



Midwest Region Report

2023



Wisconsin State
Laboratory of Hygiene
UNIVERSITY OF WISCONSIN-MADISON

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Acronym Guide

AR – Antimicrobial Resistance

CDC – Centers for Disease Control and Prevention

CP – Carbapenemase-producing

CPO – Carbapenemase-producing organism

CRAB – Carbapenem-resistant *Acinetobacter baumannii*

CRE – Carbapenem-resistant Enterobacterales

CRPA – Carbapenem-resistant *Pseudomonas aeruginosa*

KPC – Klebsiella pneumoniae carbapenemase

IMP – Imipenemase

MDRO – Multidrug-resistant organism

NDM – New Delhi Metallo-beta-lactamase

OXA – Oxacillinase

VIM – Verona Integron-Mediated Metallo-beta-lactamase

WSLH – Wisconsin State Laboratory of Hygiene

Foreword

This report is a compilation of testing performed in 2023, with some historical data from 2020–2023. The Midwest Region AR Laboratory is based in Madison, Wisconsin, at the Wisconsin State Laboratory of Hygiene (WSLH). It serves the 6 states of the Midwest Region: Illinois, Indiana, Kentucky, Michigan, Ohio, and Wisconsin.

Multidrug-resistant organisms (MDROs) are a serious public health concern, as described in CDC's 2013 and 2019 AR Threats Reports. Infections with MDROs cause 2.8 million infections and more than 35,000 deaths each year.

CDC's Antimicrobial Resistance (AR) Lab Network was established in 2016 to support testing for targeted multidrug-resistant organisms (MDROs). These Targeted MDROs are resistant to most or all available antimicrobials and have the potential to spread widely. Current Targeted MDROs that the AR Lab Network provides testing support for are:

- *Candida auris*
- Carbapenemase-producing organisms, including *Acinetobacter*, *Pseudomonas*, and those from the Enterobacterales order

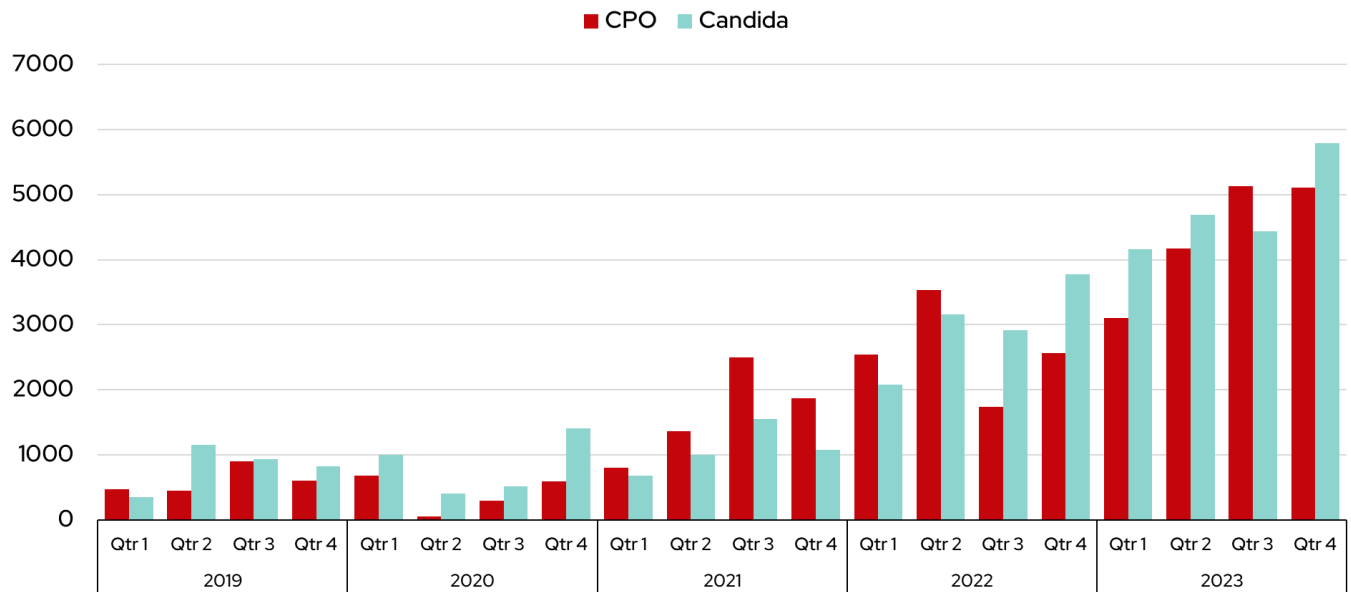
Expanding testing for antimicrobial resistance with the CDC's support has allowed public health to detect and respond to MDROs in a timely manner, to limit spread of resistant organisms.

Colonization Testing Overview

A person who is colonized with an MDRO is carrying the organism in or on their body, without it causing clinical illness. People who are colonized with MDROs can be colonized for long periods of time, possibly indefinitely. Colonized patients can spread the MDROs to other patients and to the healthcare environment. Detection of colonization is an important tool to prevent the spread of MDROs.

WSLH supports colonization testing in the Midwest Region of the AR Lab Network. Currently, WSLH performs colonization testing for carbapenemase-producing organisms (CPOs) and *Candida auris*. Testing has increased dramatically over time, especially following the COVID-19 pandemic.

Midwest Region colonization testing submissions, 2019-2023

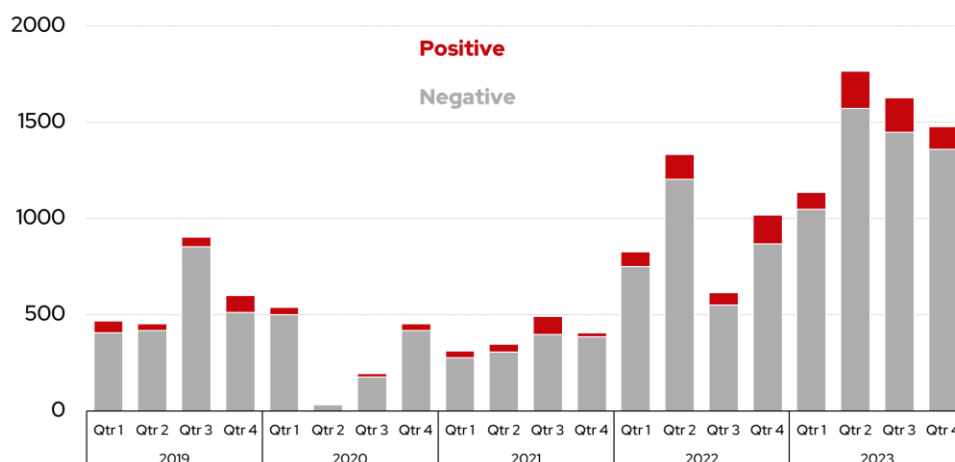


CRE and CRPA Colonization Testing

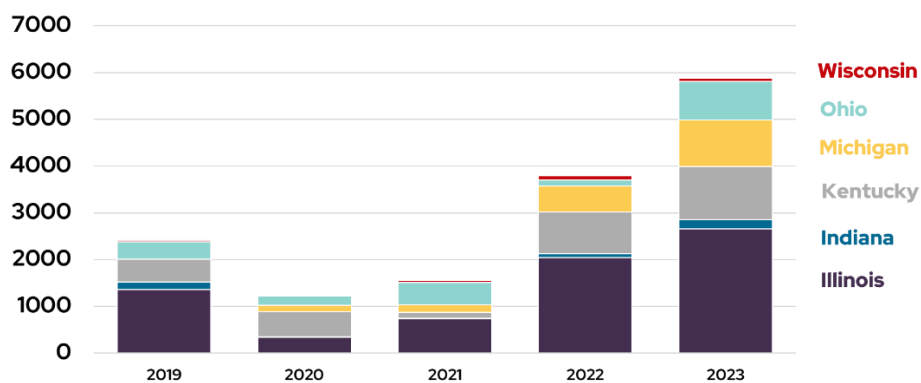
WSLH tests for some common carbapenemases using the Cepheid GeneXpert platform. CARBA-R tests can detect the presence of five carbapenemase genes (KPC, NDM, IMP, OXA-48, and VIM) directly from rectal swabs. These carbapenemases are most commonly found in bacteria that colonize the gastrointestinal tract, including species from the order Enterobacterales such as *E. coli*, *Klebsiella pneumoniae*, and *Enterobacter cloacae*. These carbapenemases can also sometimes be found in the species *Pseudomonas aeruginosa*.

In 2023, 11.2% of all 5138 swabs tested using CARBA-R tests were positive for at least one carbapenemase.

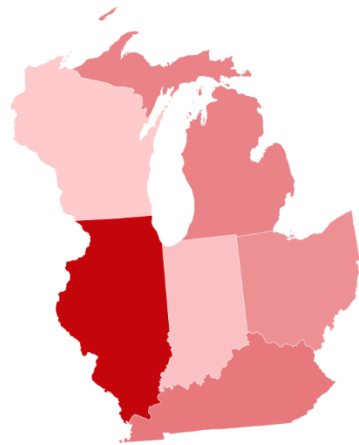
Midwest Region colonization testing using CARBA-R PCR tests, 2019-2023



Midwest Region colonization testing using CARBA-R PCR tests by state, 2019-2023



Midwest Region CPO colonization testing using Cepheid CARBA-R PCR Testing by state, 2023

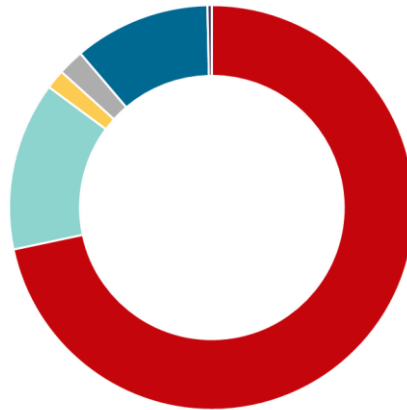


State	Total Tested
Illinois	2663
Indiana	194
Kentucky	1131
Michigan	1003
Ohio	826
Wisconsin	67

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Midwest Region detected carbapenemase mechanisms using Cepheid CARBA-R PCR Testing, 2023

■ KPC ■ NDM ■ OXA-48 ■ VIM ■ Dual ■ Triple

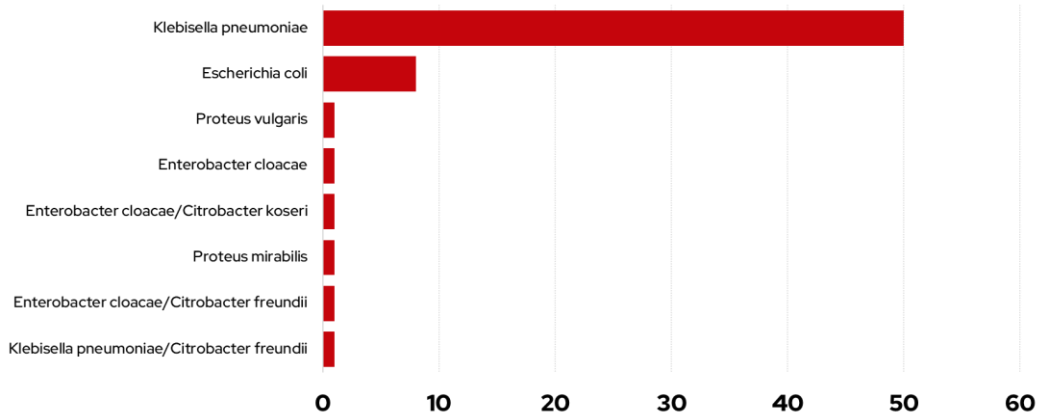


Carbapenemase	#
KPC	415
NDM	78
OXA-48	9
VIM	12
Dual	37
Triple	3
KPC/NDM	21
KPC/OXA-48	1
KPC/VIM	1
NDM/OXA-48	1
NDM/VIM	1
KPC/NDM/VIM	1
KPC/OXA-48/VIM	1

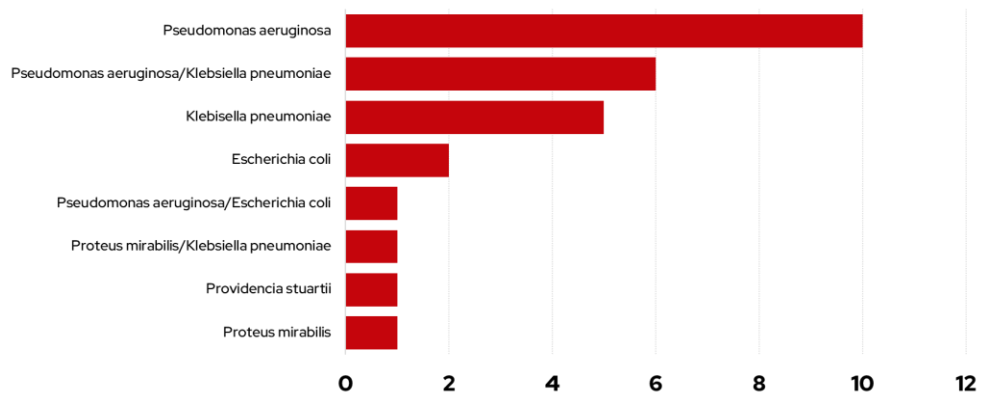
Reflex Culture for CARBA-R Positives

In order to better characterize positive results, WSLH attempts to culture every non-KPC carbapenemase positive (IMP, NDM, OXA-48, and VIM).

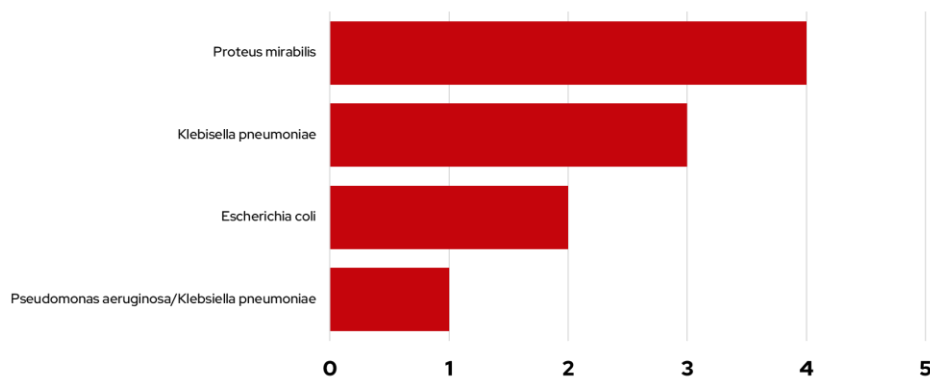
NDM-positive reflex cultures by species, 2023



VIM-positive reflex cultures by species, 2023



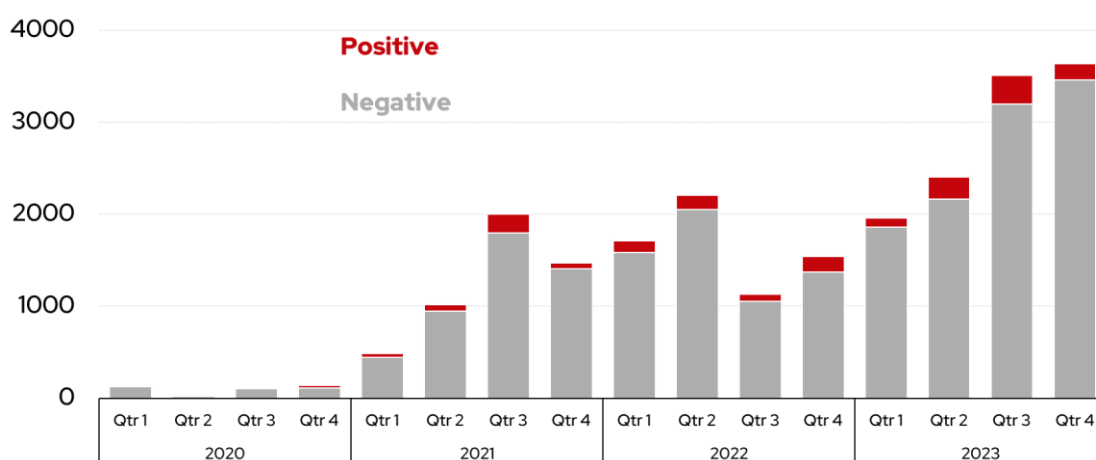
OXA-48-positive reflex cultures by species, 2023



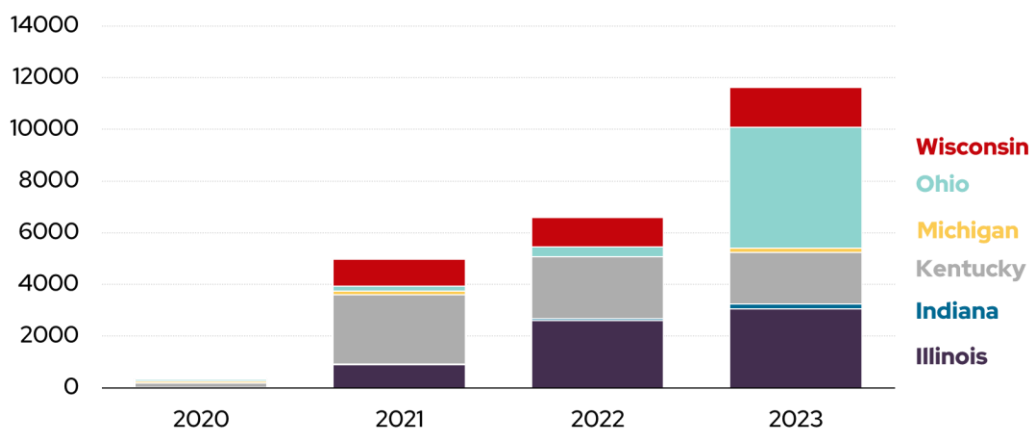
Acinetobacter baumannii Colonization Testing

Carbapenem-producing carbapenem-resistant *Acinetobacter baumannii* (CP-CRAB) often contain carbapenemases that are unique to *Acinetobacter* species. WSLH has developed PCR tests for these CRAB-specific carbapenemases, which include OXA-23-like, OXA-24/40-like, and OXA-58-like genes. Colonization testing for CP-CRAB is currently culture-based, primarily from axilla/groin swabs, though WSLH is also validated for testing from rectal and tracheostomy swabs.

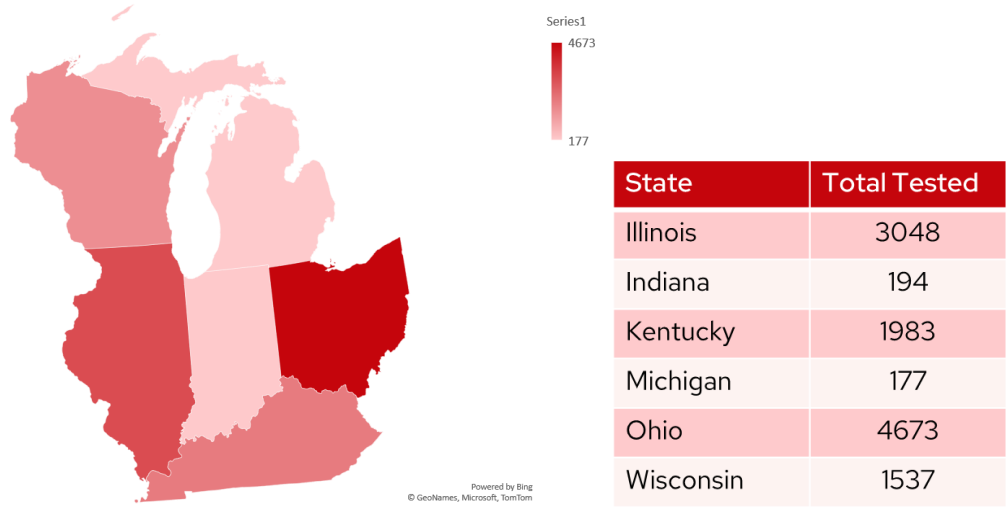
Midwest Region CP-CRAB colonization testing, 2020-2023



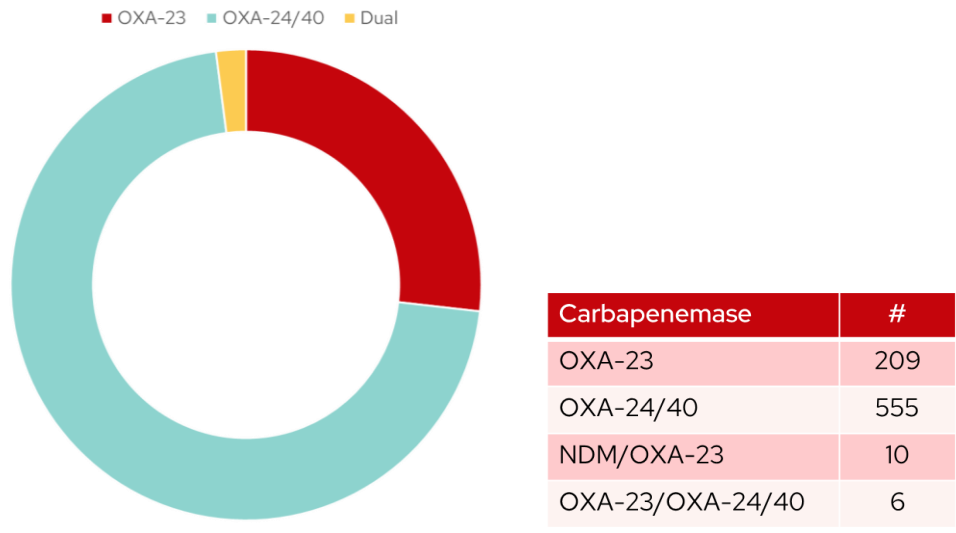
Midwest Region CP-CRAB colonization testing by state, 2020-2023



Midwest Region CP-CRAB colonization testing by state, 2023



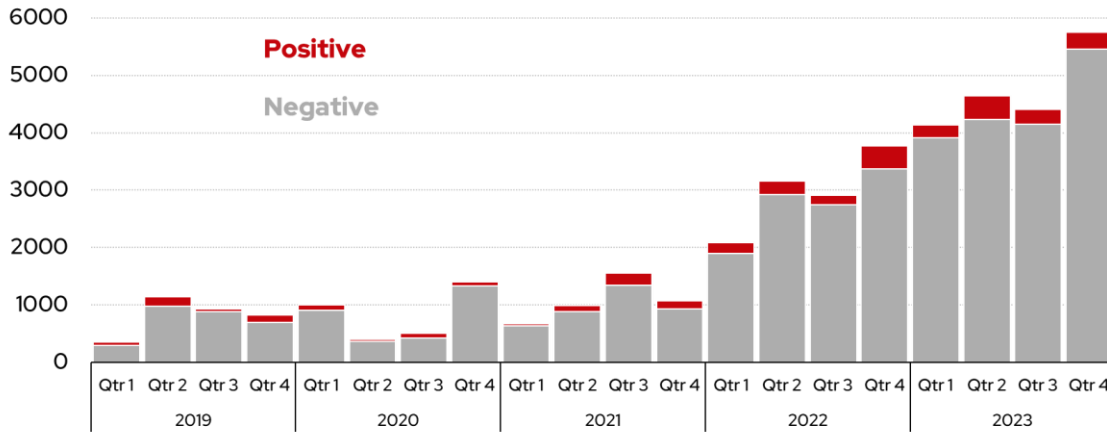
Midwest Region detected carbapenemase mechanisms in CP-CRAB, 2023



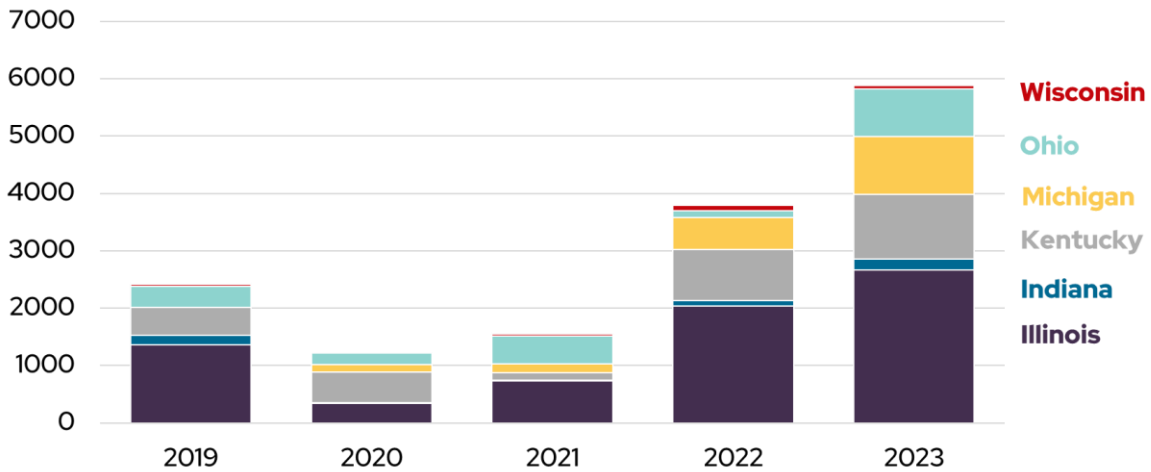
Candida auris Colonization Testing

Candida auris is a fungal pathogen that has emerged in the past 15 years. Candida auris can colonize patient skin and the healthcare environment. Colonization testing for Candida auris involves PCR-based testing of axilla/groin swabs.

Midwest Region *Candida auris* colonization testing, 2019-2023



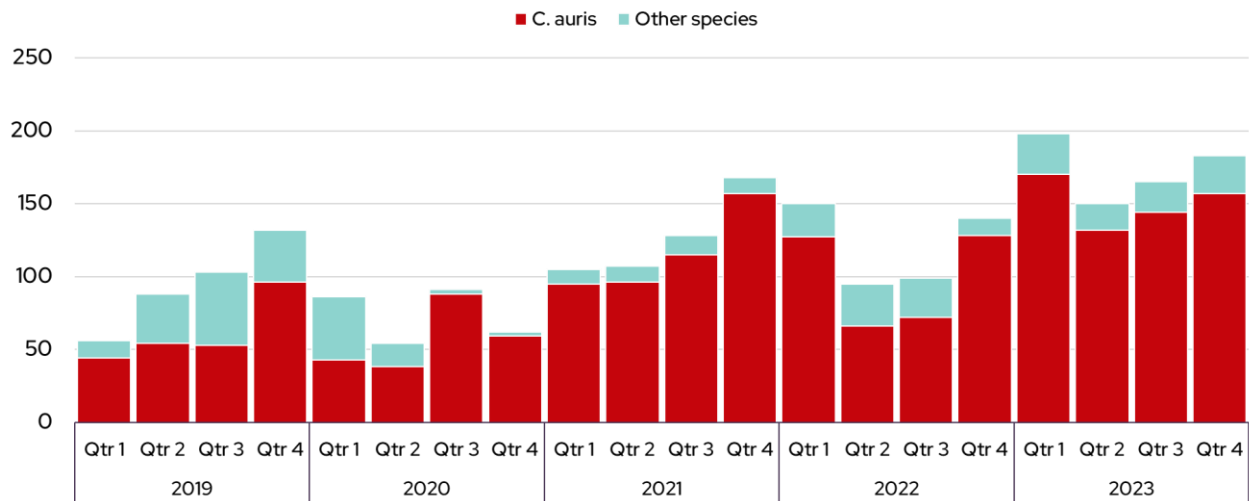
Midwest Region *Candida auris* colonization testing by state, 2019-2023



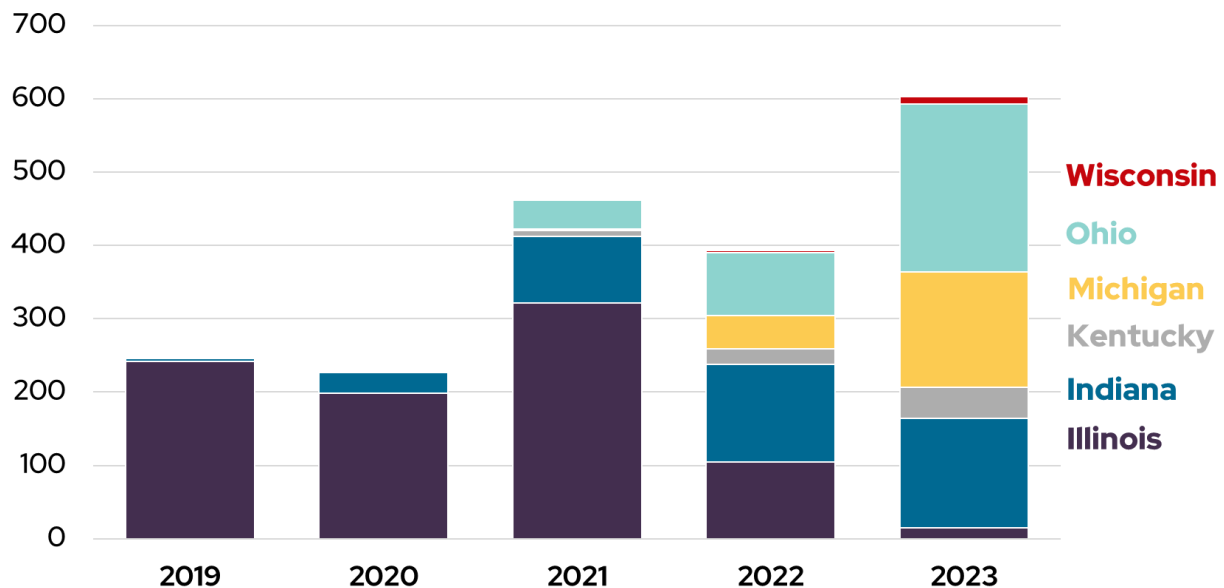
Candida auris Isolate Testing

WSLH performs isolate testing for Candida auris isolates from the Midwest region. This includes identification via MALDI-TOF and antifungal susceptibility testing (AFST) using a custom broth microdilution panel for azole and echinocandin antifungals and an E-test for amphotericin B.

Midwest Region Candida isolate testing, 2019-2023

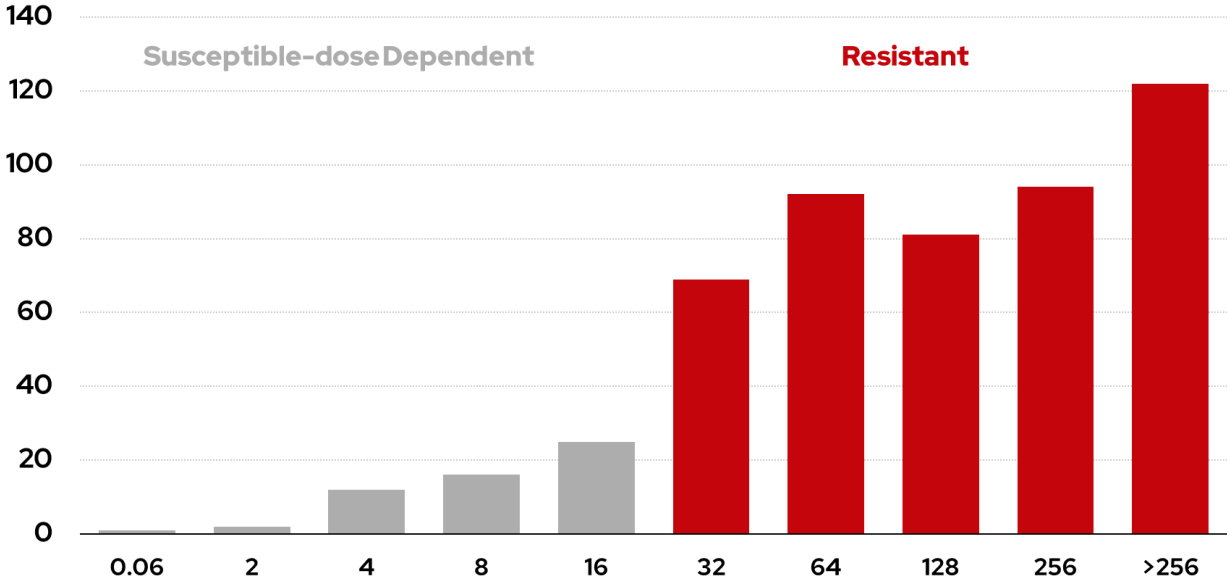


Midwest Region Candida auris isolate testing by state, 2019-2023

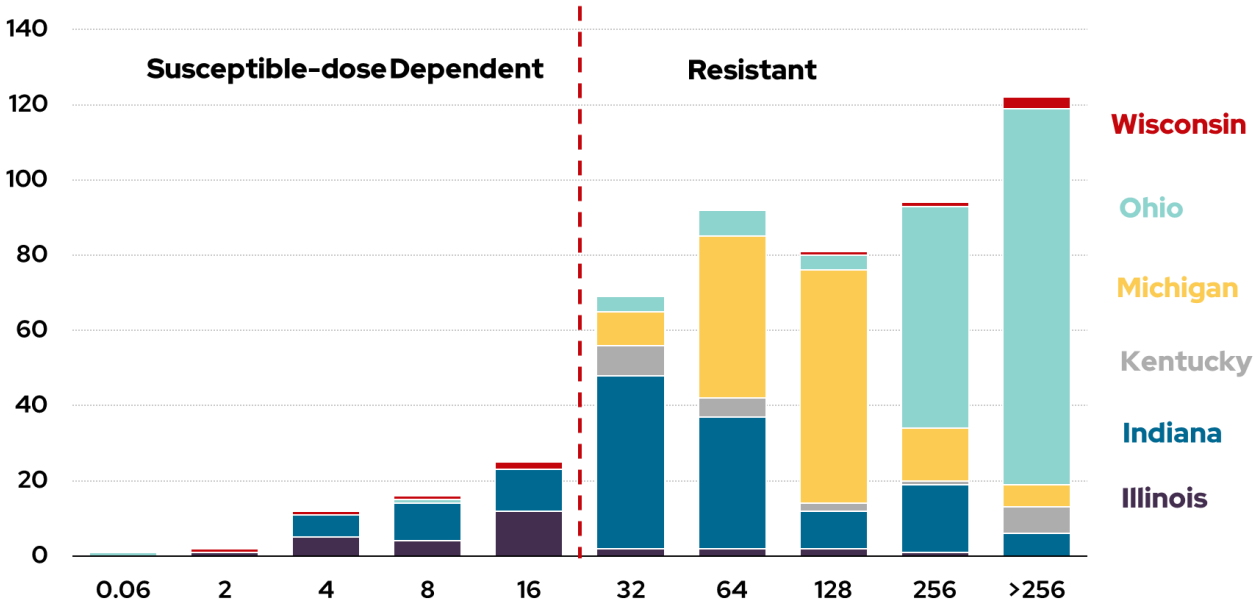


Candida auris Azole Susceptibility

Midwest Region *Candida auris* Fluconazole Susceptibility Profiles, 2023

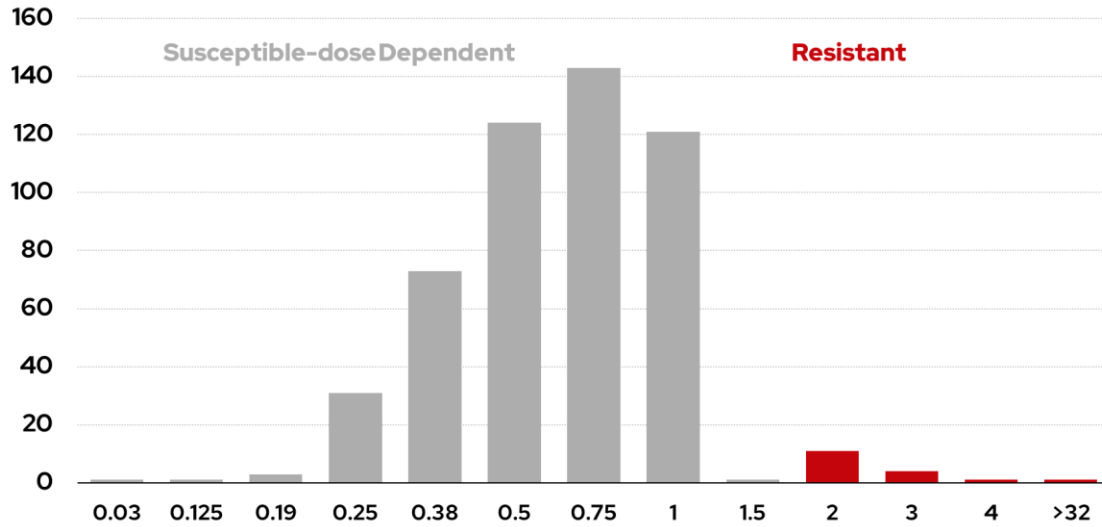


Midwest Region *Candida auris* Fluconazole Susceptibility Profiles by state, 2023

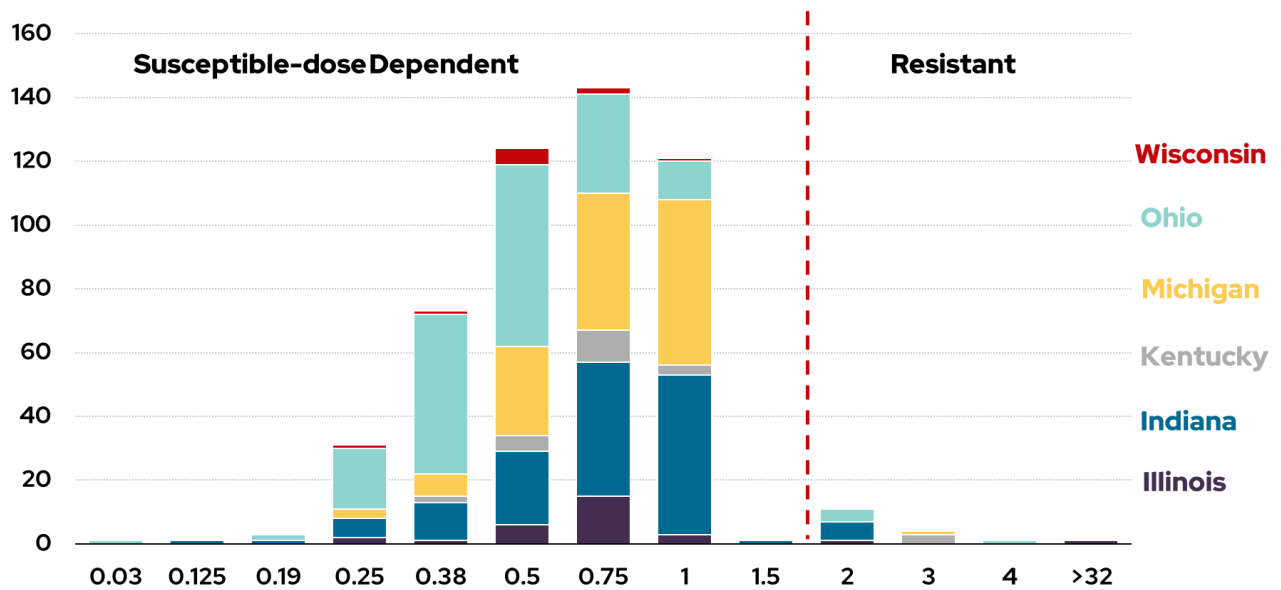


Candida auris Amphotericin B Susceptibility

Midwest Region *Candida auris* Amphotericin B Susceptibility Profiles, 2023

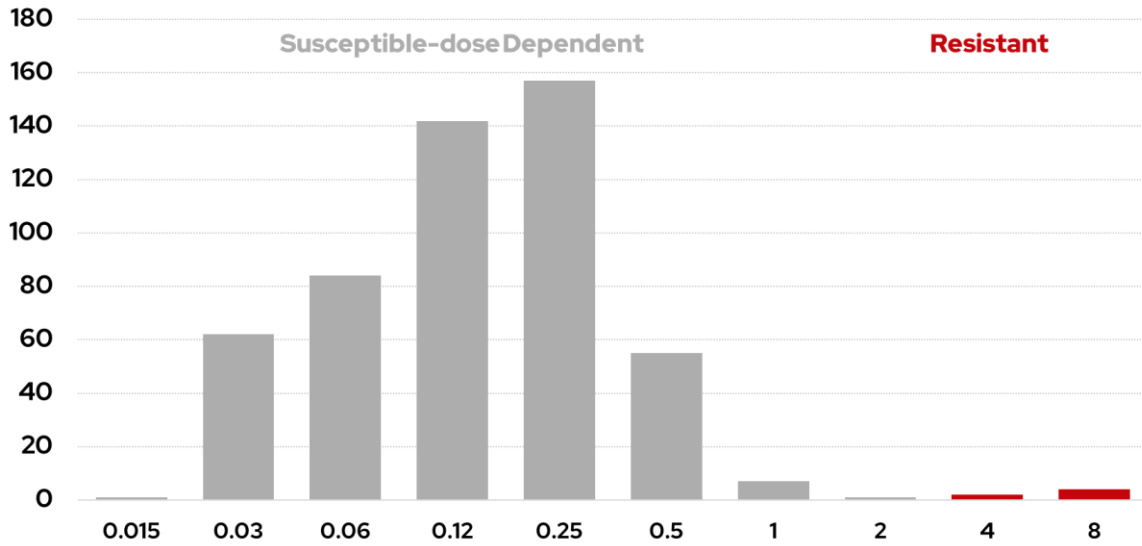


Midwest Region *Candida auris* Amphotericin B Susceptibility Profiles by state, 2023



Candida auris Echinocandin Susceptibilities

Midwest Region *Candida auris* Micafungin Susceptibility Profiles, 2023



Midwest Region *Candida auris* Micafungin Susceptibility Profiles by state, 2023

