4 | 2	44	47	26
Carbapenem producing (CP) - *Klebsiella pneumoniae*	48	0	R	0	8	0	2 | 4	2	42	2	2	8	0	44	0	17	0	48	31	0	56	25	25
Single CP gene - *Klebsiella pneumonaie*	44	0	R	0	9	0	2 | 5	2	45	2	2	9	0	48	0	18	0	48	34	0	59	27	25
Washington State Carbapenem producing (CP) - Klebsiella pneumoniae	72	0	R	1	8	1	14 | 3	6	86	11	7	19	4	64	43	33	14	40	10	6 |3	36	53	28
Carbapenem Resistant (CR) - *Pseudomonas aeruginosa* (CRPA)	642	93	R	R	31	-	52	50	75	82	R	44	R	-	10	32	11	-	-	44	R	0	R
Washington State Carbapenem producing (CP) - CR Pseudomonas aeruginosa	573	94	R	R	33	-	53	51	76	83	R	45	R	-	10	34	12	-	-	46	R	0	R
Carbapenem Resistant (CR) - *Acinetobacter baumanii* (CRAB) complex	470	35	R	6	R	-	3	3	-	-	1	2	R	24	0	4	0	38	-	0	2	34	22
Carbapenem producing (CP) CR-*Acinetobacter baumanii* complex	445	32	R	4	R	-	3	3	-	-	1	2	R	21	0	4	0	36	-	0	2	30	19
Single carbapenemase gene CR-*Acinetobacter baumanii* complex	367	36	R	4	R	-	4	4	-	-	1	3	R	24	0	4	0	40	-	0	3	35	20
OXA-23 like CRAB complex	332	25	R	1	R	-	0	2	-	-	0	2	R	17	0	4	0	30	-	0	2	25	12
OXA-235 like CRAB complex	57	72	R	18	R	-	12	7	-	-	5	5	R	39	0	7	0	37	-	0	5	54	18
Double carbapenemase genes CR-*Acinetobacter baumanii* complex	78	14	R	0	R	-	0	0	-	-	0	0	R	8	0	6	0	18	-	0	0	9	14
NDM and OXA-23 like CRAB complex	72	13	R	0	R	-	0	0	-	-	0	0	R	7	0	6	0	15	-	0	0	8	13

[1] Data are presented for surveillance purposes only and are not intended for use in clinical decision making. This antibiogram should not take the place of individual clinical assessment and isolate susceptibility testing.

[2] The %S for each organism/antimicrobial combination was generated by including only the first isolate of that organism recovered from a given patient during the time period analyzed.

[3] Percent susceptible-dose dependent (%SDD); susceptibility is dependent on the dosing regimen that is used.

(-) Drug not tested or drug not indicated, no CLSI interpretation

Table 4: West Regional Candida **Antibiogram, 2024**

West Region AR Lab Network AR Regional Surveillance Antibiogram[1] January 1, 2024 - December 31, 2024	# of isolates	Amphotericin B	Anidulafungin	Fluconazole	Isavuconazole	Itraconazole	Micafungin	Posaconazole	Voriconazole
		Organism (% susceptible)[2] | (% susceptible-dose dependent)[3]							
Candida glabrata	210	-	98	86 | 7	-	-	98	-	-
Washington State Candida glabrata	70	-	99	86 | 9	-	-	99	-	-
Candida parapsilosis	78	-	78	92	-	-	99	-	97

[1] Data are presented for surveillance purposes only and are not intended for use in clinical decision making. This antibiogram should not take the place of individual clinical assessment and isolate susceptibility testing.
[2] The %S for each organism/antimicrobial combination was generated by including only the first isolate of that organism recovered from a given patient during the time period analyzed.
[3] Percent susceptible-dose dependent (%SDD); susceptibility is dependent on the dosing regimen that is used.
(-) Drug not tested or drug not indicated, no CLSI interpretation
(R) Intrinsic Resistance

Three classes of antifungals and Candida.auris**.drug resistant mechanisms**

Clinical and Laboratory Standards Institute (CLSI) or European Committee on Antimicrobial Susceptibility Testing (EUCAST) have interpretive breakpoints for many organisms; however, there are no breakpoints for *Candida auris*. Figures 1, 2, and 3 show Minimum Inhibitory Concentration (MIC) distributions of antifungals tested by the West Regional AR Lab Network in 2019 – 2024 for the three classes of antifungals: polyenes, Echinocandins, and triazoles.

The polyene class includes Amphotericin B, which are fungal membrane disruptors. They work by binding to ergosterol in the fungal cell membranes, creating pores that leak essential components and kill the cell. MIC of 2 ug/mL shows reduced effectiveness of Amphotericin B to *C.auris*.

Echinocandins are cell wall blockers that inhibit β-glucan synthase, an enzyme crucial for fungal cell wall synthesis. It effectively stops *C.auris* from building its protective barriers. Echinocandians are the first line of treatment for *C.auris* with resistance rates seen to be generally lower and have high efficacy and lower toxicity. Most Echinocandins remain susceptible with MIC typically below 1 ug/mL.

Lastly, triazole class of antifungals are ergosterol synthesis inhibitors, blocking production of ergosterol by inhibiting the enzyme, 14-α-demethylase. This weakens the fungal membrane. Over 90% *C.auris* tested have an MIC of >64 ug/mL demonstrating resistant to fluconazole. Azole resistant is developed due to mutations in the ERG11 gene (disrupting membrane stability by affecting 14-α-demethylase and ergosterol) or efflux pump overexpression. Triazoles demonstrates that they are poor choice for *C.auris* especially fluconazole monotherapy.

In summary, the three classes of antifungals: polyenes, Echinocandins, and triazoles affect *C.auris* by affecting the enzyme, ergosterol that is important in maintaining it cell wall structure. Echinocandins are the best bet for *C.auris* with Amphotericin B as reliable backup. Triazoles especially fluconazole is largely ineffective. Combination therapy like pairing susceptible echinocandins with Amphotericin B could be effective against resistant strains of *C.auris*. Individualized patient susceptibility testing is best recommended on a case-by-case basis and along with close monitoring.

Figure 1: Polyene Class of Antifungal MIC Distribution of Candida.auris **2019 - 2024**

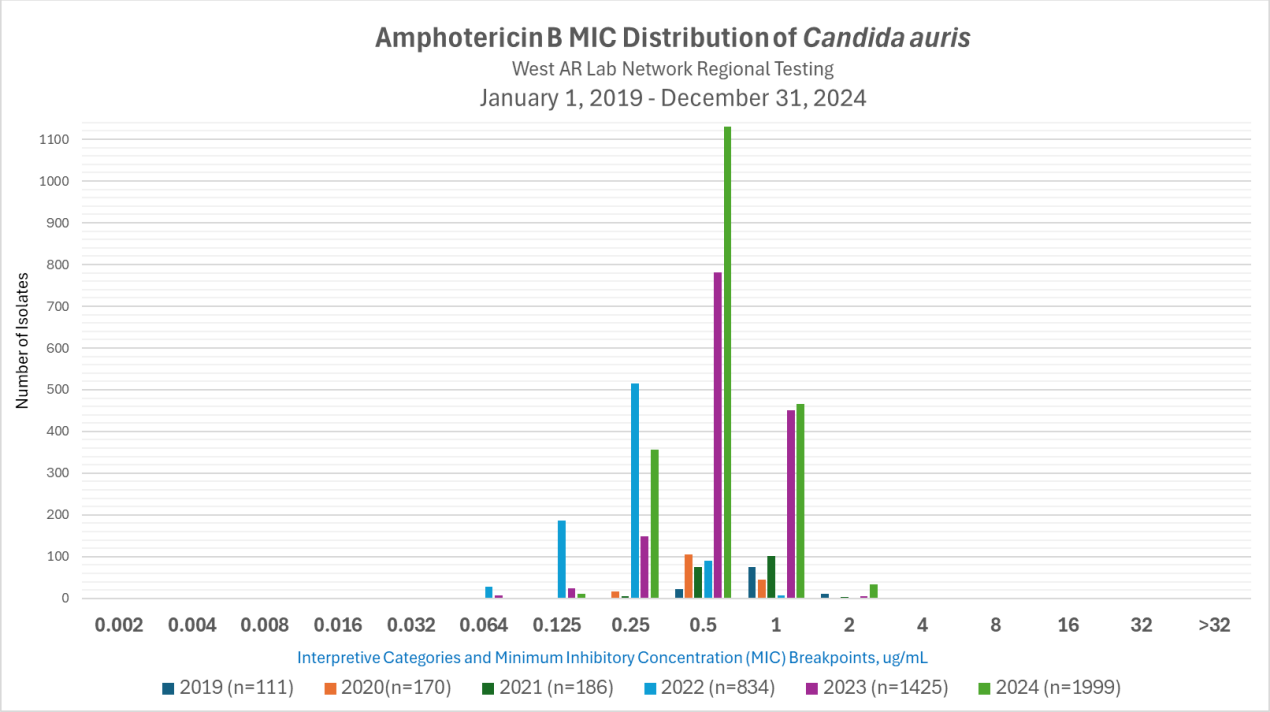
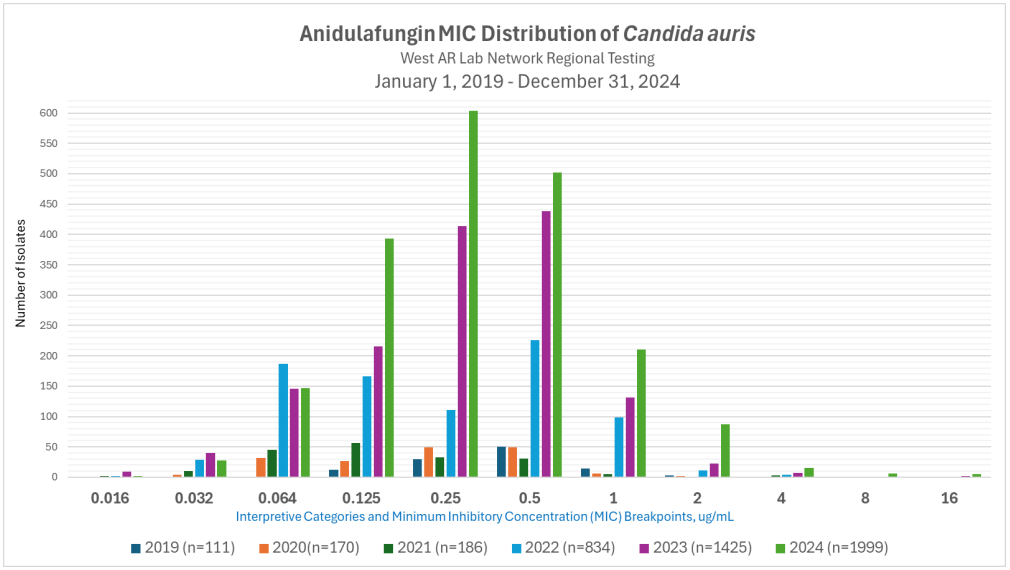
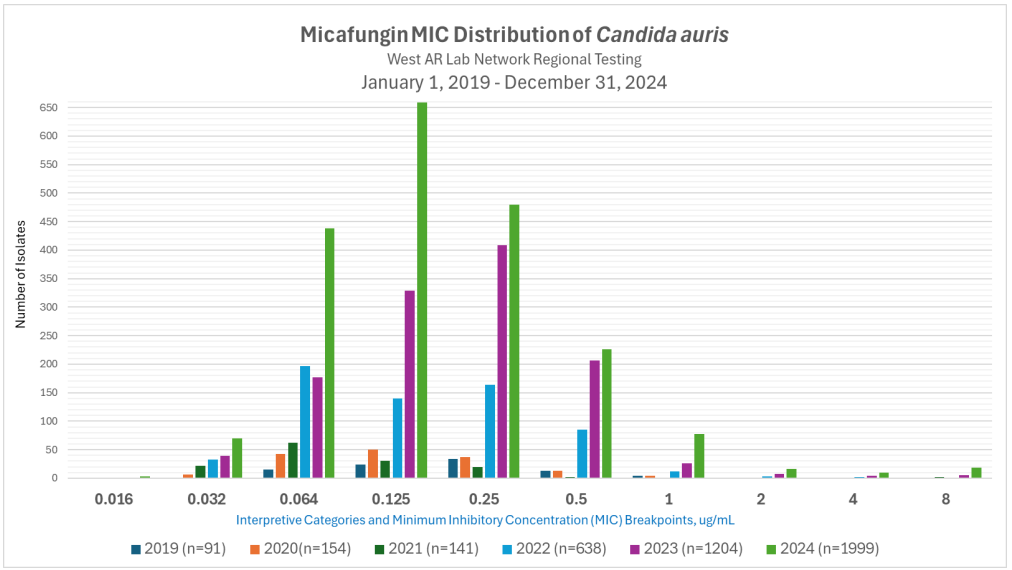


Figure 2: Echinocandin Class of Antifungal MIC Distribution Candida.auris **2019 - 2024 West Regional AR Lab Network**





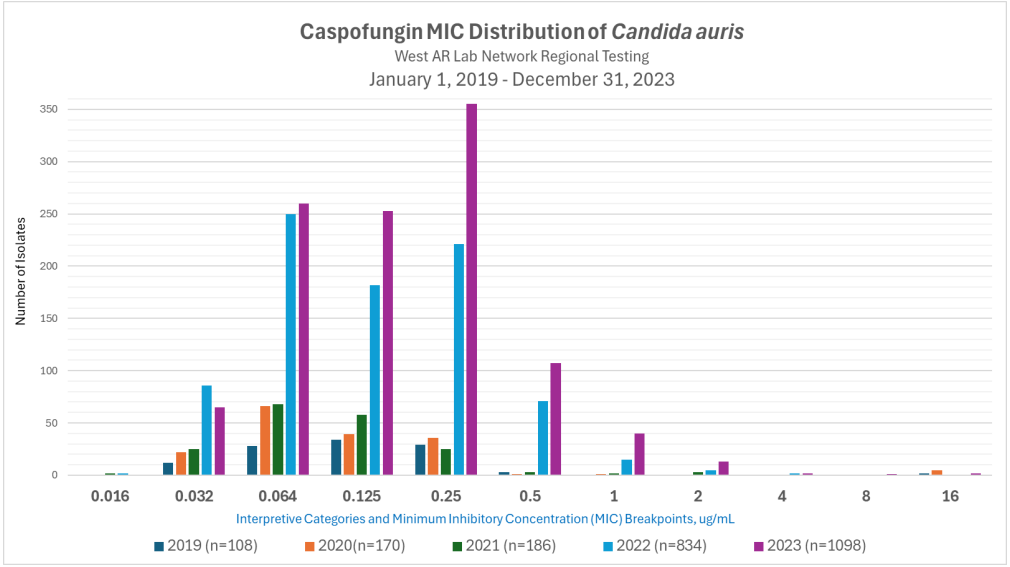
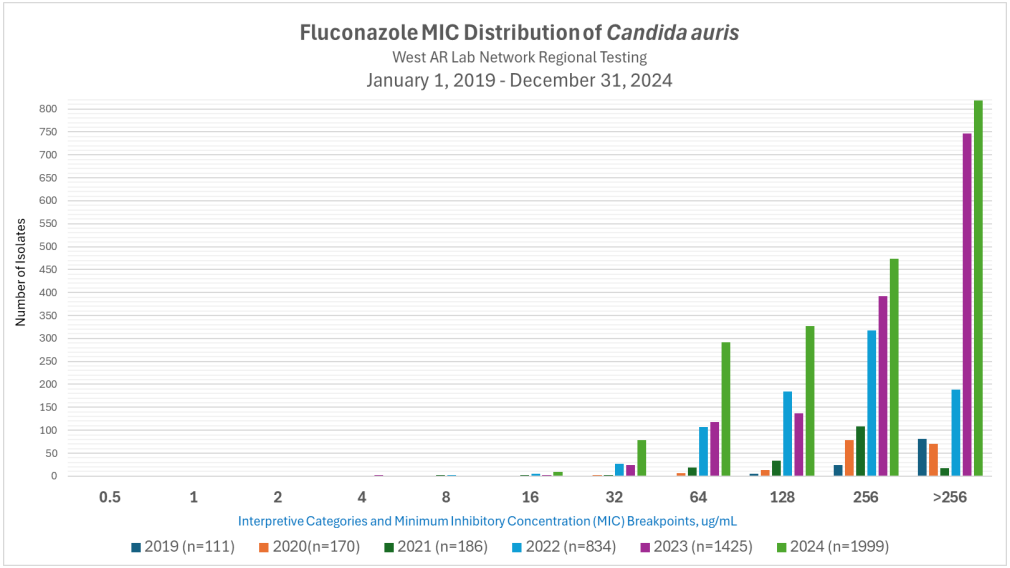
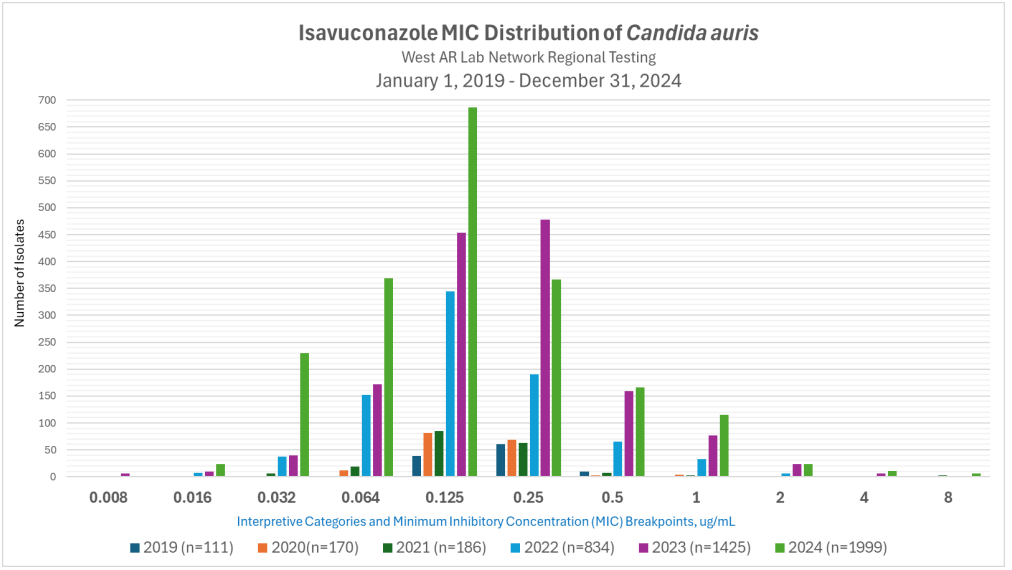
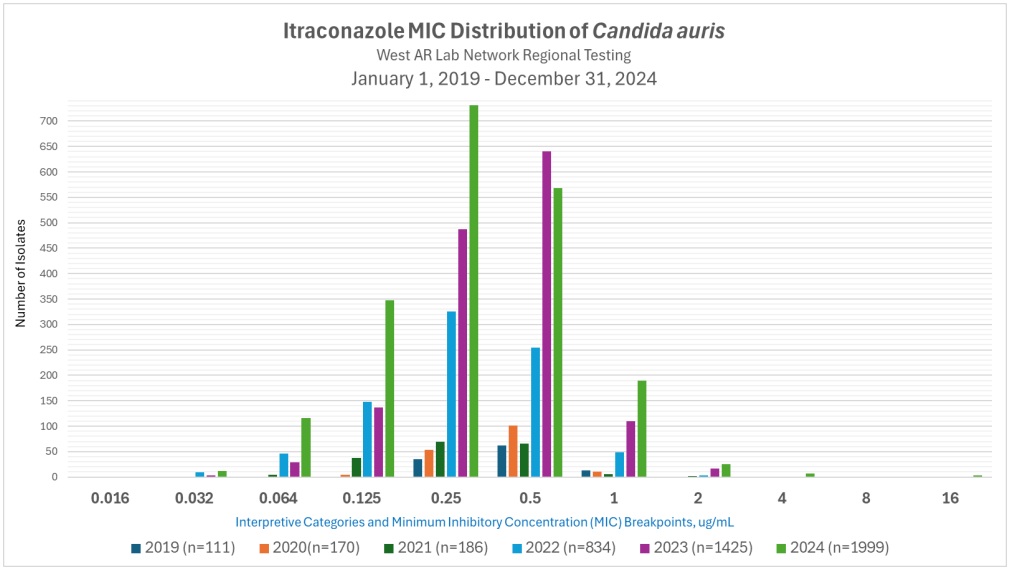
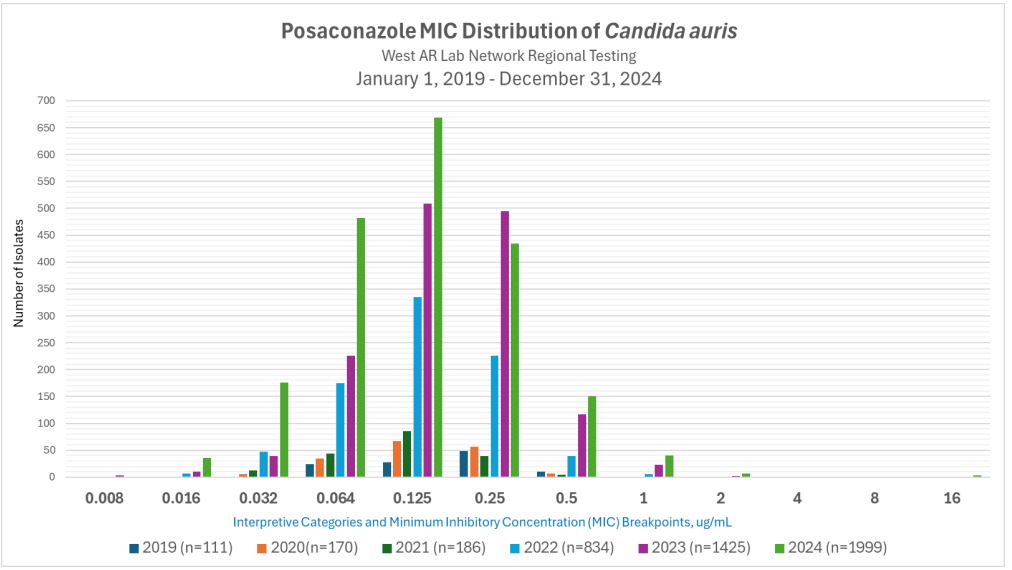


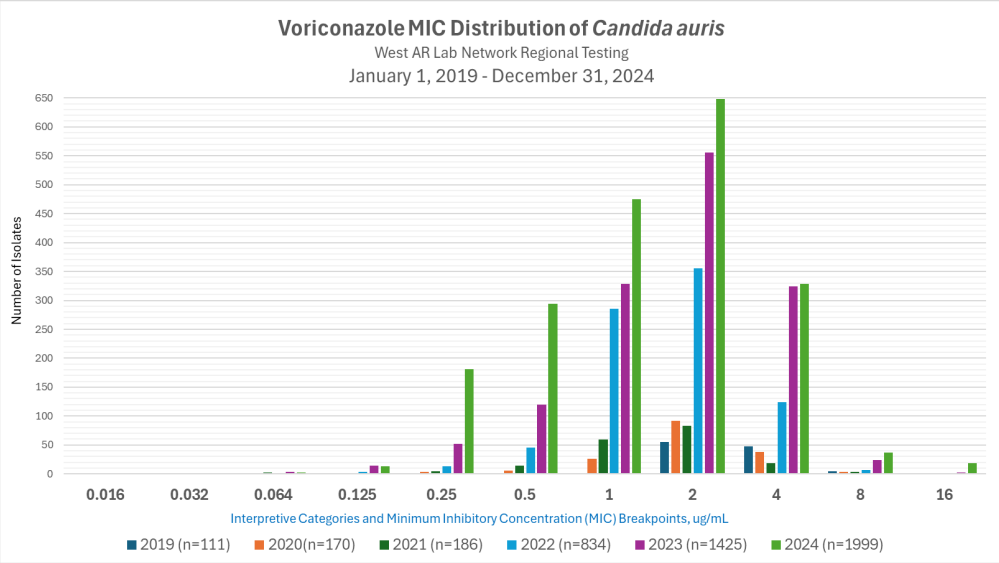
Figure 3: Triazoles Class of Antifungal MIC Distribution Candida.auris **2019 - 2024 West Regional AR Lab Network**









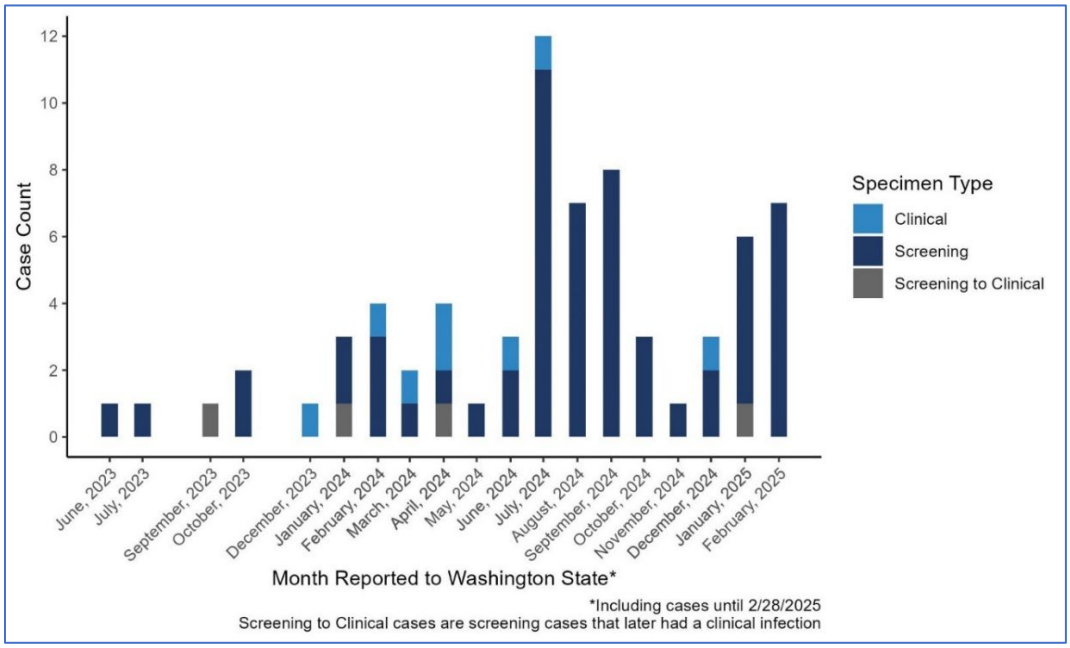


Surveillance Updates

- Candida.auris **in Washington State**

Candida auris is circulating and has been seen in most regions of Washington State. *Candida auris* case was identified on July 13, 2023, through Admission Screening at Facility B after being transferred from Facility A. Public Health initiated a Tier 2 containment response at both facilities. As of February 2025, we have found a total of 63 *C.auris* clinical and screening cases.

Figure 4: Candida.auris **in Washington State June 2023 – February 2025**



Courtesy of Audrey Valetine (DOH)

- **Current** Candida.auris **testing available**

  ARUP Laboratories
  - *Candida auris* by PCR (3006370)
  - *Candida auris* Surveillance Culture (3016815)

  LabCorp
  - *Candida auris* Surveillance Qualitative PCR Axilla-Groin (140092)

  Quest Diagnostics
  - *Candida auris* Surveillance, Qualitative, Real-Time PCR, Axilla/Groin, Nares (10153)

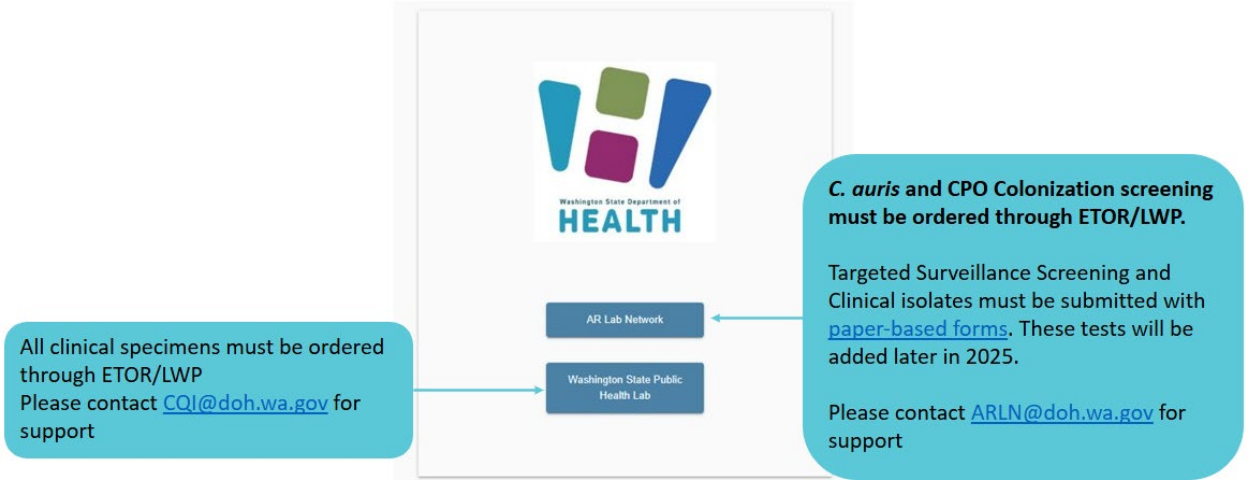
  University of Washington
  - *Candida auris* Qualitative PCR (CAQLT)

  Washington State AR Lab Network (pre-approval by public health required)
  ARLN Lab Test Menu | Washington State Department of Health

- **Electronic Test Order and Reporting (ETOR) for requisition form creation and result retrieval**

  Washington State Public Health Laboratories offers online laboratory sample submissions. *Candida auris* and CPO colonization screening must be approved by public health authority and testing ordered through ETOR / Lab Web Portal (LWP). To create an account and request access please visit Secure Access Washington (SAW) (secureaccess.wa.gov).

  Coming soon in 2025, we will be enabling targeted surveillance screening and clinical isolates to be submitted through the AR Lab Network ETOR portal.

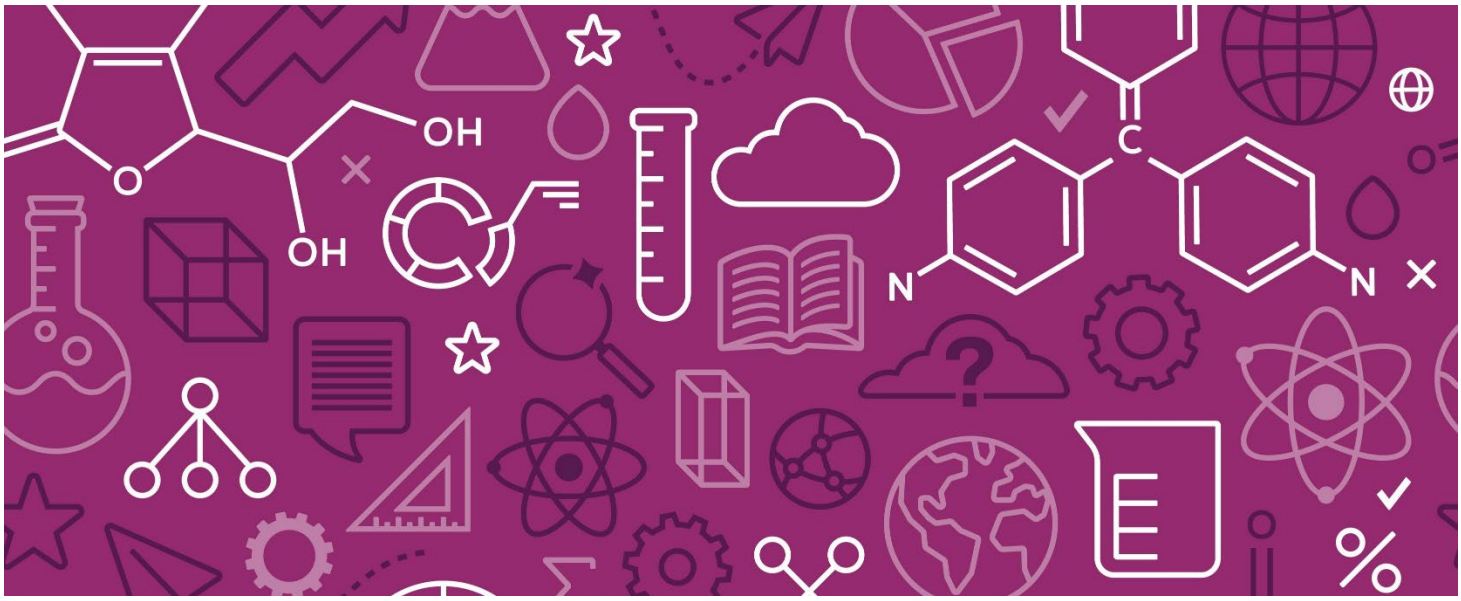


- **Azole-resistance in** Aspergillus.fumigatus **is now available through the AR Lab Network**
  Over 300 *Aspergillus species* have been described, but only a small proportion cause human disease. Globally, the most common species are *A.fumigatus*, *A.flavus*, *A.terreus*, and *A.niger*. Of these four species, *Aspergillus fumigatus* is of highest concern because it is the most common cause of disease, responsible for over 50% of all cases of aspergillosis. *Aspergillus fumigatus* developed resistance to triazole antifungal class during long-term treatment or exposure in the environment where azole antifungals are commonly used in agriculture. The most common mechanisms of resistance are mutations in the azole target protein Cyp51A, leading to overexpression and coding mutations thus decreasing its drug affinity.

  There is priority testing available for isolates from invasive infections or azoles resistant *Aspergillus fumigatus*. Please contact ARLN@doh.wa.gov, if testing is requested, we will help facilitate submission to our collaborating AR Lab Network in Tennessee.

- **Expanded Antimicrobial Susceptibility Testing for Hard-to-Treat Infections (ExAST)**
  ExAST has been available at WA PHL since 2020. Healthcare providers and clinical laboratories can request ExAST to determine effectiveness of new-to-market antibiotics for treating infections caused by metallo-β-lactamase (MBL)-producing Enterobacterales.
  - Eligible isolates undergo standard testing (see Table 1), as well as susceptibility testing for ceftazidime/avibactam, aztreonam, and aztreonam/avibactam.
  - Eligible isolates include Enterobacterales that:
    - Test non-susceptible to all beta-lactams, including either ceftazidime/avibactam or meropenem/vaborbactam (these isolates may be MBL-producing isolates with few effective treatment options)
      OR
    - Possess MBL genes (NDM, VIM, or IMP) confirmed by molecular test
  - Turn-around-time is 3 business days
  - Pre-approval is required, please contact ARLN@doh.wa.gov.

We thank laboratories for their diligence in reporting and submitting antibiotic resistant organisms to public health. The AR Lab Network will cover shipping costs associated with MDRO submission upon request. Please contact ARLN@doh.wa.gov if you are interested in sentinel laboratory participation or if you have any questions/concerns regarding testing or shipping. Contact MDRO-AR@doh.wa.gov for questions about admission- or surveillance-screening.



Practice Guidelines

The following practice guidelines have been developed by the Washington Clinical Laboratory Advisory Council. They can be accessed at the Medical Test Site Program website.

- Acute Diarrhea
- Anemia
- ANA
- Bioterrorism Event Management
- Bleeding Disorders
- Chlamydia
- Diabetes
- Group A Strep Pharyngitis
- Group B Streptococcus
- Hepatitis
- HIV
- Infectious Diarrhea
- Intestinal Parasites
- Lipid Screening
- PAP Smear Referral
- Point-of-Care Testing
- PSA
- Rash Illness
- Red Cell Transfusion
- Renal Disease
- STD
- Thyroid
- Tuberculosis
- Urinalysis
- Wellness

2025 Virtual Joint Spring Seminar (ASCLS-WA, ASCLS-OR, & ASCLS-AK), April 3-4

2025 Virtual Northwest Laboratory Symposium (NWMLS), October 2-3

The Calendar of Events is a list of upcoming conferences, deadlines, and other dates of interest to the clinical laboratory community. If you have events that you would like to have included, please mail them to chuck.talburt@doh.wa.gov. Information must be received at least one month prior to the scheduled event. The editor reserves the right to make final decisions on inclusion in *ELABORATIONS*.

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Washington State Department of HEALTH

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