

Candida auris

I (Daniel Diekema) am not an employee of and am not affiliated with the Indiana Department of Health. The views expressed are my own and may not reflect the view(s) of the Indiana Department of Health.

***Candida auris*: An emerging multiply-resistant fungal pathogen**

***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

Microbiol Immunol 2009;53:41.

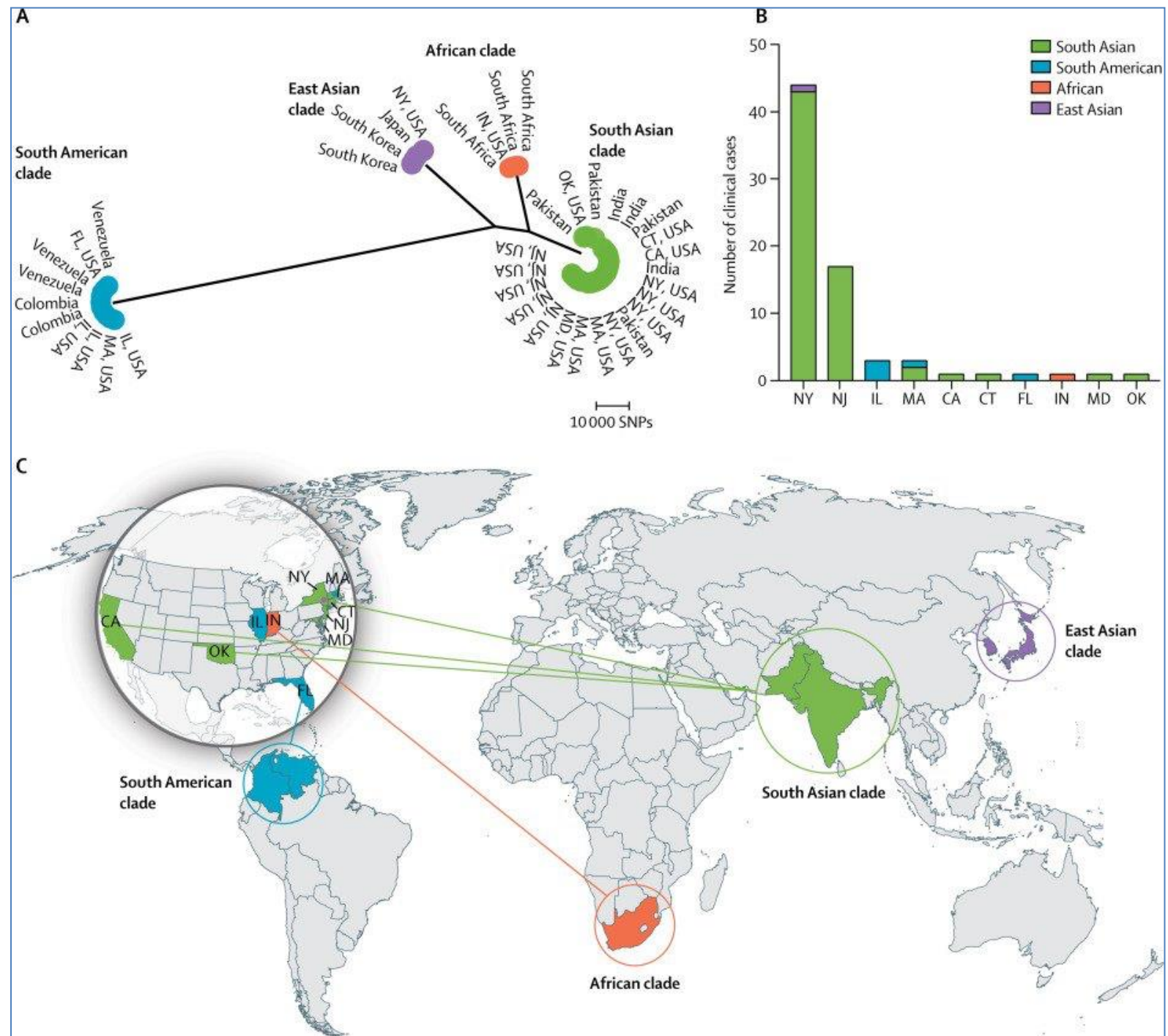


Candida auris: Global spread

- Highly transmissible in healthcare settings
- Emerging pathogen, multiple-drug resistant yeast
- Common colonizer, persists in environment
- Healthcare outbreaks are common
 - Bloodstream infection, high associated mortality
- Most labs unable to identify during early spread
 - Commercial systems misidentified, often as:
 - Different ID systems made different errors
 - PCR and MALDI-TOF MS most reliable

Candida auris

- *Four major clades worldwide*
- *US outbreaks due to multiple introductions and subsequent in-facility transmission events*
- *98% fluconazole resistant*
- *33% amphotericin B resistant*
- *6% echinocandin resistant*
- *Five clearly documented travel-related introductions*



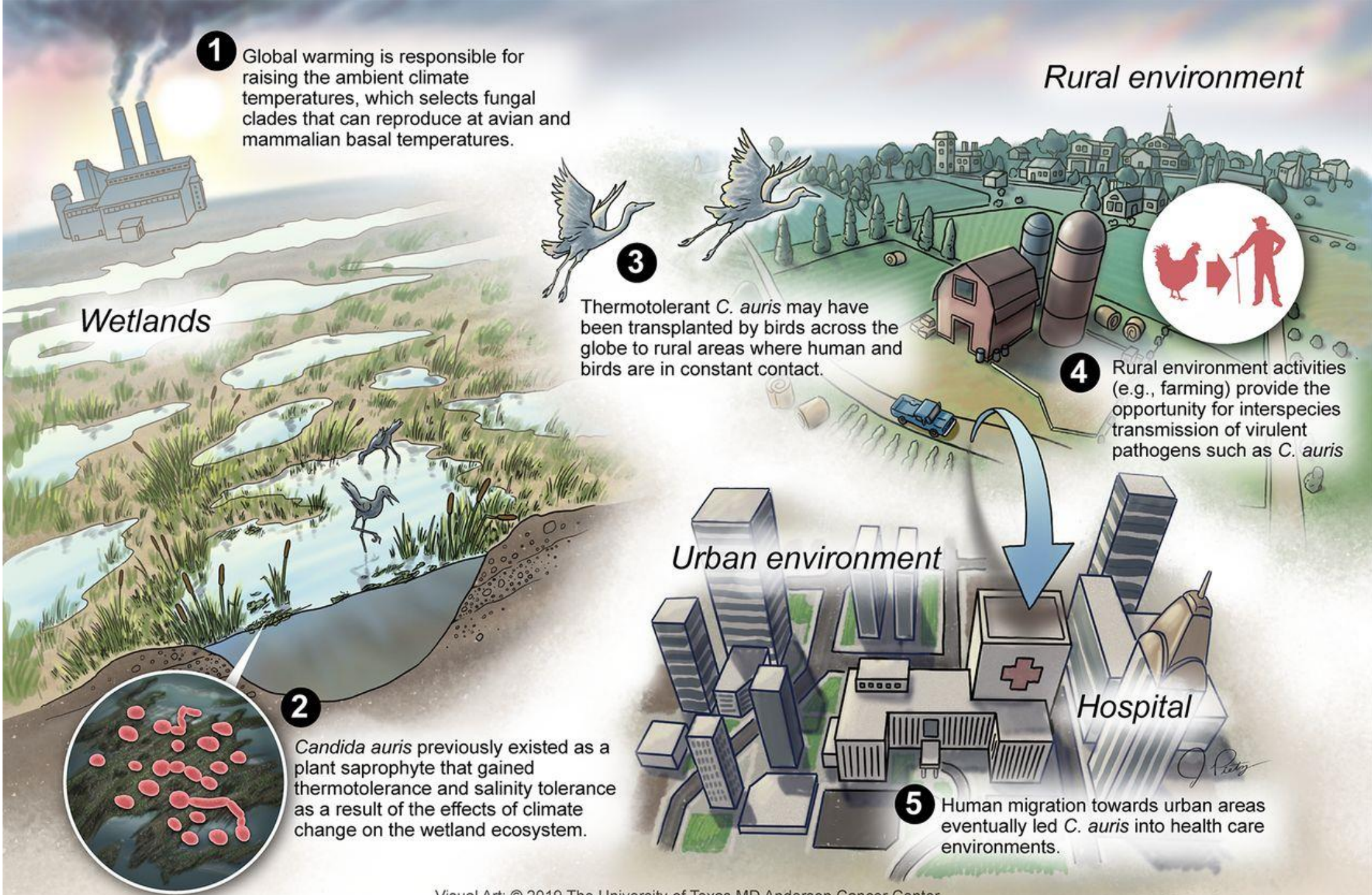
Candida auris

*“It is a creature from
the black lagoon”*

Dr. Tom Chiller, CDC

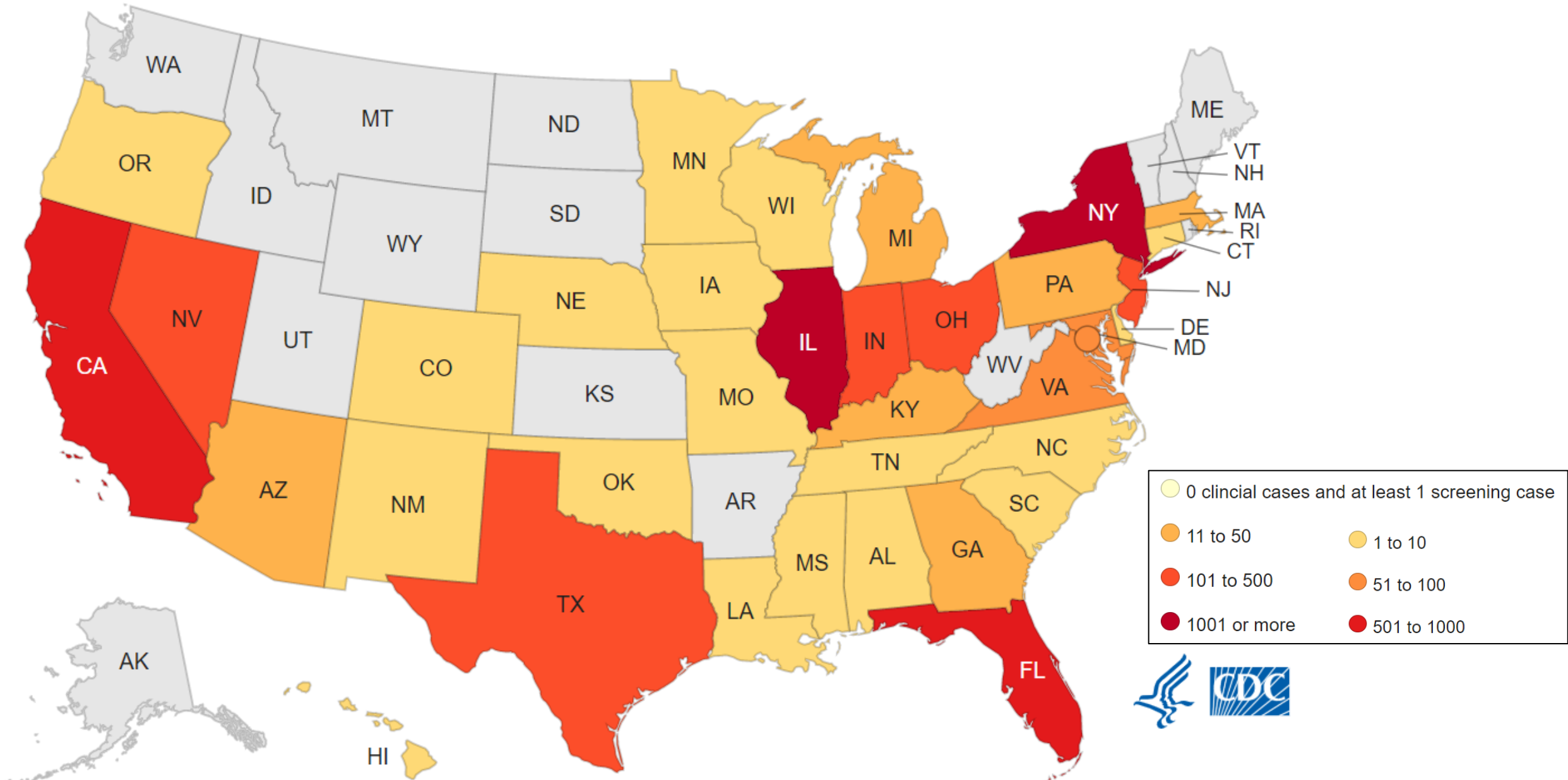


New York Times, April 6, 2019



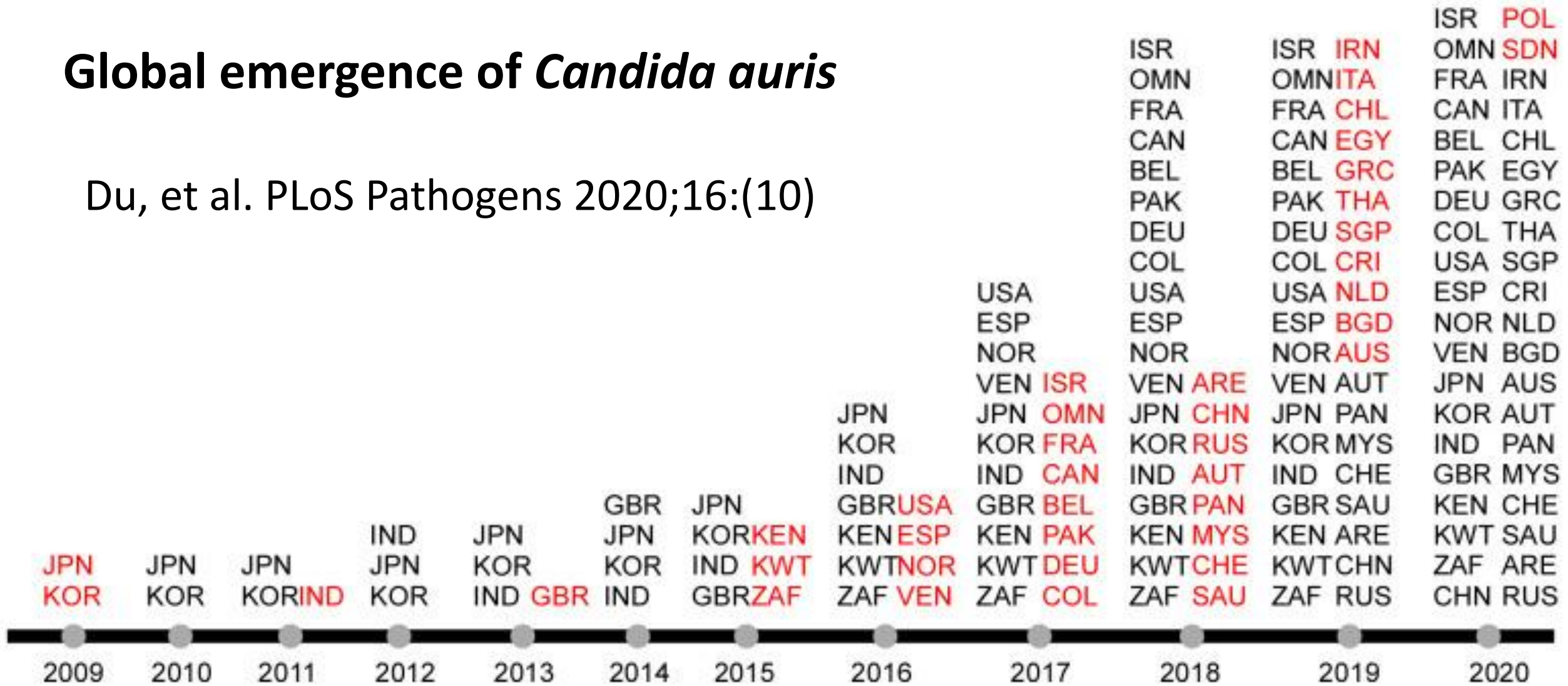
Casadevall
 Kontoyiannis
 & Robert.
 mBio 2019

Candida auris cases in US as of Dec. 31, 2022



Global emergence of *Candida auris*

Du, et al. PLoS Pathogens 2020;16:(10)

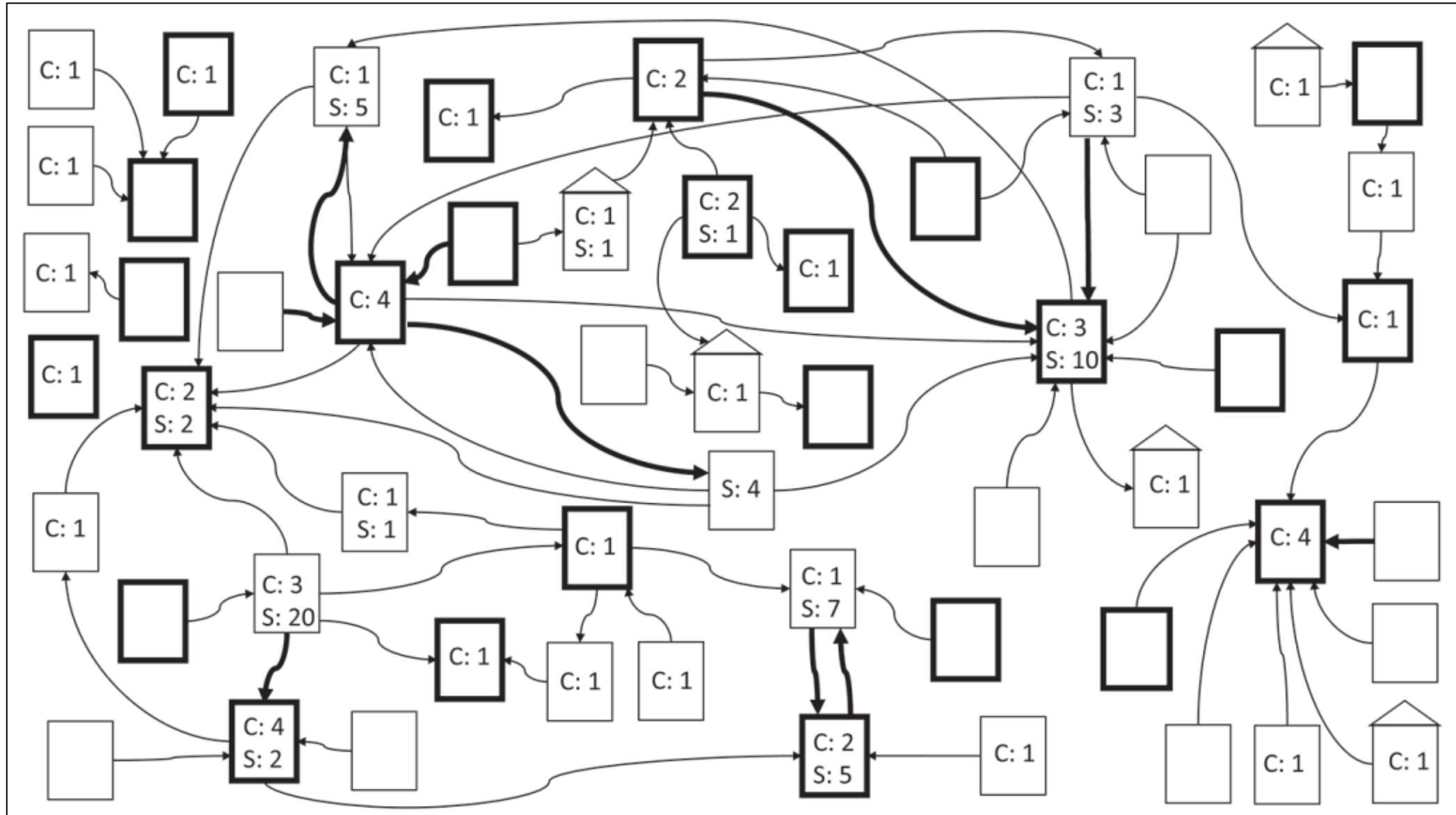


Candida auris cases in US, 2013-2021

Table. Percentage Resistance of *Candida auris* Isolates Tested by the Antimicrobial Resistance Laboratory Network, 2018 to 2020*

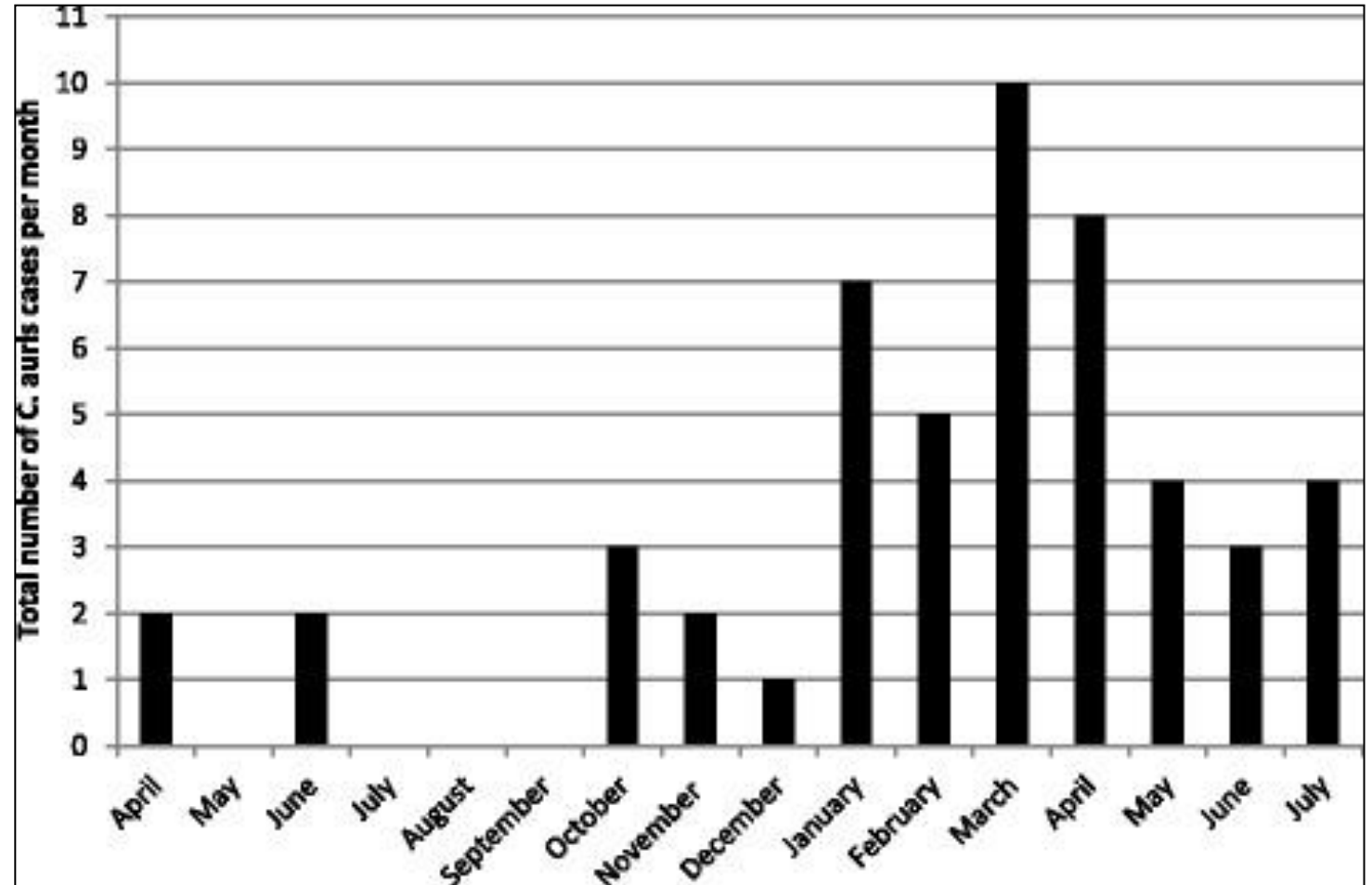
Year or Region	Azoles†	Amphotericin B‡	Echinocandins§
Year			
2018 (<i>n</i> = 463)	372 (80.3)	151 (32.6)	2 (0.4)
2019 (<i>n</i> = 1006)	787 (78.2)	242 (24.1)	14 (1.4)
2020 (<i>n</i> = 1294)	1109 (85.7)	331 (25.6)	15 (1.2)

C. auris spread among HCF in New York, 2013-17



First EU outbreak of *Candida auris*

- 50 patients acquired *C auris*!
- 22 (44%) develop infection
 - Nine candidemias
- Surface contamination
 - >Four weeks on plastic
 - Usual quats not effective
- Control is difficult
 - Contact precautions
 - Contact tracing
 - CHG bathing
 - Bleach disinfection
 - Unit closure



Clinical characteristics of *C auris* BSI

- Three hospital retrospective case control study
 - *C auris* vs. other *Candida*, treated with echinocandin
- Crude mortality no different, high in both groups
 - 30% at 30 days, 45% at 90 days
- MDR-GNR infection more common (~40%)
- 60-day recurrence more common (12% vs 4%)
- Other sequelae similar to the other *Candida* species

***C. auris*: Preventing transmission and outbreaks**

Detection and reporting

- Review lab methods
 - MALDI-TOF, PCR
 - Susceptibility testing
- Expand species ID approach
 - ID yeast from all sites
- Screening for carriage
 - Axilla and groin swab
 - CDC LRN: state lab assistance

Prevention and control

- Hand hygiene
- Contact precautions
- Environmental disinfection
 - Products with EPA claim, or...
 - As for *C. difficile*
- Dedicated/single use items
- Screen contacts

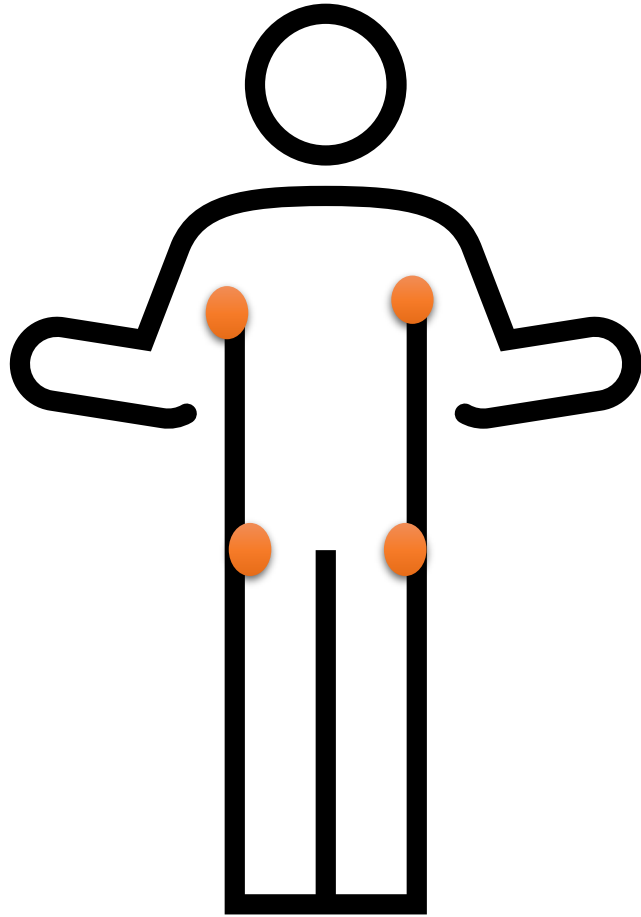
Identification of *Candida auris*

- Traditional phenotypic methods are not reliable (and being updated)
- MALDI-TOF & PCR
- Direct from + blood culture
 - GenMark BCID-FP
 - Biofire BCID2
- Susceptibility testing is standard
- Send suspected or confirmed isolates to CDC AR Lab network



Identification Method	Database/Software, if applicable	<i>C. auris</i> is confirmed if initial identification is <i>C. auris</i> .	<i>C. auris</i> is possible if the following initial identifications are given. Further work-up is needed to determine if the isolate is <i>C. auris</i> .
Bruker Biotyper MALDI-TOF	RUO libraries (Versions 2014 [5627] and more recent)	<i>C. auris</i>	n/a
	CA System library (Version Claim 4)	<i>C. auris</i>	n/a
bioMérieux VITEK MS MALDI-TOF	RUO library (with Saramis Version 4.14 database and Saccharomycetaceae update)	<i>C. auris</i>	n/a
	IVD library (v3.2)	<i>C. auris</i>	n/a
	Older IVD libraries	n/a	<i>C. haemulonii</i> <i>C. lusitaniae</i> No identification
VITEK 2 YST	Software version 8.01*	<i>C. auris</i>	<i>C. haemulonii</i> <i>C. duobushaemulonii</i> <i>Candida</i> spp. not identified
	Older versions	n/a	<i>C. haemulonii</i> <i>C. duobushaemulonii</i> <i>Candida</i> spp. not identified
API 20C		n/a	<i>Rhodotorula glutinis</i> (without characteristic red color) <i>C. sake</i> <i>Candida</i> spp. not identified
API ID 32C		n/a	<i>C. intermedia</i> <i>C. sake</i> <i>Saccharomyces kluyveri</i>
BD Phoenix		n/a	<i>C. catenulata</i> <i>C. haemulonii</i> <i>Candida</i> spp. not identified
MicroScan		n/a	<i>C. lusitaniae</i> ** <i>C. guilliermondii</i> ** <i>C. parapsilosis</i> ** <i>C. famata</i> <i>Candida</i> spp. not identified
RapID Yeast Plus		n/a	<i>C. parapsilosis</i> ** <i>Candida</i> spp. not identified
GenMark ePlex BCID-FP Panel		<i>C. auris</i>	n/a

Screening for *Candida auris*



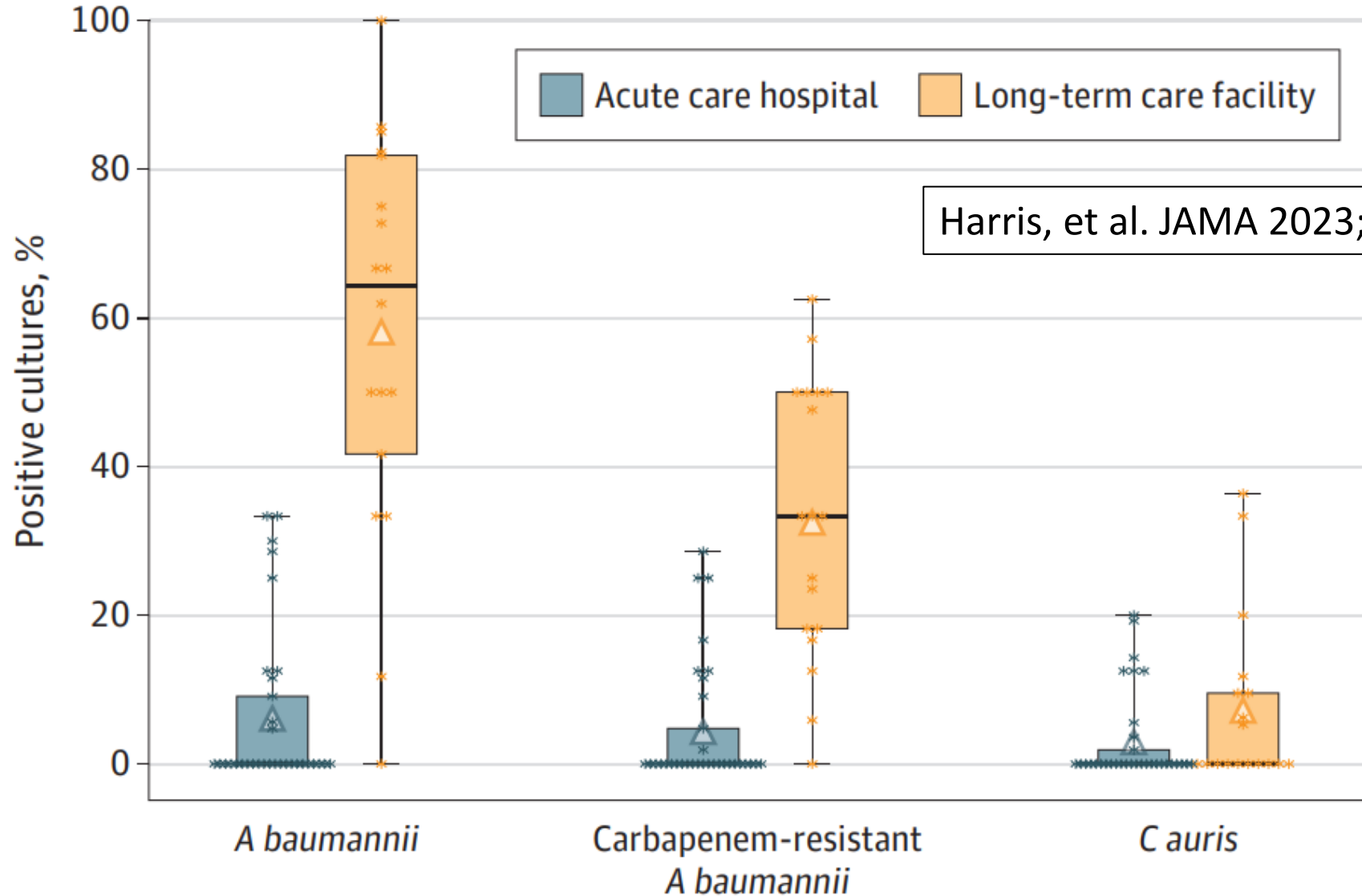
+/- nares



Procedure for collection of patient swabs for *Candida auris*

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

Prevalence of *C. auris* colonization among mechanically ventilated patients, Maryland



Harris, et al. JAMA 2023;10/12/23

***Candida auris*: Risk factors for colonization**

Case control study in skilled nursing ventilator units

- 60 cases, 218 controls from NY state vSNF's
- Control for underlying illnesses and functional status
- Colonized patients more likely to have had:
 - Mechanical ventilation
 - Acute care admission in prior six months
 - Receipt of carbapenems in prior 90 days
 - Receipt of fluconazole in prior 90 days

Rossow, et al. Clin Infect Dis 2021;72:e753-60.

Yield of screening for *C auris* in acute care

- Tertiary care hospital in NYC, 14 index cases
- Contact investigations (going back 30 days)
- 621 potential contacts, 305 were screened
 - Axilla, groin, nares
 - Five patients (1.6%) positive for *Candida auris*
 - Three were from initial unit survey, two were roommates of case
- Extensive contact investigations in acute care are low yield, focus on closest contacts

Walits and Schaefer. Am J Infect Control 2023; Oct. 12, 2023.

Who to screen for *Candida auris*?

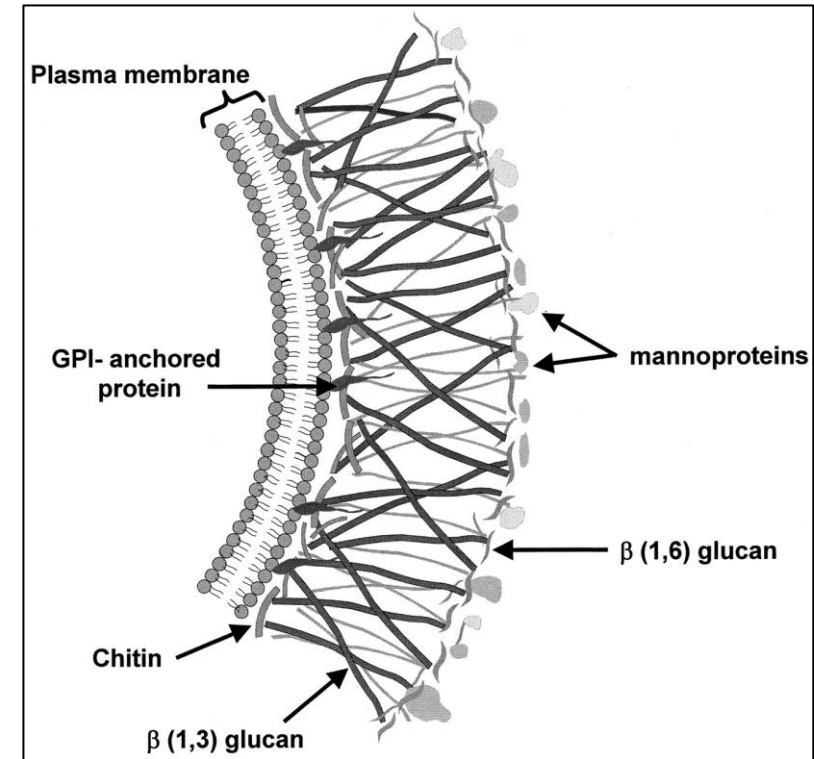
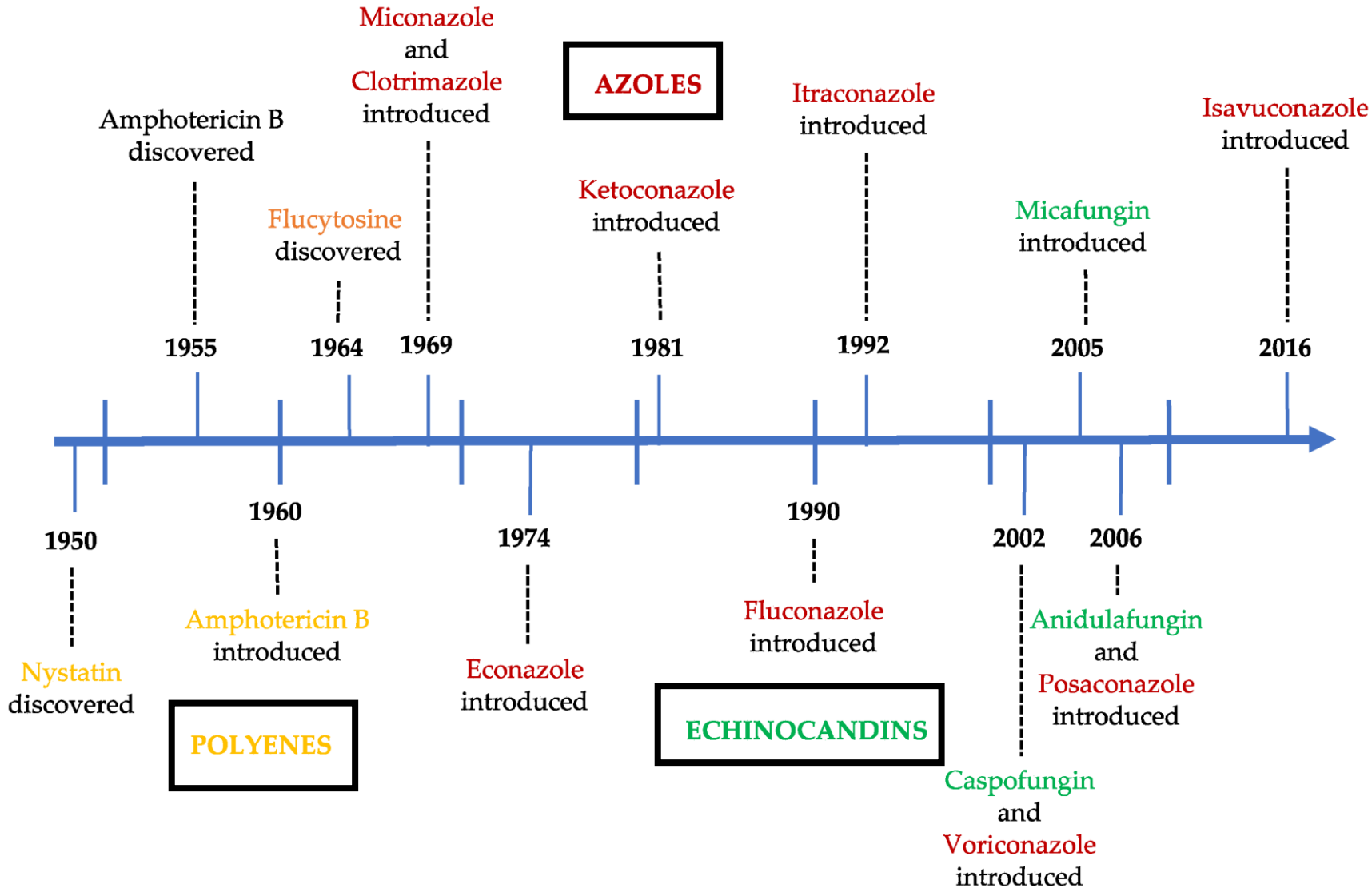
- Close contacts of a colonized or infected patient
 - Roommates, expand if transmission on unit

Consider also:

- Hospital stay outside of the US
 - Especially if from country reporting *C. auris*
- HCF stay in region where *C. auris* is common
 - LTACH, ventilator unit, CPE carriage or infection

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

Antifungal therapy: Three major classes since 2002



Candida auris Isolates Resistant to Three Classes of Antifungal Medications — New York, 2019

Weekly / January 10, 2020 / 69(1);6–9


Belinda Ostrowsky, MD¹; Jane Greenko, MS²; Eleanor Adams, MD²; Monica Quinn, MS³; Brittany O'Brien, MS⁴; Vishnu Chaturvedi, PhD^{4,5}; Elizabeth Berkow, PhD⁶; Snigdha Vallabhaneni, MD⁶; Kaitlin Forsberg, MPH⁶; Sudha Chaturvedi, PhD^{4,5}; Emily Lutterloh, MD^{3,5}; Debra Blog, MD^{3,5}; *C. auris* Investigation Work Group ([View author affiliations](#))

- New York State Public Health Laboratory (Wadsworth)
- >800 patients in New York infected or colonized with *C. auris*
- Three patients identified with pan-resistant *C. auris*
- Epi investigation:
 - 7/100 contacts positive for *C. auris*, **none were pan-R**
 - 18/75 environmental samples positive, **none were pan-R**
 - All pts treated with echinocandin prior to pan-R isolate
 - Two to 22 months between initial and R isolate

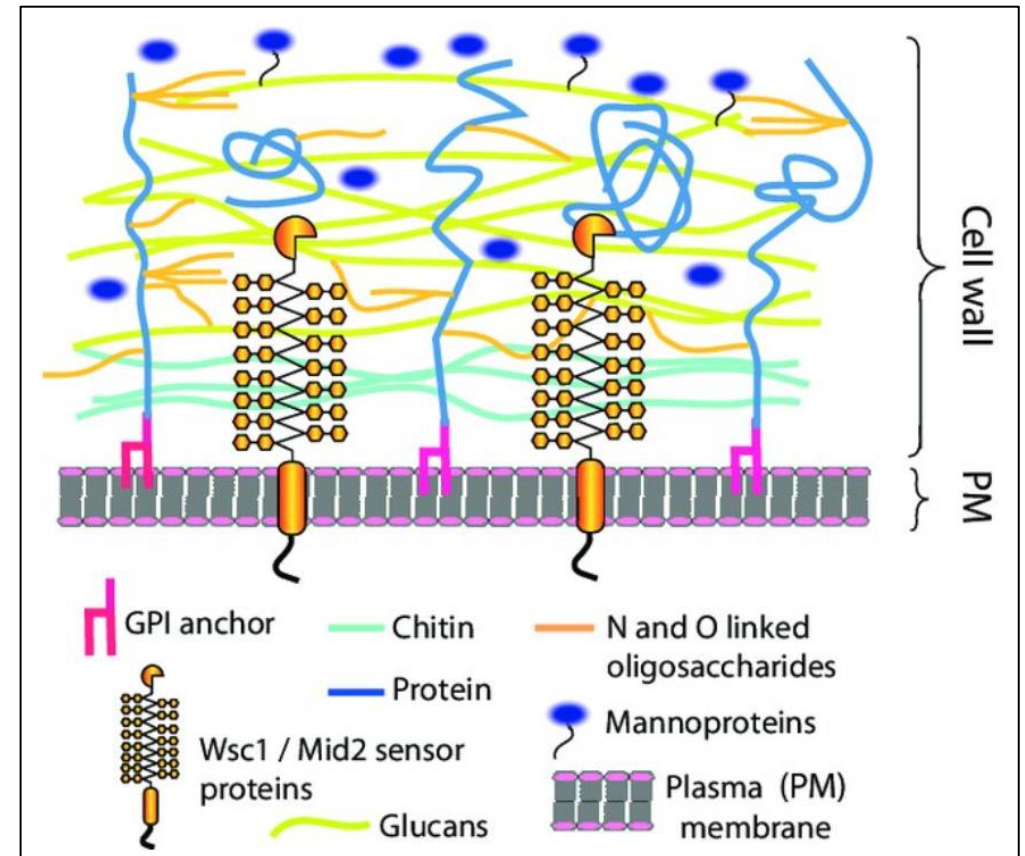
New antifungal agents and classes!

Antifungal	Rezafungin	Ibrexafungerp	Olorofim	Fosmanogepix
Inhibits:	Glucan synthase	Glucan synthase	Pyrimidine synthesis	GPI (<i>Gwt1</i>)
<i>Candida</i>	+	+	-	+
<i>Aspergillus</i>	+	+	+	+
<i>Fusarium</i>	-	-	+/-	+
<i>Scedosporium</i>	-	-	+	+
<i>Mucorales</i>	-	-	-	+/-

Clinical Efficacy and Safety of a Novel Antifungal, Fosmanogepix, in Patients with Candidemia Caused by *Candida auris*: Results from a Phase 2 Trial

Jose A. Vazquez,^a Peter G. Pappas,^b Kenneth Boffard,^c Fathima Paruk,^d Paul A. Bien,^e  Margaret Tawadrous,^f Eric Ople,^e Pamela Wedel,^e Iwona Oborska,^e Michael R. Hodges^e

- GPI (Gwt1) inhibitor
- Case series of nine patients with BSI
- 1,000 mg IV bid load, 600 mg IV qd
- Eight of nine had treatment success (clearance and survival) without need for additional antifungal agent



Newly discovered chemicals are so deadly to fungi they are named after Keanu Reeves

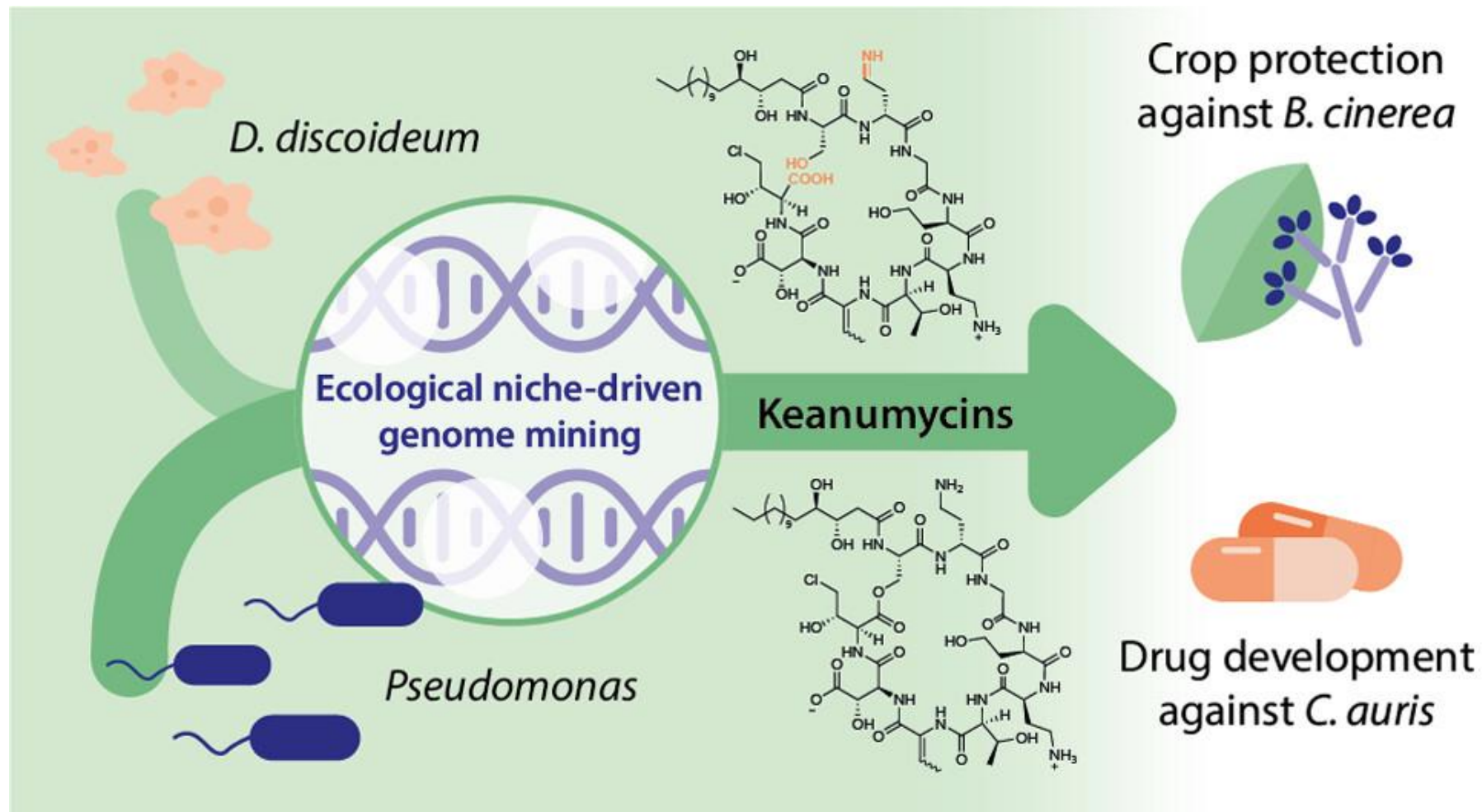
By Taylor Nicioli, CNN

Published 11:19 AM EST, Fri March 3, 2023



Ecological Niche-Inspired Genome Mining Leads to the Discovery of Crop-Protecting Nonribosomal Lipopeptides Featuring a Transient Amino Acid Building Block

Sebastian Götze, Raghav Vij, Katja Burow, Nicola Thome, Lennart Urvat, Nicolas Schlosser, Sebastian Pflanze, Rita Müller, Veit G. Hänsch, Kevin Schlabach, Leila Fazlikhani, Grit Walther, Hans-Martin Dahse, Lars Regestein, Sascha Brunke, Bernhard Hube, Christian Hertweck, Philipp Franken, and Pierre Stallforth*



A petri dish containing a culture of Candida yeast, showing numerous white, fuzzy colonies growing on a dark agar surface. The colonies are arranged in a grid-like pattern, with some larger, more confluent patches. The background is a dark, textured surface.

A paradigm shift for *Candida* infections

A yeast that acts like a bacteria!

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

Summary: *Candida auris*

- Infection and colonization increasingly common
- Can cause severe infection with high mortality
- Is often resistant to common antifungal drugs
- Persists and spreads easily in healthcare settings
 - Most prevalent in ventilator SNFs
- Prevention and control requires:
 - Ability to identify! Review of lab capacity
 - Infection control as for other MDROs
 - Emphasis on environmental cleaning/disinfection
 - Screening of contacts and high-risk admissions