APIC SAN JOAQUIN VALLEY

Candida auris: An Emerging Threat

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Speaker Bio

Doe Kley, RN, MPH, T-CHEST, LTC-CIP, CIC
Infection Prevention Fellow
Clinical and Scientific Affairs, Clorox Healthcare

Doe Kley is an Infection Prevention Fellow within Clorox Healthcare's Clinical and Scientific Affairs team and is passionate about helping gleam insights and solutions to tackle the many challenges faced in infection prevention. Her role focuses on providing consultative services and developing practice tools using her nearly 20 years of clinical expertise in acute care infection prevention from working in large healthcare systems, such as Intermountain Healthcare and Kaiser Permanente.

Doe is a registered nurse and received her Master of Public Health from the University of Nevada, Reno, as well as a Bachelor of Microbiology from Weber State University. She teaches an infection control course for the Ohio State University (OSU) and is also dual-board certified in infection prevention and epidemiology in both acute and long-term care. Additionally, Doe is certified to train EVS through Association for the Healthcare Environment (AHE) and is currently a member of AHE, the Association for Professionals in Infection Control & Epidemiology (APIC), the Association of periOperative Registered Nurses (AORN), and the Society for Healthcare Epidemiology of America (SHEA). Doe is active on several committees including Test Committee for the Certification Board of Infection Control & Epidemiology (CBIC) and the Advisory Council for the Pearce Foundation Environmental Services Optimization Playbook (EvSOP). She also served on the board of directors for California APIC Coordinating Council (CACC) in 2022.

Relevant Financial Disclosures

Faculty for this activity:

- Doe Kley is employed by the Clorox Company. However, no products will be discussed or promoted in this presentation.

Agenda

What we will cover today:

- A brief history of *C. auris*
- What is *C. auris* and why it's so problematic
- Review transmission and outbreaks
- Infection prevention & control measures for *C. auris*
- Caveats around environmental cleaning & disinfection for this unique pathogen.
- Q&A

Learning Objectives

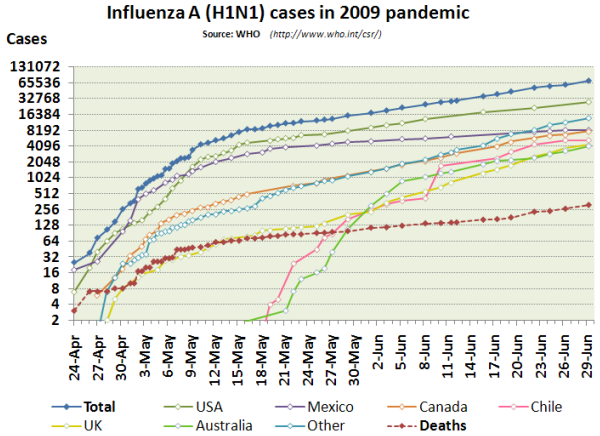
At the conclusion of this webinar, participants will be able to:

- Explain the epidemiology of *C. auris*.
- Differentiate *C. auris* from other antimicrobial-resistant pathogens.
- Implement surveillance for *C. auris* into their infection control program.
- Select appropriate infection control measures to contain *C. auris.*
- Identify the subtleties around cleaning and disinfection for this pathogen.

C. auris: humble beginnings but rapid spread

Remember 2009?

Barack Obama sworn in as 44th US President



Swine (H1N1) Influenza Pandemic

	2009 H1N1	COVID-19
# Cases	61 million	612 million
# Deaths	12,000	6.5 million

US airways Flight 1549
"Hudson Miracle", Captain Sullenberger

Cruise I never got to take ☹

2009: Japan - A new foe emerges

Microbiol Immunol 2009; 53: 41–44
doi:10.1111/j.1348-0421.2008.00083.x

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 Hasumi[1], Yayoi Nishiyama[1], Katsuhisa Uchida[1] and Hideyo Yamaguchi[1]

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

"auris" means "ear" in Latin

ABSTRACT

A single strain of a novel ascomycetous yeast species belonging to the genus *Candida* was isolated from the external ear canal of an inpatient in a Japanese hospital. Analyses of the 26S rDNA D1/D2 domain, nuclear ribosomal DNA ITS region sequences, and chemotaxonomic studies indicated that this strain represents a new species with a close phylogenetic relationship to *Candida ruelliae* and *Candida haemulonii* in the Metschnikowiaceae clade. This strain grew well at 40 °C, but showed slow and weak growth at 42 °C. The taxonomic description of *Candida auris* sp. nov. is proposed (type strain JCM15448^T = CBS10913^T = DSM21092^T).

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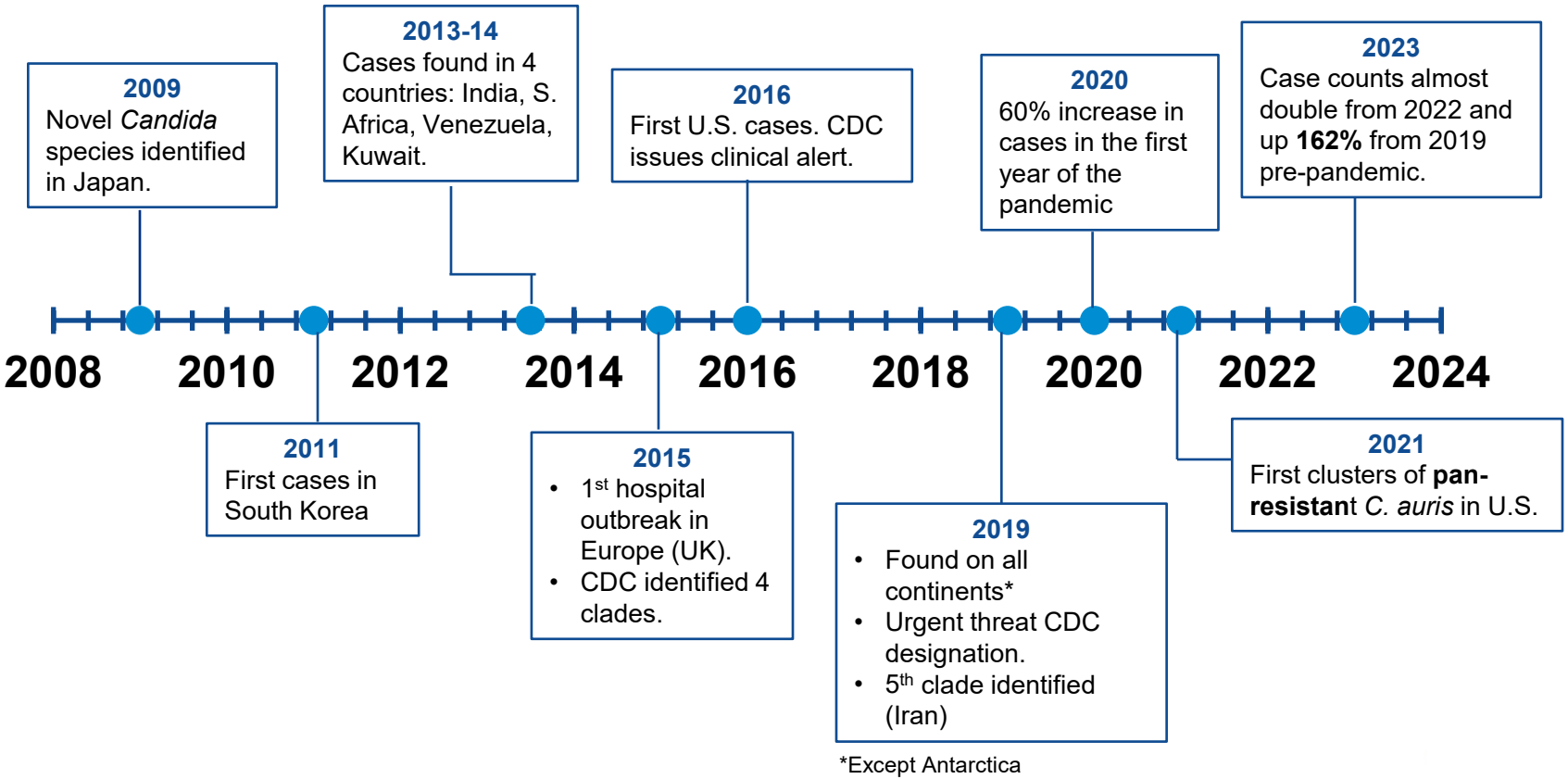
C. auris likely around since the 1980s

1980s

Cases under-reported:

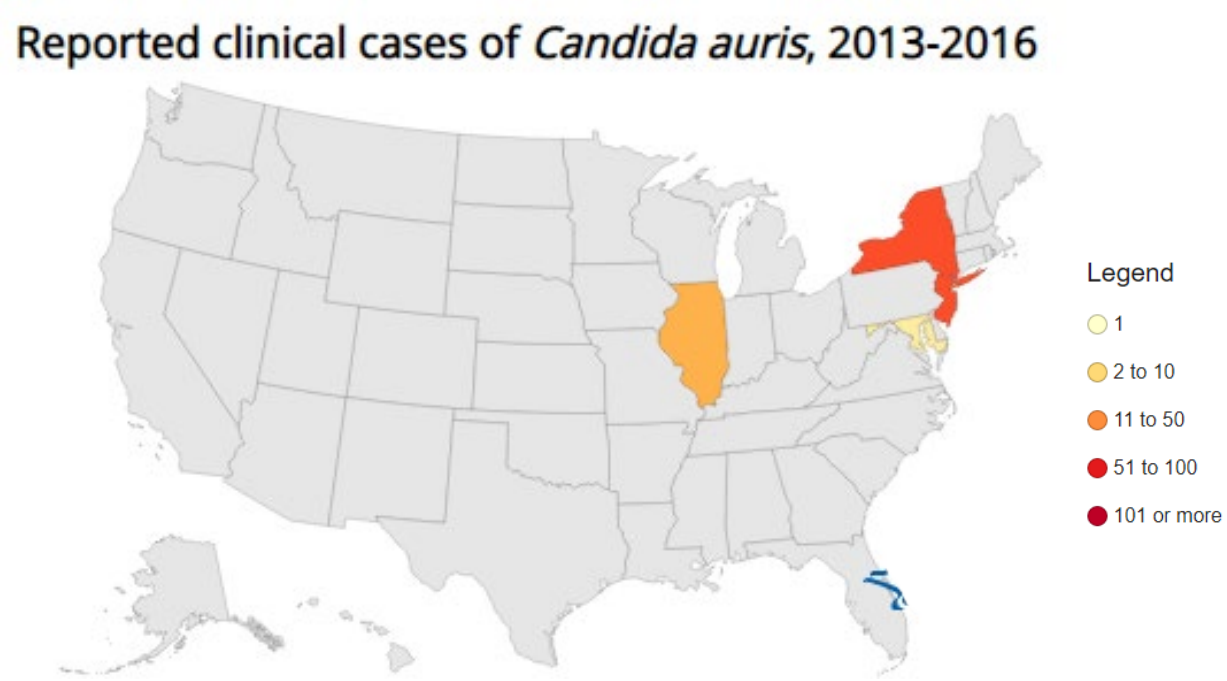
- Not looking for it
- Lack of local diagnostic testing methods
- Misidentification

C. auris Timeline



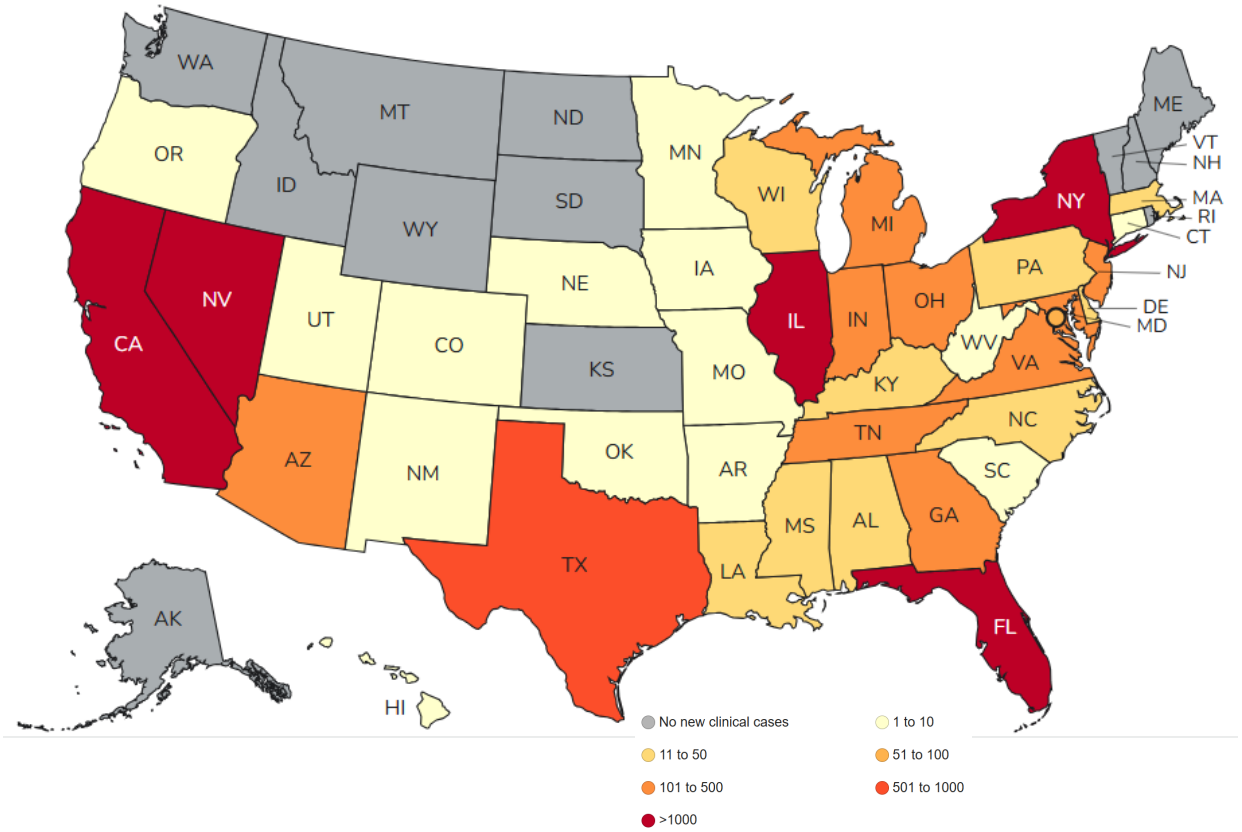
*Except Antarctica

C. auris Case Counts in its Early Years in the U.S.



References:
1. CDC. Candida auris 2019 Case Definition. Available from https://ndc.services.cdc.gov/case-definitions/candida-auris-2019/
2. CDC. MMWR: Investigation of the First 7 Reported Cases of C. auris, A Globally Emerging Invasive, Multidrug-Resistant Fungus – US, May 2013-Aug 2016. Available from https://www.cdc.gov/mmwr/volumes/65/wr/mm6544e1.htm#T1_down
3. CDC. C. auris Clinical Update 2017. Available from https://www.cdc.gov/fungal/candida-auris/c-auris-alert-09-17.html

Fast Forward 10 years to the Current U.S. Case Counts



Year	U.S. Total Case Count*
2013-16	63
2017	173
2018	331
2019	478
2020	757
2021	1,474
2022	2,377
2023	4,514

*Clinical cases only. Colonizations excluded

Image from https://www.cdc.gov/fungal/candida-auris/tracking-c-auris.html

C. auris: A global view

Countries from which *Candida auris* cases have been reported, as of February 15, 2021
This map is no longer being updated given how widespread *C. auris* has become.

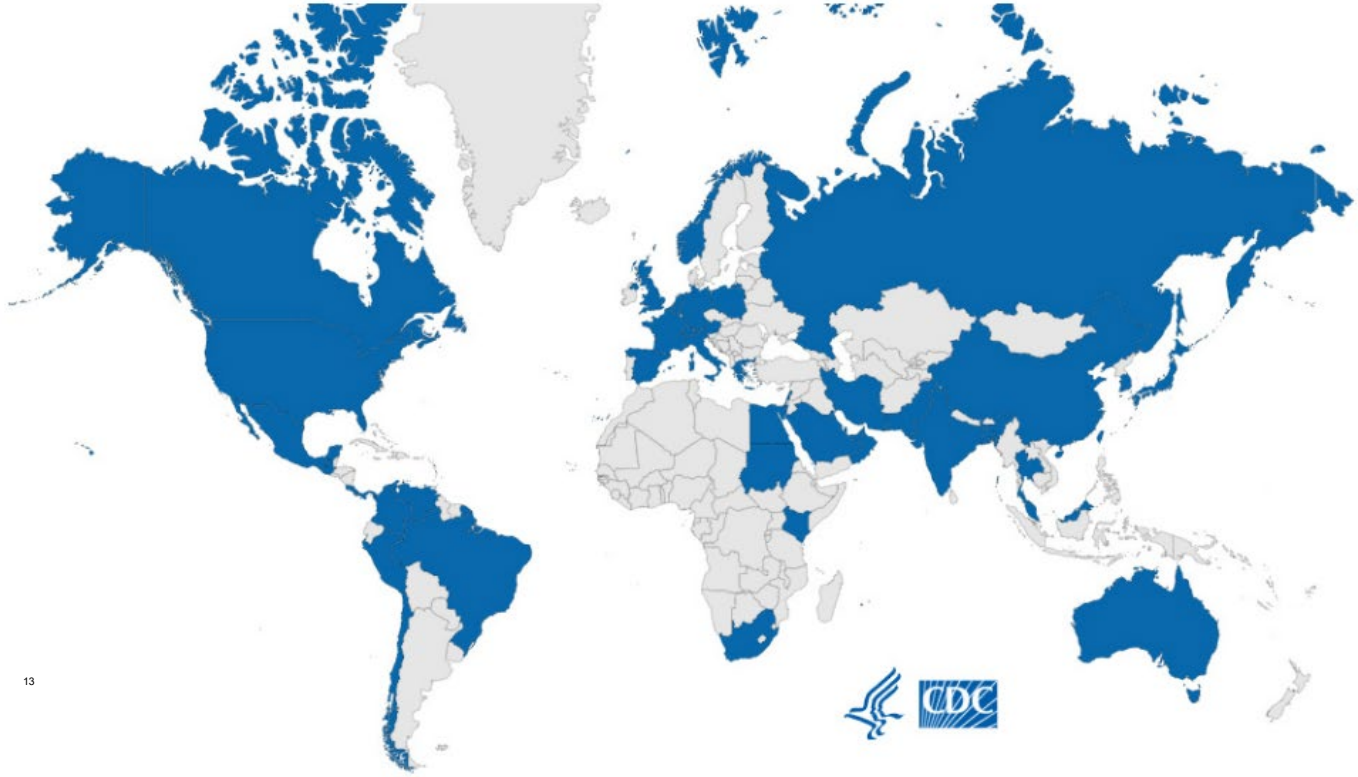


Image from https://www.cdc.gov/fungal/candida-auris/tracking-c-auris.html

What is *C. auris* and why is it problematic?

Global Emerging Threat – Five Reasons Why

1. Multi-drug resistant
2. Difficult to identify with routine lab methods
3. Invasive infections, high mortality
4. Persists in the environment
5. Spreads rapidly in healthcare settings

Multi-drug Resistant

3 classes of antifungals to treat Candida infections:

Antifungal	% Resistance
Azoles	86%
Amphotericin B (polyenes)	26%
Echinocandins	1.2%

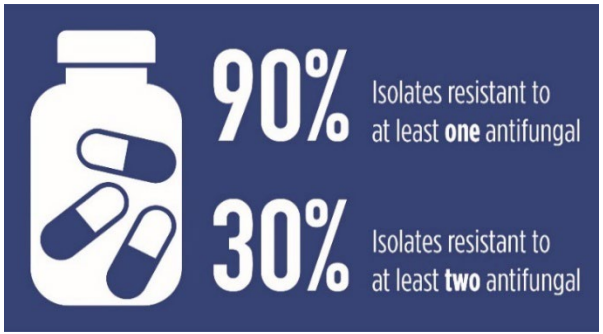


Image retrieved from CDC (2019) AR Threat Report

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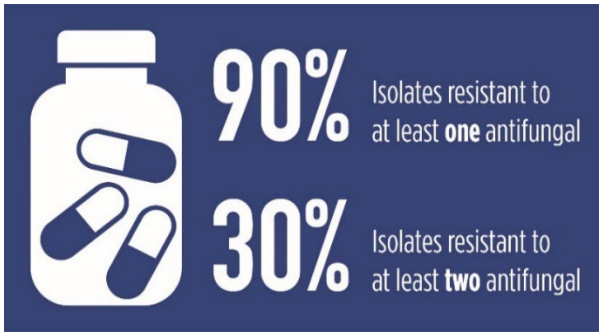

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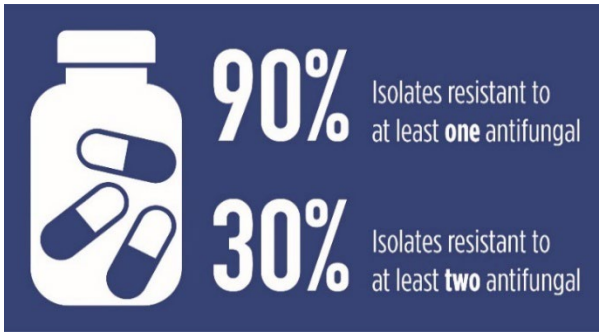
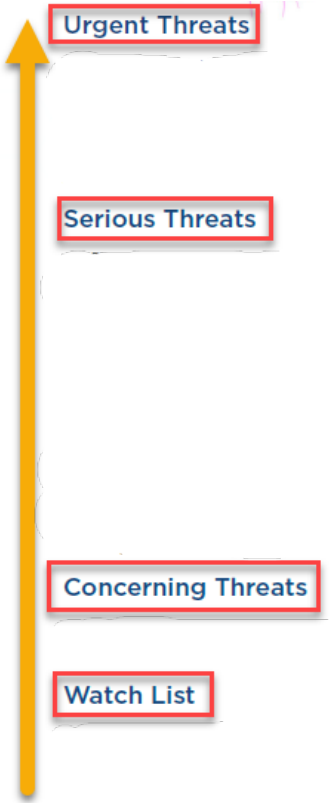


Image retrieved from CDC (2019) AR Threat Report

Multi-drug Resistant

URGENT THREAT!



Reference: AR Threats Report (2019) available from https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf

Multi-drug Resistant

THREAT LEVEL **URGENT**

URGENT THREAT!

Urgent Threats

- Carbapenem-resistant *Acinetobacter*
- *Candida auris (C. auris)*
- *Clostridioides difficile (C. difficile)*
- Carbapenem-resistant Enterobacteriaceae (CRE)
- Drug-resistant *Neisseria gonorrhoeae (N. gonorrhoeae)*

Serious Threats

- Drug-resistant *Campylobacter*
- Drug-resistant *Candida*
- Extended-spectrum beta-lactamase (ESBL)-producing Enterobacteriaceae
- Vancomycin-resistant *Enterococci* (VRE)
- Multidrug-resistant *Pseudomonas aeruginosa (P. aeruginosa)*
- Drug-resistant nontyphoidal *Salmonella*
- Drug-resistant *Salmonella* serotype Typhi
- Drug-resistant *Shigella*
- Methicillin-resistant *Staphylococcus aureus* (MRSA)
- Drug-resistant *Streptococcus pneumoniae (S. pneumoniae)*
- Drug-resistant Tuberculosis (TB)

Concerning Threats

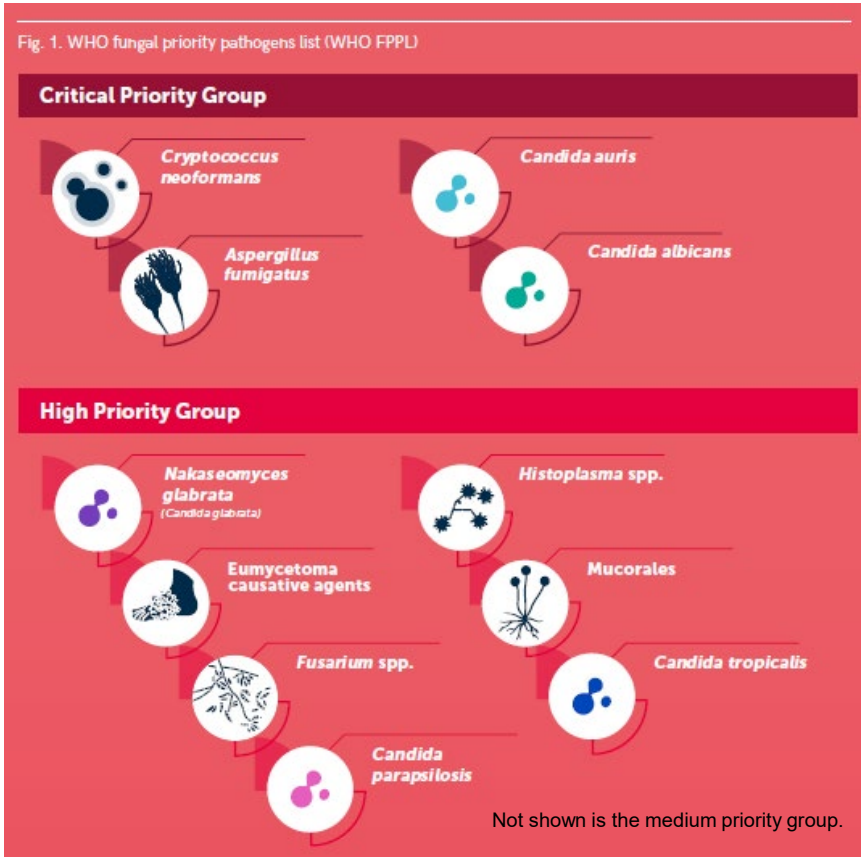
- Erythromycin-resistant group A *Streptococcus*
- Clindamycin-resistant group B *Streptococcus*

Watch List

- Azole-resistant *Aspergillus fumigatus (A. fumigatus)*
- Drug-resistant *Mycoplasma genitalium (M. genitalium)*
- Drug-resistant *Bordetella pertussis (B. pertussis)*

Reference: AR Threats Report (2019) available from https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf

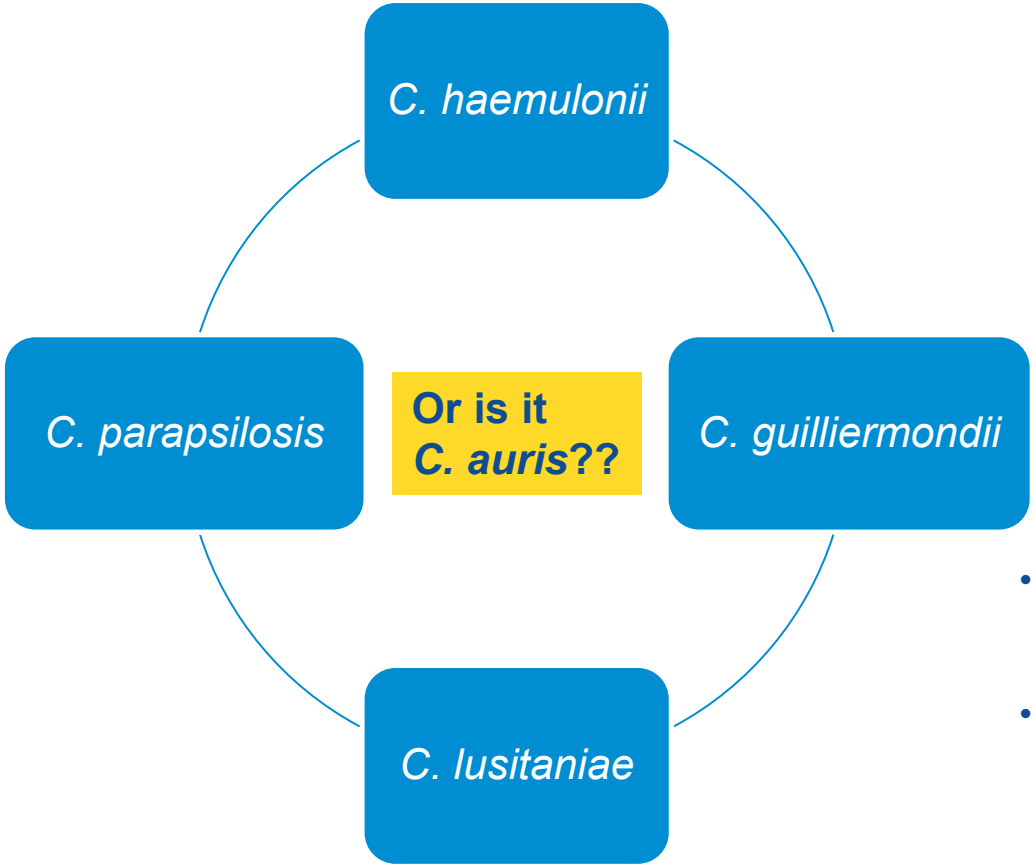
Multi-drug Resistant



CRITICAL PRIORITY GROUP!

Reference: WHO Fungal Priority Pathogens List, (2022). Available from https://www.who.int/publications/i/item/9789240060241

2 Difficult to identify

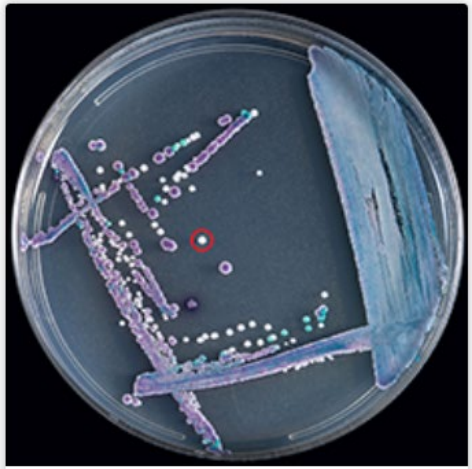


Misidentification

- Its not common to identify to species level when isolated from non-sterile body site.
- When hospital labs do speciate, it is often misidentified as other *Candida* sp.

Difficult to identify

When to suspect C. auris, when to speciate



Mixed culture of *Candida glabrata* (purple), *Candida tropicalis* (navy blue), and *Candida auris* (white, circled in red) on CHROMagar Candida.

Candida auris on CHROMagar Candida, displaying multiple color morphs.

Image retrieved from https://www.cdc.gov/fungal/candida-auris/identification.html

2

Difficult to identify

Tests to ID C. auris:
- MALDI-TOF
- DNA sequencing
- Enrichment broth

Misidentification

Identification Method	Organism *C. auris* can be misidentified as
Vitek 2 YST*	*Candida haemulonii* *Candida duobushaemulonii*
API 20C	*Rhodotorula glutinis* (characteristic red color not present) *Candida sake*
API ID 32C	*Candida intermedia* *Candida sake* *Saccharomyces kluyveri*
BD Phoenix yeast identification system	*Candida haemulonii* *Candida catenulata*
MicroScan	*Candida famata* *Candida guilliermondii*** *Candida lusitaniae*** *Candida parapsilosis***
RapID Yeast Plus	*Candida parapsilosis***

Source: CDC: https://www.cdc.gov/fungal/candida-auris/identification.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Ffungal%2Fcandida-auris%2Frecommendations.html

**

3

Invasive infections - High mortality

Mortality 30-60%

Colonization	Non-Invasive Infections	Invasive Infections
Urine or Stool	Wounds	Bloodstream
External ear canal	Otitis	Intra-abdominal
Wounds	UTI	Myocarditis
Respiratory tract	SSI	Meningitis
Skin (axilla, groin)	Skin abscesses	Osteomyelitis

Persists in the Environment

Survival on surfaces

Surface Type	Survival Time	# Studies
 Glass	3 days	1 study
 Stainless steel	>7 days	1 study
 Plastic	>14 days	3 studies

C. auris **contaminates** and **persists** in the environment

Wißmann JE et al., Persistence of Pathogens on Inanimate Surfaces: A Narrative Review. Microorganisms. 2021 Feb 9;9(2):343. https://pubmed.ncbi.nlm.nih.gov/33572303/

5

Spreads rapidly in healthcare settings

Transmission

Direct Contact

Indirect Contact

Created by WEBTECHOPS LLP from the Noun Project

Spreads rapidly in healthcare settings

Rapid Spread → Outbreaks!

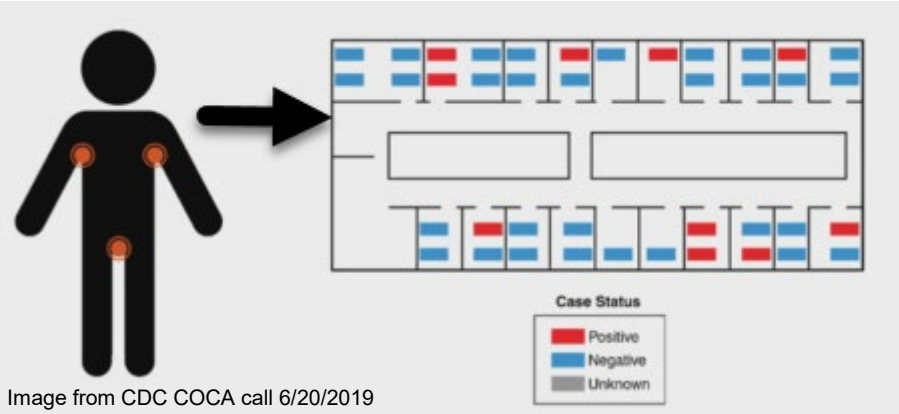


Image from CDC COCA call 6/20/2019

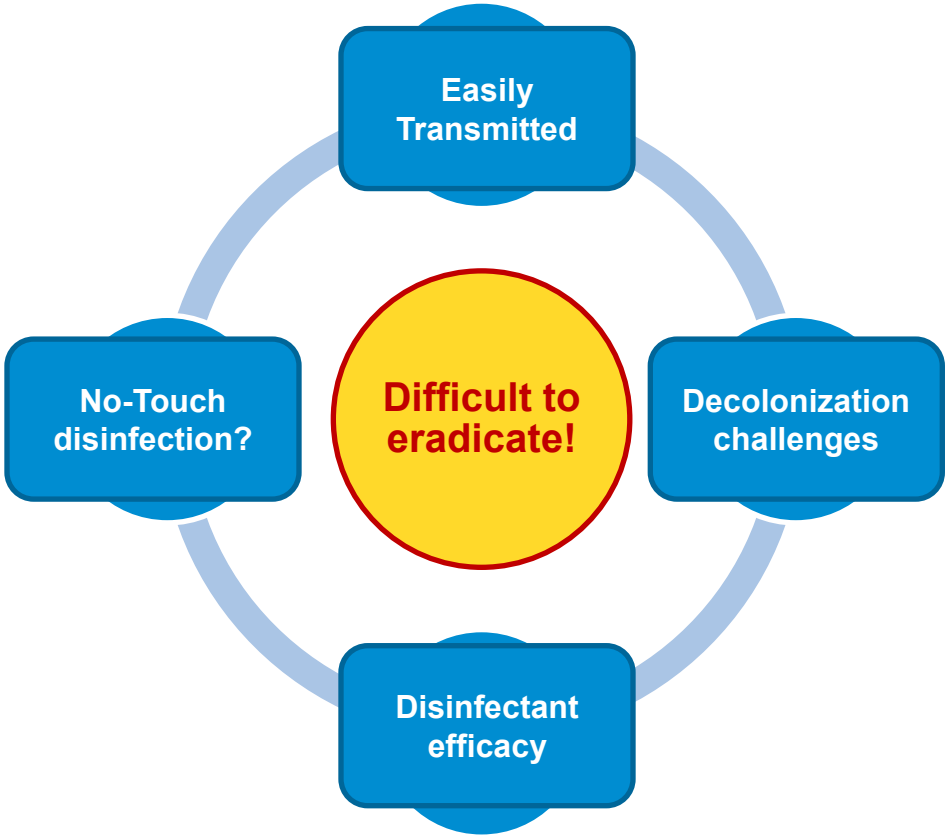
Easily transmitted:

- Spread by direct and indirect contact.
- Shedding from colonized pt's.
- Prolonged survival on environmental surfaces,
- Difficult to kill with some disinfectants.
- Movement of pt's across the HC continuum.

- 1/3-1/2 of residents on a unit become colonized within weeks of an index case.
- *C. auris* prevalence increased from 43% to **71%** in the 2yr study period.
- **39%** of environmental samples tested (+) for *C. auris.*

Reference: Pacilli M, et al. Regional Emergence of C. auris in Chicago….Clin Infect Dis. 2020; 71(11):e718-e725

Spreads rapidly in healthcare settings

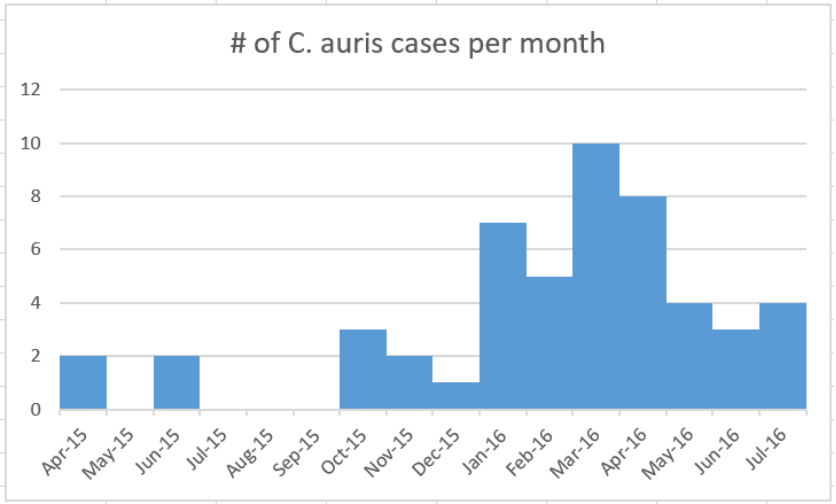


References:
1. Hayden M, et al. Characterization of Skin Microbiota, and Relation of Chlorhexidine Gluconate (CHG) Skin Concentration to *C. auris* Detection Among Patients at a High-Prevalence Ventilator-Capable Skilled Nursing Facility (vSNF) with Established CHG Bathing. Open Forum Infect Dis. 2019; 6(Supple 2): S25-S26.
2. Council of State and Territorial Epidemiologists (CSTE). *C. auris* Update. May 2018. Available from https://www.cste.org/resource/dynamic/forums/20180822_092336_22224.pdf

Surveillance:
Don’t let *C. auris* get a foot in the door

UK Hospital Outbreak: One case becomes many

First Hospital Outbreak of *C. auris* (UK, 2015-16)



Adapted from Schelenz et al. (2016)

Clinical Manifestation	Total number (%)
Colonized only	28/50 (56%)
Candidemia	9/50 (18%)
Central line tip culture (+)	7/50 (14%)
Sternal wound SSI	3/50 (6.3%)
Invasive candidiasis of unknown primary infection site	2/50 (4%)
CAUTI	1/50 (2%)

Reference: Schelenz et al. (2016). First Hospital Outbreak of the Globally Emerging *Candida auris* in a European Hospital. *Antimicrobial Resistance and Infection Control*, 5:35.

One case is a big deal!

Epidemic

- Sudden increase in cases above normal in the population of a given area

Outbreak

- Same as epidemic but used for more limited geographic area

1 case: Report & Investigate
≥2 cases: Outbreak!

References:
1. CDC. Division of Scientific Education and Professional Development Archives. Introduction to Epidemiology, 2012. Available from https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section11.html.
2. APIC.(nd). Outbreaks, epidemics and pandemics – what you need to know. Available from https://apic.org/monthly_alerts/outbreaks-epidemics-and-pandemics-what-you-need-to-know/
3. CORHA. C. auris: Recommendations for Healthcare Outbreak Response, 2022. Available from https://www.corha.org/resources/candida-auris-recommendations-for-healthcare-outbreak-response/

Case Study: The start of the day…

DAY 1
-90yr old female admitted from SNF
-OR to ICU
-Central line placed
-Broad spectrum antibiotics

DAY 2
-Fever
-*C. haemulonii* in blood

Risk factors for *C. auris*

- Recently* hospitalized **outside of the US** in endemic country
- Recently* hospitalized in an area **in the US** seeing transmission
- Multiple or prolonged healthcare stays
- Recent care in post-acute care (PAC) setting
- Presence of invasive medical devices
- Patients infected or colonized with other MDROs
- Complex or high acuity patients

* In past year

References:
1. Hu, S. (2021) Retrospective Analysis of Clinical Characteristics of *C. auris* Infection Worldwide 2009-2020. Microbiol., Vol 12.
2. CDC. Candida auris: Screening Recommendations for Healthcare Facilities; April 2024. Available from CDC

3 Situations to Seek Species-Level Identification?

When to speciate for *C. auris*	
1	Yeast identified from **sterile body site**.[1]
2	Candida isolated from **non-sterile body site** when:[1] • Clinically indicated • Patient is high-risk for C. auris *(see previous slide)* • Surveillance cultures as part of outbreak management
3	Identification of a fungal isolate known to represent potential misidentification of *C. auris*. Ex: *C. haemulonii*[2]

References
1. CDC (2022). Surveillance for Candida auris Available from CDC. h
2. CDC (2022). Identification of Candida auris. Available from CDC.

A decision to be made

DAY 1
-90yr old female admitted from SNF
-OR to ICU
-Central line placed
-Broad spectrum antibiotics

DAY 2
-Fever
-*C. haemulonii* in blood

The results are in…

The results are in…

You have a case.
5 things to do… NOW!

Robust IP&C Response!

1.Isolate – Contact Precautions

- Private room or cohort with other *C. auris* pt's.
- Dedicate equipment to the room.
- Hand sanitizer, PPE, and disinfectant wipes should be readily available at the point-of –use.
- Ensure PPE is correctly donned/doffed.
- Consider cohorting staff.

2. Notification

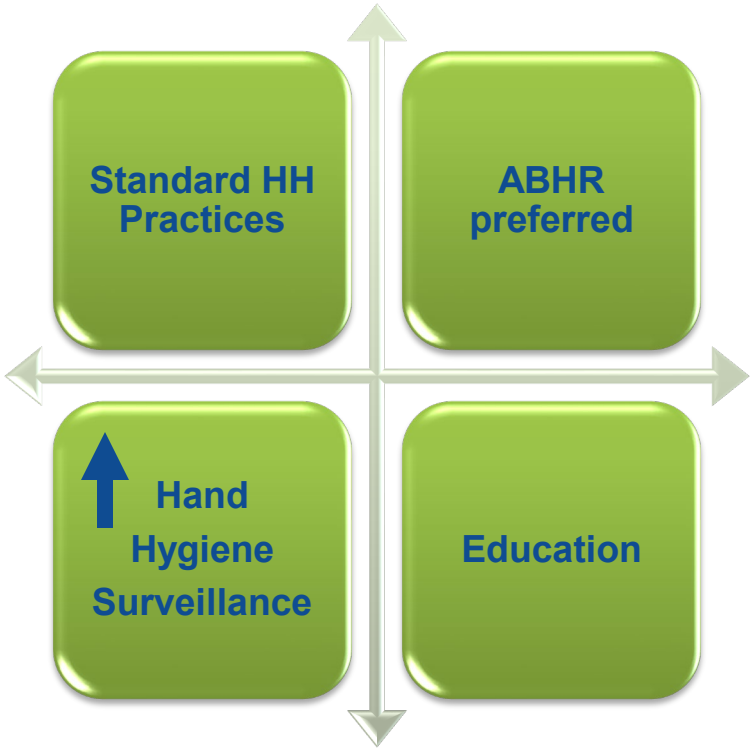
Report to Public Health Authorities
Notify Facility Leadership and & Risk Mgt

***C. auris*, clinical cases**

***C. auris*, colonization or screening cases**

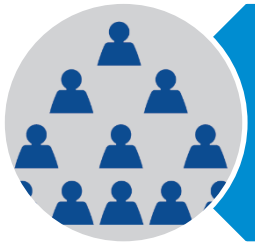
3. Adherence to Infection Control Practices

3. Adherence to Infection Control Practices



4. Contact Screening

Pts who were close contacts of a case



Point prevalence survey if ongoing transmission

Composite swab of groin and axilla

5. Communication

Poor communication is at the root of every HAI or risk event.

Inter-facility Transfer Form:

Inter-facility Infection Control Transfer Form

This form must be filled out for transfer to accepting facility with information communicated prior to or with transfer.
Please attach copies of latest culture reports with susceptibilities if available.

Sending Healthcare Facility:

Patient/Resident Last Name	First Name	Date of Birth	Medical Record Number

Name/Address of Sending Facility	Sending Unit	Sending Facility Phone

Sending Facility Contacts	Contact Name	Phone	E-mail
Transferring RN/Unit			
Transferring physician			
Case Manager/Admin/SW			
Infection Preventionist			

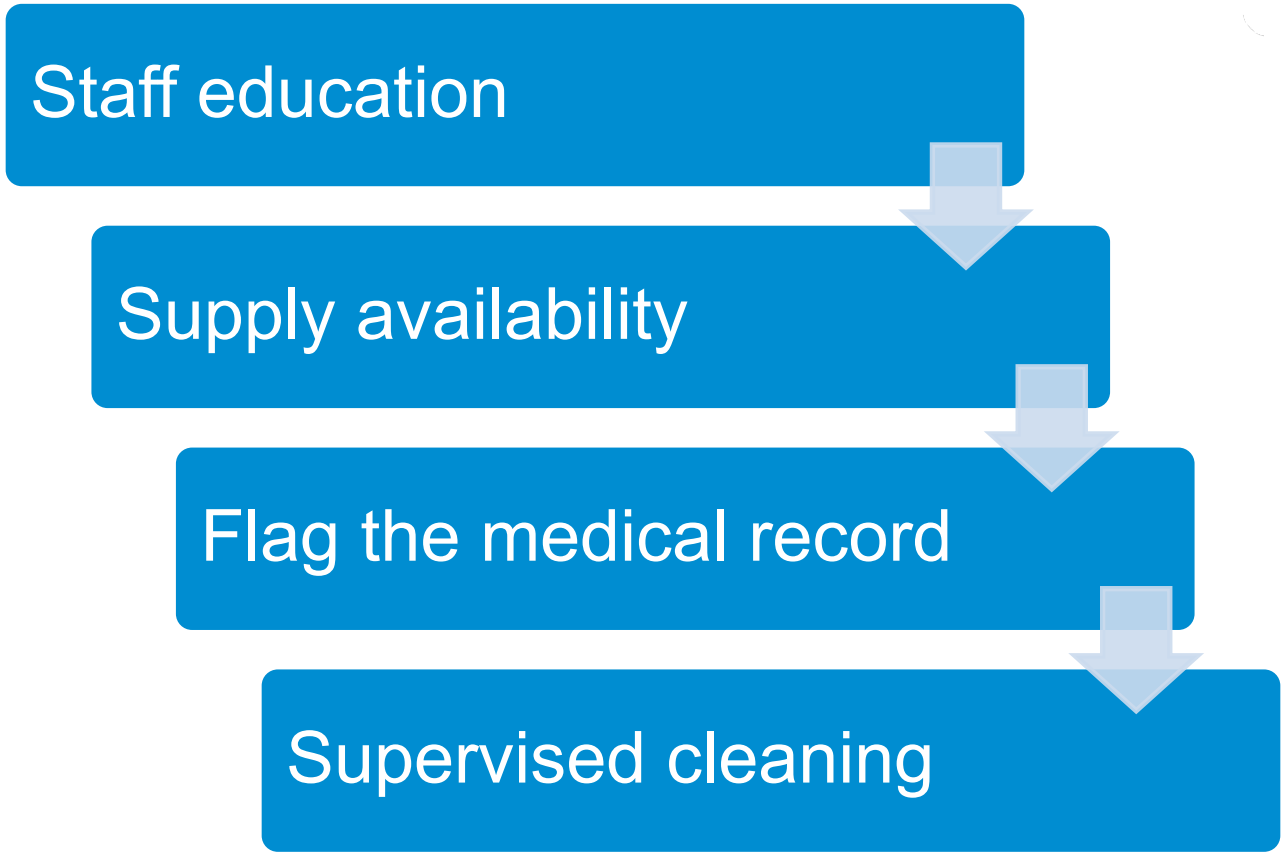
Does the person* currently have an infection, colonization OR a history of positive culture of a multidrug-resistant organism (MDRO) or other potentially transmissible infectious organism?	Colonization or history (*Check if YES*)	Active infection on Treatment (*Check if YES*)
Methicillin-resistant *Staphylococcus aureus* (MRSA)	Yes	Yes
Vancomycin-resistant *Enterococcus* (VRE)	Yes	Yes
Clostridioides difficile	Yes	Yes
Acinetobacter, multidrug-resistant	Yes	Yes
Enterobacteriaceae (e.g., *E. coli, Klebsiella, Proteus*) producing-Extended Spectrum Beta-Lactamase (ESBL)	Yes	Yes
Carbapenem-resistant Enterobacteriaceae (CRE)	Yes	Yes
Pseudomonas aeruginosa, multidrug-resistant	Yes	Yes
Candida auris	Yes	Yes
Other, specify (e.g., lice, scabies, norovirus, influenza):	Yes	Yes

Does the person* currently have any of the following? (Check here if none apply)

- Cough or requires suctioning
- Diarrhea
- Vomiting
- Incontinent of urine or stool
- Open wounds or wounds requiring dressing change
- Drainage (source):
- Central line/PICC (Approx. date inserted)
- Hemodialysis catheter
- Urinary catheter (Approx. date inserted)
- Suprapubic catheter
- Percutaneous gastrostomy tube
- Tracheostomy

Download form here.

Facilitate adherence to infection control measures



Lessons Learned from Outbreaks

Key IPC Measures

- Rapid case detection
- Species identification
- Cleaning & disinfection

Reference: Schelenz et al. (2016). First Hospital Outbreak of the Globally Emerging *Candida auris* in a European Hospital. *Antimicrobial Resistance and Infection Control*, 5:35.

Considerations for Cleaning & Disinfection

Option 1 of 2 Disinfectant for *C. auris*

Option 1 → Use product that has kill claims for *C. auris* (EPA List P)

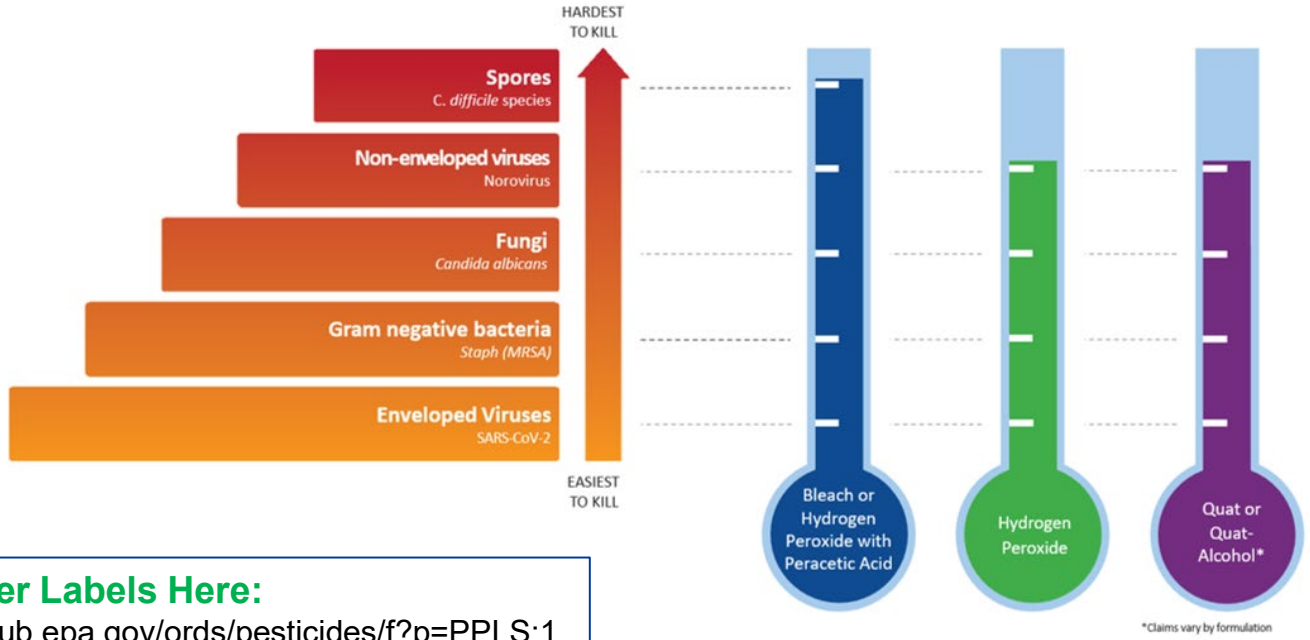
List P Sampling

EPA Registration #	Active Ingredient	Product Brand Name	Company	Contact Time (minutes)
56392-7	Sodium Hypochlorite	Dispatch Hospital Cleaner Disinfectant with Bleach	Clorox Professional Products Company	3
67619-12	Sodium Hypochlorite	Clorox HealthcareBleach Germicidal Wipes	Clorox Professional Products Company	3
67619-24	Hydrogen Peroxide	Clorox Healthcare Hydrogen Peroxide Cleaner Disinfectant	Clorox Professional Products Company	2
67619-25	Hydrogen Peroxide	Clorox Healthcare Hydrogen Peroxide Cleaner Disinfectant Wipes	Clorox Professional Products Company	2
67619-40	Sodium Hypochlorite	Clorox Spore Defense Cleaner Disinfectant	Clorox Professional Products Company	3

Reference: CDC. (2021). IP&C for *C. auris*. Available from https://www.cdc.gov/fungal/candida-auris/c-auris-infection-control.html

Option 2 of 2 Disinfectant for *C. auris*

Option 2 → Use product that has kill claims for *C. difficile* (EPA List K)



Find Master Labels Here:
https://ordspub.epa.gov/ords/pesticides/f?p=PPLS:1

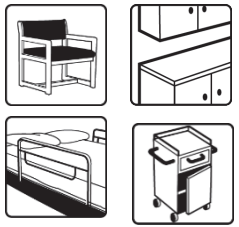
Reference: CDC. (2021). IP&C for *C. auris*. Available from https://www.cdc.gov/fungal/candida-auris/c-auris-infection-control.html

What to Clean

Outbreak studies have isolated *C. auris* from these surfaces:

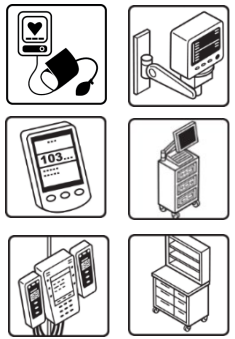
High-touch surfaces:

- Around the patient → overbed table, bed rails, remote/call button
- Remote from patient → chair, countertops, windowsills, floor



Mobile medical equipment

- Transport equipment, equipment monitors, keypads, infusion pumps, glucometers, temperature probes, blood pressure cuffs, ultrasound machines, nursing carts, and crash carts.



Important

1. Mobile equipment
2. Increase frequency
3. Declutter

References:

Vallabhaneni S. Investigation of the First Seven Reported Cases of *Candida auris* in the US. MMWR. 2016 / 65(44);1234–1237

Schelenz S. First hospital outbreak of the globally emerging *Candida auris* in a European hospital. Antimic Resist Infect Control (2016) 5:35

Tsay S. Notes from the Field: Ongoing Transmission of *Candida auris* in Health Care Facilities — United States, June 2016–May 2017. MMWR. 2017 / 66(19);514–515

CDC. Infection Prevention and Control for *Candida auris.* https://www.cdc.gov/fungal/candida-auris/c-auris-infection-control.html

Sansom S, et al. Abstract 50. Presented at: Society for Healthcare Epidemiology of America Spring Meeting; April 12-14, 2022

Summary

Let’s review what we’ve learned:

1. The history of *C. auris* and how quickly a single case of an emerging threat can spread

2. Its problematic!

3. IPC measures

4. Special considerations around cleaning & disinfection for this unique pathogen

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Archived slides

Active Surveillance: Guidance Continues to Evolve

Screening Considerations
Those w/an epi link to a colonized or infected patient (e.g., shared a room)
Pts transferred from a facility w/known or suspected transmission
Pts from LTACHS or vSNFs
Pts from facilities outside the US or in a part of the country with a high burden of *C. auris*
Pts with risk factors (e.g., presence of invasive devices, frequent or long healthcare stays, colonized with other MDROs)

Reference: CDC. Candida auris: Screening Recommendations for Healthcare Facilities; April 2024. Available from CDC.