Lessons Learned: An Update on Candida auris Epidemiology

January 16, 2019
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Healthcare Epidemiology & Infection Control Program
New York State Department of Health
Objectives

• Global & U.S. *Candida auris* epidemiology
• *C. auris* epidemiology in New York State
  • Patient characteristics
  • Environmental findings
  • Laboratory findings
• *Lessons Learned*

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

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¹Teikyo University Institute of Medical Mycology, 359 Otsuka, Hachioji, Tokyo 192-0395, ²Japan Health Sciences Foundation, 13-4 Nihonbashi-Kodennmacho, 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

Global *C. auris* Emergence: Rapid Emergence Since 2009

- Japan
- South Korea
- India
- S. Africa
- Kenya
- Kuwait
- Pakistan
- Venezuela
- Israel
- United Kingdom

Global *C. auris* Emergence

**Clinical Infectious Diseases**

**EDITOR'S CHOICE**

**Simultaneous Emergence of Multidrug-Resistant *Candida auris* on 3 Continents Confirmed by Whole-Genome Sequencing and Epidemiological Analyses**

Shawn R. Lockhart, Kizee A. Etienne, S nigdha Vallabhaneni, Joveria Farooqi, Anuradha Chowdhary, Nelesh P. Govender, Arnaldo Lopes Colombo, Belinda Calvo, Christina A. Cuomo, Christopher A. Desjardins, ... Show more

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**Published:** 16 December 2016  **Article history**

https://academic.oup.com/cid/article/64/2/134/2706620
Global *C. auris* Emergence

Countries from which *Candida auris* cases have been reported, as of November 30, 2018

C. auris in U.S.

U.S. Clinical Cases of *Candida auris* Reported by State, United States, as of November 30, 2018

C. auris in U.S.

U.S. Clinical Cases of Candida auris Reported by State, United States, as of September 30, 2018

New York State Numbers

• As of January 14, 2019
  – Confirmed cases:
    • Clinical cases: 280
    • Surveillance cases: 391
  – Probable cases: 4
Lessons Learned
**Lessons Learned C. auris in New York**

- **June 2016**: CDC Clinical Alert
  - Case Count: 9
  - End of 1st CDC Epi Aid

- **Learned about a retrospective case from 2013**
- **Learned about a retrospective case from April 2016**
  - NYS Facilities & Lab Alert
  - Case Count: 7
  - Beginning of 1st CDC Epi Aid
  - Case Count: 19
Lessons Learned *C. auris* in New York

Spread in Healthcare Facilities
Lessons Learned: Spread in Healthcare Facilities

*Candida auris* Clinical Cases in New York State by Month, May 2013 - January 14, 2018

**Surveillance to Clinical Detail**

- **Surv to Clinical**
- **Initial Clinical**

Number of Clinical Cases

Month of First Clinical Culture of *Candida auris*
Lessons Learned Spread in Healthcare Facilities

Cumulative number of Candida auris clinical cases

Number of cases in ZIP code group
- 0
- 1-5
- 6-10
- 11-15
- 16-20
- 21-25
- 26-26

——-2016Q4
Lessons Learned Spread in Healthcare Facilities

Cumulative number of Candida auris clinical cases

---

2017Q1

Number of cases in ZIP code group:
- 0
- 1-5
- 6-10
- 11-15
- 16-20
- 21-25
- 26-28
Lessons Learned Spread in Healthcare Facilities

Cumulative number of Candida auris clinical cases

---

2017Q2
Lessons Learned Spread in Healthcare Facilities

Cumulative number of Candida auris clinical cases

Number of cases in ZIP code group:

- 0
- 1-5
- 6-10
- 11-15
- 16-20
- 21-25
- 26-26

------------------------ 2017Q3
Lessons Learned Spread in Healthcare Facilities

Cumulative number of Candida auris clinical cases

Number of cases in ZIP code group
- 0
- 1-5
- 6-10
- 11-15
- 16-20
- 21-25
- 26-26

-------------------2017Q4
Lessons Learned Spread in Healthcare Facilities

Cumulative number of Candida auris clinical cases

Number of cases in ZIP code group:
- 0
- 1-5
- 6-10
- 11-15
- 16-20
- 21-25
- 26-28

-----------------------------2018Q1
Lessons Learned Spread in Healthcare Facilities

Cumulative number of Candida auris clinical cases
Lessons Learned Spread in Healthcare Facilities

- Data from first 51 clinical cases in NYS
  - 31 (61%) in Long Term Care Facility (LTCF) immediately before hospital admission
  - 19 of 31 (61%) in LTCFs with ventilator beds

### Data from first 212 Clinical Cases

<table>
<thead>
<tr>
<th>Healthcare Exposure Prior to Current Admission, Prior 90 Days</th>
<th>Number of Cases (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Care Hospital</td>
<td>185</td>
<td>79%</td>
</tr>
<tr>
<td>Long Term Care Facility (Nursing Home)</td>
<td>74</td>
<td>31%</td>
</tr>
<tr>
<td>None</td>
<td>32</td>
<td>15%</td>
</tr>
<tr>
<td>Community</td>
<td>14</td>
<td>6%</td>
</tr>
<tr>
<td>Long Term Acute Care Hospital</td>
<td>6</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>1%</td>
</tr>
</tbody>
</table>
Lessons Learned Spread in Healthcare Facilities


Lessons Learned Spread in Healthcare Facilities

Facilities Through Which a Patient with *C. auris* Has Passed, 90 Days Prior to Diagnosis as of January 14, 2019

<table>
<thead>
<tr>
<th>Facility Type</th>
<th># Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals</td>
<td>57</td>
</tr>
<tr>
<td>Nursing Homes</td>
<td>96</td>
</tr>
<tr>
<td>LTACH</td>
<td>1</td>
</tr>
<tr>
<td>Hospice</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>156</strong></td>
</tr>
</tbody>
</table>
Lessons Learned Spread in Healthcare Facilities

Intense NYS Efforts

- Incident Management System activation
- Case finding
- Hired additional staff
- Roundtable with healthcare leadership
- Webinar for NYC hospitals and nursing homes
- Required infection control self-assessment survey for all NYC hospitals and nursing homes
- On-site reviews of all hospitals and nursing homes in Brooklyn and Queens to assess compliance with infection control requirements
- Point prevalence studies, environmental surveys & educational infection control assessments
Lessons Learned Spread in Healthcare Facilities

Point Prevalence Surveys (PPS) in New York State

- As of March 25, 2018, 81 point prevalence surveys & environmental surveys had been conducted at 55 healthcare facilities
  - PPS:
    - 4268 samples were collected from 2344 individuals
    - 144 (6.1%) individuals had a positive *C. auris* culture
    - 125 (5.3%) individuals had a positive *C. auris* PCR test
# Lessons Learned: Spread in Healthcare Facilities

<table>
<thead>
<tr>
<th>Facility Type (N=55)</th>
<th># Patients C. auris Positive</th>
<th># Total Patients Tested</th>
<th>% Positive for C. auris</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals (N=22)</td>
<td>36</td>
<td>767</td>
<td>5.0</td>
</tr>
<tr>
<td>LTACHs* (N=1)</td>
<td>1</td>
<td>35</td>
<td>2.9</td>
</tr>
<tr>
<td>LTCFs** (N=30)</td>
<td>88</td>
<td>1404</td>
<td>6.3</td>
</tr>
<tr>
<td>Ventilator LTCFs (N=16)</td>
<td>86</td>
<td>1120</td>
<td>7.7</td>
</tr>
<tr>
<td>Non-Ventilator LTCFs (N=14)</td>
<td>2</td>
<td>284</td>
<td>0.7</td>
</tr>
<tr>
<td>Co-located Hospital &amp; LTCEF*** (N=2)</td>
<td>17</td>
<td>138</td>
<td>12.3</td>
</tr>
</tbody>
</table>

*LTACHs: Long-Term Acute Care Hospitals  
**LTCFs: Long-Term Care Facilities  
***Co-located: Hospital and LTCEF are located in the same building
## Lessons Learned: Spread in Healthcare Facilities

<table>
<thead>
<tr>
<th>Facility Type</th>
<th># Patients C. auris</th>
<th># Total Patients Tested</th>
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</table>
Lessons Learned *C. auris* in New York

Persistent Colonization
Lessons Learned Persistent Colonization

Follow-up Cultures for Clinical C. auris Cases, by Case

- Data from first 43 clinical patients in NYS
  - 2 deemed to be “cleared”
  - 19/43 (44%) expired

Lessons Learned *C. auris* in New York

Colonized Patients are Becoming Infected
Lessons Learned Spread in Healthcare Facilities

*Candida auris* Clinical Cases in New York State by Month, May 2013 - January 14, 2018

Surveillance to Clinical Detail

**Monthly Cases of Candida auris**

- **Month of First Clinical Culture of *Candida auris***
- **Number of Clinical Cases**
- **Surv to Clinical**
- **Initial Clinical**
Lessons Learned *C. auris* in New York

Persistence in the Environment
Lessons Learned Persistence in the Environment

Environmental Surveys (ES) in New York State

- As of March 2018, 81 point prevalence surveys & environmental surveys had been conducted at 55 healthcare facilities
  - ES:
    - 2896 environmental samples collected
      - 86 (3.0%) samples positive for *C. auris* by culture
      - 257 (8.9%) samples positive by PCR
      - Many were from surfaces or equipment deemed to be “clean”
Lessons Learned Persistence in the Environment

- C. auris recovered from multiple sites within patient & procedure rooms:
  - Call bells
  - TV remotes, telephones
  - Window sills
  - Curtains
  - Light cords
  - Ventilators
  - Blood pressure cuffs
  - PPE carts
  - Medication carts
  - Clean supply carts
  - Housekeeping carts
  - IR suite equipment
  - OR equipment
Lessons Learned Persistence in the Environment

Survival, Persistence, and Isolation of the Emerging Multidrug-Resistant Pathogenic Yeast *Candida auris* on a Plastic Healthcare Surface

Rory M. Welsh, Meghan L. Bentz, Alicia Shams, Hollis Houston, Amanda Lyons, Laura J. Rose, Anastasia P. Litvintseva

DOI: 10.1128/JCM.00921-17

Lessons Learned *C. auris* in New York

Vulnerable Hosts
Lessons Learned Vulnerable Hosts

- Currently, 57% of clinical cases are males
- Clinical cases have multiple underlying conditions

<table>
<thead>
<tr>
<th>Age Range (Years)</th>
<th># Cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>1 (0%)</td>
</tr>
<tr>
<td>1-18</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>19-44</td>
<td>25 (9%)</td>
</tr>
<tr>
<td>45-64</td>
<td>85 (30%)</td>
</tr>
<tr>
<td>&gt;64</td>
<td>169 (60%)</td>
</tr>
</tbody>
</table>
Lessons Learned Vulnerable Hosts

- Clinical cases through August 20, 2018
  - Blood and urine majority of first positive sites
  - Variety of sites

<table>
<thead>
<tr>
<th>First Positive Site</th>
<th>Count</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood</td>
<td>119</td>
<td>56</td>
</tr>
<tr>
<td>Urine</td>
<td>40</td>
<td>19</td>
</tr>
<tr>
<td>Wound/skin</td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>Respiratory site</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Bile</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Catheter tip or segment</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Ear</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>212</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
**Lessons Learned Vulnerable Hosts**

<table>
<thead>
<tr>
<th>We ARE NOT seeing large numbers of patients with <em>C. auris</em> who:</th>
<th>We ARE seeing large numbers of patients with <em>C. auris</em> who:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are children</td>
<td>Are over the age of 65</td>
</tr>
<tr>
<td>Are neutropenic</td>
<td>Have wounds, lines, or drains</td>
</tr>
<tr>
<td>Are in the community</td>
<td>Are on ventilators</td>
</tr>
<tr>
<td>Do not have co-morbid medical conditions</td>
<td>Are nursing home residents with frequent hospitalizations</td>
</tr>
</tbody>
</table>
Lessons Learned *C. auris* in New York

High Mortality
Lessons Learned: High Mortality

Probability of Survival, All Cases Combined

Probability of surviving past:

- 2 days = 96%
- 7 days = 89%
- 30 days = 66%
- 60 days = 54%
- 90 days = 44%
Lessons Learned *C. auris* in New York

Antifungal Drug Resistance
Lessons Learned: Antifungal Drug Resistance

• Lockhart 2016: 54 isolates from Pakistan, India, South Africa, Venezuela, and Japan
  • Susceptibility testing
    • 93% resistant to fluconazole, 54% to voriconazole, 35% to amphotericin B, 7% to echinocandins, 6% to flucytosine
    • 41% resistant to ≥2 classes, 2 isolates resistant to 3 classes

Lessons Learned: Antifungal Drug Resistance

Antifungal susceptibility data for first *Candida auris* isolates from 51 clinical cases, New York, USA, 2013–2017

<table>
<thead>
<tr>
<th>Antifungal</th>
<th>Tentative resistance breakpoint</th>
<th>MIC&lt;sub&gt;50&lt;/sub&gt;</th>
<th>MIC range</th>
<th>No. (%) resistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluconazole</td>
<td>&gt;32</td>
<td>&gt;256</td>
<td>8.00 to &gt;256</td>
<td>50 (98)</td>
</tr>
<tr>
<td>Caspofungin</td>
<td>&gt;2</td>
<td>0.060</td>
<td>0.03–0.25</td>
<td>0</td>
</tr>
<tr>
<td>Micafungin</td>
<td>&gt;4</td>
<td>0.120</td>
<td>0.06–0.25</td>
<td>0</td>
</tr>
<tr>
<td>Anidulafungin</td>
<td>&gt;4</td>
<td>0.250</td>
<td>0.12–0.50</td>
<td>0</td>
</tr>
<tr>
<td>Amphotericin B</td>
<td>&gt;2</td>
<td>1.500</td>
<td>0.50–4.00</td>
<td>15 (29)</td>
</tr>
<tr>
<td>Flucytosine</td>
<td>NA</td>
<td>0.125</td>
<td>0.125–0.25</td>
<td>NA</td>
</tr>
</tbody>
</table>

Infection Prevention and Control Measures are Challenging…

But They Work!
What Are The Recommendations?

<table>
<thead>
<tr>
<th>Infection Control &amp; Prevention</th>
<th>Environmental Cleaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand Hygiene</td>
<td>Use EPA-Registered Hospital Grade Disinfectant Effective Against C. difficile spores (“List K”)</td>
</tr>
<tr>
<td>Private Patient Rooms</td>
<td></td>
</tr>
<tr>
<td>Isolation/Cohorting</td>
<td></td>
</tr>
<tr>
<td>- Contact Precautions</td>
<td>- Attention to contact times</td>
</tr>
<tr>
<td>- Dedicated equipment</td>
<td>- Attention to contact times</td>
</tr>
<tr>
<td>- Attention to transporting</td>
<td>- Attention to high touch surfaces &amp; moveable equipment</td>
</tr>
<tr>
<td>Reporting &amp; Interfacility Communication</td>
<td></td>
</tr>
<tr>
<td>Screening of Contacts &amp; CDC Recommended Groups</td>
<td></td>
</tr>
<tr>
<td>Lab Identification</td>
<td></td>
</tr>
</tbody>
</table>
Importance of Interfacility Communication

• We have been tracking admissions, discharges, and transfers
• Numbers are growing too large for tracking to be feasible
• *This means that interfacility communication will become even more important!*
• Infection preventionists need to be involved in discharges and transfers
• Pay special attention to after-hours/weekend discharge and transfer procedures
• Inadequate communication might result in regulatory action
Long-Term Care Facilities

- Infection control and home environment
  - “Modified” Contact Precautions*
    - Allow resident to leave room
    - Discuss with NYSDOH
- Need for alcohol-based hand rub in locations that allow for use upon room entrance and exit

* NYSDOH Resource: Transmission Based Precautions in Long Term Care Facilities Memo
Available at: https://www.health.ny.gov/diseases/communicable/c_auris/providers/
Transmission-Based Precautions Signage

Facility
Nursing homes & Hospitals:
➢ “We can’t have the diagnosis on the door…we can get cited.”
➢ Default signage: “See Nurse”

Pertinent Factors/ Data:
➢ CMS (42 C.F.R. section 483.10), signage restrictions do not apply to “the CDC isolation precaution transmission based signage for reasons of public health protection, as long as the sign does not reveal the type of infection” (CMS State Operations Manual, Appendix PP)*.
➢ Bottom line: Signs can be more informative

*Diagnosis, organism, or resident identifiers (e.g., name, bed number) should not be disclosed on for Transmission-Based Precautions Signs.
NYSDOH Resource: Transmission Based Precautions in Long Term Care Facilities Memo
Available at: https://www.health.ny.gov/diseases/communicable/c_auris/providers/

Table 1: Pros and Cons of Various Types of Transmission-based Precautions Signs*

<table>
<thead>
<tr>
<th>Description</th>
<th>Pros</th>
<th>Cons</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signs stating the type of precautions (e.g. “Contact Precautions”)</td>
<td>Easily recognizable and meaningful for healthcare providers</td>
<td>Not meaningful for visitors – might need additional language such as “Visitors: see nurse”</td>
<td></td>
</tr>
<tr>
<td>Signs stating the type of precautions but without the word “precautions” (e.g. “Contact”, “Droplet”)</td>
<td>Likely recognizable and meaningful for healthcare providers; might be less alarming to visitors than signs with the word “precautions”</td>
<td>Not meaningful for visitors – might need additional language such as “Visitors: see nurse”</td>
<td></td>
</tr>
<tr>
<td>Signs stating the type of precautions (e.g. “Contact Precautions”) and providing detailed information about what those precautions entail (e.g. pictures of PPE to be worn)</td>
<td>Easily recognizable and meaningful for healthcare providers; remind healthcare providers what needs to be done while caring for the resident</td>
<td>Might be confusing or alarming for visitors and might need additional language such as “Visitors: see nurse”; might result in a large, obstructive, and/or cluttered sign</td>
<td></td>
</tr>
<tr>
<td>Signs with language such as “See nurse before entering”</td>
<td>Useful for visitors; may be less alarming than signs that are more explicit about precautions</td>
<td>Might not be understood to indicate Transmission-Based Precautions by healthcare providers</td>
<td>NYSDOH staff have witnessed healthcare providers entering rooms with these types of signs without using PPE because the signs were not recognized as indicating Transmission-Based Precautions. If these types of signs are chosen, the facility should ensure that all healthcare providers and other staff receive effective, periodic training on the meaning of the signs. Regardless of sign type, adherence should be monitored.</td>
</tr>
<tr>
<td>Signs consisting of colored dots to indicate which type of precautions are required</td>
<td>Unobtrusive</td>
<td>Not meaningful for visitors – might need additional language such as “Visitors: see nurse”; might not be understood to indicate Transmission-Based Precautions by healthcare providers; not useful for healthcare providers who are color-blind</td>
<td></td>
</tr>
<tr>
<td>Signs consisting of symbols to indicate precaution types (e.g. a water drop to indicate Droplet Precautions)</td>
<td>Unobtrusive and relatively easy for healthcare providers to remember</td>
<td>Not meaningful for visitors – might need additional language such as “Visitors: see nurse”; might not be understood to indicate Transmission-Based Precautions by healthcare providers</td>
<td></td>
</tr>
</tbody>
</table>

* Legal questions regarding signage content and ensuring such signage complies with CMS and HIPAA requirements should be directed to facility counsel.

Pros and Cons of various types signage
- See the nurse
- “Contact precautions”
- Each precaution
- Verbal description
- PPE
- Pictures of PPE
Where do we go from here?

- **Targeted admission screening**
  - Currently ongoing in at least 3 facilities
  - May need to be expanded as laboratory capacity for rapid testing grows
  - Goal: prevent *C. auris* endemicity and transmission within high acuity units such as vent units and ICUs
- **Focus on preventing spread beyond NYC Metropolitan area**
Lessons Learned: Summary

C. auris:

• Emerged independently multiple times
• Spread rapidly among healthcare facilities in NYC area
• Individuals can be colonized for many months
• Colonized individuals can develop infections
• It is affecting individuals who are vulnerable hosts
• High mortality rate among infected individuals
• Can persist in the healthcare environment
• Potential for antifungal drug resistance
Lessons Learned: Summary

C. auris:

• We have learned how C. auris is transmitted
• Extensive infection control efforts in NYS to identify cases and optimize infection control interventions do work
• Local health department staff, hospital and nursing home staff, and federal agency staff are wonderful partners willing to assist with NYS efforts
• The more we know, the better!
Acknowledgements

Hospital, LTACH, & Nursing Home Infection Preventionists, Nurses, Environmental Services Staff, Laboratorians, Administrators

- NYSDOH
  - Belinda Ostrowsky
  - Debra Blog
  - Monica Quinn
  - Emily Lutterloh
  - Karen Southwick
  - Jane Greenko
  - Rafael Fernandez
  - Sudha Chaturvedi
  - Richard Erazo
  - Ronald Jean Denis
  - Sarah Kogut

- NYSDOH
  - Rutvik Patel
  - Elizabeth Dufort
  - Barbara Bright-Motelson
  - Robert McDonald
  - Nina Ahmad
  - Karyn Langguth
  - Valeria Haley
  - Sudha Chaturvedi
  - YanChun Zhu
  - Wexuan Yang
  - Erin Gustufson

- CDC
  - Karlyn Beer
  - Tom Chiller
  - Nancy Chow
  - Janet Glowicz
  - Brendan Jackson
  - Alex Kallen
  - Ana Litvintseva
  - Shawn Lockhart
  - Abimbola Ogundimu
  - Eugenie Poirot
  - Sharon Tsay
  - Snigdha Vallabhaneni
  - Rory Welsh

- NYCDOHMH
January 16, 2019

References