



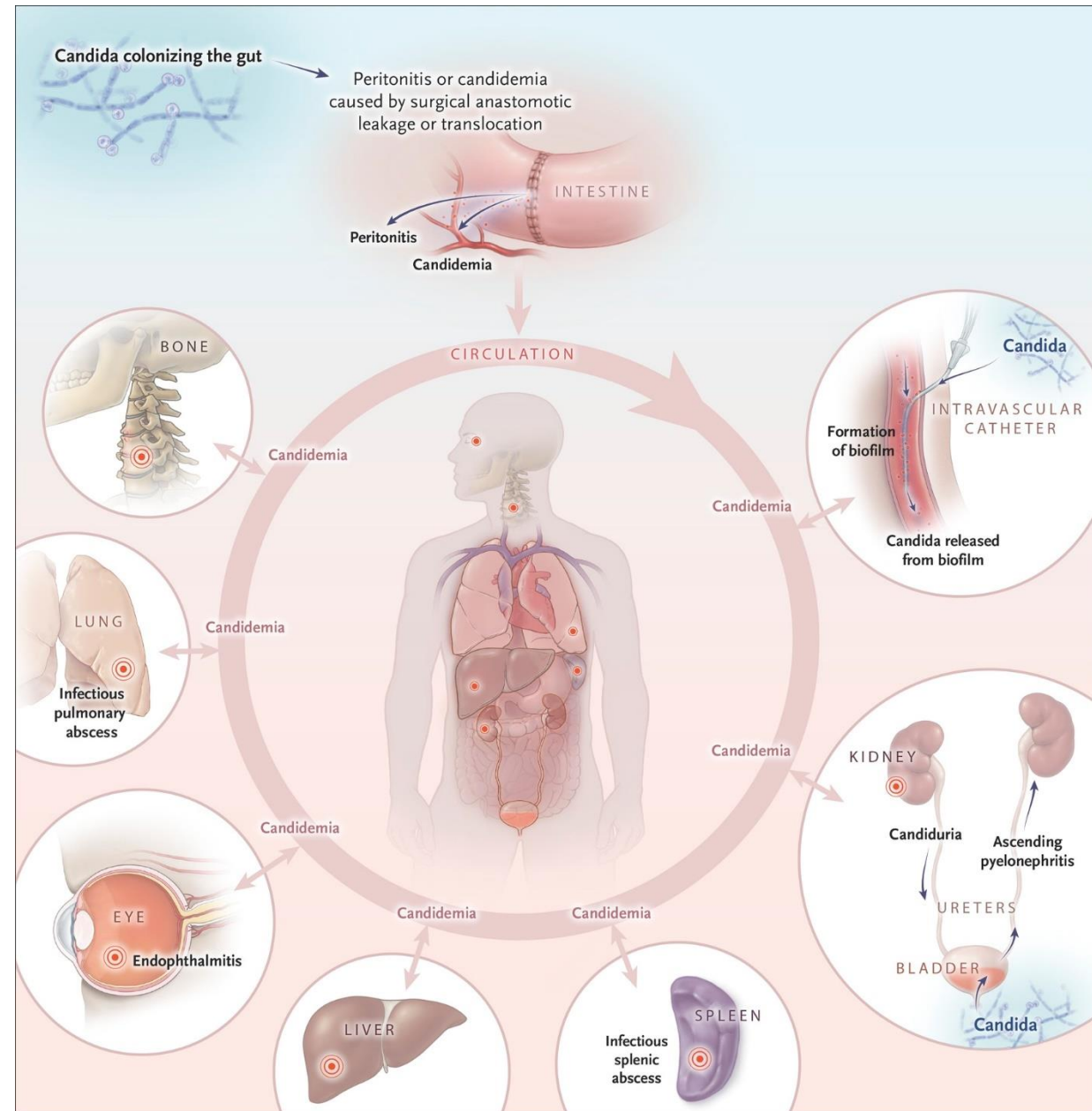
AR Lab Network Candida Testing

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Medical Epidemiologist

Centers for Disease Control and Prevention

Invasive Candidiasis



Most Common Healthcare-Associated Bloodstream Infection in the United States?

Candida species



The NEW ENGLAND
JOURNAL of MEDICINE

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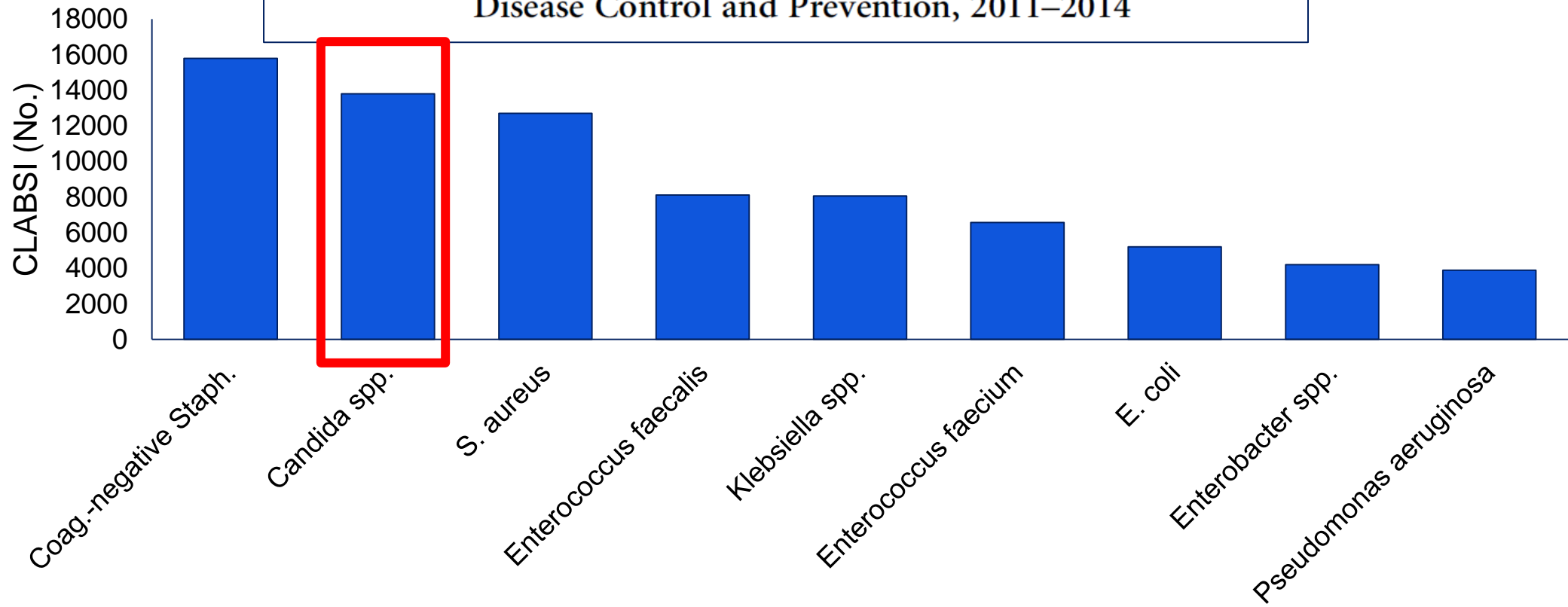
ORIGINAL ARTICLE

Multistate Point-Prevalence Survey of Health Care–Associated Infections

Shelley S. Magill, M.D., Ph.D., Jonathan R. Edwards, M.Stat., Wendy Bamberg, M.D., Zintars G. Beldavs, M.S., Ghinwa Dumyati, M.D., Marion A. Kainer, M.B., B.S., M.P.H., Ruth Lynfield, M.D., Meghan Maloney, M.P.H., Laura McAllister-Hollod, M.P.H., Joelle Nadle, M.P.H., Susan M. Ray, M.D., Deborah L. Thompson, M.D., M.S.P.H., Lucy E. Wilson, M.D., and Scott K. Fridkin, M.D., for the Emerging Infections Program Healthcare-Associated Infections and Antimicrobial Use Prevalence Survey Team*

N Engl J Med 2014; 370:1198-1208 | March 27, 2014 | DOI: 10.1056/NEJMoa1306801

Antimicrobial-Resistant Pathogens Associated With Healthcare-Associated Infections: Summary of Data Reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2011–2014



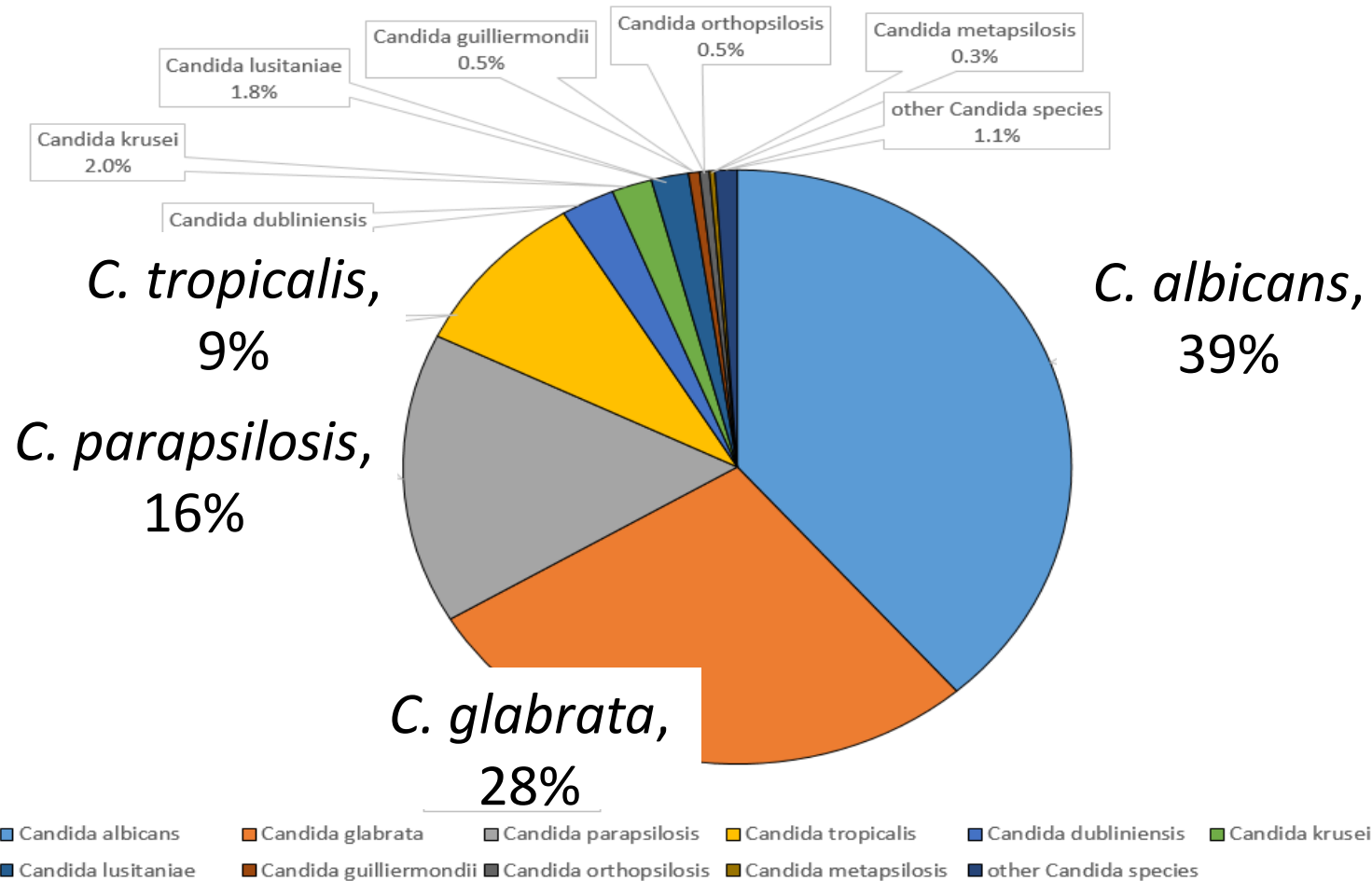
**Bloodstream infections with
Candida are associated with 30%
mortality**



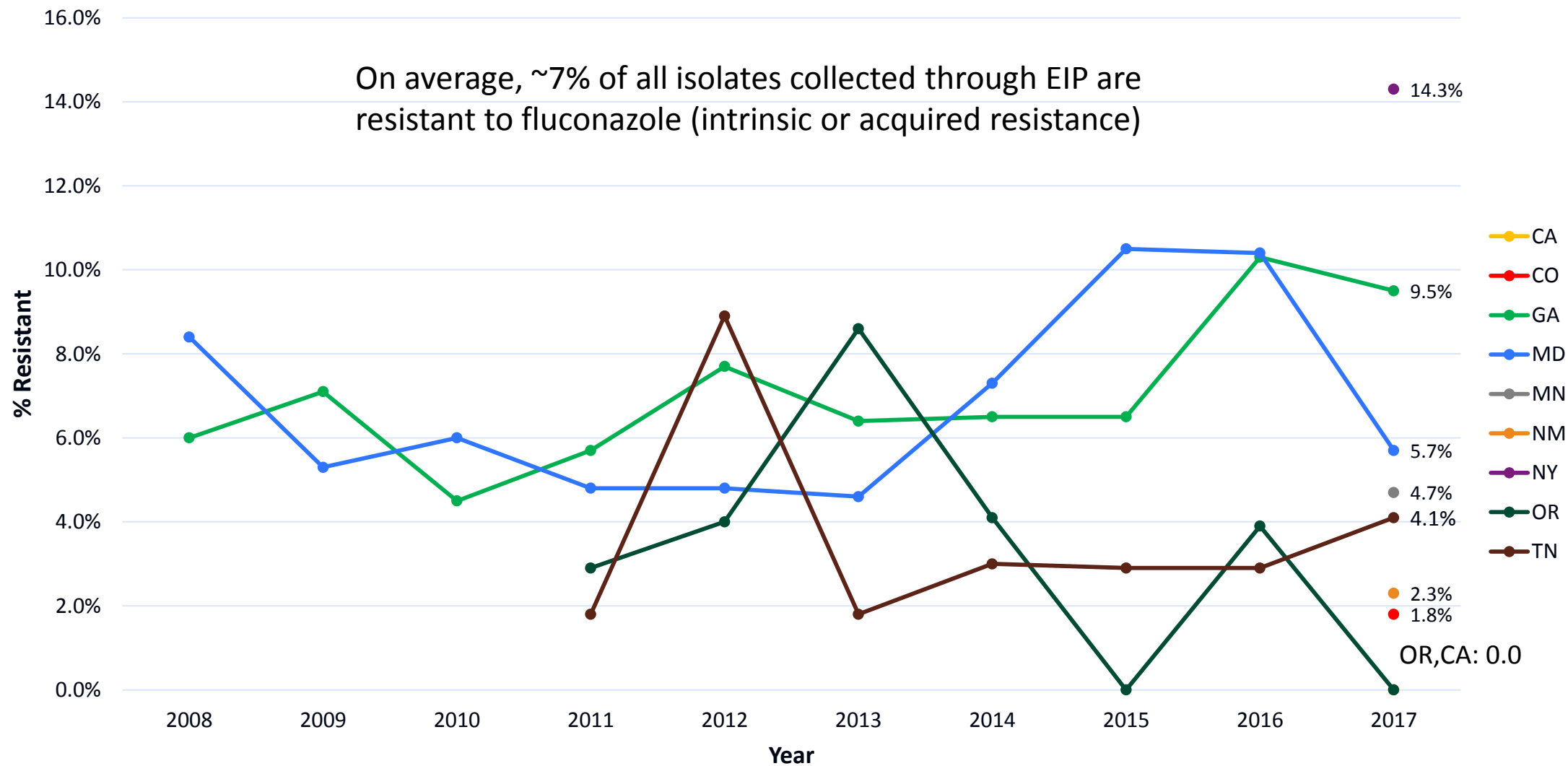
Candida species distribution: (n=~8000 bloodstream isolates 2008-2017)

CDC conducts populations-based surveillance for candidemia through the Emerging Infections Program in 9 U.S. sites, covering 17 million persons (~5% of U.S. population)

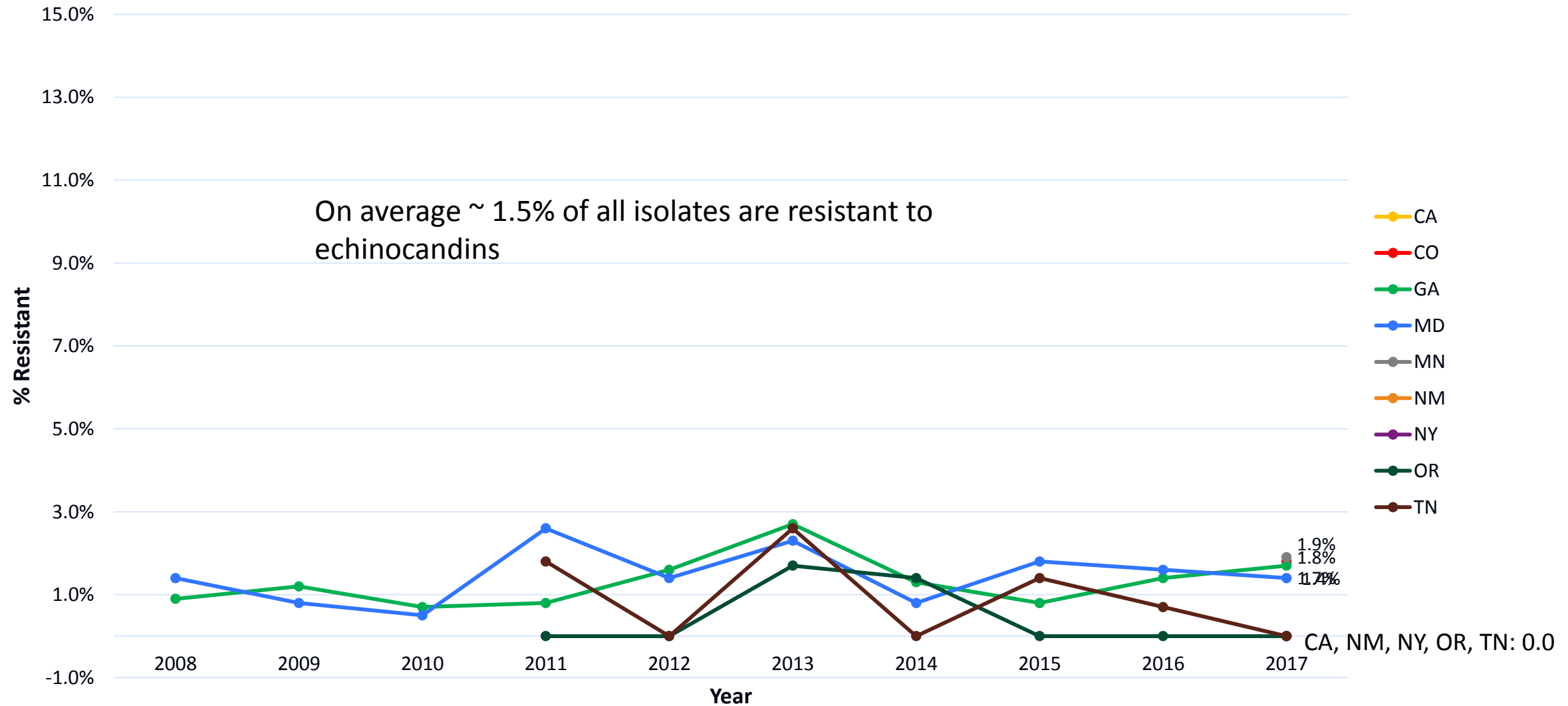
Non-
albicans
Candida
tend to be
more drug
resistant



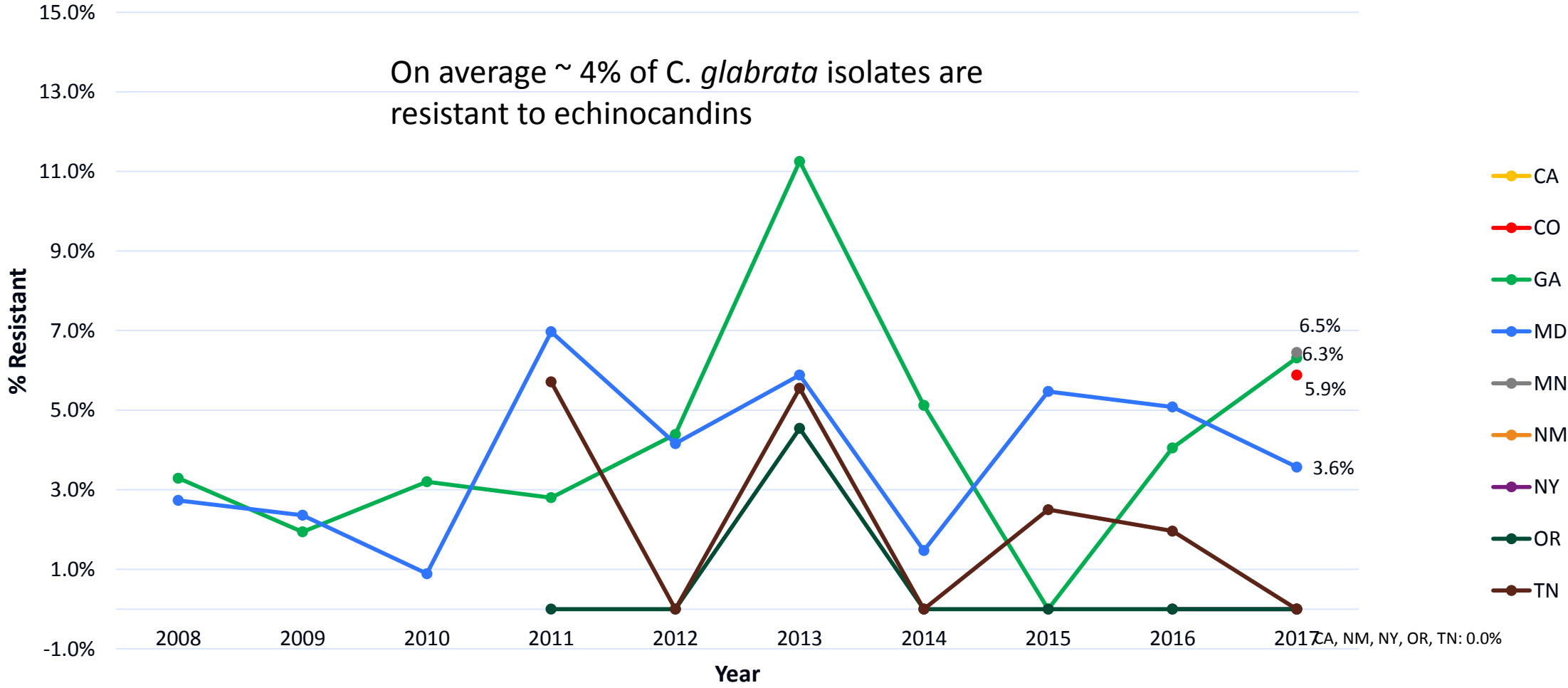
Fluconazole Resistance (all species) by EIP Surveillance Site 2008-2017 (n=~8000 isolates)



Echinocandin Resistance (all species) by EIP Surveillance Site 2008-2017 (n=~ 8000 isolates)



Echinocandin-resistant *C. glabrata* by Surveillance Site 2008-2017 (n=2230 isolates)



Important to monitor for resistance through ARLN

- Many clinical labs don't perform species identification for *Candida*, let alone resistance testing
- There are only three main classes of antifungal drugs—so treatment options are limited in the setting of resistance
- The 2016 IDSA guidelines recommend treating invasive candidiasis with echinocandins. Alternatives to treatment with echinocandins are limited because of toxicity concerns with amphotericin. Therefore monitoring for resistance towards echinocandins is crucial
- Even though there is some resistance data through EIP, it represents <5% of *Candida* infections and does not capture all parts of the U.S and regional variability.

Candida auris:

Why you should really care

Why is *Candida auris* a public health threat?

- Highly drug-resistant yeast
- Causes invasive infections associated with high mortality
- Spreads easily in healthcare settings
- Difficult to identify

All the makings of a fungal superbug!



Major Antifungal Resistance Seen

1



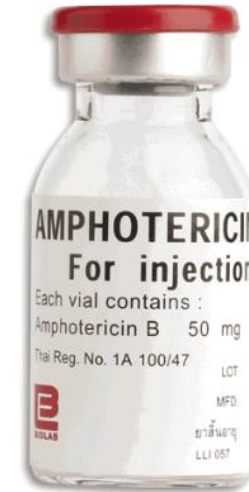
>90%
Azoles

2



7%
Echinocandins

3



35%
Polyenes

- **>40% multidrug resistant**
- **A few resistant to all three classes**

Causes invasive infections

- 50% of clinical cases are bloodstream infections
- 40% in-hospital mortality in BSI cases

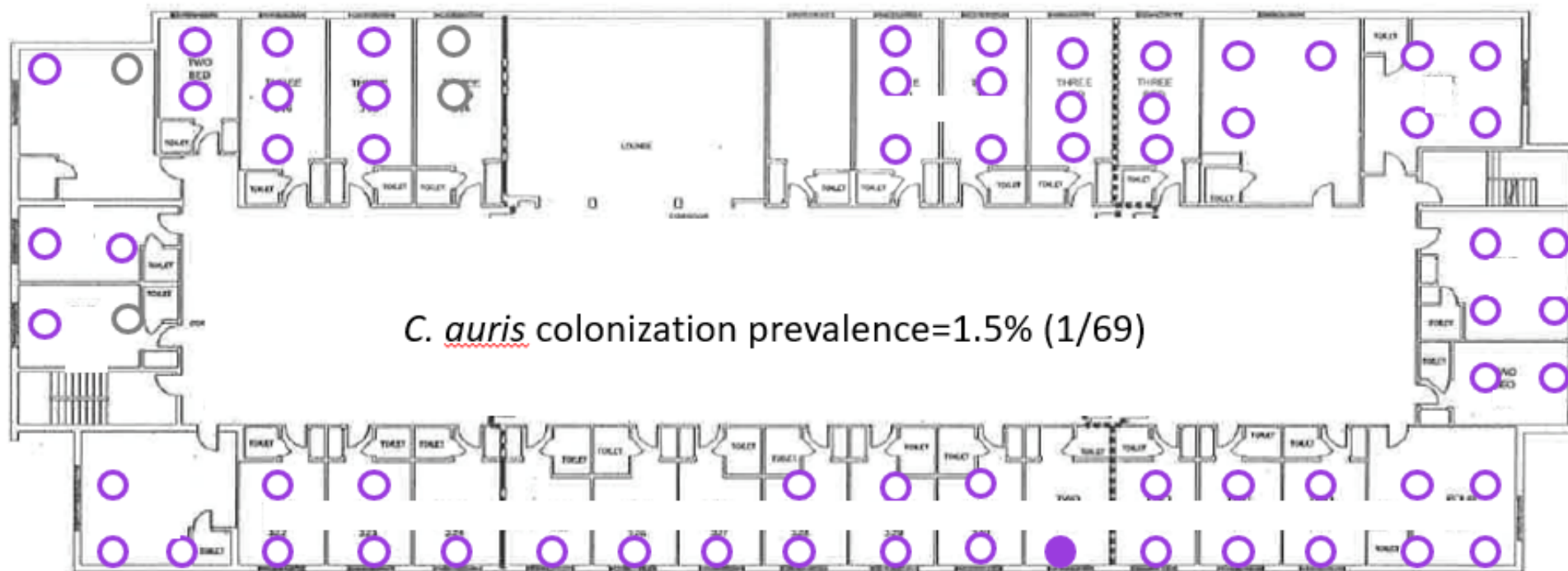


Affects the sickest of the sick

- Older age
- Multiple healthcare stays (acute and long term)
- Central catheters
- Tracheostomy/Ventilator
- PEG tubes
- On antibiotics and antifungals
- Have other MDROs like CP-CRE



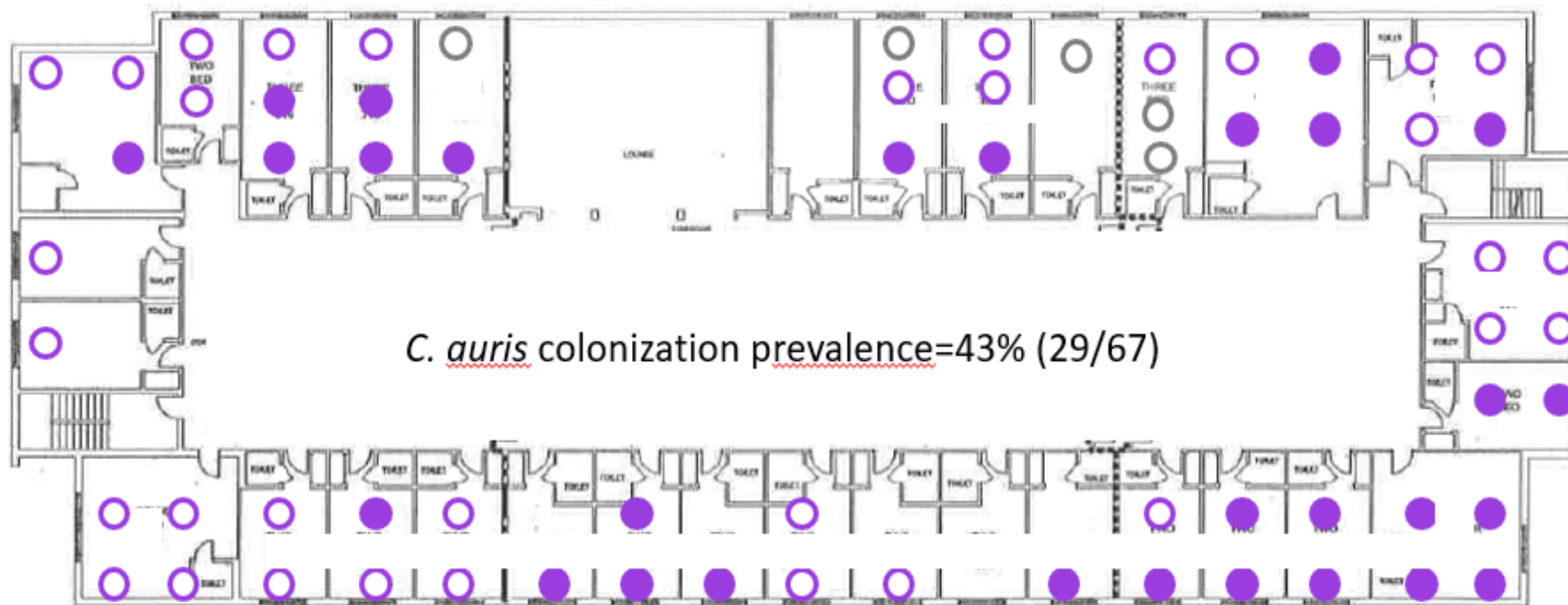
vSNF A Ventilator/Trach Floor March 2017 *C. auris* PPS Results



- *C. auris* positive
- Screened negative for *C. auris*
- Not tested for *C. auris* (refused or not in room)

vSNF A Ventilator/Trach Floor

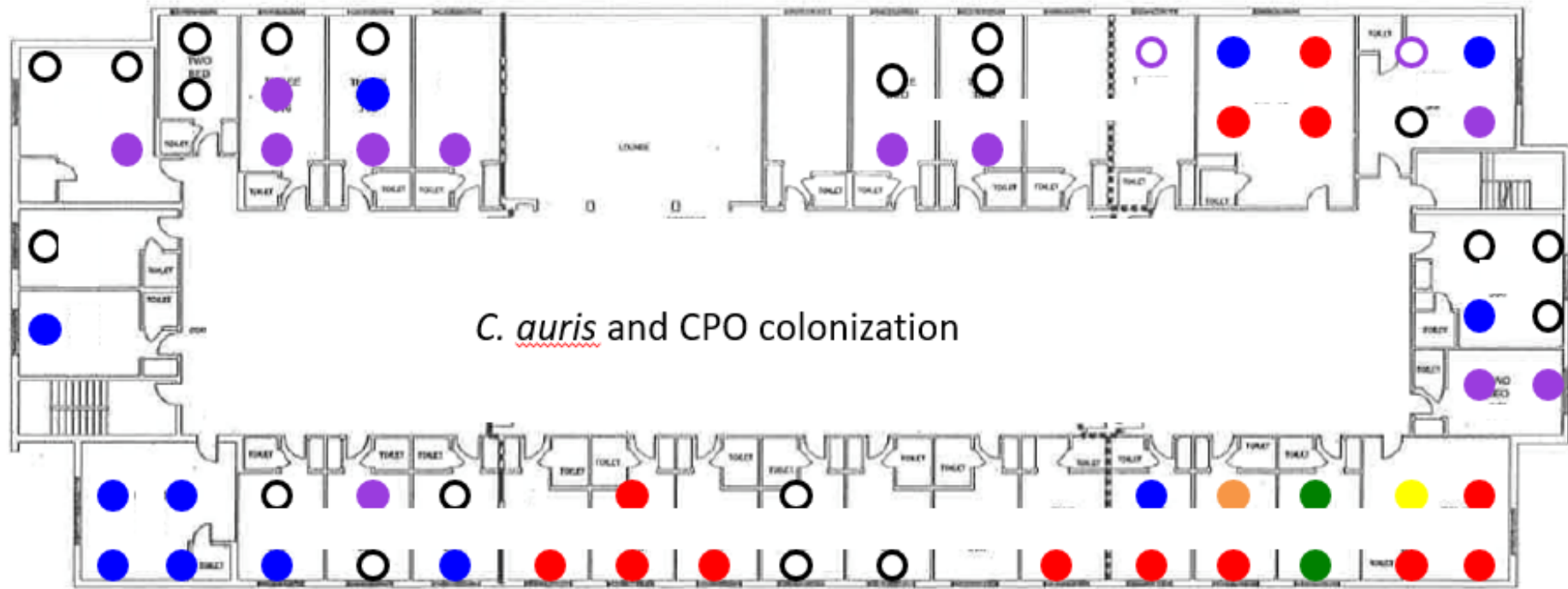
January 2018 *C. auris* PPS Results



C. auris colonization prevalence=43% (29/67)

- *C. auris* positive
- Screened negative for *C. auris*
- Not tested for *C. auris* (refused or not in room)

vSNF A Ventilator/Trach Floor January 2018 CPO and *C. auris* PPS Results



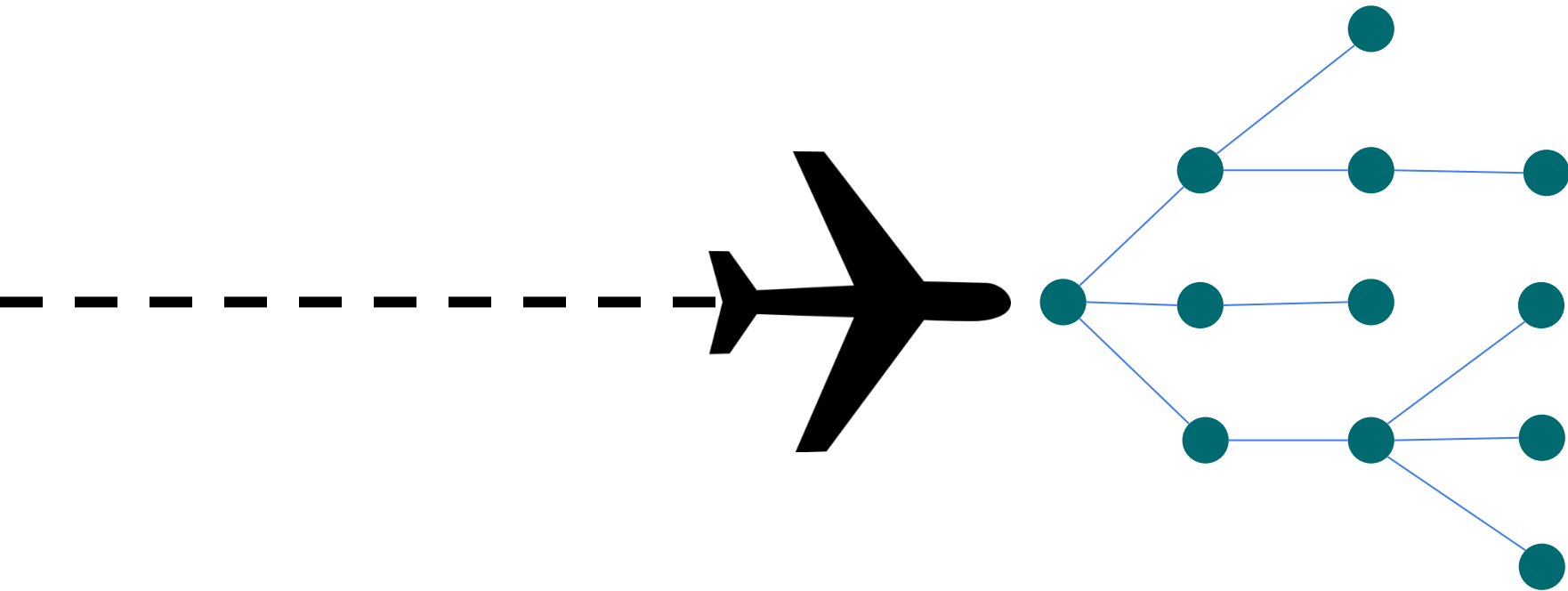
- | | |
|---|--|
| ● <i>C. auris</i> | ○ Screened negative for <i>C. auris</i> , but not tested for CRE |
| ● <i>C. auris</i> and KPC | ○ Screened negative for CRE and <i>C. auris</i> |
| ● KPC or CRE with unknown mechanism of resistance | |
| ● <i>C. auris</i> , KPC, and NDM | |
| ● <i>C. auris</i> , VIM-CRPA, and KPC | |
| ● <i>C. auris</i> and KPC-CRPA | |

C. auris persists in the environment

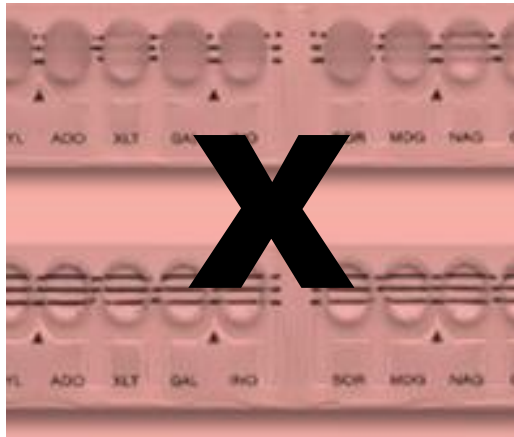


Healthcare abroad is risk factor for *C. auris*

- 11 U.S. cases have links to healthcare abroad
- US *C. auris* cases are a result of introductions from abroad followed by local transmission



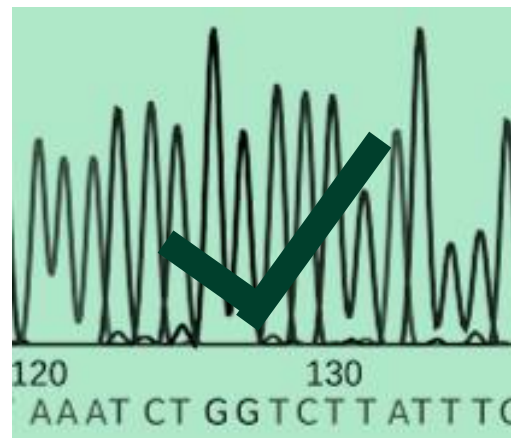
Candida auris is difficult to identify



* Ver 8.01 software



* RUO with Saramis Ver 4.14



C. auris identification is a challenge

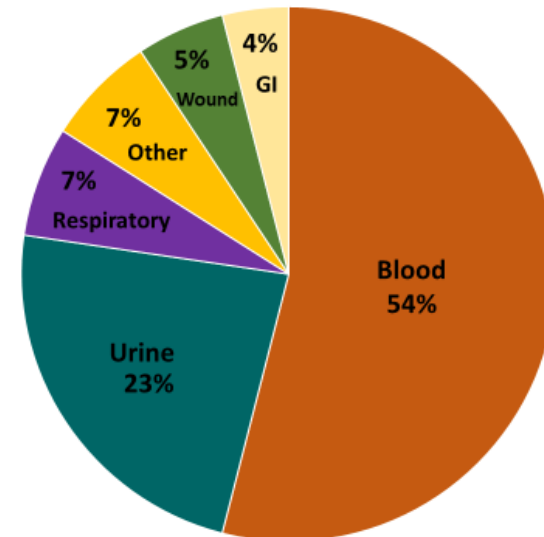
Identification Method	Organism <i>C. auris</i> can be misidentified as
Vitek 2 YST	<i>Candida haemulonii</i> <i>Candida duobushaemulonii</i>
API 20C	<i>Rhodotorula glutinis</i> (characteristic red color not present) <i>Candida sake</i>
BD Phoenix yeast identification system	<i>Candida haemulonii</i> <i>Candida catenulata</i>
MicroScan	<i>Candida famata</i> <i>Candida guilliermondii</i> * <i>Candida lusitaniae</i> * <i>Candida parapsilosis</i> *
RapID Yeast Plus	<i>Candida parapsilosis</i> *

Challenges with identification

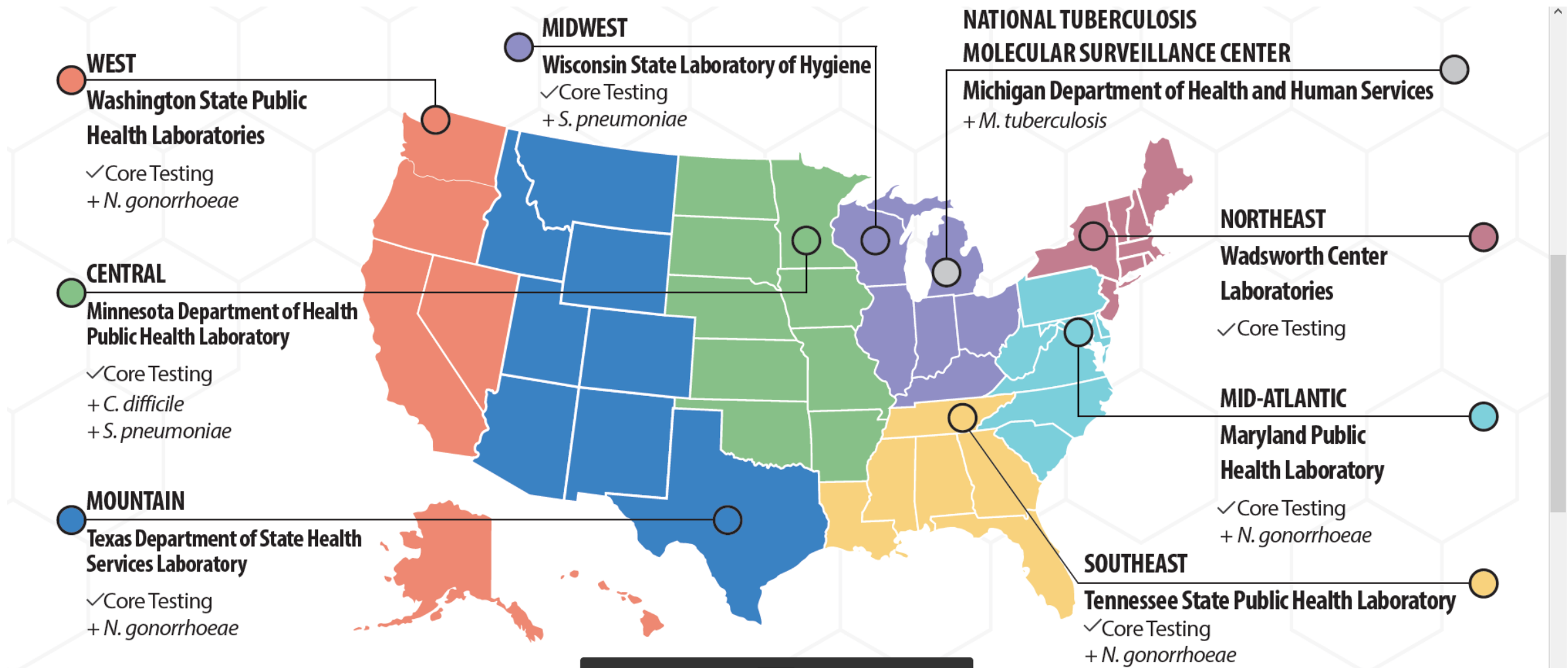
- >40% of clinical cases in the US have been from non-bloodstream isolates (e.g., urine, bile, wounds)
- Species from non-sterile isolates often not identified



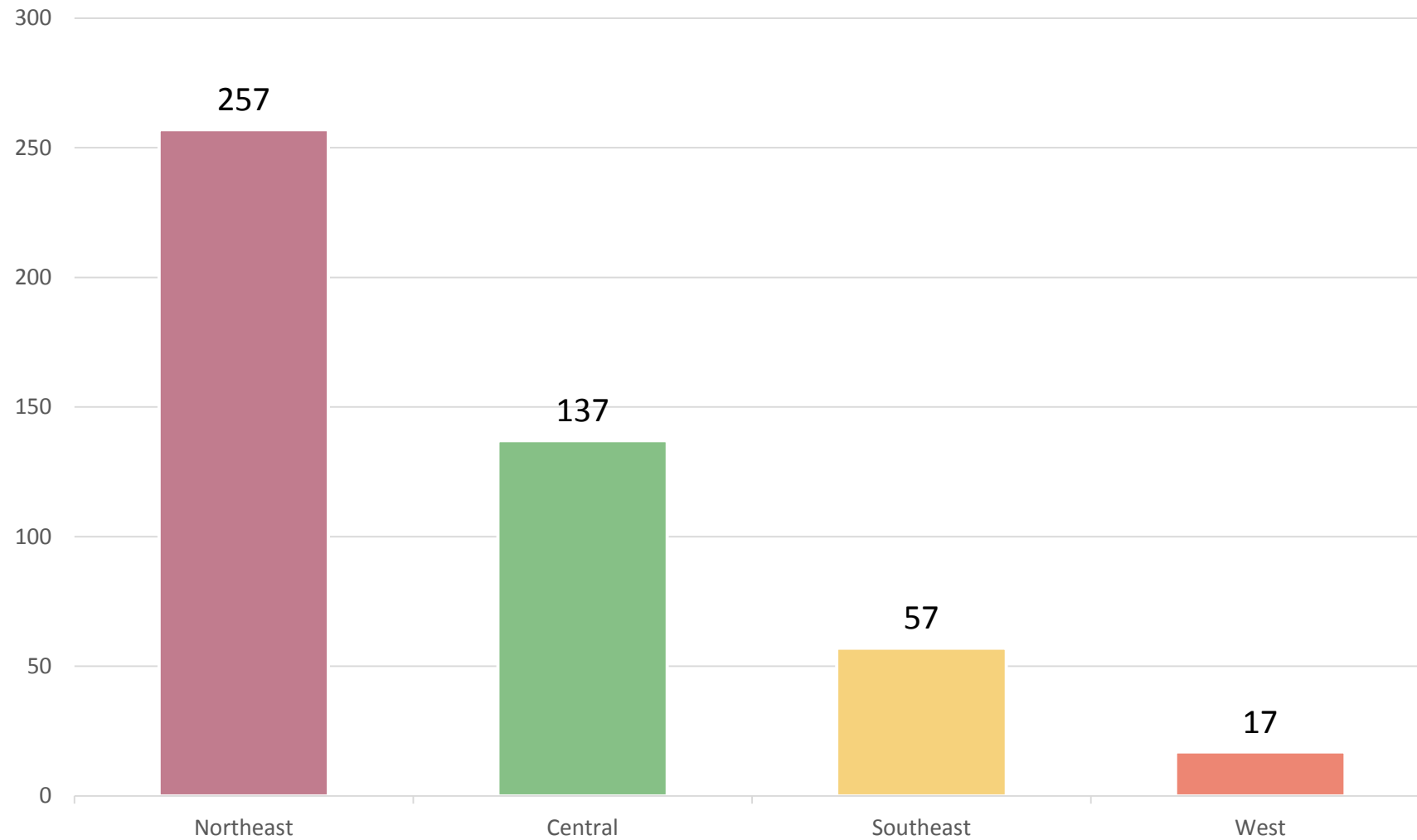
Initial culture site of *C. auris* clinical cases (n = 150)



ARLN Labs – Candida part of CORE

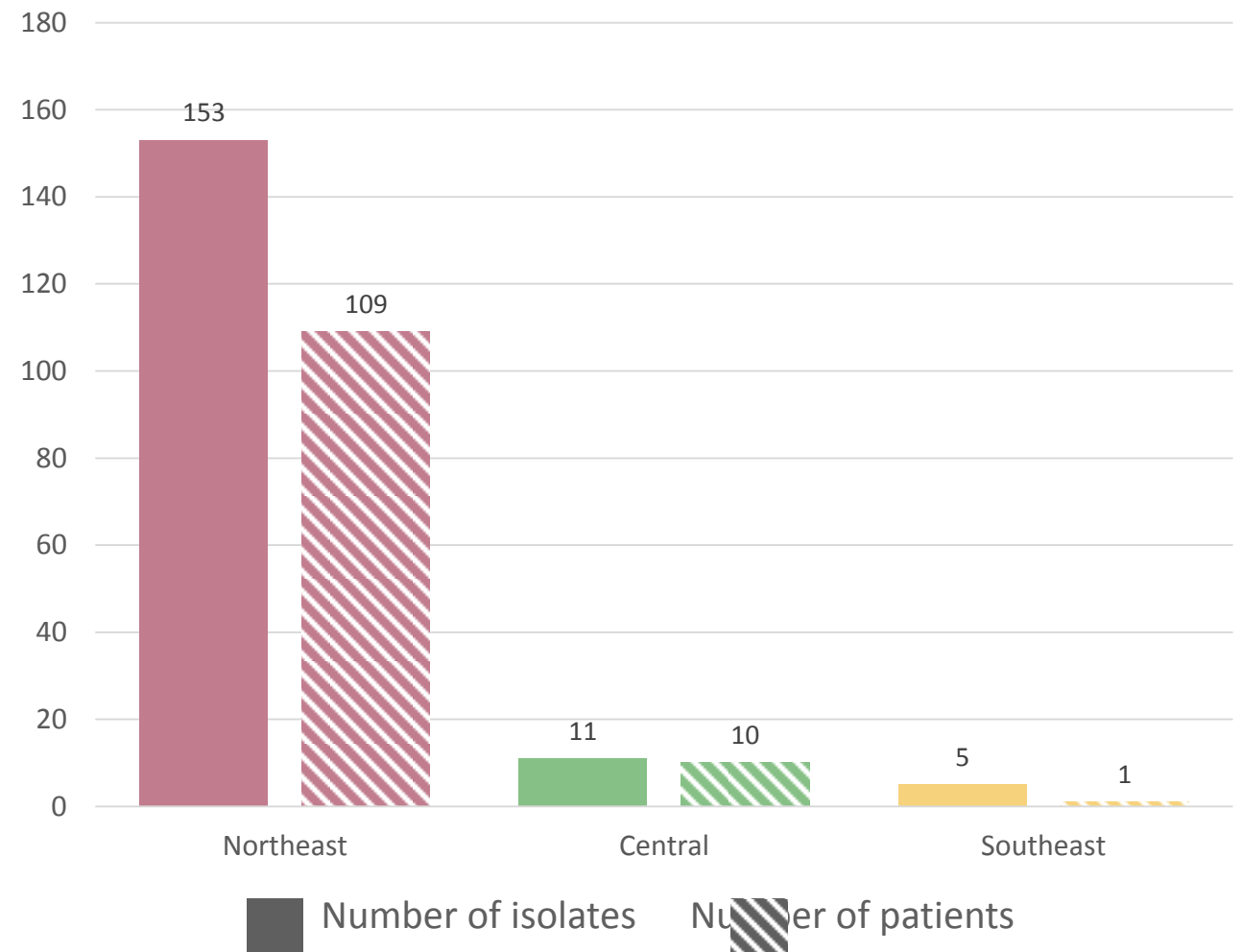


468 isolates tested

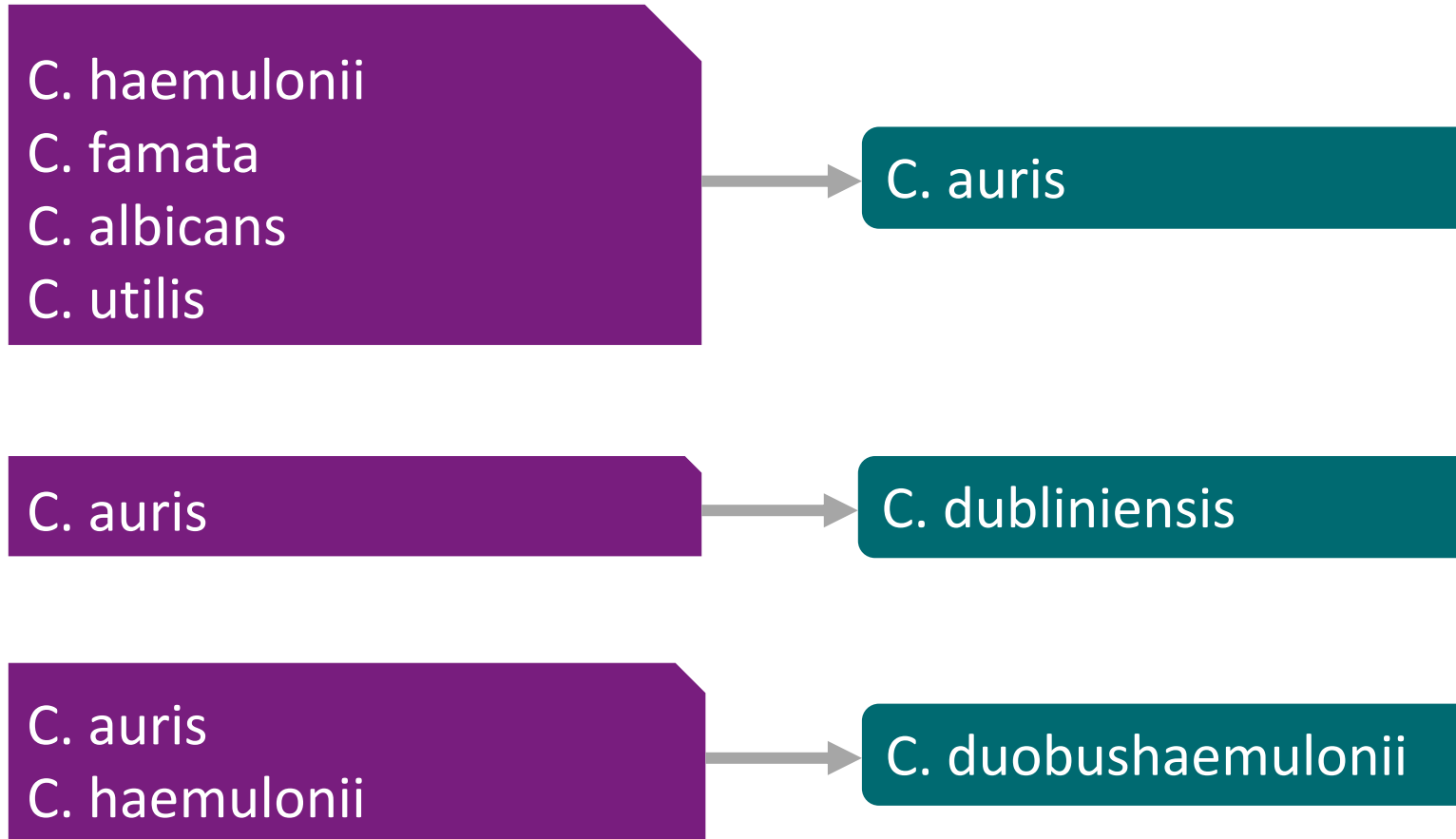


169 isolates confirmed as *C. auris*

- 36% of all isolates
- 95% of all isolates identified as *C. auris* by the submitter
- 120 unique patients



Misidentifications: Clinical lab species by AR Lab Network species – *C. auris*



Species submitted by clinical lab when final identification was *C. auris*

Species identified by clinical lab	n	%
Candida auris	74	44.3
Candida haemulonii	38	22.8
Rule out Candida auris, species not specified	26	15.6
Yeast, not specified	25	15.0
Candida albicans	1	0.6
Candida famata	1	0.6
Candida utilis	1	0.6
Non-albicans Candida	1	0.6

Current guidance on *C. auris* misidentification

Identification Method	Organism <i>C. auris</i> can be misidentified as
Vitek 2 YST	Candida haemulonii Candida duobushaemulonii
API 20C	Rhodotorula glutinis (characteristic red color not present) Candida sake
BD Phoenix	Candida haemulonii Candida catenulata
MicroScan	Candida famata Candida guilliermondii Candida lusitaniae Candida parapsilosis

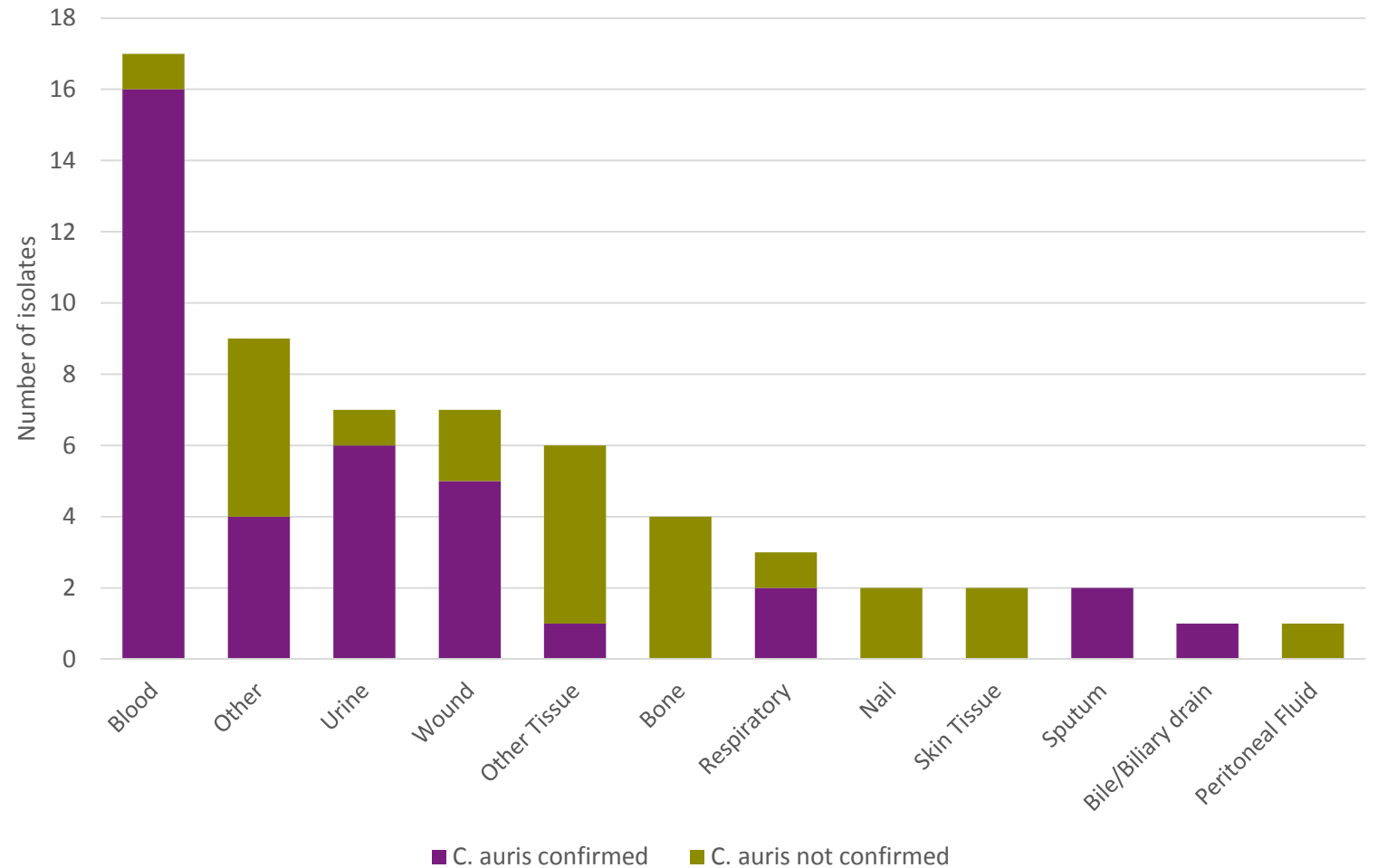
C. haemulonii submissions: final identification

Species identified by AR Lab Network	n	%
<i>Candida auris</i>	38	60.3
<i>Candida haemulonii</i>	12	19.0
<i>Candida duobushaemulonii</i>	11	17.5
<i>Candida lusitanae</i>	1	1.6
<i>Saccharomyces cerevisiae</i>	1	1.6

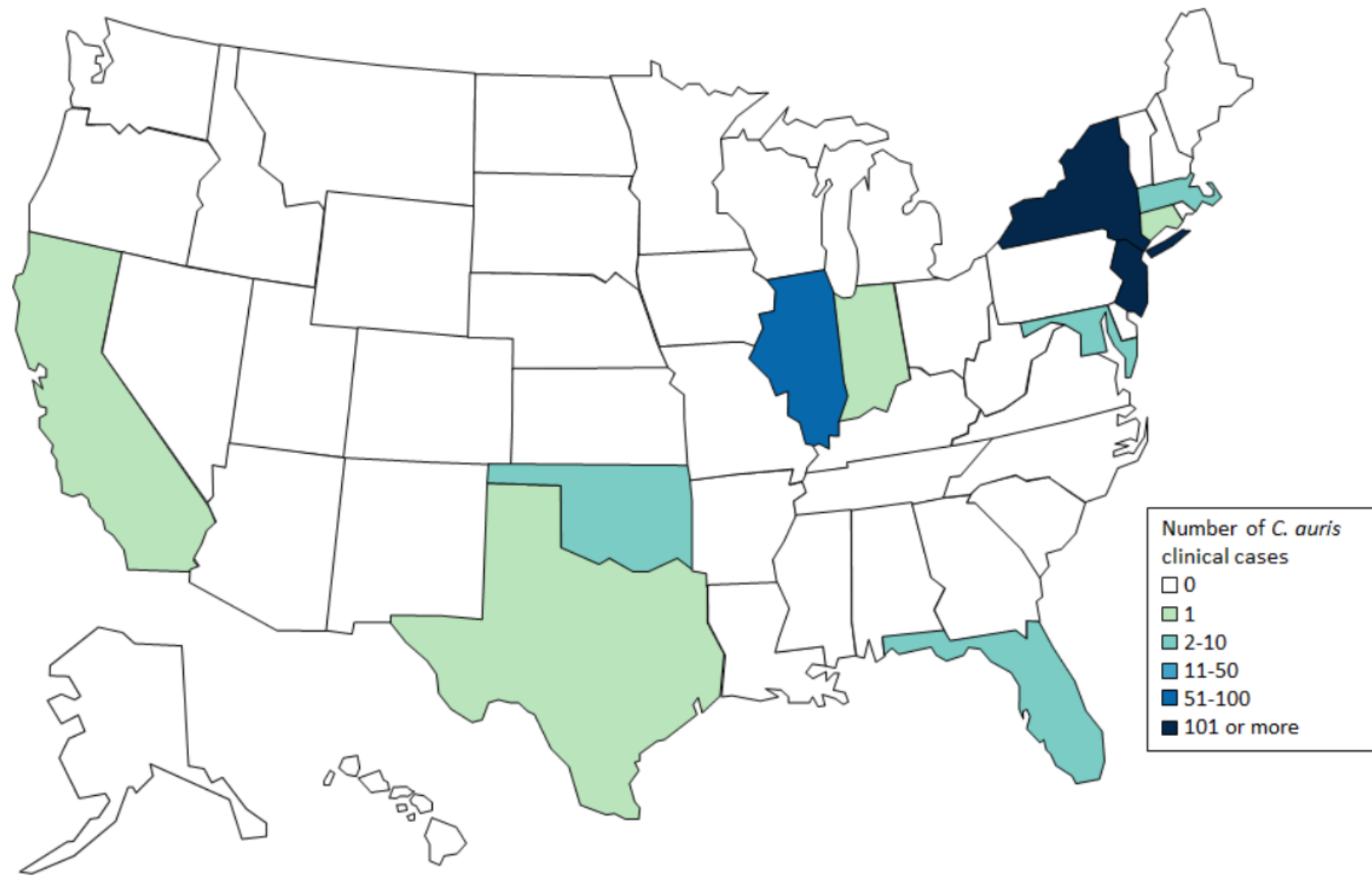
60% of isolates originally identified as *C. haemulonii* by clinical labs were confirmed as *C. auris*

C. haemulonii confirmed as *C. auris* by specimen type

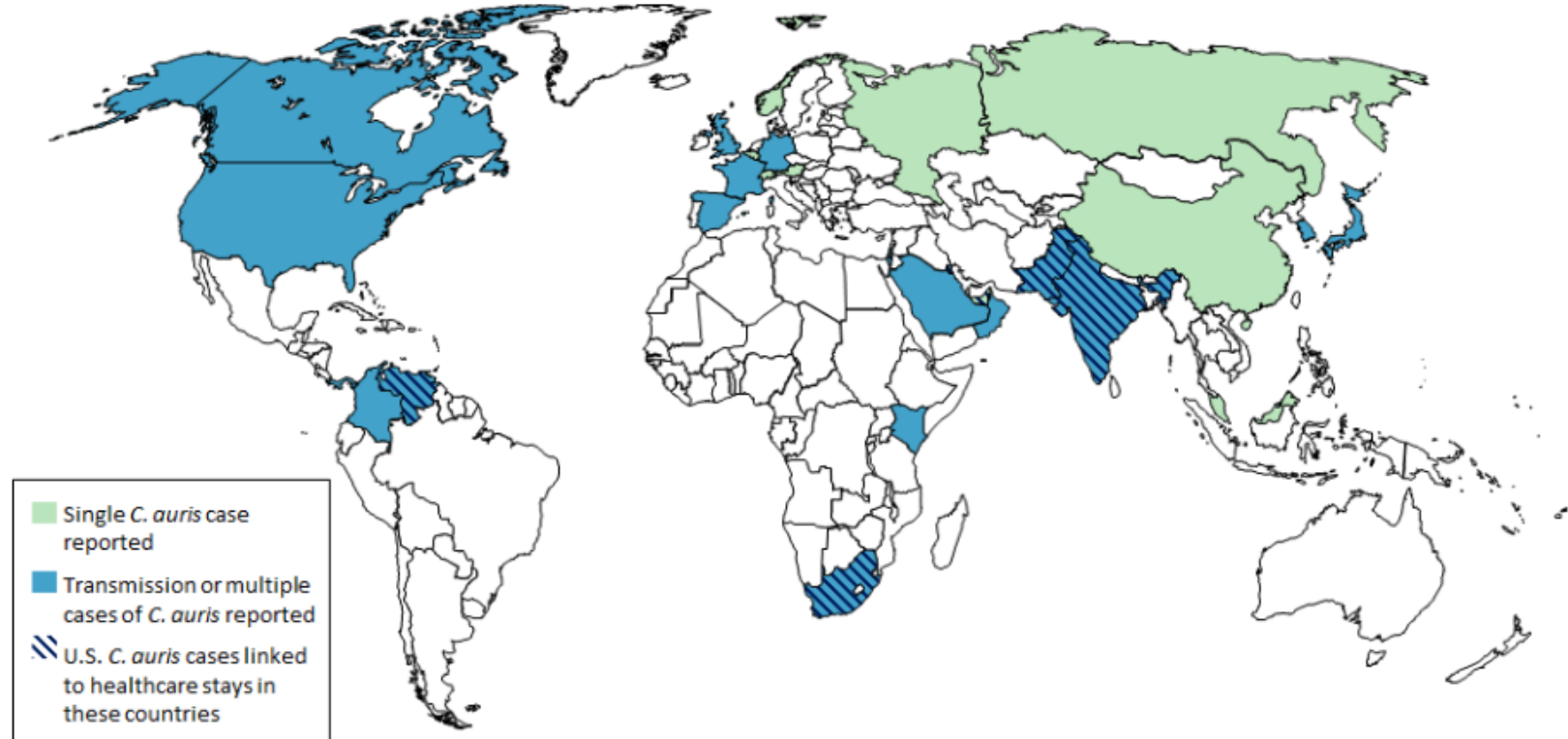
- 94% of blood and 86% of urine *C. haemulonii* isolates were confirmed as *C. auris*
- Note 1 person had 4 *C. auris* positive wound specimens



U.S. Map: Clinical cases of *Candida auris* reported by state, United States, as of July 31, 2018



Countries from which *Candida auris* cases have been reported, as of June 15, 2018



- Single cases of *C. auris* have been reported from Austria, Belgium, China, Malaysia, Norway, Russia, Switzerland, and the United Arab Emirates.
- Multiple cases of *C. auris* have been reported from Canada, Colombia, France, Germany, India, Israel, Japan, Kenya, Kuwait, Oman, Pakistan, Panama, Saudi Arabia, South Africa, South Korea, Spain, the United Kingdom, the United States (primarily from the New York City Area, New Jersey, and the Chicago area) and Venezuela; in some of these countries, extensive transmission of *C. auris* has been documented in more than one hospital.
- U.S. cases of *C. auris* have been found in patients who had recent stays in healthcare facilities in India, Kuwait, Pakistan, South Africa, the United Arab Emirates, and Venezuela, which also have documented transmission.
- Other countries not highlighted on this map may also have undetected or unreported *C. auris* cases.

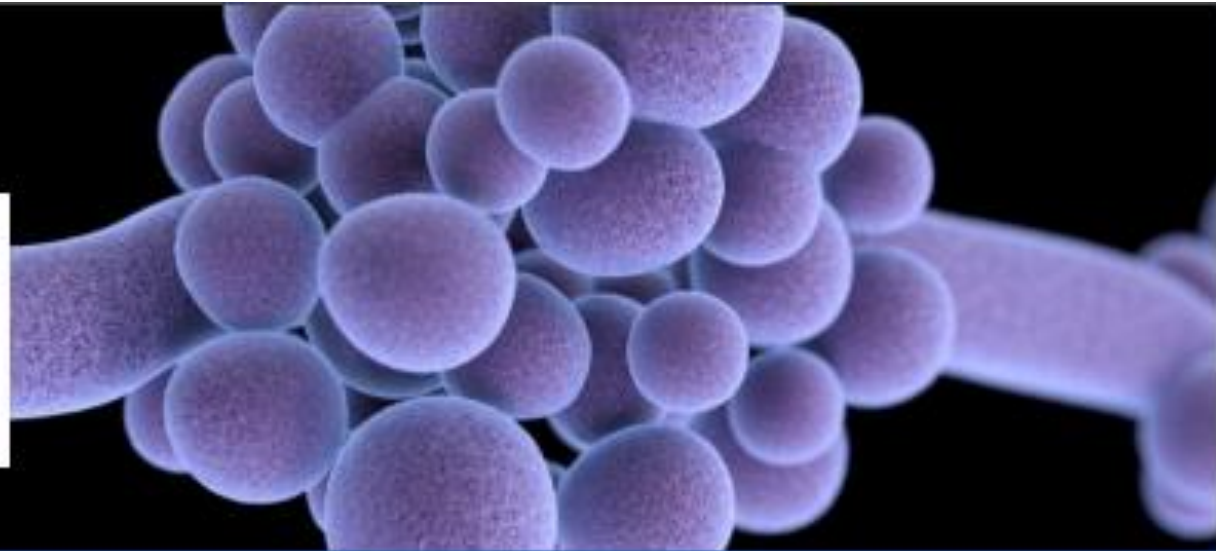


***C. auris* nationally
notifiable as of 2019**

Objectives of the Candida ARLN program

- Track antifungal resistance among *Candida*/yeast species
- Identify emerging resistant species like *Candida auris* and respond to outbreaks

**Send *Candida* Isolates
to Your Public Health Lab**





**Wisconsin State
Laboratory of Hygiene**
UNIVERSITY OF WISCONSIN-MADISON



Candida in Wisconsin

Alana Sterkel, PhD, SM(ASCP)^{CM}

Assistant Director, Communicable Diseases

Wisconsin State Laboratory of Hygiene



C. auris Reporting

- Nationally notifiable in 2019
- Reportable in Wisconsin
 - “Any detection of, or illness caused by, an agent that is foreign, exotic or unusual to Wisconsin, and that has public health implications”- WDHS

<https://www.dhs.wisconsin.gov/disease/diseasereporting.htm>

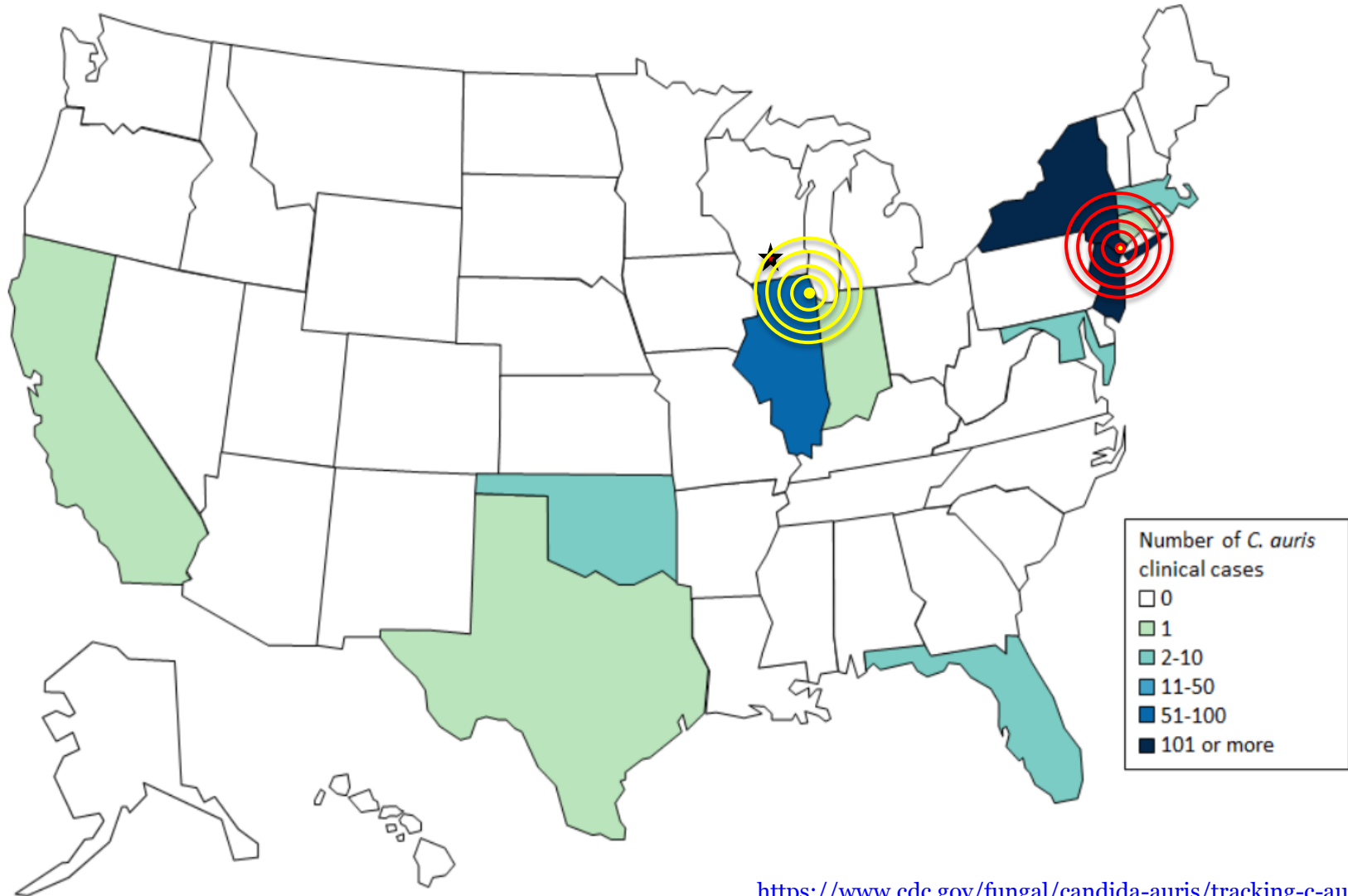


Has *C. auris* spread to WI?

- One isolate has been identified from a patient in Wisconsin to date
- The patient was highly suspected and had transferred from a Chicago health care facility
- Currently, no documented cases of transmission in Wisconsin



U.S. Map: Clinical cases of *Candida auris* reported by state, United States, as of July 31, 2018

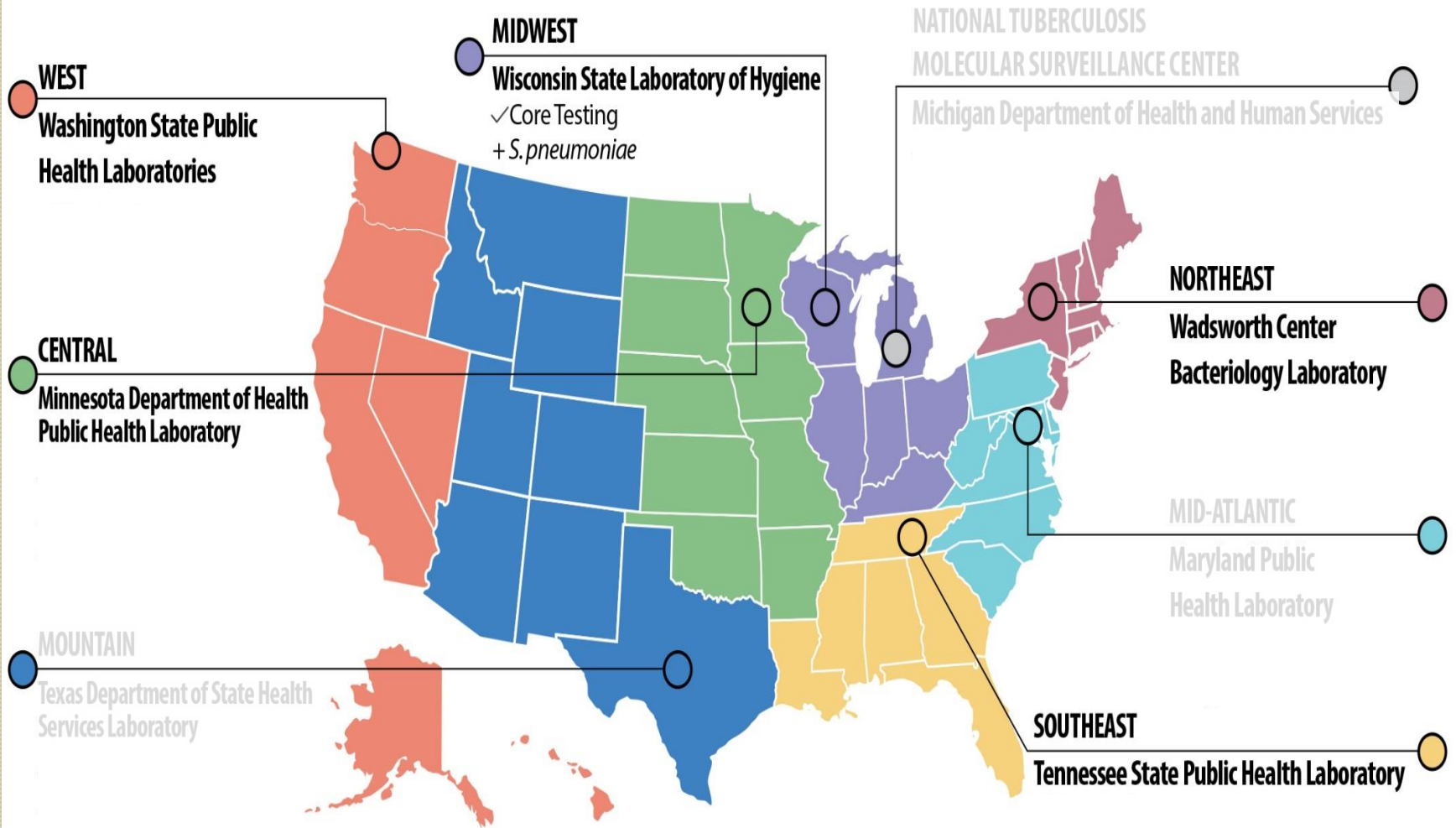


<https://www.cdc.gov/fungal/candida-auris/tracking-c-auris.html>



ARLN Labs

(Antimicrobial Resistance Laboratory Network)





New Testing at WSLH

- Fungal Characterization
- Antifungal Susceptibility Testing
- *Candida auris* Colonization Screening



Fungal Characterization

- Bruker MALDI-TOF with the RUO library and MicrobeNet <https://microbenet.cdc.gov/>
- Challenging isolates will be sent to the CDC for molecular analysis

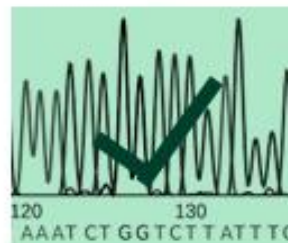
Candida auris is difficult to identify



* Ver 5.01 software

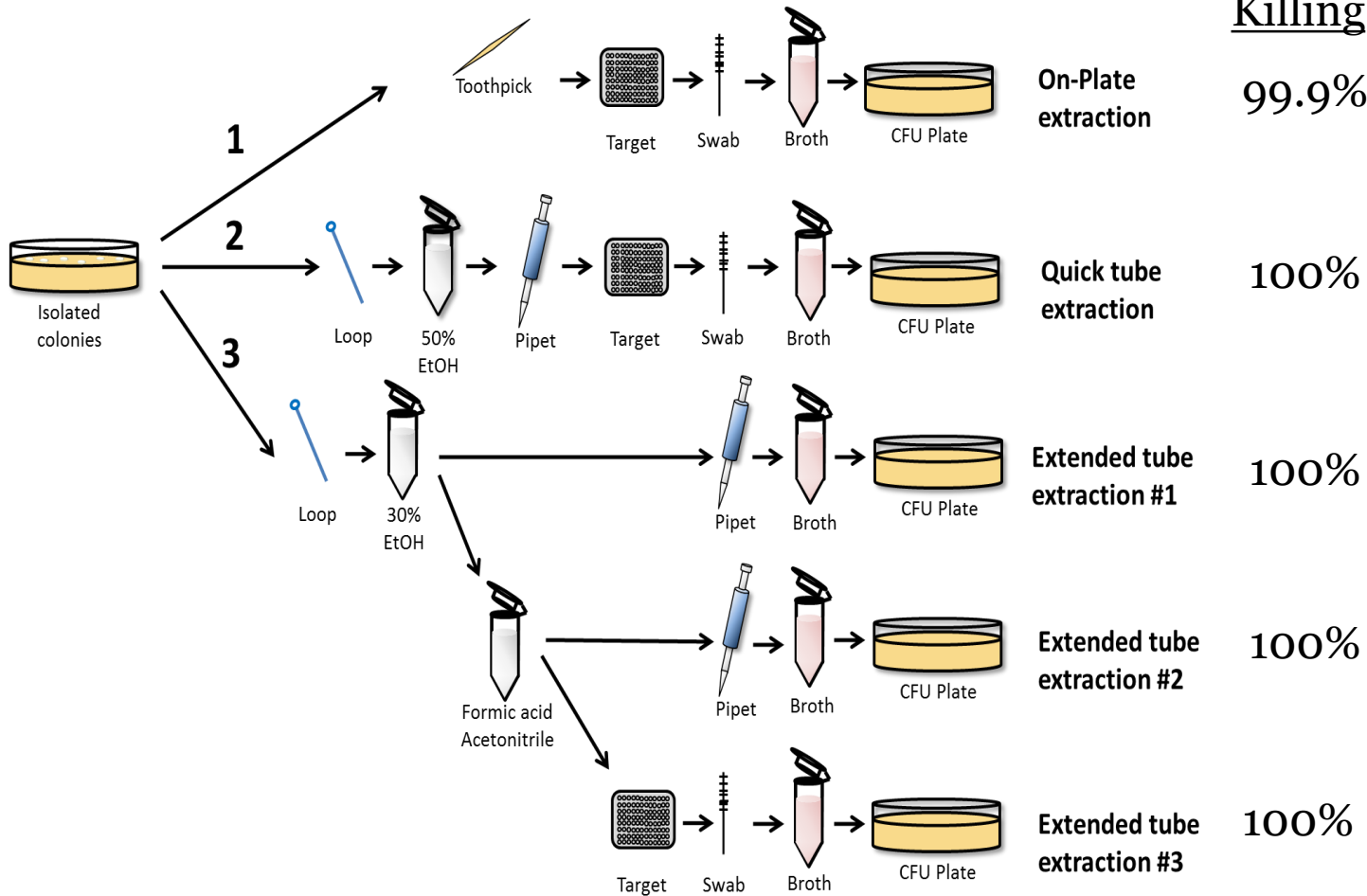


* RUO with Saramis Ver 4.14





Is *C. auris* safe to test on MALDI?



<https://jcm.asm.org/content/early/2018/06/21/JCM.00886-18>



Antifungal Susceptibility Testing

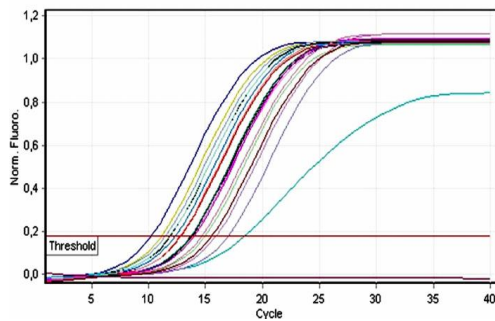
- Microbroth dilution plates made for the ARLN and Etest
- Not FDA approved, validated by WSLH
- Testing for surveillance purposes
- Results available on request (MIC)
 - Micafungin, Caspofungin, Anidulafungin, Fluconazole, Voriconazole, Posaconazole, Itraconazole, Isavuconazole, Amphotericin B



Candida auris Colonization Screening WSLH Testing

- Culture based testing currently available
 - TAT: 5-14 days
- PCR test being validated
 - TAT: 2-4 days

Quantitation data for Cycling A.Orange

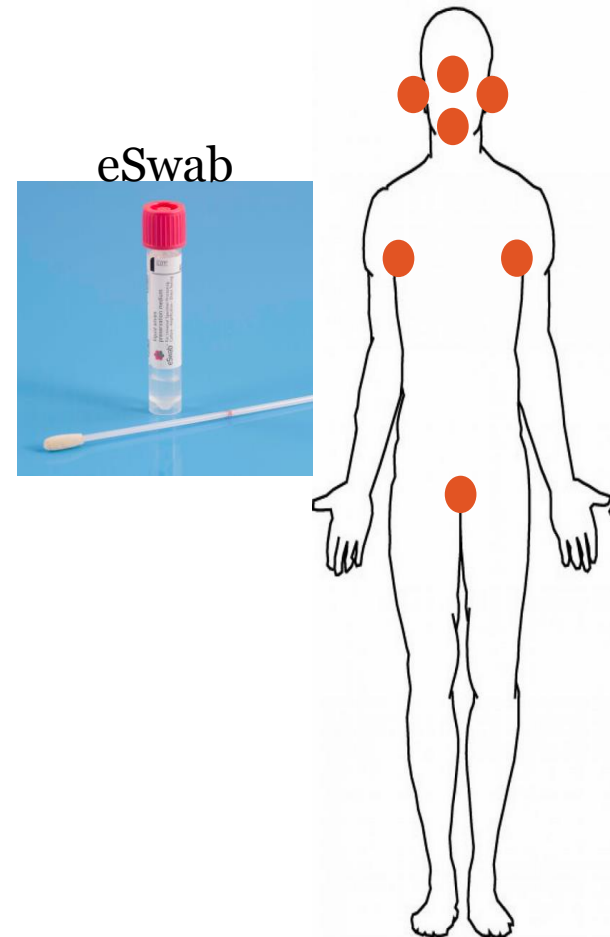




Candida auris Colonization Screening

What to swab

- Most sensitive (>90%) and cost-effective swab: axilla and groin
- Patients remain persistently colonized
- No environmental testing at this time





Candida auris Colonization Screening

When to screen

- Contact tracing around a newly identified case
- Point prevalence surveys in places with some documented transmission
- Admission screening
- Screening of patients with history of healthcare abroad
- Screening of patients in long-term care facilities, especially those with CP-CRE and other MDROs



Goals of testing

1. Aid clinical labs in identification of *C. auris* to help guide treatment, isolation, and patient management decisions
2. Track the spread of *C. auris* to help control the spread by focusing resources
3. Track antifungal resistance in *C. auris* and other *Candida* to inform on treatment decisions, testing, and drug development
4. Perform surveillance to identify the “next *C. auris*” among *Candida*



Please Send Isolates

1. All *Candida auris* isolates
 - Any body site, confirmed or suspected
2. Unusual *Candida* species
 - Any species other than *C. albicans*, *C. parapsilosis*, *C. dubliniensis*, *C. lusitaniae*, *C. tropicalis*, or *C. krusei*
 - *Candida* species that are unable to be identified after a validated method was attempted
3. Multi-drug resistant *Candida* isolates of any species
 - Resistant to 2 or more classes of antifungals
4. *C. glabrata* isolates from invasive, normally sterile sites
 - Include serial *C. glabrata* isolates from patients receiving antifungal treatment over time



How to send samples

- Ship to the WSLH free of charge using our GoldCross Courier
- We will accept taped SDA, BHI, chocolate, and blood agar plates or slants.
- Customer service 1-800-862-1013



Resources

CDC- *C. auris*

<https://www.cdc.gov/fungal/candida-auris/index.html>

Wisconsin Department of Health Services- Disease reporting

<https://www.dhs.wisconsin.gov/disease/diseasereporting.htm>

Wisconsin State Laboratory of Hygiene

Customer service 1-800-862-1013

Viability of *Candida auris* and other *Candida* species after various MALDI-TOF extraction protocols

<https://jcm.asm.org/content/early/2018/06/21/JCM.00886-18>

MicrobeNet

<https://microbenet.cdc.gov/>