

Candida auris: The Emergence of a Fungal Superbug

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CSTE Webinar

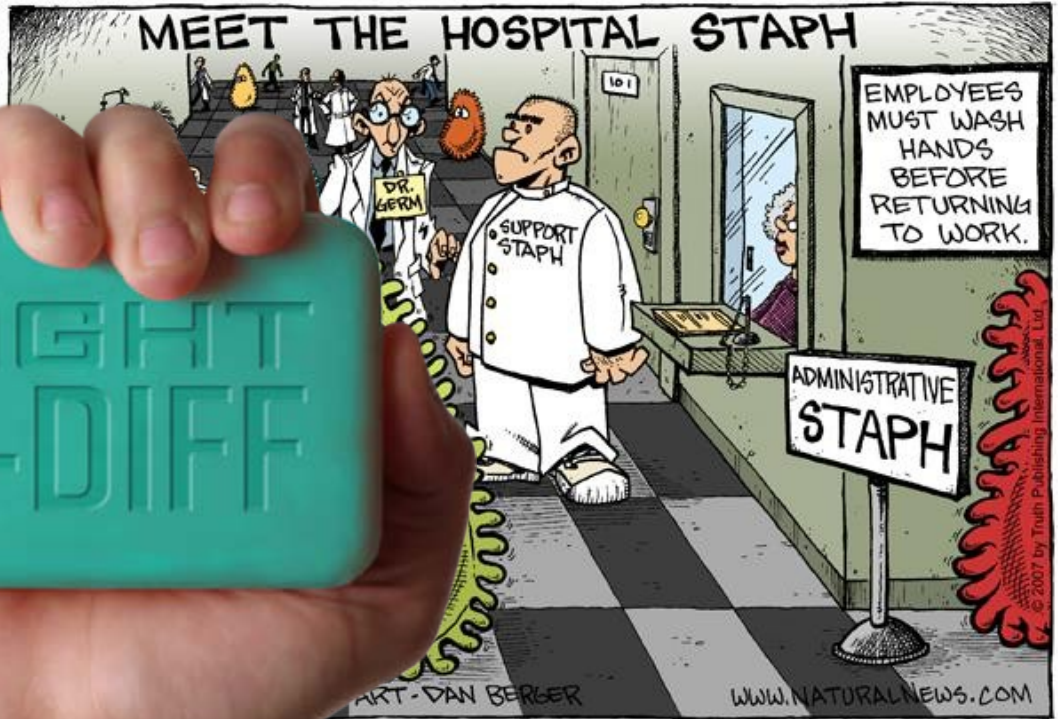
July 24, 2017



What the public thinks



COUNTERTHINK



What the healthcare professionals think



THERE'S A FUNGUS
AMONG US.

April 14th 2021

Fungi can cause serious invasive infections

- **Candidemia**

Most common healthcare-associated BSI in a recent US point prevalence study

- Incidence of 5-15/100,000
- 30-50% mortality



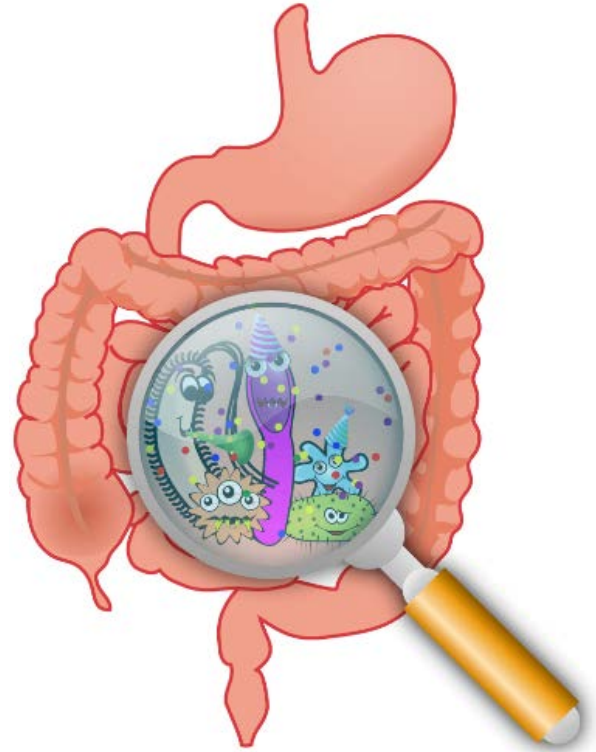
Risk Factors for Candidemia (“the other *C. diff*”)

- Broad-spectrum antibiotic use
- Immune compromise
- Prolonged ICU stay
- Abdominal surgery
- Central lines

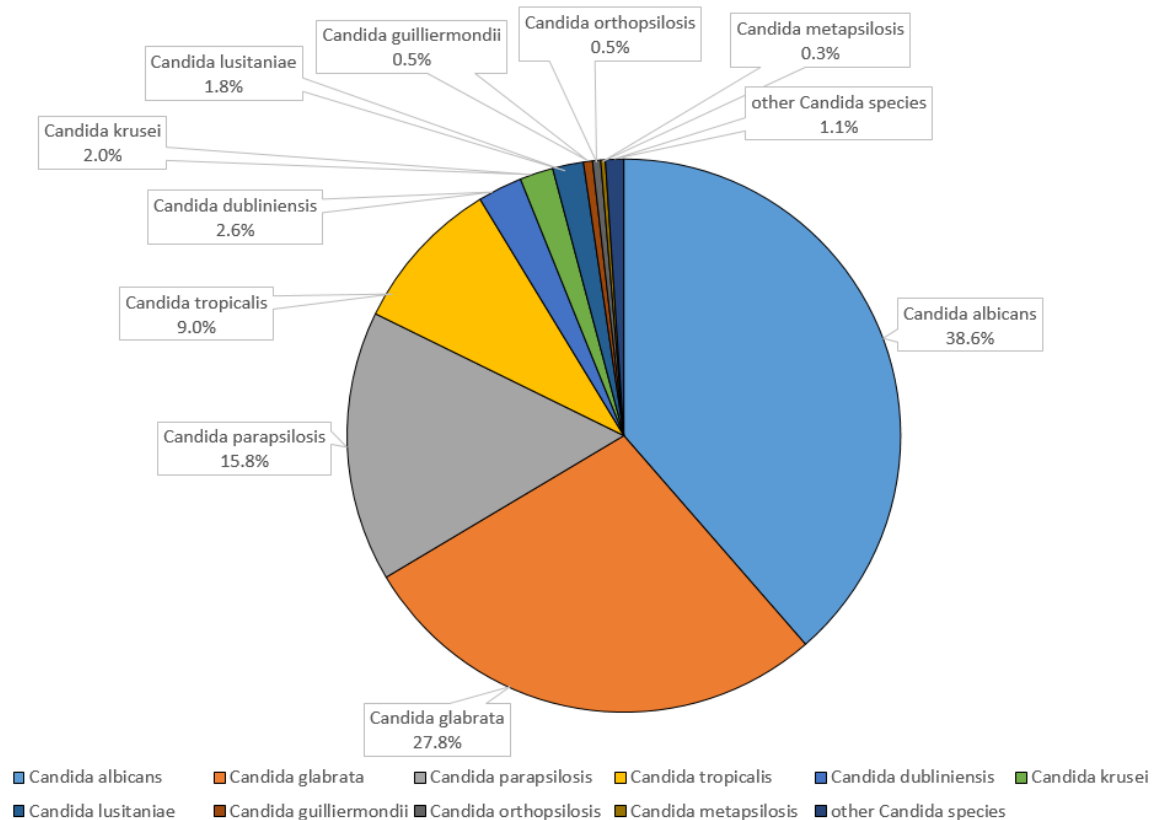


Source of infection

- **Conventional wisdom:**
autoinfection with host gut flora
- Transmission in hospital environments not thought to be common
- Outbreaks rare



Candida species distribution, EIP Surveillance, U.S. 2008-2016 (n=~7000 isolates)





**Why Do We Care About an Obscure
Candida Species called *C. auris*?**

Discovery of *C. auris*—2009

ORIGINAL ARTICLE

***Candida auris* sp. nov., a novel ascomycetous yeast isolated from the external ear canal of an inpatient in a Japanese hospital**

Kazuo Satoh^{1,2}, Koichi Makimura^{1,3}, Yayoi Hasumi¹, Yayoi Nishiyama¹, Katsuhisa Uchida¹ and Hideyo Yamaguchi¹

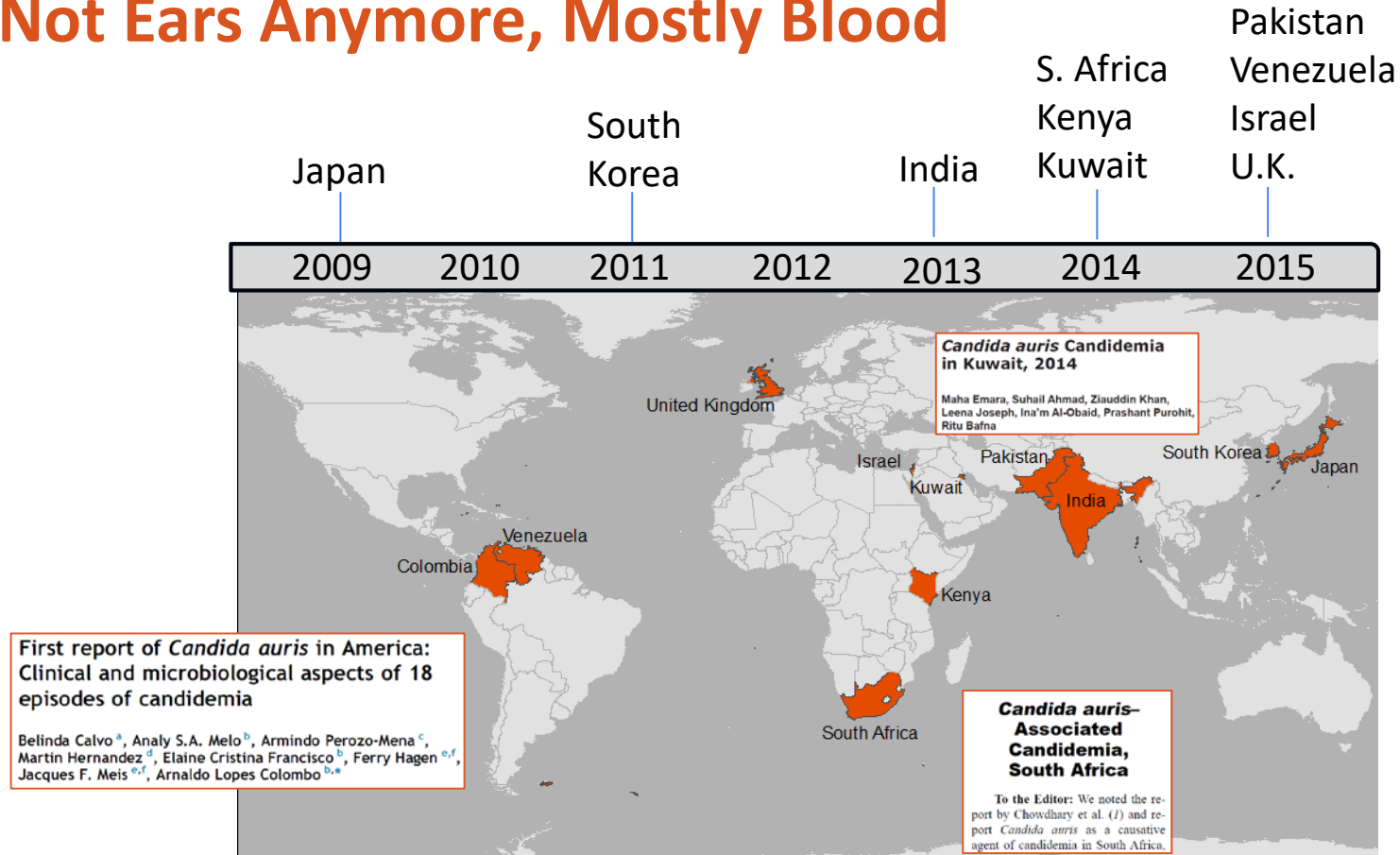
¹Teikyo University Institute of Medical Mycology, 359 Otsuka, Hachioji, Tokyo 192-0395, ²Japan Health Sciences Foundation, 13-4 Nihonbashi-Kodenmacho, Chuo-ku, Tokyo 103-0001 and ³Genome Research Center, Graduate School of Medicine and Faculty of Medicine, Teikyo University, Otsuka 359, Hachioji, Tokyo 192-0395, Japan

Auris is Latin for ear



Rapid Emergence Since 2009

Not Ears Anymore, Mostly Blood



Multidrug Resistant *Candida auris*

Polyenes



Azoles



Echinocandins



- A few resistant to all three classes

Healthy Skepticism

- Was *C. auris* with us all along?
- Maybe newer diagnostic methods responsible for supposed emergence
 - MALDI-TOF
 - DNA sequencing
- Most systems misidentify as *Candida haemulonii* or other species

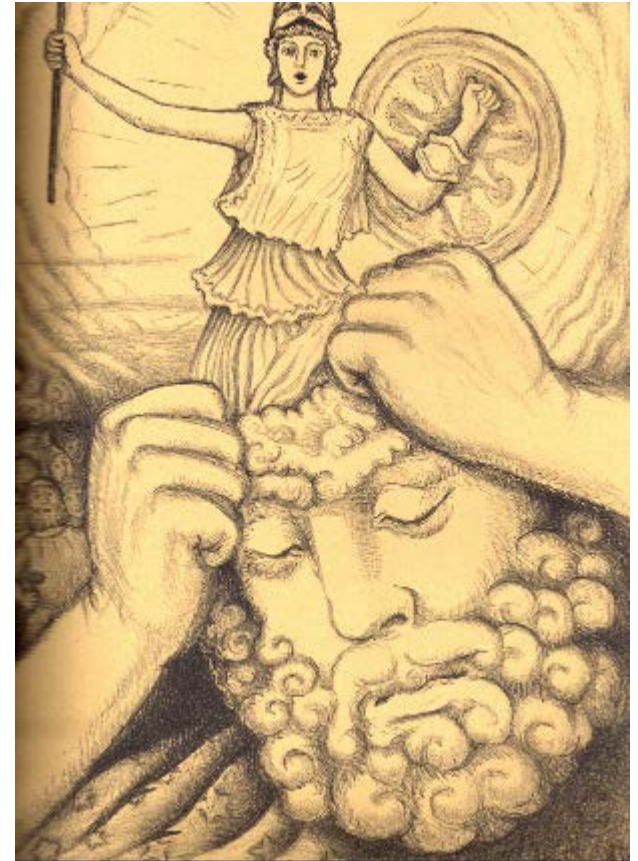


Not Just Improved Detection

- EIP Candidemia Surveillance Program
 - >7000 *Candida* isolates collected in U.S. 2008 –2016
 - No *C. auris*
- SENTRY and ARTEMIS programs (private collections from 4 continents)
 - >30,000 *Candida* isolates from 1996-2015
 - No *C. auris* before 2009
- Earliest known isolate of *C. auris* has been recorded in S. Korea in 1996

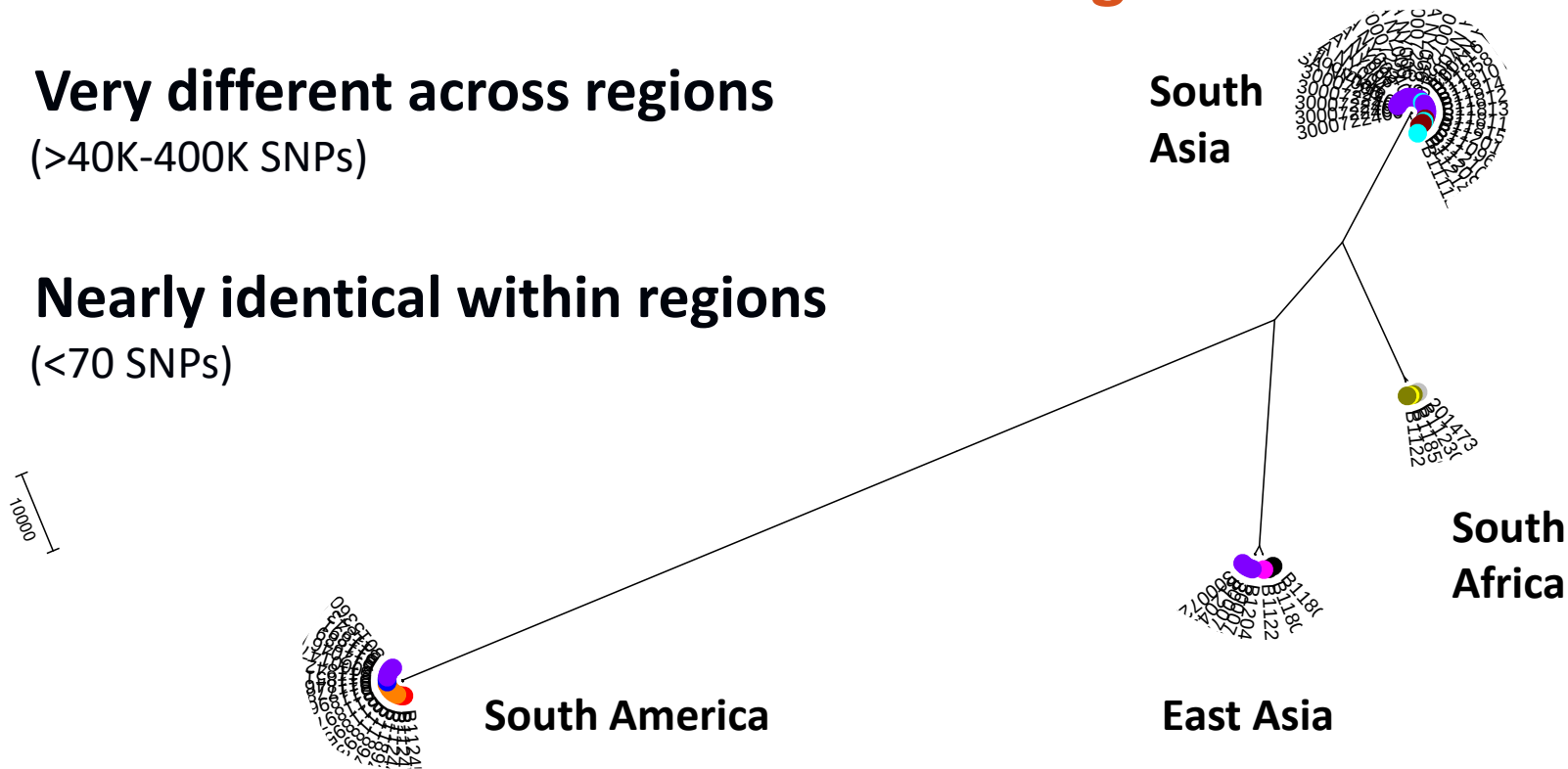
How Did *C. auris* Emerge?

- Global spread of single epidemic strain? (e.g., through food or medical product)
- Many introductions from the environment or other sources?
- Whole-genome sequencing (WGS) provides remarkable but puzzling results



WGS of 47 isolates from 4 world regions

- **Very different across regions**
(>40K-400K SNPs)
- **Nearly identical within regions**
(<70 SNPs)



But This Really Got Our Attention...

- *C. auris* outbreak in a UK hospital
- 9 *C. auris* bloodstream infections
- >40 people colonized
- Clear patient-to-patient transmission



Hard to Control

- Contact precautions
- Screening for colonization
- Chlorhexidine bathing
- Cleaning room with bleach 3X/day
- Terminal cleaning with higher concentration bleach
- Eventually closed unit



C. auris cultured from many hospital surfaces

CDC Clinical Alert to Healthcare Facilities – June 2016

Fungal Diseases

Fungal Diseases	
Types of Fungal Diseases	–
Aspergillosis	+
Blastomycosis	+
Candidiasis	–
Oropharyngeal / Esophageal Candidiasis	
Genital / vulvovaginal candidiasis	
Invasive candidiasis	
<i>Candida auris</i> Q&A	
<i>Candida auris</i> Alert	
Coccidioidomycosis	+
<i>C. neoformans</i> Infection	+
<i>C. gattii</i> Infection	+
Fungal Eye Infections	+

[CDC](#) > [Fungal Diseases](#) > [Types of Fungal Diseases](#) > [Candidiasis](#)

Clinical Alert to U.S. Healthcare Facilities



Global Emergence of Invasive Infections Caused by the Multidrug-Resistant Yeast *Candida auris*

Summary: The Centers for Disease Control and Prevention (CDC) has received reports from international healthcare facilities that *Candida auris*, an emerging multidrug-resistant (MDR) yeast, is causing invasive healthcare-associated infections with high mortality. Some strains of *C. auris* have elevated minimum inhibitory concentrations (MICs) to the three major classes of antifungals, severely limiting treatment options. *C. auris* requires specialized methods for identification and could be misidentified as another yeast when relying on traditional biochemical methods. CDC is aware of one isolate of *C. auris* that was detected in the United States in 2013 as part of ongoing surveillance. Experience outside the United States suggests that *C. auris* has high potential to cause outbreaks in healthcare facilities. Given the occurrence of *C. auris* in nine countries on four continents since 2009, CDC is alerting U.S. healthcare facilities to be on the lookout for *C. auris* in patients.

Background

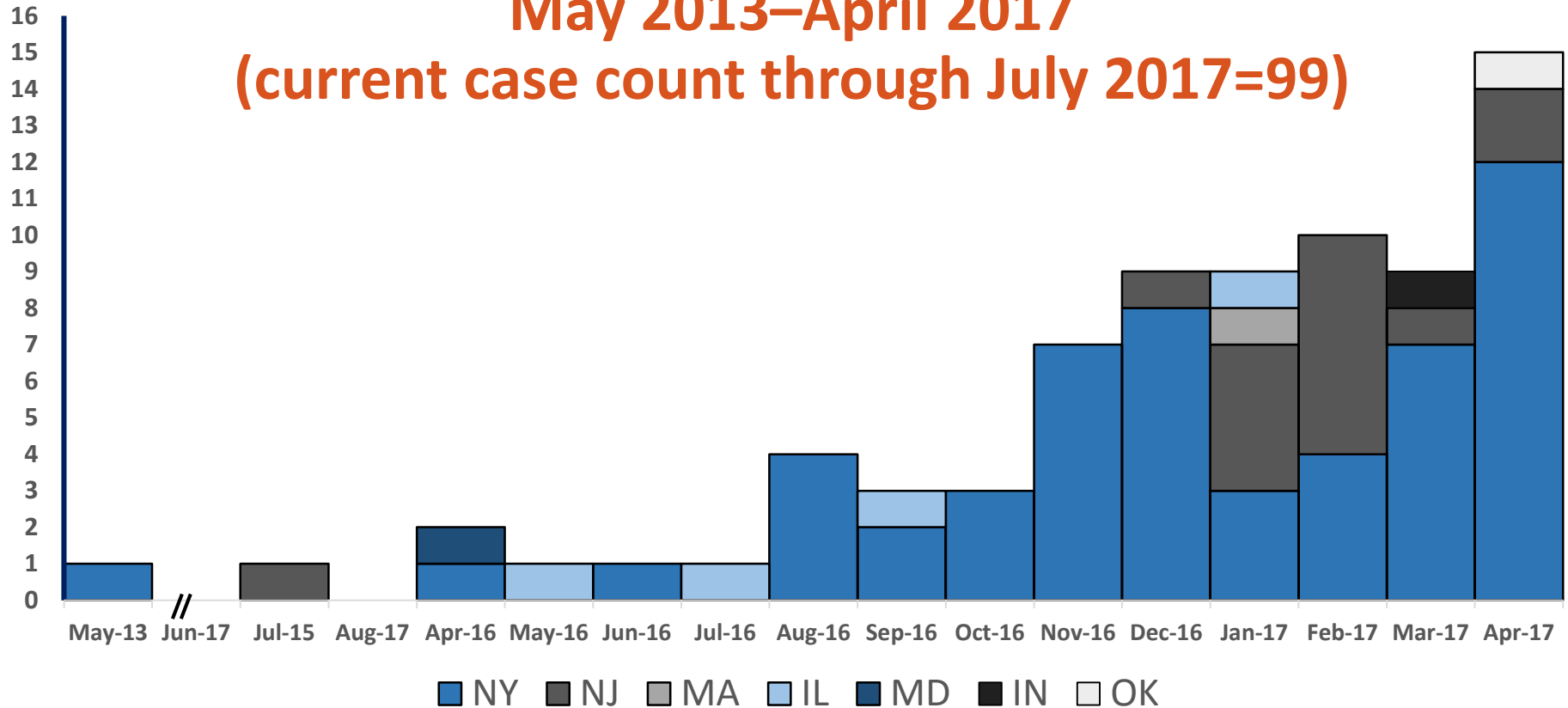
Candida auris is an emerging multidrug-resistant (MDR) yeast that can cause invasive infections and is associated with high mortality. It was first described in 2009 after being isolated from external ear discharge of a patient in Japan¹. Since the 2009 report, *C. auris* infections, specifically fungemia, have been reported from South Korea², India³, South Africa⁴, and Kuwait⁵. Although published reports are not available, *C. auris* has also been identified in Colombia, Venezuela, Pakistan, and the United Kingdom.

It is unknown why *C. auris* has recently emerged in so many different locations. Molecular typing of strains performed by CDC suggests isolates are highly related within a geographic region but highly distinct between continents⁶. The earliest known infection with *C. auris* based on retrospective testing of

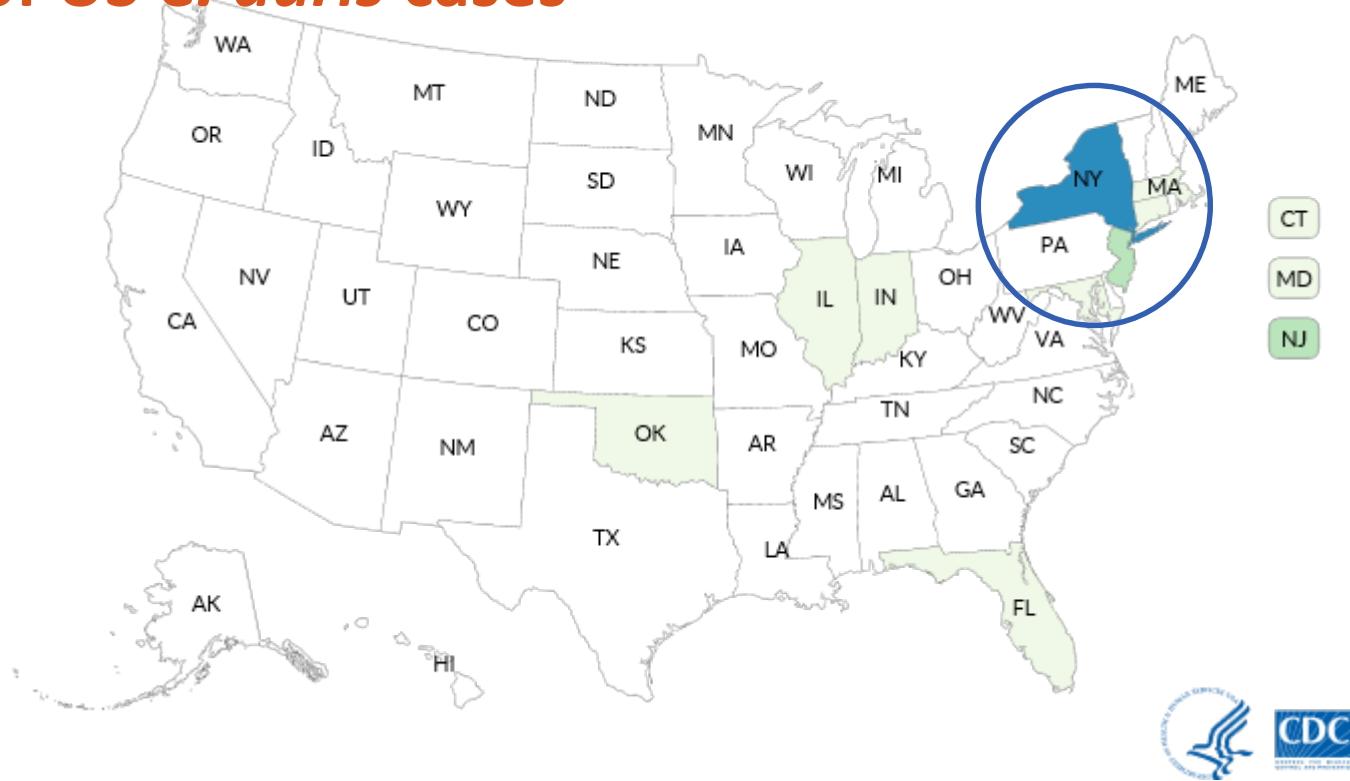
Clinical *C. auris* cases by date

May 2013–April 2017

(current case count through July 2017=99)



Map of US *C. auris* cases



Epidemiologic Characteristics of US Cases

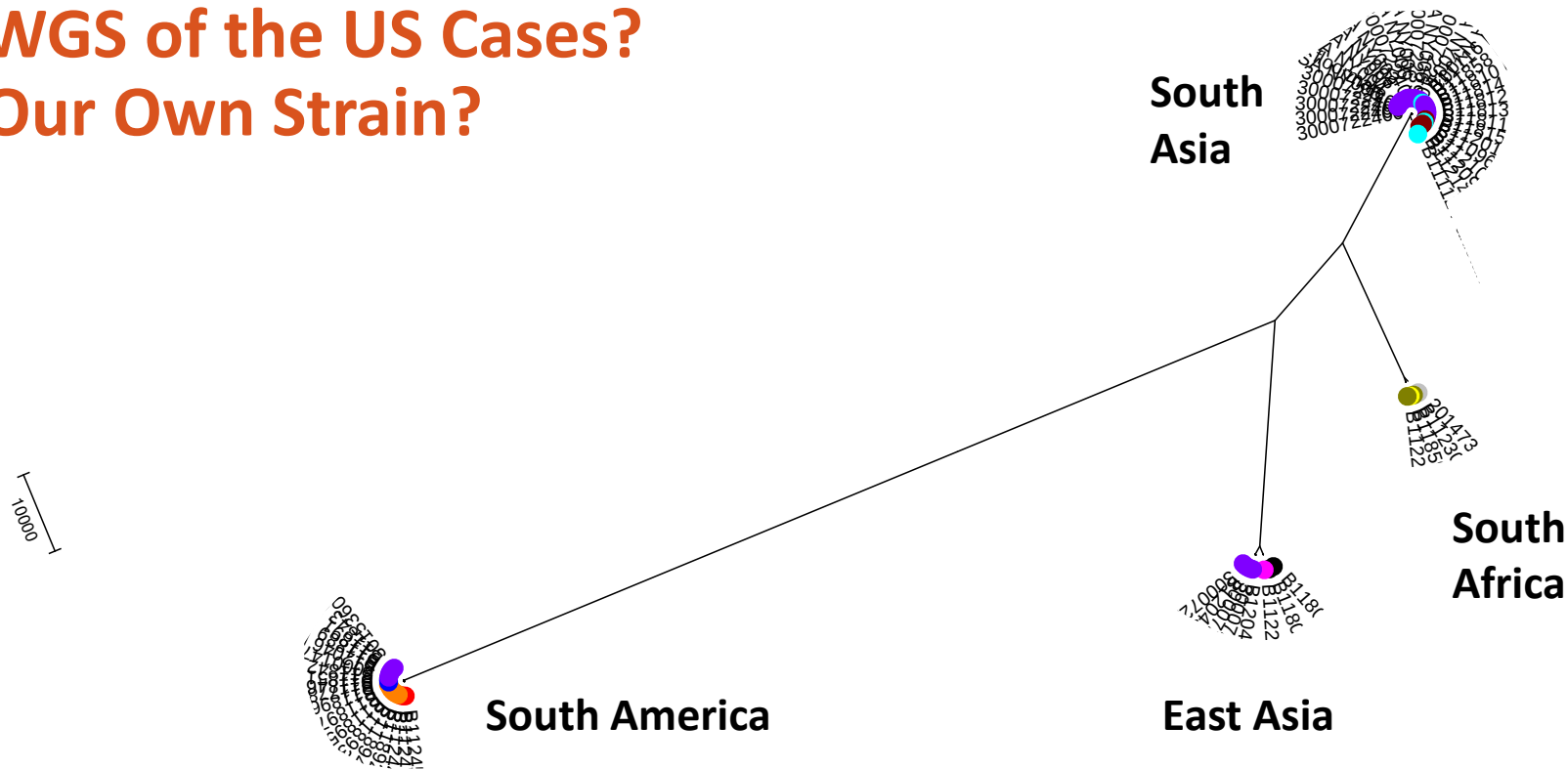
- 75% of isolates from blood
- Median age: 70; one case in a neonate
- Multiple underlying medical conditions and indwelling devices
 - Tracheostomy tube, central venous catheter, gastrostomy tube
- Extensive healthcare exposure (acute care hospitals, LTACHs, vSNFs)
- Resistant: 80% to Fluconazole, 40% to Ampho B, ~3% to Echinocandins
- ~30% 30-day mortality

Four cases with recent travel

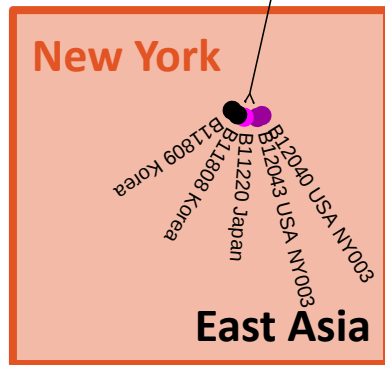
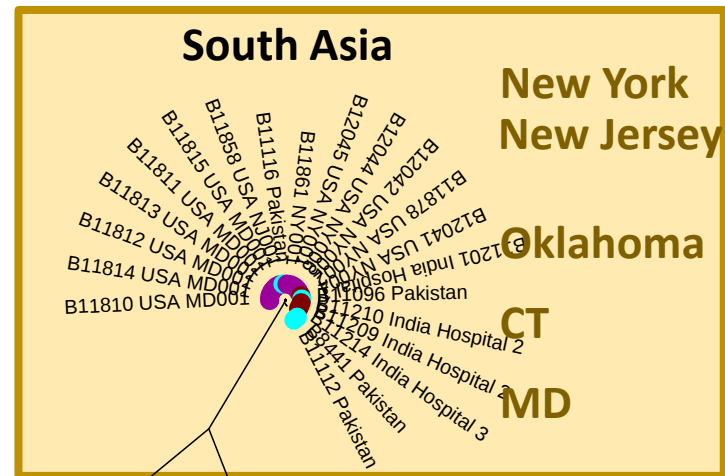
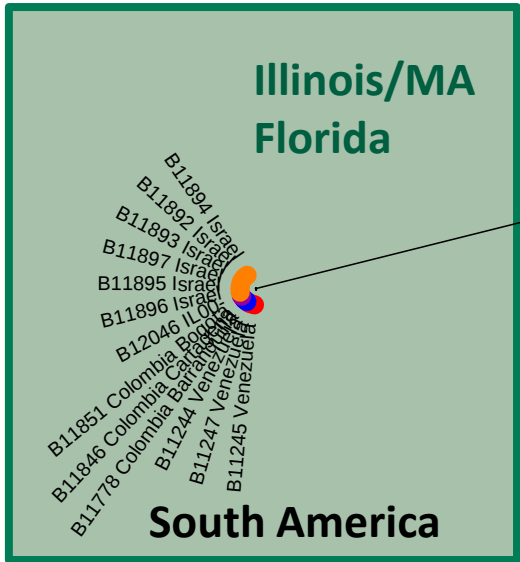
- Countries involved:
 - India
 - Pakistan
 - South Africa
 - Venezuela
- Cases involved urine and wound cultures
- Occurred in CT, OK, IN, FL



WGS of the US Cases? Our Own Strain?



10000

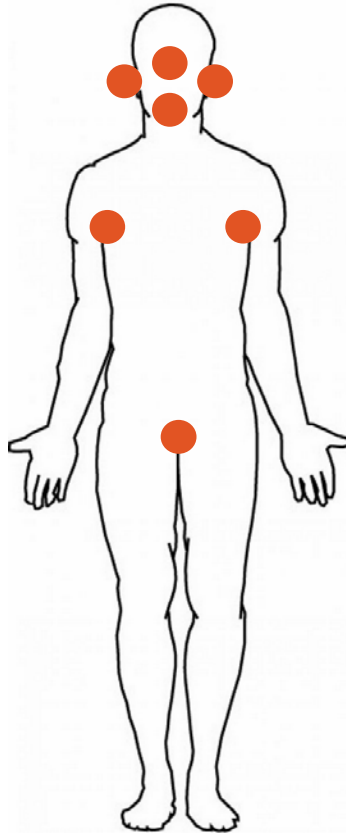


**Recent emergence (mid 2015)
Multiple introductions of *C. auris*
followed by local transmission**

Transmission of Candida?



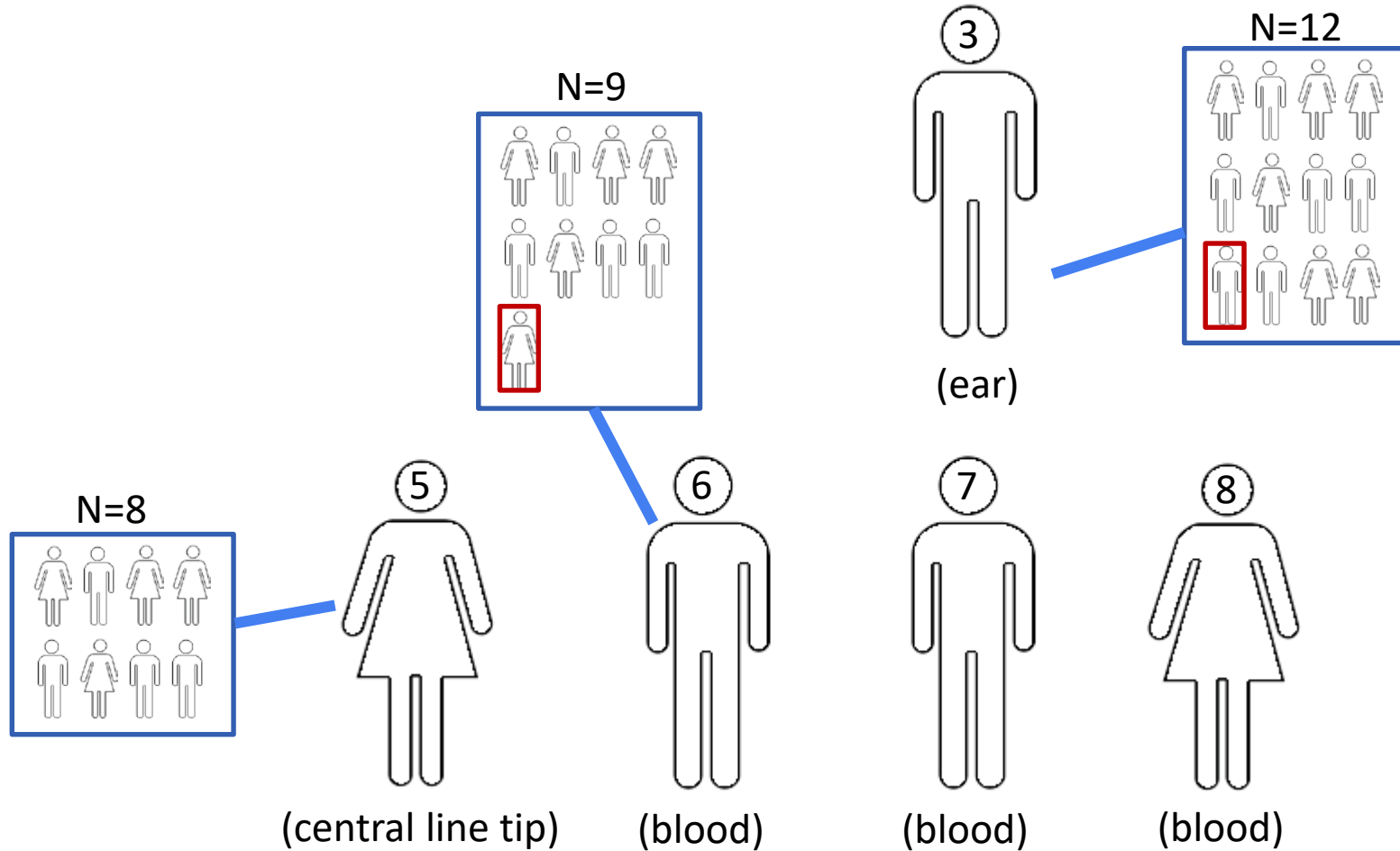
C. auris Colonizes Skin and Other Body Sites



C. auris Contaminates the Environment



Contacts Get Colonized with *C. auris*



What Could Account for Transmission?

- Persists as skin colonizer for many months
- In lab, persists for >4 weeks on plastic surfaces
- Quaternary ammonium compounds inadequate for disinfection



A Paradigm Shift for *Candida* infections

- Antifungal resistance is the norm
- Thrives on skin
- Contaminates patient rooms
- **CAN SPREAD IN HEALTHCARE SETTINGS**

Controlling the spread of *C. auris*



IDENTIFY



TREAT



INFECTION CONTROL



Challenges with Identification

- *C. auris* can be misidentified as

Candida haemulonii

- *Candida famata*

- *Candida sake*

- *Candida guilliermondii*

- *Candida lusitanae*

- *Rhodotorula glutinis*,

- *Candida* spp. after a validated method of *Candida* identification attempted.



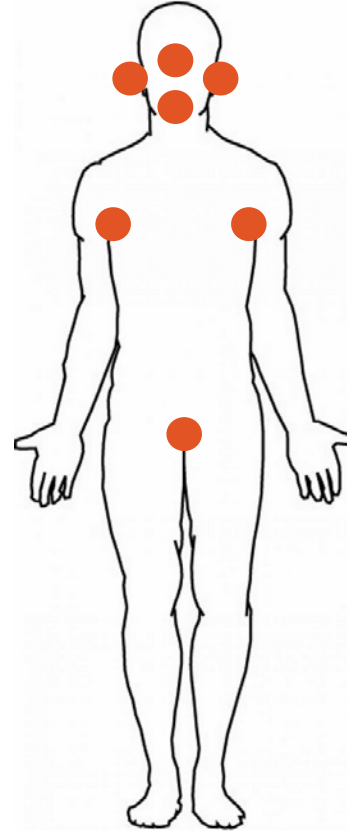
C. auris can be correctly identified using MALDI-TOF and DNA sequencing

Challenges with Identification

- 30% of clinical cases in the U.S. have been from non-bloodstream isolates (urine, bile, wounds, etc)
- Isolates from non-sterile sites may not be worked up species level
 - Though no treatment may be needed, infection control is needed if *C. auris*



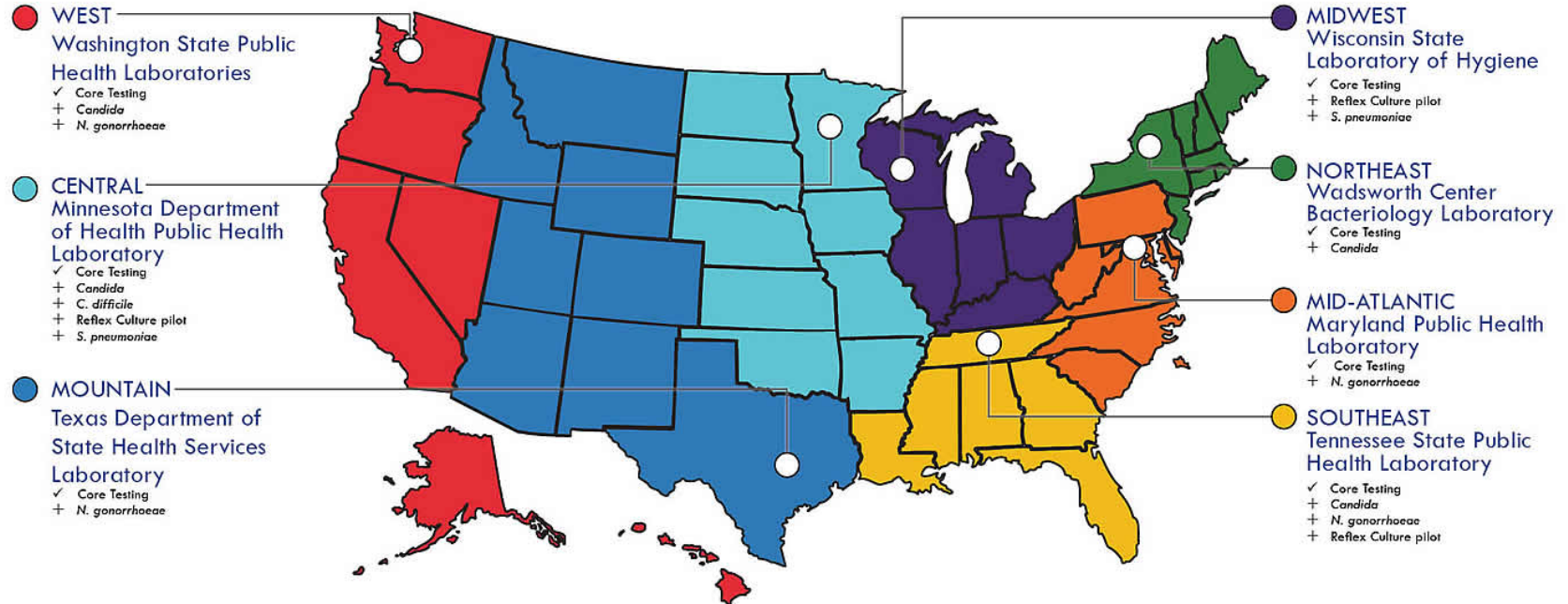
Challenges with Detecting Colonized individuals



**Important because
infection control
measures are needed**

Candida ARLN Labs

CDC Antibiotic Resistance Laboratory Network: 7 Regional Labs



Treatment

- Echinocandins are first line
- Resistance can be problematic
 - Some echinocandin resistant isolates
 - At least one case with documented development of echinocandin resistance on treatment
- Close monitoring of patient needed



Infection control is key for stopping transmission of *C. auris*



Recommended Infection Control Practices

- Standard and Contact Precautions
- Single room
- Hand hygiene
- Daily and terminal cleaning with disinfectants with ***Clostridium difficile* claim**
- Contact tracing



Global *C. auris* Situation

- Now common in some international hospitals
 - Up to 40% of *Candidas* in 1 Indian and 1 Kenyan hospital
 - 10% of *Candidas* in private South African hospitals
 - Probably well-established in Venezuela (limited dx capacity)
 - Cases now in Colombia and Panama
- UK continues to have introductions; seem to have controlled initial spread
- No further isolates in Japan; relatively few in South Korea
- Major unknowns in most of Africa and parts of Latin America

Need for further work

- Improved diagnostics, assessment of diagnostic capacity
- Expand understanding of epidemiology, risk factor for invasive infection and colonization
- Characterize resistance, virulence factors
- Evaluate effectiveness of new antifungal agents against *C. auris*
- Assess decolonization strategies
- Strengthen IPC; evaluate effectiveness of various IPC interventions
- Determine environmental niche/origins of *C. auris*

Summary

- *C. auris*
 - Causes invasive infections with high mortality
 - Challenging to identify
 - Multidrug resistant
 - Transmitted in healthcare settings
- Surveillance and Infection Control are needed to control its spread

CDC guidance on *C. auris* can be found here:

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

We Need Your Help!

- Surveillance
- Raise awareness
- Containment once cases are detected