Candida auris: an emerging fungal pathogen

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Candidemia

- Bloodstream infection caused by *Candida* spp.
- One of the most common healthcare-associated bloodstream infections in the United States
- Mortality 30-50%
Who gets candidemia?

- Risk factors include:
  - Prolonged ICU stay
  - Central lines
  - Broad spectrum antibiotic use
  - Diabetics
  - Surgical patients
  - Immunocompromised patients
How do they get candidemia?

- Usually auto-inoculation of host flora (gut)
- Outbreaks rare, but reported with *Candida parapsilosis*
Surveillance reveals changing species epidemiology

![Bar chart showing percentage of different species over two periods.]

- **1992-1993**
  - C. albicans: 54%
  - C. glabrata: 11%
  - C. parapsilosis: 27%
  - C. tropicalis: 37%
  - Other: 0%

- **Current**
  - C. albicans: 37%
  - C. glabrata: 27%
  - C. parapsilosis: 11%
  - C. tropicalis: 0%
  - Other: 27%
Emergence of *C. auris*
New species: *Candida auris*

- Discovered during the course of a study to analyze antifungal yeast diversity in humans
Global emergence of *C. auris*
Phylogenetic tree of *Candida* spp

Cryptococcus neoformans
Rhodotorula glutinis

Candida rugosa
Candida krusei
Candida lusitaniae
Candida *auris*

Saccharomyces cerevisiae
Candida glabrata
Candida bracarensis
Candida nivariensis
Candida catenulata

Candida albicans
Candida dubliniensis
Candida tropicalis
Candida metapsilosis
Candida parapsilosis
Candida orthopsilosis
Candida famata
Candida fermentati
Candida guilliermondii

Candida haemulonii
Candida duobushaemulonii
Candida pseudohaemulonii

Antifungal resistant clade

Based on rDNA sequencing
Preliminary epidemiology of *Candida auris*

- Patients of all age ranges
- Similar risk factors as for other *Candida* spp.
- Median time from admission to infections: 19 days
- Mortality \(~60\%
- Many patients on antifungal treatment when *C. auris* isolated
Antifungal resistance of *Candida auris*

- There are 3 major classes of antifungal drugs

<table>
<thead>
<tr>
<th>Polyenes</th>
<th>Azoles</th>
<th>Echinocandins</th>
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<tr>
<td>Amphotericin B</td>
<td>Fluconazole</td>
<td>Caspofungin</td>
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<td>Voriconazole</td>
<td>Micafungin</td>
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<td></td>
<td>Itraconazole</td>
<td>Anidulafungin</td>
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Antifungal resistance of *Candida auris*

- There are 3 major classes of antifungal drugs
  - Polyenes
  - Azoles
  - Echinocandins

- Many isolates multi-drug resistant
- Few resistant to all three classes
C. auris is a serious global health threat

- Difficult to identify
- Multidrug-resistance
- Nosocomial pathogen
- Outbreak potential
Outbreak in the United Kingdom

- ICU in large referral center with >50 *C. auris* infections
  - 20% with candidemia
- Patients found to be colonized on the skin
- Environmental sampling showed extensive contamination around bed space areas
So, is it in the United States?

- EIP Candidemia Surveillance Program
  - No *C. auris*

- SENTRY system (Private collection funded by pharma)
  - >6000 North American isolates collected from the US since 2004
  - 1 *C. auris* isolate from 2013
PHAC Communication Re: Emerging global HAI-AMR issue – *Candida auris*

PHAC has recently learned of a public health alert from US CDC in relation to the global emergence of invasive infections caused by the Multidrug-Resistant yeast organism, *Candida auris*. 
Investigation of the First Seven Reported Cases of *Candida auris*, a Globally Emerging Invasive, Multidrug-Resistant Fungus — United States, May 2013–August 2016

Smita Vallabhнато, MD1; Alan Kahn, MD1; Sharon Tiao, MD1; Nancy Chow, PhD1; Barry Walsh, PhD1; James Karis, VMD1; Sarah K. Kesten, MD2; Pro roaming, MD2; Sarah K. Kesten, MD2; Pro roaming, MD2; Stephanie R. Block, MD1; Emily Landers, MD1; Jessica Rudger, MD1; Tara N. Johnson, MD1; Adriana Zalana, PhD2; Blane H. Adams, MD3; Monica Quintero, MS4; Sathiya Chinnaswamy, PhD5; June Goochik, MPH6; Rafael Fernandez, MPH7; Karen Saurick, MD2; E. Yoko Furuta, MD8; David P. Callie, MD8; Camille Hamzah, PhD9; Casey Paul, MD10; Patricia Barnett, MD10; Patricia Latané11; Elizabeth L. Berkow, PhD9; Heather Morey-Mann, PhD2; Judith Noble-Wong, PhD1; Ryan E. Fagan, MD2; Brendan R. Jackson, MD1; Shawn R. Lockhart, PhD7; Anastasia Lisitsina, PhD3; Tim M. Chafee, MD2

No. of cases

- Blue: >= 3
- Turquoise: 2
- Light blue: 1

- Medical chart reviews
- Facility and microbiology lab visits
- Case-patient, contacts, and environmental sampling
- Infection control assessments
- Wider point-prevalence surveys
What did we find?

- Bloodstream infections
- Traditional candidemia risk factors – with the addition of nursing homes
- Colonized on skin in multiple sites
- Rooms colonized when patients present
- Multiple contacts of cases were positive on point-prevalence surveys
- Whole genome sequencing
US situation

- As of March 16, 80 positive
  - 53 clinical cases
  - 27 screening positive
- Clusters in NY, NJ, IL
- Laboratory look-backs
C. auris: A global health threat now in the U.S.

- Challenging to identify
- Multidrug resistant
- Outbreaks
Candida auris: what you should know

1. It is difficult to identify... so when should C. auris be suspected?

- Resistance to one or more antifungals
- An isolate is identified as:
  - Candida haemulonii
  - Candida famata
  - Candida sake
  - Rhodotorula glutinis, or
  - Candida spp after a validated method of Candida identification was attempted.

C. auris can be identified using MALDI-TOF and sequencing of the D1-D2 region.
Candida auris: what you should know

2. Treatment for invasive *C. auris* infection is same as IDSA guidelines.
   - First line antifungal drug: echinocandin
   - Careful monitoring for treatment failure
Candida auris: what you should know

3. Specific infection control practices are recommended.

- Standard and Contact Precautions
- Single room
- Daily and terminal cleaning of patient rooms with EPA-registered disinfectant known to be effective against C. difficile (i.e., bleach)
- On transfer to another facility, notification and need for precautions communicated

Report all cases to state & local public health departments and CDC:

candidaauris@cdc.gov
C. *auris* Response Plan: halt the spread!

- Increase awareness
- Expand avenues for surveillance
- Toolkit in production for epidemiologic investigation and infection control
- Laboratory and epidemiologic studies to understand organism and transmission
- Large scale control efforts based on other MDROs in highly affected areas like NY
Thank you for your time and attention.
Any questions?

For more information, contact CDC
1-800-CDC-INFO (232-4636)

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.