


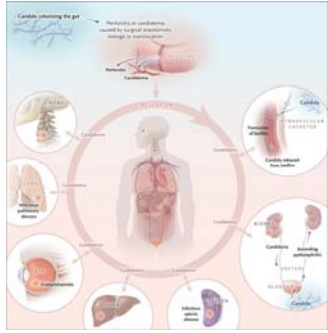
National Center for Emerging and Zoonotic Infectious Diseases



## AR Lab Network Candida Testing

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Medical Epidemiologist  
Centers for Disease Control and Prevention

## Invasive Candidiasis



Candida entering the gut  
Particulate candida are used for fungal attachment  
Candida survival in the bloodstream  
Candida spreading to various organs

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

*Candida species*

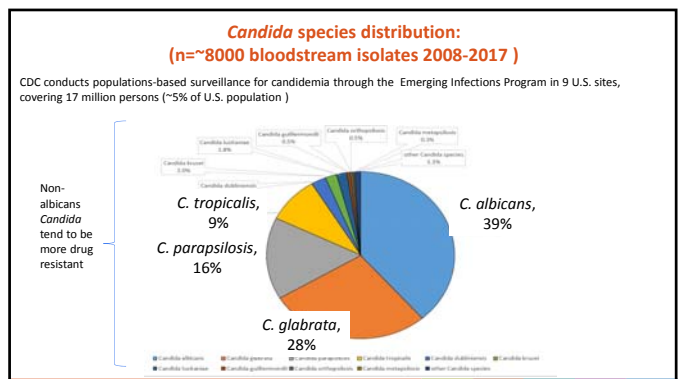
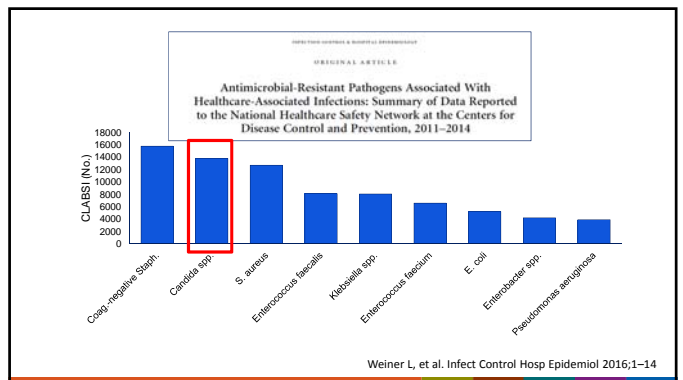


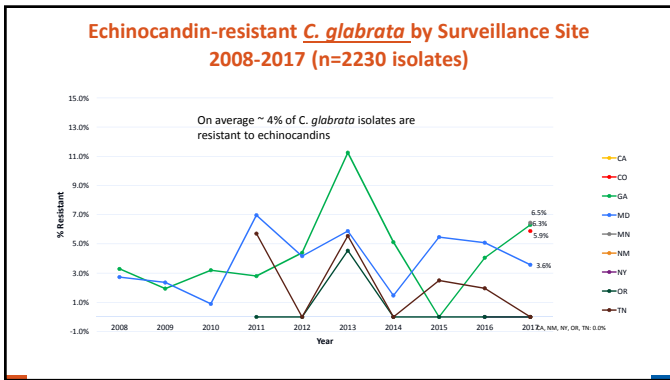
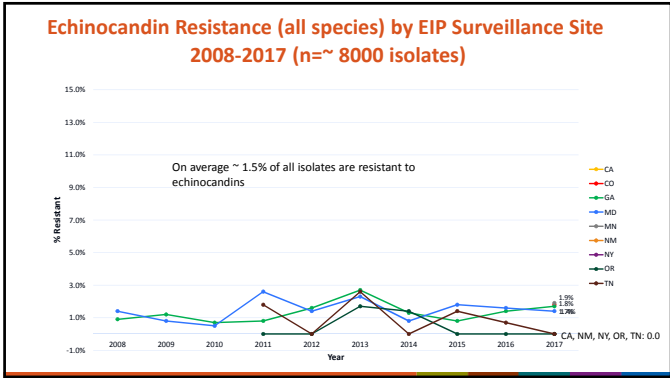
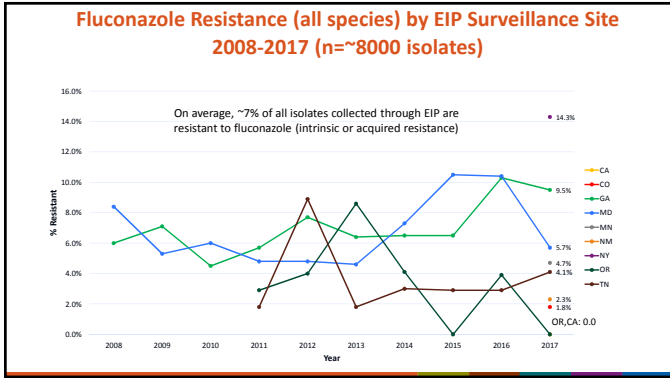
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**ORIGINAL ARTICLE**  
Multistate Point-Prevalence Survey of Health Care-Associated Infections

Shelley S. Magill, M.D., Ph.D., Jonathan R. Edwards, M.Stat., Wendy Berthel, M.D., Zina O. Beidas, M.S., Charles D'Amico, M.D., Sharon A. Kainer, M.D., M.P.H., Ruth Lyfield, M.D., Meghan Saloner, M.P.H., Laura Kluddeker-Hoffel, M.P.H., Joella 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. Fackler, 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: 10.1093/NEJM/ata130801

Magill S, et al. NEJM, 2014; 370: 1198-1208





- ### 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

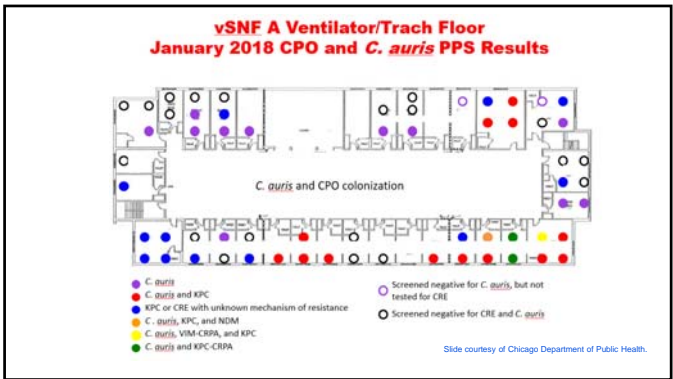
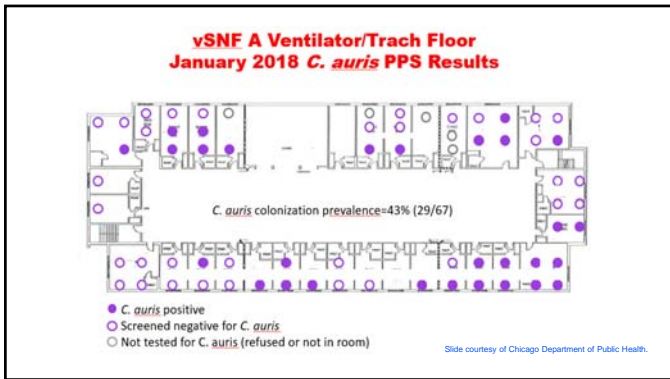
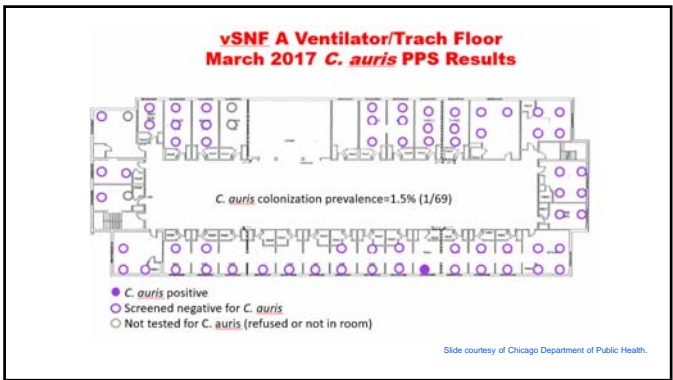
### Causes invasive infections

- 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

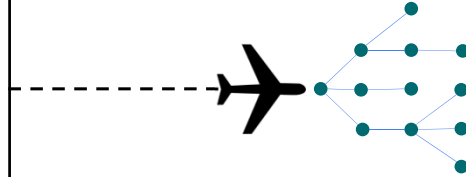



**C. auris persists in the environment**

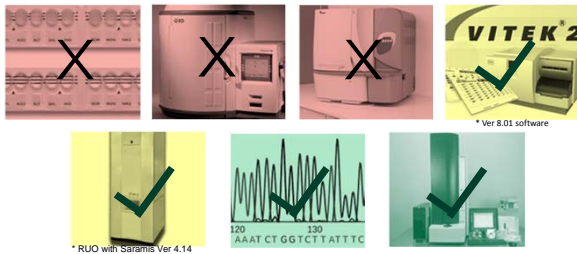


**Healthcare abroad is risk factor for C. auris**

- 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**

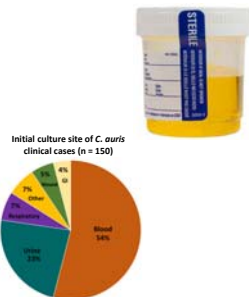


**C. auris identification is a challenge**

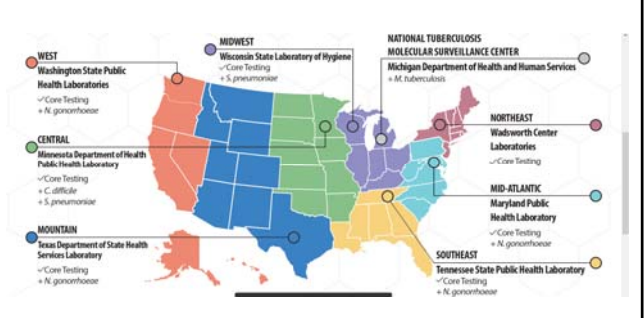
Identification Method	Organism <i>C. auris</i> can be misidentified as
Vitek 2 YST	<i>Candida haemulonii</i> <i>Candida duobushaemulonii</i>
API 20C	<i>Rhodotorula glutinis</i> (characteristic red color not present) <i>Candida sake</i>
BD Phoenix yeast identification system	<i>Candida haemulonii</i>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

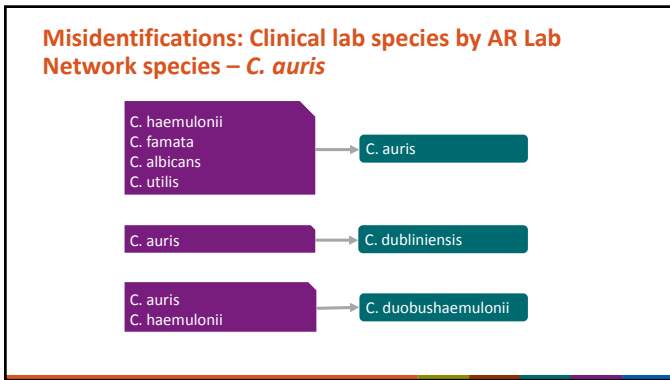
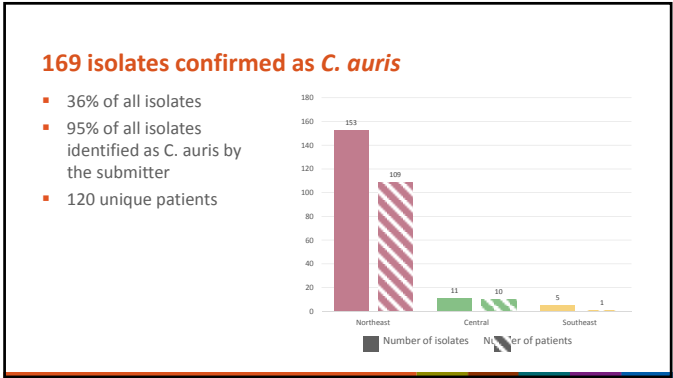
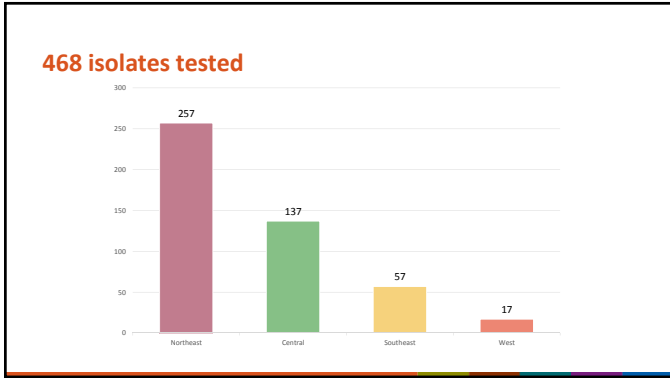
**Challenges with identification**

- >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



**ARLN Labs – Candida part of CORE**





### 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
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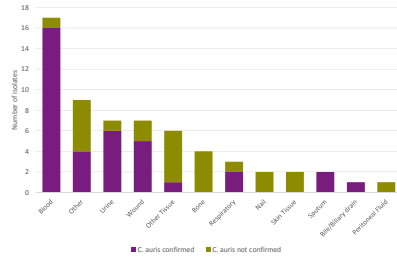
### *C. haemulonii* submissions: final identification

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

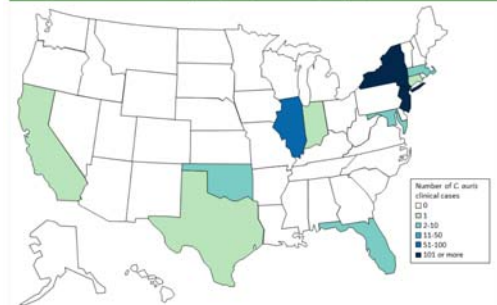
60% of isolates originally identified as *C. haemulonii* by clinical labs were confirmed as *C. auris*

**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

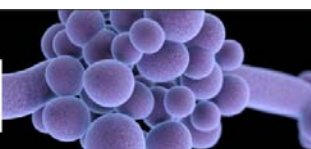


**C. auris nationally notifiable as of 2019**

**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)<sup>CM</sup>  
 Assistant Director, Communicable Diseases  
 Wisconsin State Laboratory of Hygiene

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### 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

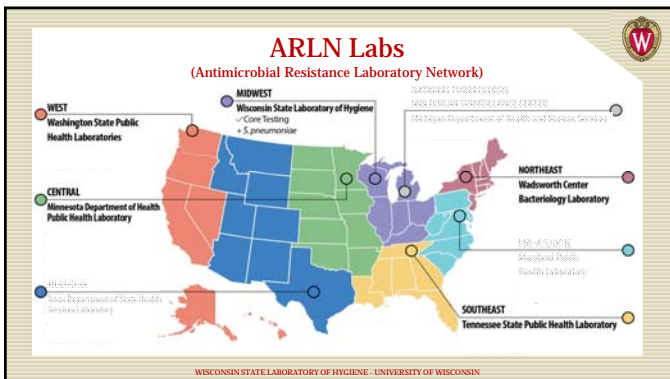
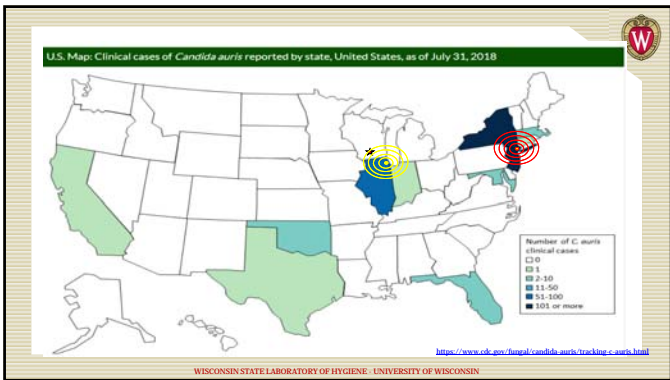
<https://www.dhs.wisconsin.gov/disease/diseasereporting.htm>

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### 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

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### New Testing at WSLH

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

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### Fungal Characterization

- Bruker MALDI-TOF with the RUO library and MicrobeNet
- Challenging isolates will be sent to the CDC for molecular analysis

**Candida auris is difficult to identify**

\* RUO with GeneSight Ver 4.14  
AAATKCGGCTATATTC  
<https://microbenet.cdc.gov/>

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

Method	Killing
On-Plate extraction	99.9%
Quick tube extraction	100%
Extended tube extraction #1	100%
Extended tube extraction #2	100%
Extended tube extraction #3	100%

<https://jcm.asm.org/content/early/2018/06/21/JCM.00886.18>

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### 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

### *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

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### *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

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## 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*

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## 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. lusitanae*, *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

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## 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.00580-18>

MicrobeNet

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

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