# Featuring *Candida auris*: Coming Soon to a Healthcare Facility Near You

Dr. Shawn R. Lockhart, PhD D(ABMM) FAAM

Mycotic Diseases Branch
Centers for Disease Control and Prevention

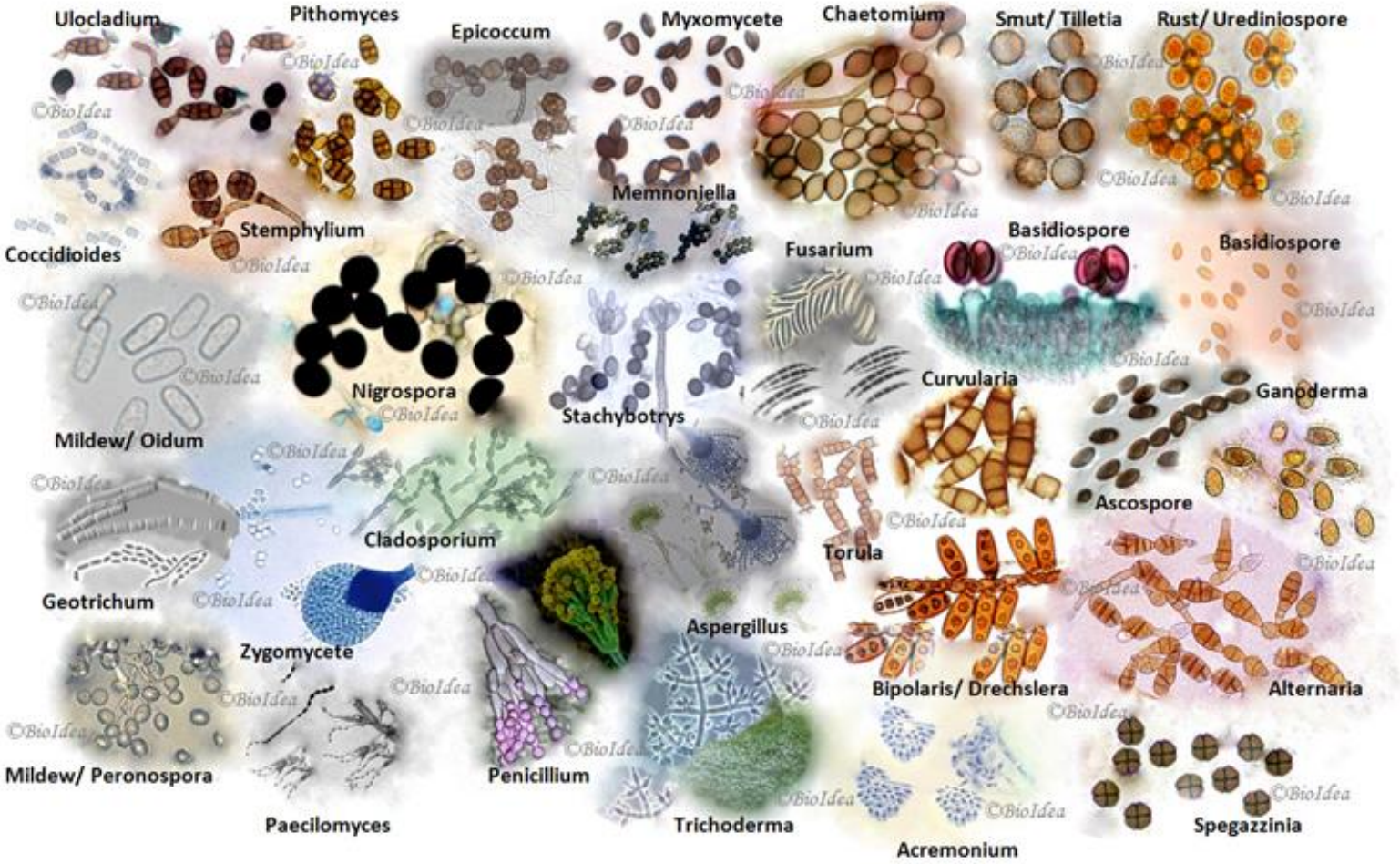
WCLN Webinar
10/4/2023

# Outline

- Background and introduction
- What you need to know
- Just plain cool stuff

No disclosures

# Fungi have an image problem


Ulocladium
Pithomyces
Epicoccum
Myxomycete
Chaetomium
Smut/ Tilletia
Rust/ Urediniospore
Memnoniella
Stemphylium
Coccidioides
Fusarium
Basidiospore
Basidiospore
Curvularia
Nigrospora
Stachybotrys
Ganoderma
Mildew/ Oidum
Ascospore
Cladosporium
Torula
Geotrichum
Aspergillus
Zygomycete
Bipolaris/ Drechslera
Alternaria
Mildew/ Peronospora
Penicillium
Paecilomyces
Trichoderma
Acremonium
Spegazzinia

# 600

species are pathogenic to mammals

# Typical patient with invasive fungal disease


# Meet Dorothy…

- Dorothy is an 77 year old, active, female history buff

# Meet Dorothy…

- Dorothy goes on a history tour to the east coast, and while she is there, she falls and breaks two ribs

# Meet Dorothy…

- Dorothy is hospitalized and while in the hospital she develops pneumonia and is admitted to the ICU

# Meet Dorothy…

- Dorothy is placed on a ventilator, but she is stable so she is being considered for a move

# Released to the LTACH, hooray!

- Dorothy continues to improve and after a few weeks she is moved to a Long-term Acute-care Hospital back in North Dakota

# Dorothy is going home

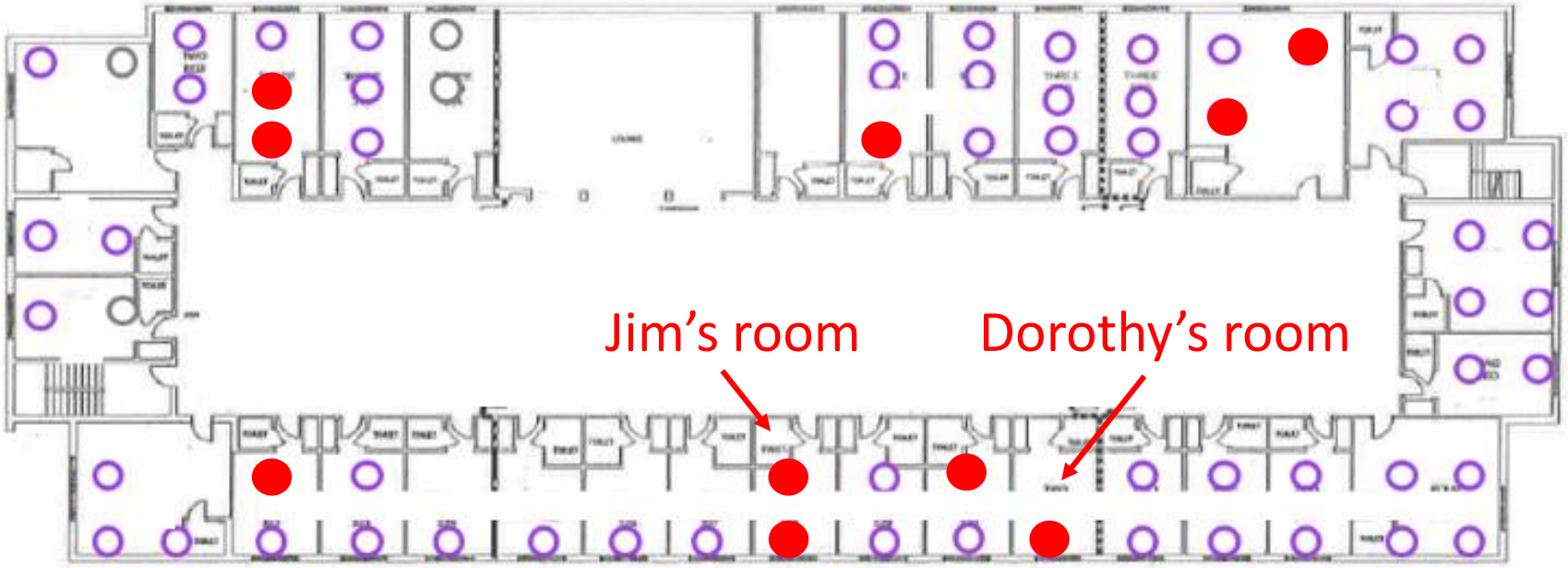
- After three weeks at the LTACH Dorothy is well enough to go back home

# Jim has *Candida auris*

- Three weeks after Dorothy's admission, Jim, another resident at the LTACH, is diagnosed with a *Candida auris* bloodstream infection

# *Candida auris* has spread…

- A point prevalence survey identified 8 other patients at the LTACH who are colonized with *C. auris*



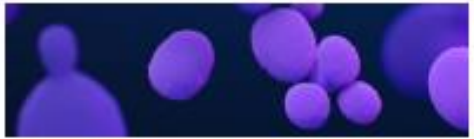
# Where did Jim get *Candida auris*?

# Candida auris:
## coming soon to a healthcare facility near you!

# Urgent Threats

These germs are public health threats that require urgent and aggressive action:

CARBAPENEM-RESISTANT
***ACINETOBACTER***



***CANDIDA AURIS***

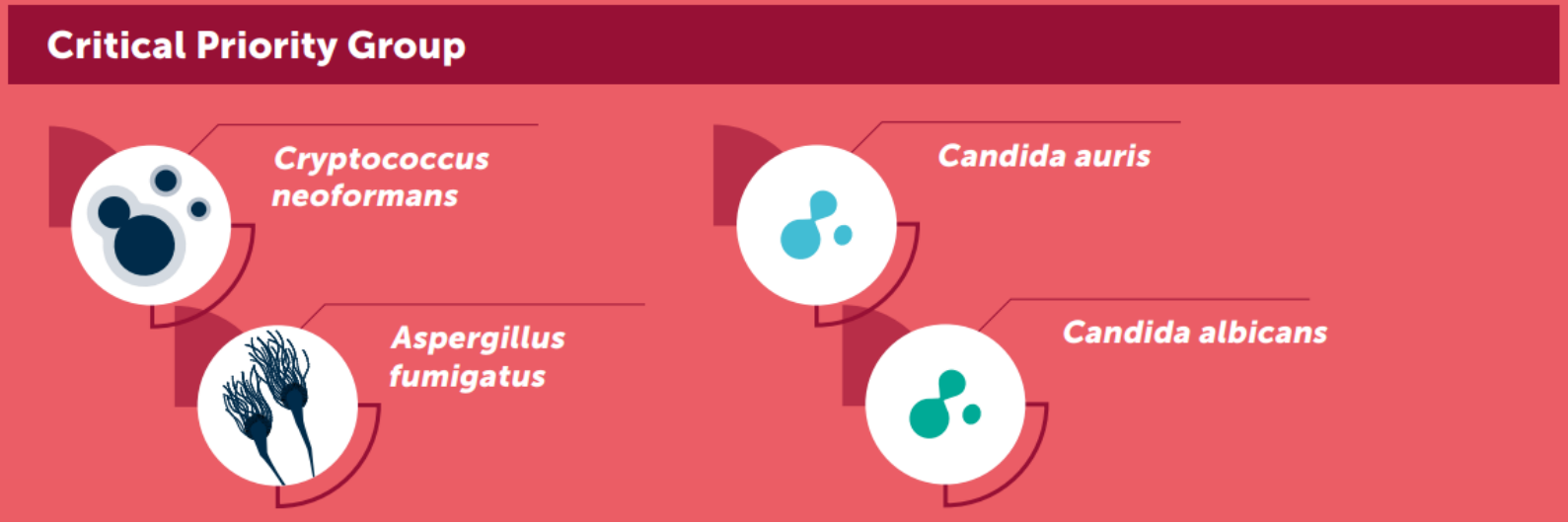
***CLOSTRIDIOIDES DIFFICILE***

CARBAPENEM-RESISTANT
**ENTEROBACTERIACEAE**

DRUG-RESISTANT
***NEISSERIA GONORRHOEAE***

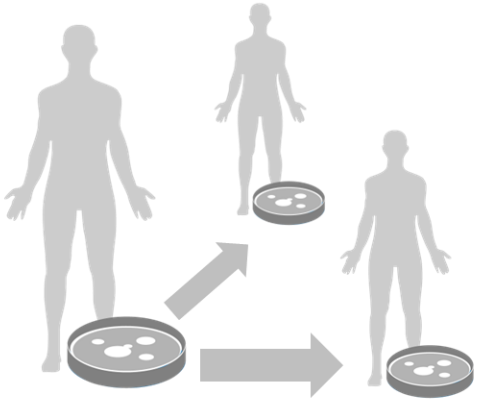
# *C. auris* classified in the “Critical Priority Group” in WHO Fungal Priority Pathogen List

Fig. 1. WHO fungal priority pathogens list (WHO FPPL)



# Why we are concerned about *C. auris*

Antifungal resistance is the norm



Skin colonization amplifies transfer between patients

Healthcare outbreaks are common

# *C. auris* often affects the sickest of the sick

- Multiple and prolonged healthcare stays
- Invasive devices (e.g., tracheostomies)
- Ventilator-dependent
- Colonized with other multidrug-resistant organisms
- Recently received antibiotics and/or antifungals

# Antifungal resistance

# Resistance in *Candida auris*


azoles


polyenes


echinocandins

0%

50%

100%

# Increasing *C. auris* pan or echinocandin resistance

## Notes from the Field

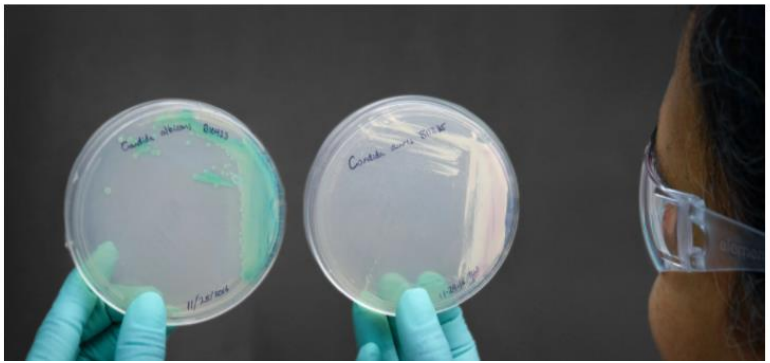
### Transmission of Pan-Resistant and Echinocandin-Resistant *Candida auris* in Health Care Facilities — Texas and the District of Columbia, January–April 2021

Meghan Lyman, MD[1]; Kaitlin Forsberg, MPH[1]; Jacqueline Reuben, MHS[2]; Thi Dang, MPH[3]; Rebecca Free, MD[1]; Emma E. Seagle, MPH[1]; D. Joseph Sexton, PhD[1]; Elizabeth Soda, MD[4]; Heather Jones, DNP[4]; Daryl Hawkins, MSN[2]; Adonna Anderson, MSN[2]; Julie Bassett, MPH[3]; Shawn R. Lockhart, PhD[1]; Enyinnaya Merengwa, MD, DrPH[3]; Preetha Iyengar, MD[2]; Brendan R. Jackson, MD[1]; Tom Chiller, MD[1]

The New York Times

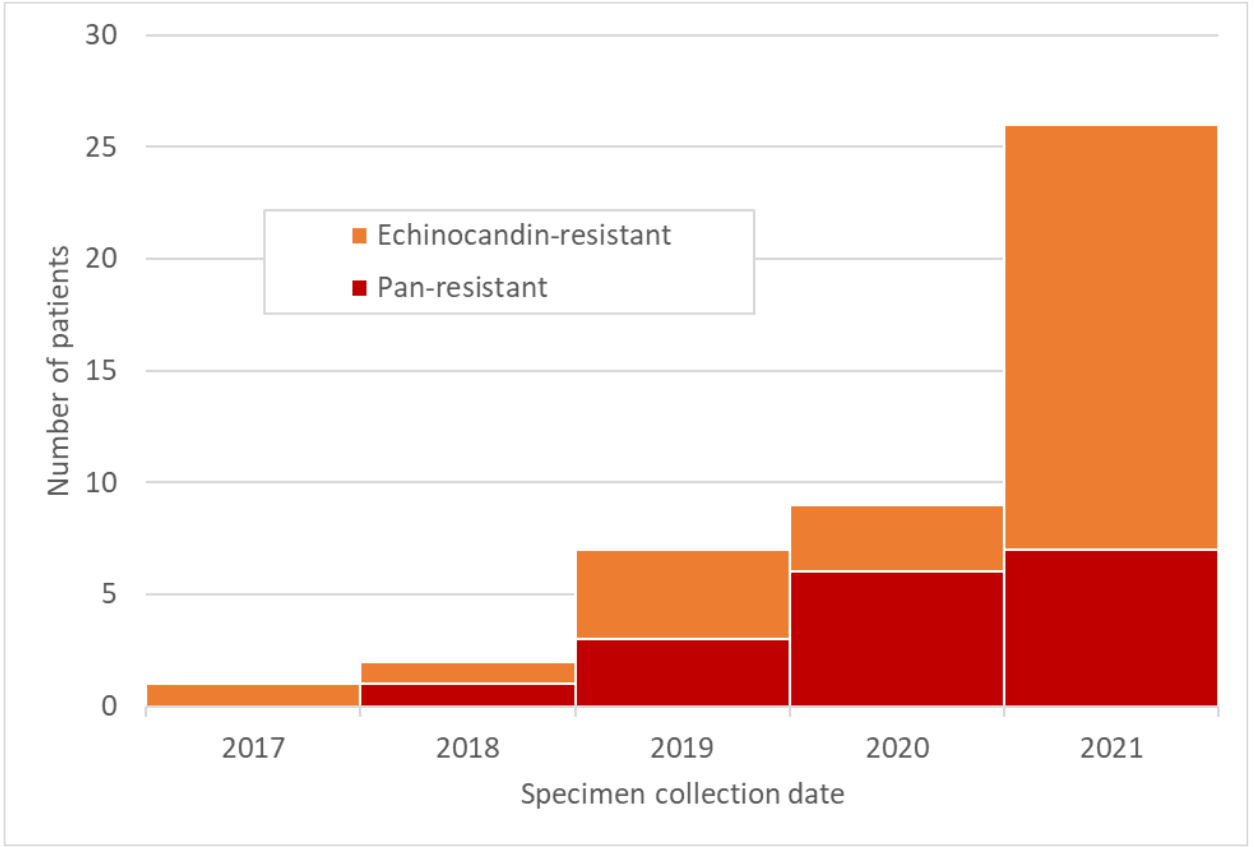
### *Outbreaks of Untreatable, Drug-Resistant Fungus Spread in 2 Cities*

For the first time, the C.D.C. identified several cases of Candida auris that were resistant to all drugs, in two health facilities in Texas and a long-term care center in Washington, D.C.



https://www.cdc.gov/mmwr/volumes/70/wr/mm7029a2.htm

# Increasing *C. auris* pan or echinocandin resistance




Lyman, Annals of Internal Medicine: 2023

# Pan resistance


+

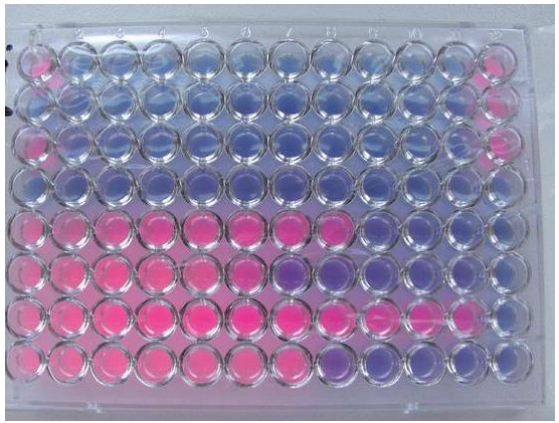

+


=

**SUPER BUG!**

# Choosing an AFST methodology for *C. auris*

azoles
echinocandins
amphotericin B

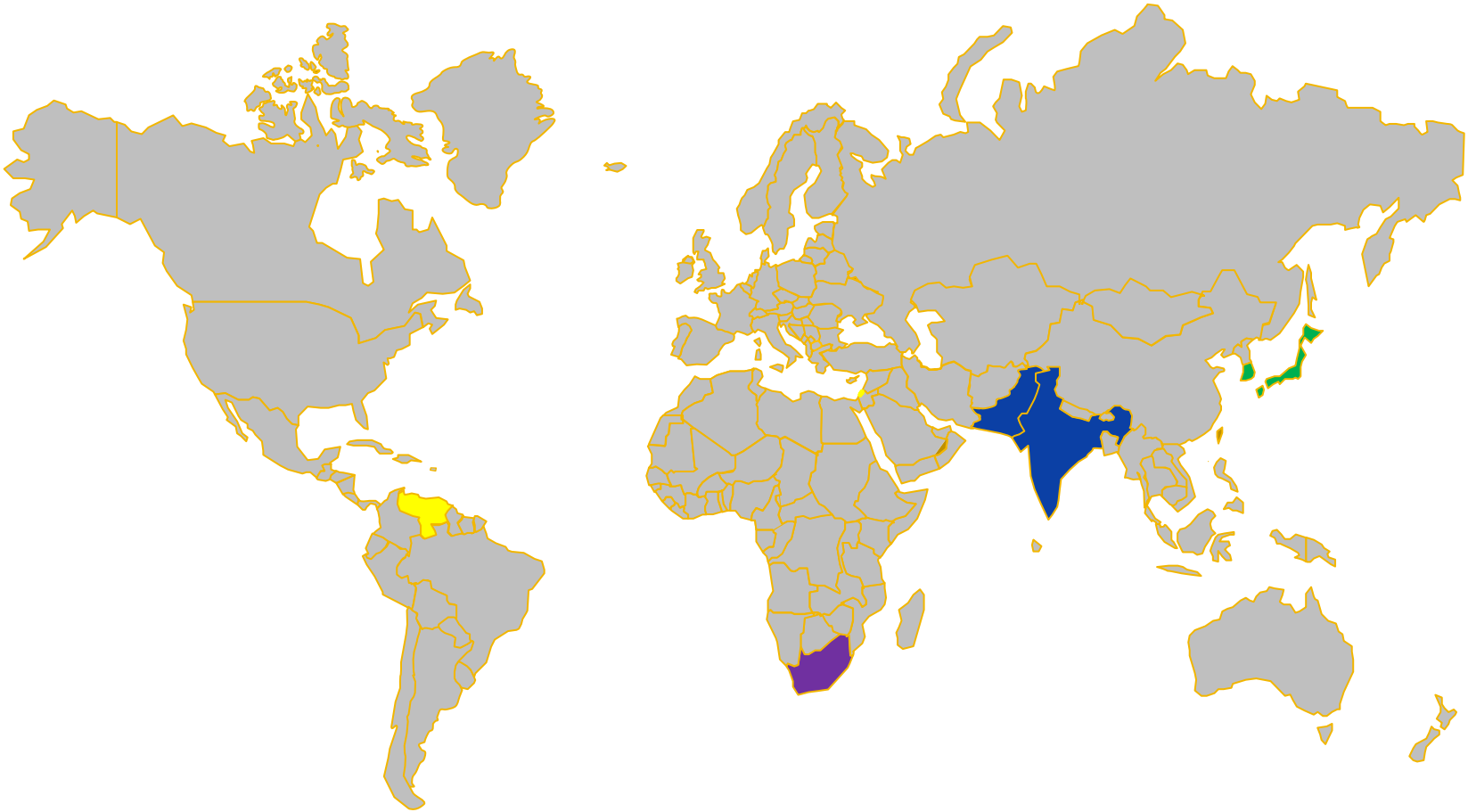


azoles
echinocandins
Amphotericin B??

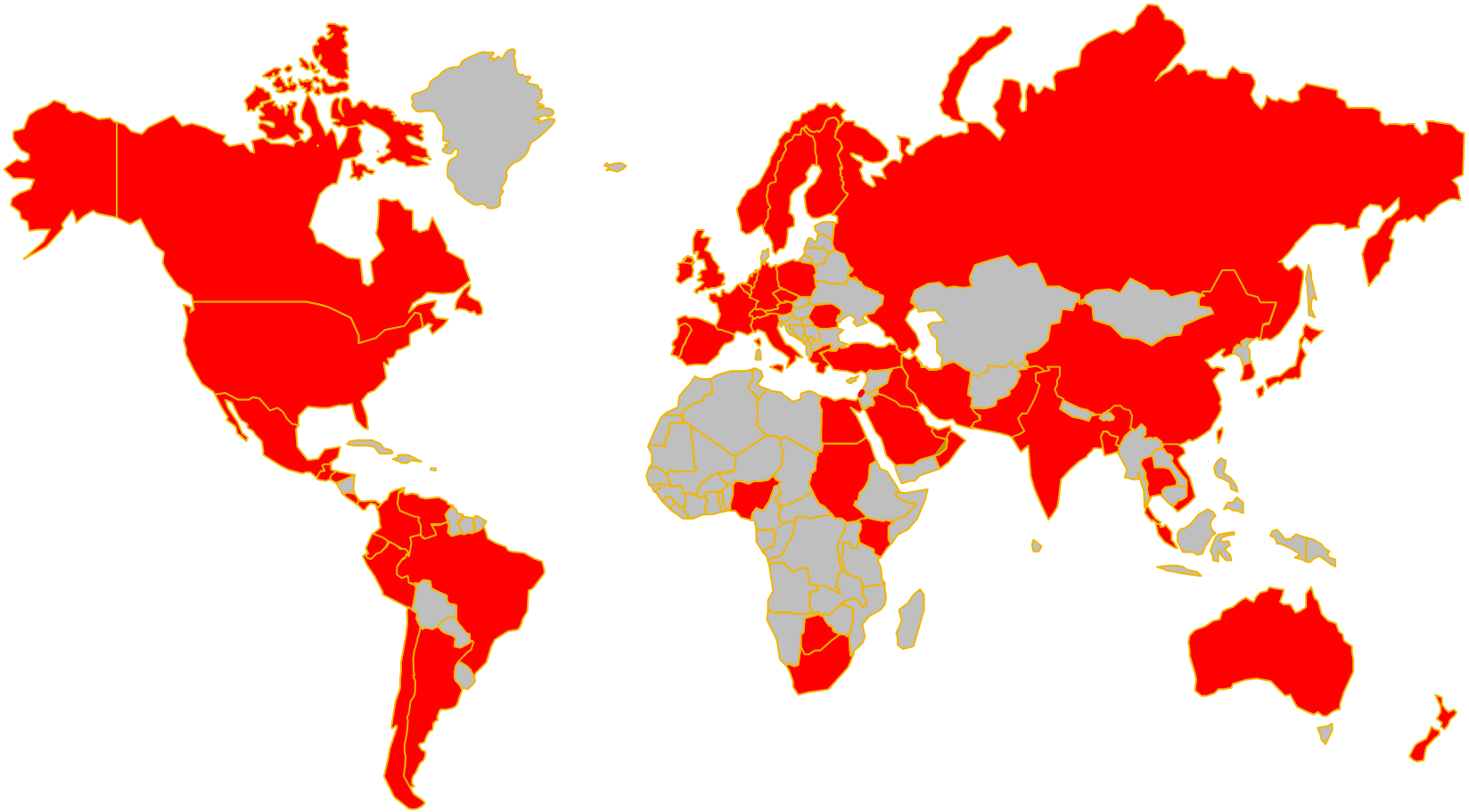

azoles
echinocandins??
~~amphotericin B~~

# Global Spread

# *C. auris* in 2015 – 4 clades

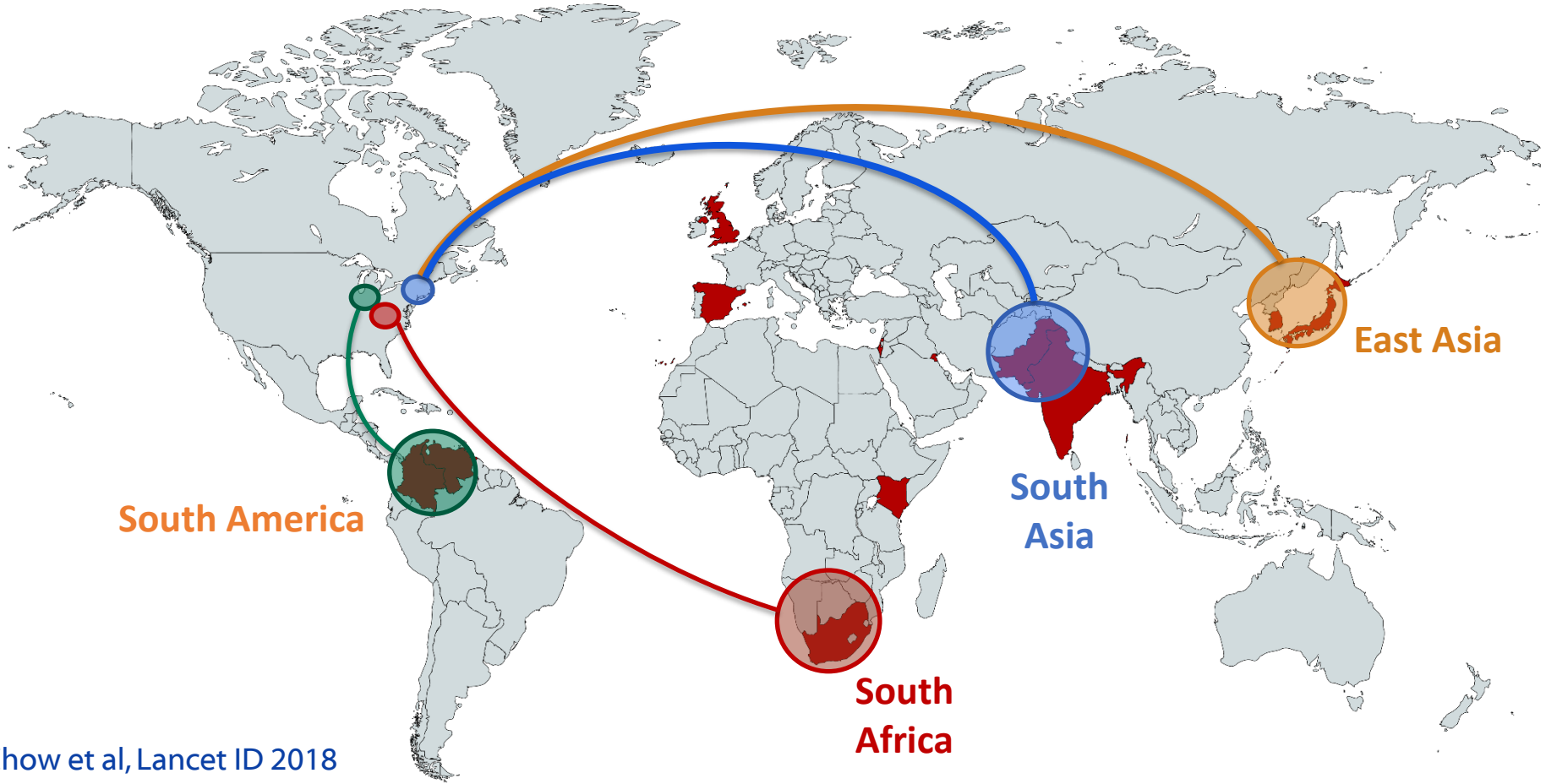


# *C. auris* in 2023 – 6 clades

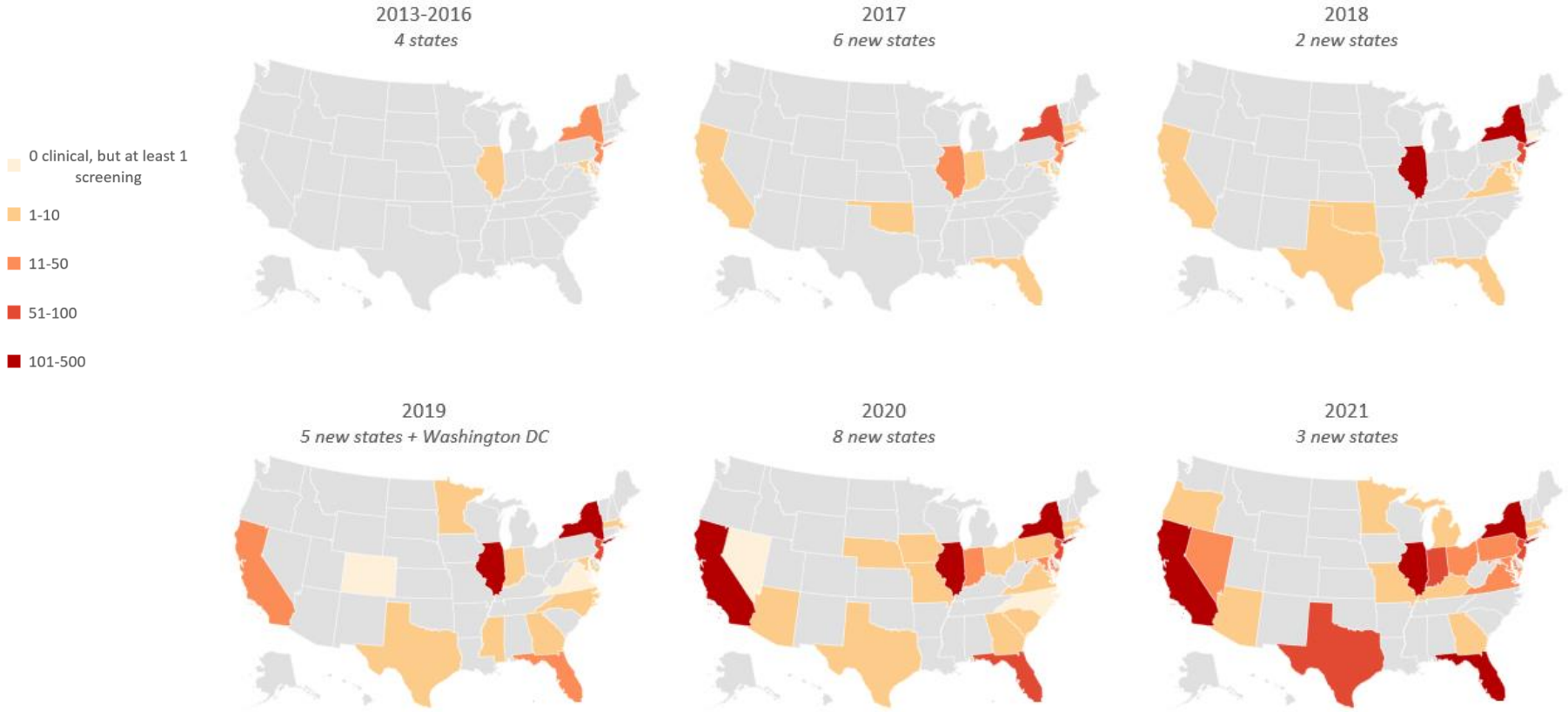


# Local spread

# US 2016 -2017




Chow et al, Lancet ID 2018



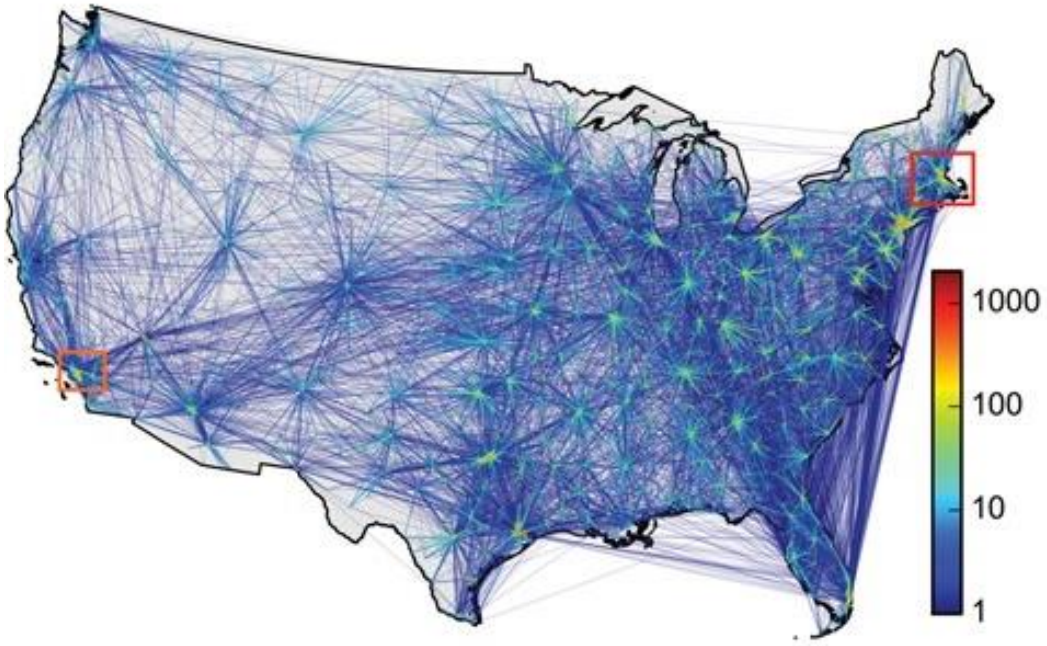

Lyman, Annals of Internal Medicine: 2023

# *C. auris* no longer just introduced from abroad

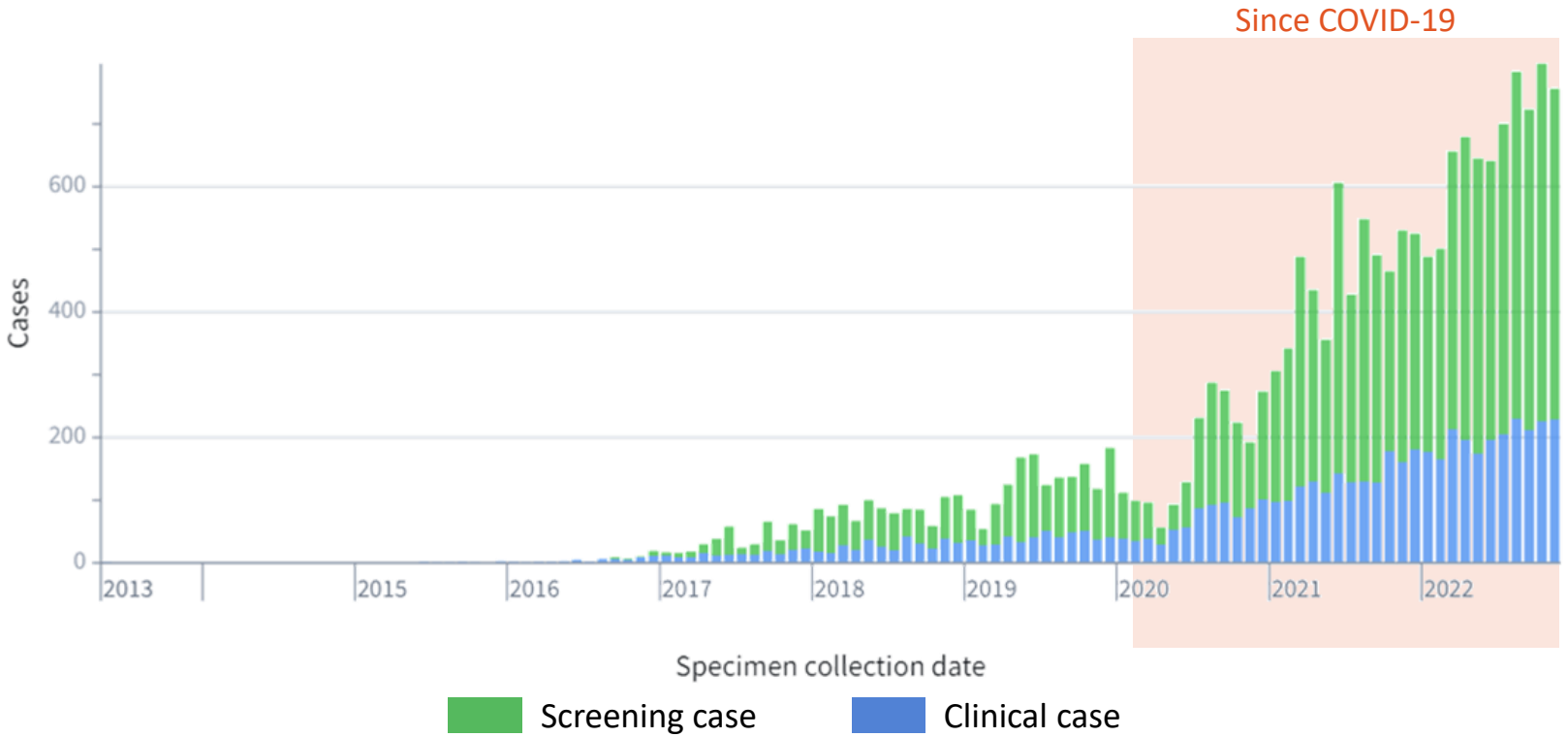
Introductions by colonized patients from high burden areas in the U.S. are more common

U.S. facility transfer network

Fernandez-Garcia et al. Nature (2017)



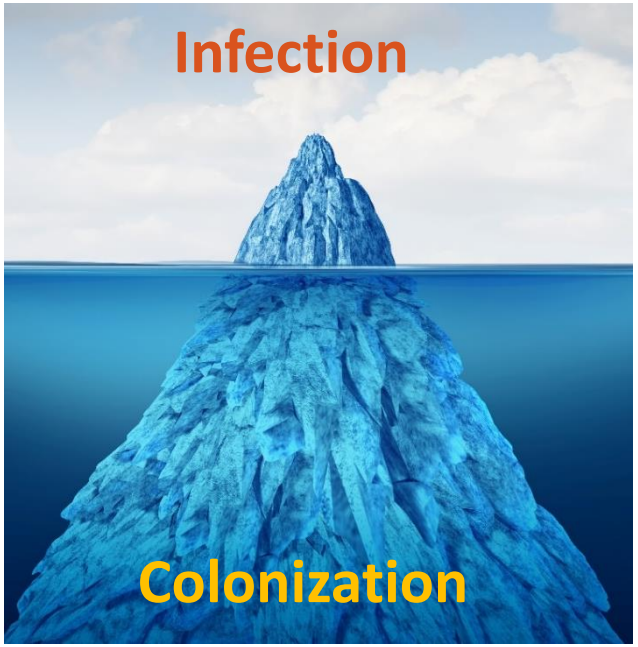
# Cases and colonizations continue to increase




Lyman, Annals of Internal Medicine: 2023

# *C. auris* colonization

- **Can lead to:**
  - Infections
  - Transmission to others (so also require precautions)
- **Primarily on skin**
  - Recommend screening by swabbing axilla/groin
  - Nose and other body sites also can become colonized
- **Colonization can persist for a long time, often months to years**
- **Currently, no well-established decolonization strategies**



# Colonization often leads to infection

## 5-10% of colonized patients go on to develop an infection

Mortality of invasive infections is

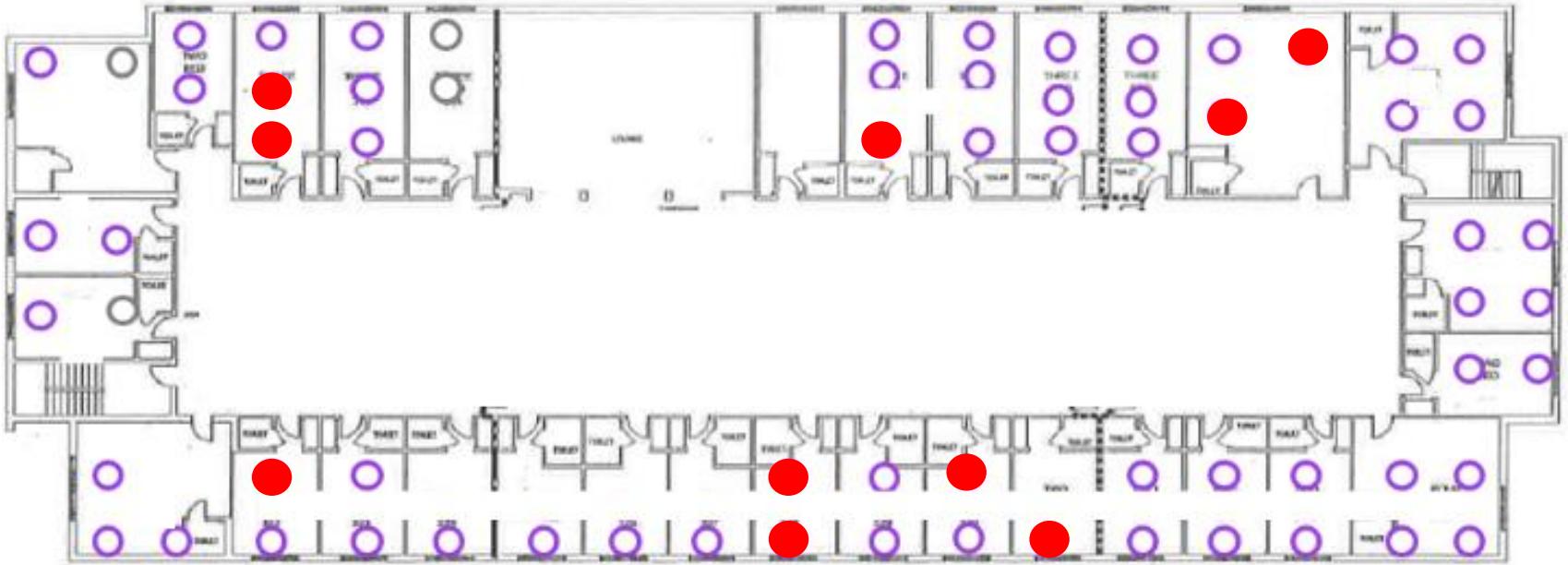
**~40%** ***within the first 30 days***

Adams E, Quinn M, Tsay S, et al. Candida auris in Healthcare Facilities, New York, USA, 2013–2017. *Emerg Infect Dis*. 2018;24(10):1816-1824.

# *Candida auris* spreads in healthcare facilities

Especially –

- Long-term acute care hospital
- Ventilator-equipped skilled nursing facilities



# Acute Care Hospitals play an important role too!

- Can still have transmission and outbreaks
- Can identify local cases and outbreaks that might be missed
- Role model for infection control

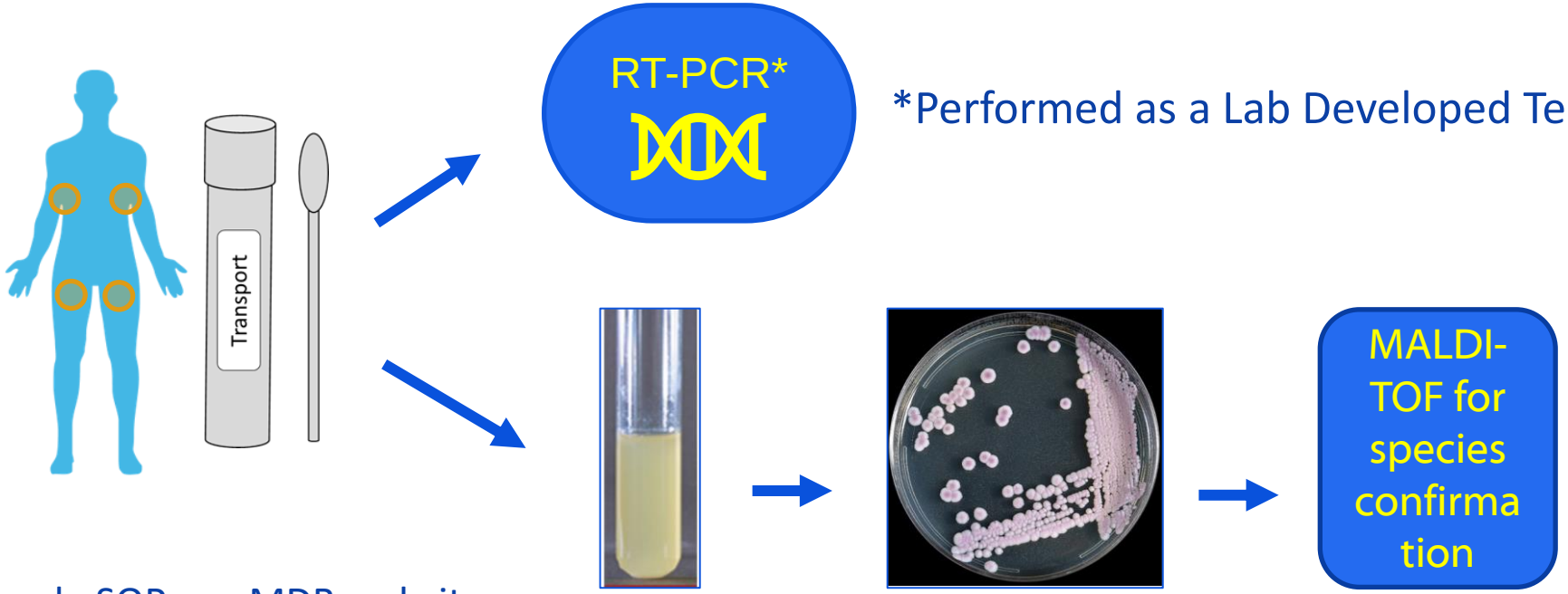
Morbidity and Mortality Weekly Report

## *Candida auris* Outbreak in a COVID-19 Specialty Care Unit — Florida, July–August 2020

Christopher Prestel, MD[1,2]; Erica Anderson, MPH[2]; Kaitlin Forsberg, MPH[3]; Meghan Lyman, MD[3]; Marie A. de Perio, MD[4,5]; David Kuhar, MD[1]; Kendra Edwards[6]; Maria Rivera, MPH[2]; Alicia Shugart, MA[1]; Maroya Walters, PhD[1]; Nychie Q. Dotson, PhD[2]

# Detection

# Colonization screening




*Performed as a Lab Developed Test

## Example SOPs on MDB website

Real-Time PCR Based Identification of Candida auris Using Applied Biosystems 7500 Fast Real-Time PCR Platform | Fungal Diseases | CDC

Procedure for Isolation of Candida auris Using Sabouraud Salt Dulcitol Broth With Chloramphenicol and Gentamicin followed by CHROMagar | Fungal Diseases | CDC

Lockhart, JCM; 2022

# Latest on *C. auris* diagnostics

**TABLE 1** Methods for identification or isolation of *Candida auris* (Table view)

| Test type and details | Notes[a] | Reference(s) |
|---|---|---|
| Culture | | |
| Original enrichment broth | Valuable reference method for diagnostic development | 30 |
| Chromogenic medium | Aids visual identification to the species level of the common *Candida* spp. | 24, 26, 27 |
| Other differential media | Use of Pal's medium, ferrous sulfate, and crystal violet | 25, 28, 29 |
| Biochemical tests | | |
| API 20C AUX | Cannot currently identify *C. auris*; see CDC follow-up algorithm | 12, 15, 16 |
| API ID 32C | Cannot currently identify *C. auris*; see CDC follow-up algorithm | 12 |
| BD Phoenix | Cannot currently identify *C. auris*; see CDC follow-up algorithm | 12 |
| MicroScan | Cannot currently identify *C. auris*; see CDC follow-up algorithm | 12 |
| RapID yeast plus | Cannot currently identify *C. auris*; see CDC follow-up algorithm | |
| Vitek 2 YST | Can ID some but not all *C. auris*; see CDC follow-up algorithm | 17 |
| MALDI-TOF MS | | |
| Bruker Biotyper 2.0 Microflex LT | FDA approved for isolate ID with CA System library (v4) | 20 |
| bioMérieux Vitek MS | FDA approved for isolate ID with IVD library v3.2 | 19 |
| Blood culture, molecular | | |
| BioFire BCID2 | FDA approved for positive blood culture | |
| GenMark Dx ePlex BCID-FP panel | FDA approved for positive blood culture | 58 |
| RT-PCR | | |
| TaqMan chemistry | Most common LDT for colonization screening in U.S. PHL | 41, 52 |
| SYBR green chemistry | Evaluated for skin and anterior nares | 39, 42 |
| Commercial RT-PCR kits | | |
| AurisID, OLM Diagnostics | CE-IVD reagents for *C. auris* RT-PCR | 47 |
| BioGX *Candida auris* | RUO reagents supporting RT-PCR and extraction on BD Max platform | |
| Fungiplex *Candida auris* | RUO reagents for *C. auris* RT-PCR | 47 |
| Other | | |
| LAMP | Unique molecular method for *C. auris* detection | 40 |
| T2MR *C. auris* | RUO test for *C. auris* using T2 magnetic resonance technology | 50 |
| Conventional PCR with GPI target | *C. auris* specific and multiplex tests feasible in low-resource settings | 36–38 |

# Send *Candida* Isolates to Your Public Health Lab

## Labs that take swift action to submit isolates to their public health lab can help detect *Candida* and stop its spread.

*Candida* is one of the most common causes of healthcare-associated bloodstream infections in the United States and antifungal resistance in *Candida* is increasing. There are new and emerging species, like *Candida auris (C. auris)*, which can spread in healthcare settings and cause outbreaks.

## What to send?

- All confirmed or suspected *Candida auris* isolates (any specimen source)
- *Candida* species **other than** *C. albicans* from any specimen source, especially invasive sites
- Yeast isolates from any specimen source when unable to identify species after identification was attempted

## With support from CDC's Antibiotic Resistance Lab Network, your regional lab can:


- Identify species and detect organisms that are public health threats
- Provide antifungal susceptibility data to track resistance
- Help respond to outbreaks of *Candida*

# Educational Links & Resources

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

https://www.cdc.gov/fungal/candida-auris/health-professionals.html

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

# Where did it come from?

NEWS HEALTH & MEDICINE

# A deadly fungus behind hospital outbreaks was found in nature for the first time

The discovery could spur search expeditions for the yeast in more places

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OBSERVATION
March/April 2021 Volume 12 Issue 2 e03181-20
https://doi.org/10.1128/mBio.03181-20

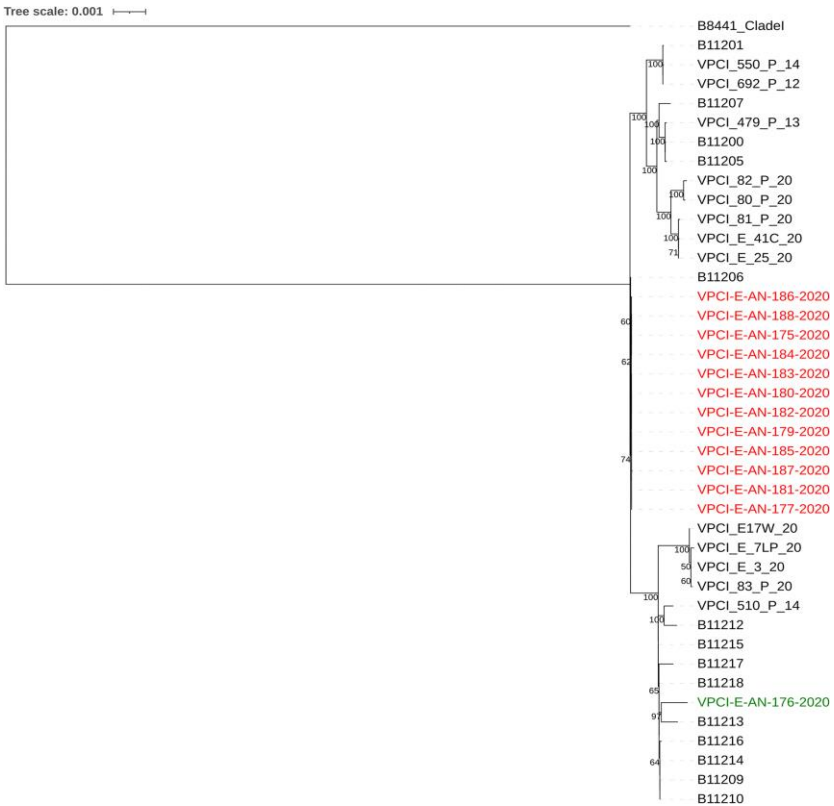
# Environmental Isolation of *Candida auris* from the Coastal Wetlands of Andaman Islands, India

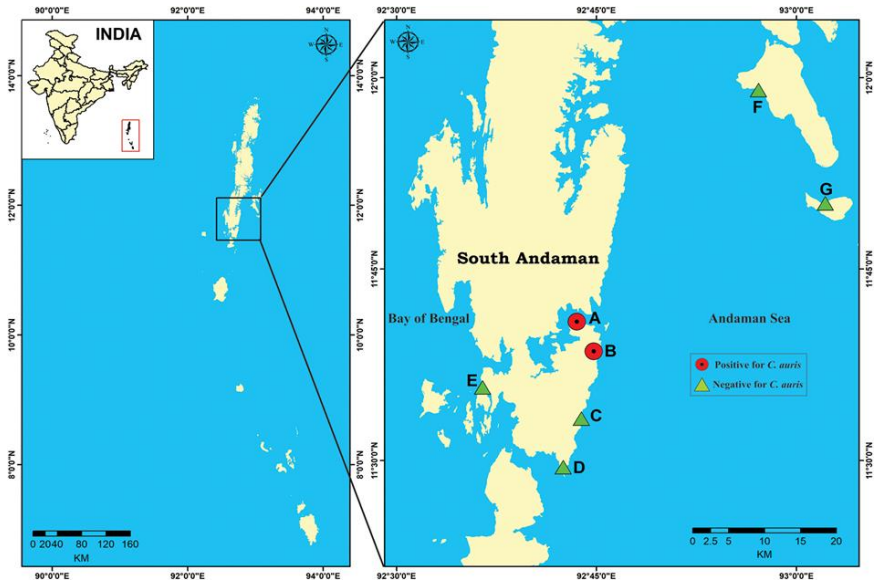
**Parth Arora[a,b], Prerna Singh[a], Yue Wang[c], Anamika Yadav[a], Kalpana Pawar[a], Ashutosh Singh[a], Gadi Padmavati[b], Jianping Xu [c], and Anuradha Chowdhary [a]**

[a]Department of Medical Mycology, Vallabhbhai Patel Chest Institute, University of Delhi, New Delhi, India
[b]Department of Ocean Studies and Marine Biology, Pondicherry University, Port Blair, Andaman & Nicobar Islands, India

Arora et al, 2021 https://journals.asm.org/doi/full/10.1128/mBio.03181-20

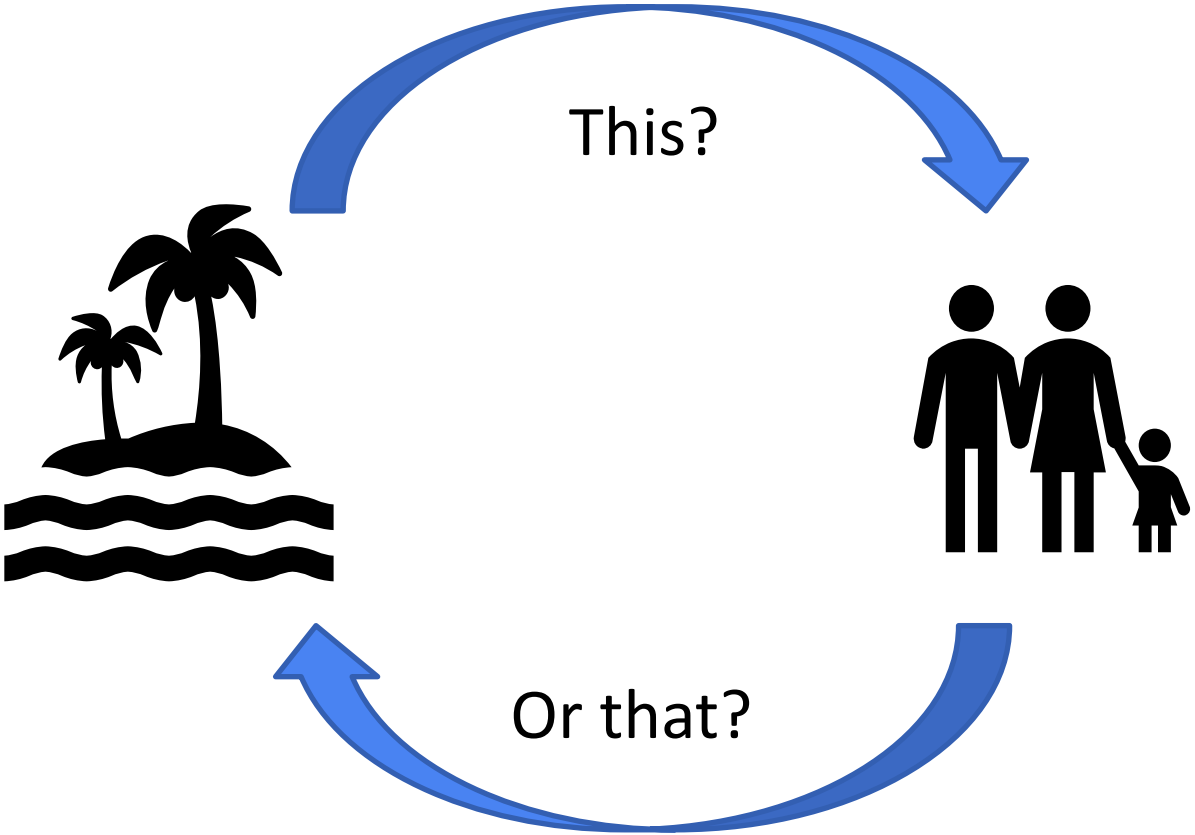
# Genetic relationships between environmental and clinical isolates




Arora et al, 2021 https://journals.asm.org/doi/full/10.1128/mBio.03181-20

# Origin of *C. auris* on the islands



# *Candida auris* Discovery through Community Wastewater Surveillance during Healthcare Outbreak, Nevada, USA, 2022

Alessandro Rossi, Jorge Chavez, Thomas Iverson, John Hergert,
Kelly Oakeson, Nathan LaCross, Chidinma Njoku, Andrew Gorzalski, Daniel Gerrity

Emerging Infectious Disease, February, 2023

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PERSPECTIVE

# Role of Microbiota in the Skin Colonization of *Candida auris*

Brooke Tharp,[a] Rachel Zheng,[a] Garrett Bryak,[a] Anastasia P. Litvintseva,[b] Mary K. Hayden,[c] Anuradha Chowdhary,[d,e] Shankar Thangamani[a,f]

# Skin flora microbiome


Gram positive bacteria
*Malassezia* species

No *Candida auris*


Gram negative bacteria
*Candida* species

*Candida auris* colonization

# Two most basal clades primarily found in ears…so far



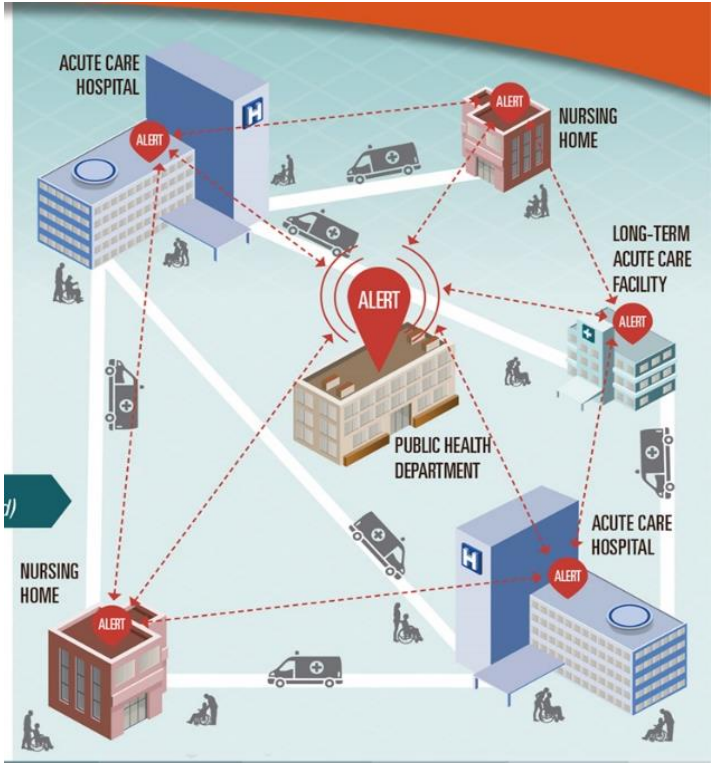

# Take home messages

# Summary

- Emerged suddenly
- Reported in >50 countries
- Highly transmissible healthcare-associated infection
- Affects the most vulnerable
- Highly resistant to antifungal drugs
- Increasing rates of pan-resistance

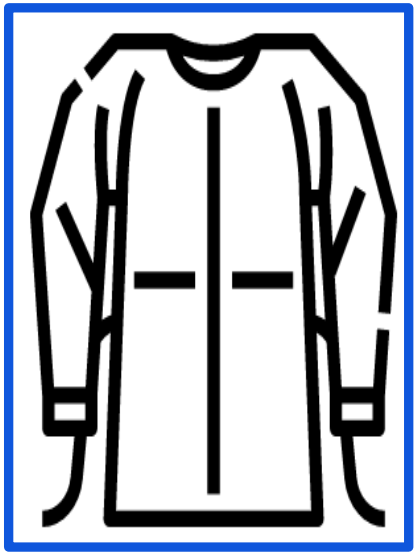
# We are all Connected

- Healthcare facilities exist in intricate networks of patient sharing
- What one facility does or does not do can affect a whole region
- Coordinated communication between facilities and with health departments in essential



# Prevention strategies: back to the basics

Hand Hygiene



Transmission-based precautions & Personal Protective Equipment

Environmental Cleaning & Disinfection

# Thank you!  Questions?


For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY:  1-888-232-6348  www.cdc.gov

Contact me at:
gyi2@cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.