Candida auris: Update on the Laboratory Investigations

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Mycology Laboratory @ Wadsworth Center: Scope

- **Yeast and Mold Identification**
  - Culture
  - MALDI-TOF MS (Bruker)
  - ITS-PCR/Sequencing
  - Real time PCR assays:
    - *Coccidioides immitis/posadasii*
    - *Histoplasma capsulatum*
    - *Blastomyces dermatitidis*
    - *Exserohilum rostratum*
    - *Candida spp.*
    - ***Candida auris***
- **Surveillance Testing** → *Candida auris* Outbreak!
- **Antifungal Susceptibility Testing**
  - E-tests (Yeasts)
  - Microbroth dilution (Yeasts & Molds)
  - Y09 (Yeasts)
- **Research**
  - *Pseudogymnoascus* (‘bat white nose’)
  - Fungal virulence mechanisms
  - Antifungal test innovation

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First Reported from Japan, 2009

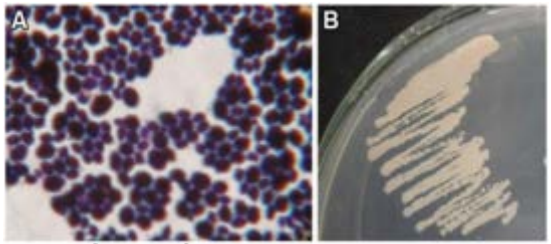
Candida auris sp. nov., a novel ascomycetous yeast isolated from the external ear canal of an inpatient in a Japanese hospital

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

- High temperature tolerance (45°C)
- High salt tolerance (10%)
- No specific features e.g. chlamydospore, hyphae, pseudohyphae, etc.
- Unique sugar assimilation profile

Chrome agar



Gram Stain

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Rapid Worldwide Emergence of *Candida auris*

Reason for Concern

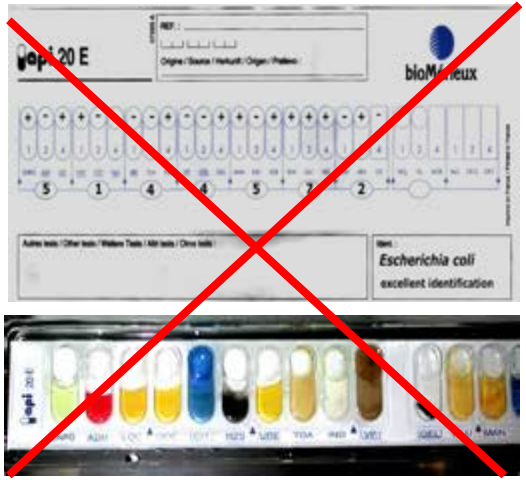
Unlike other *Candida* species

- Readily transmitted in hospitals and nursing homes
- Survives on surfaces (weeks), and on skin (months)
- **Level of drug resistance never seen**-some infections have NO traditional treatment options
- High mortality (60%)

***Candida auris* = MRSA**

Reason for Concern

- **Current diagnostic methods** used in the majority of the hospitals are inadequate for *C. auris* ID



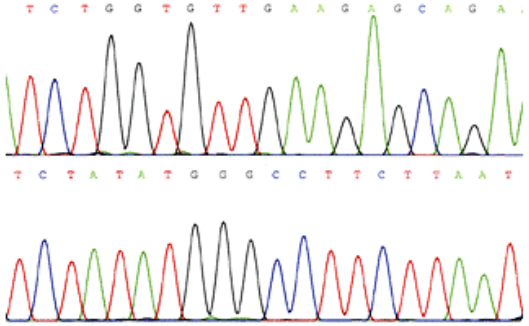
API

Vitek 2

Microscan

MALDI & DNA Sequencing - *Candida auris* ID

MALDI-BRUKER

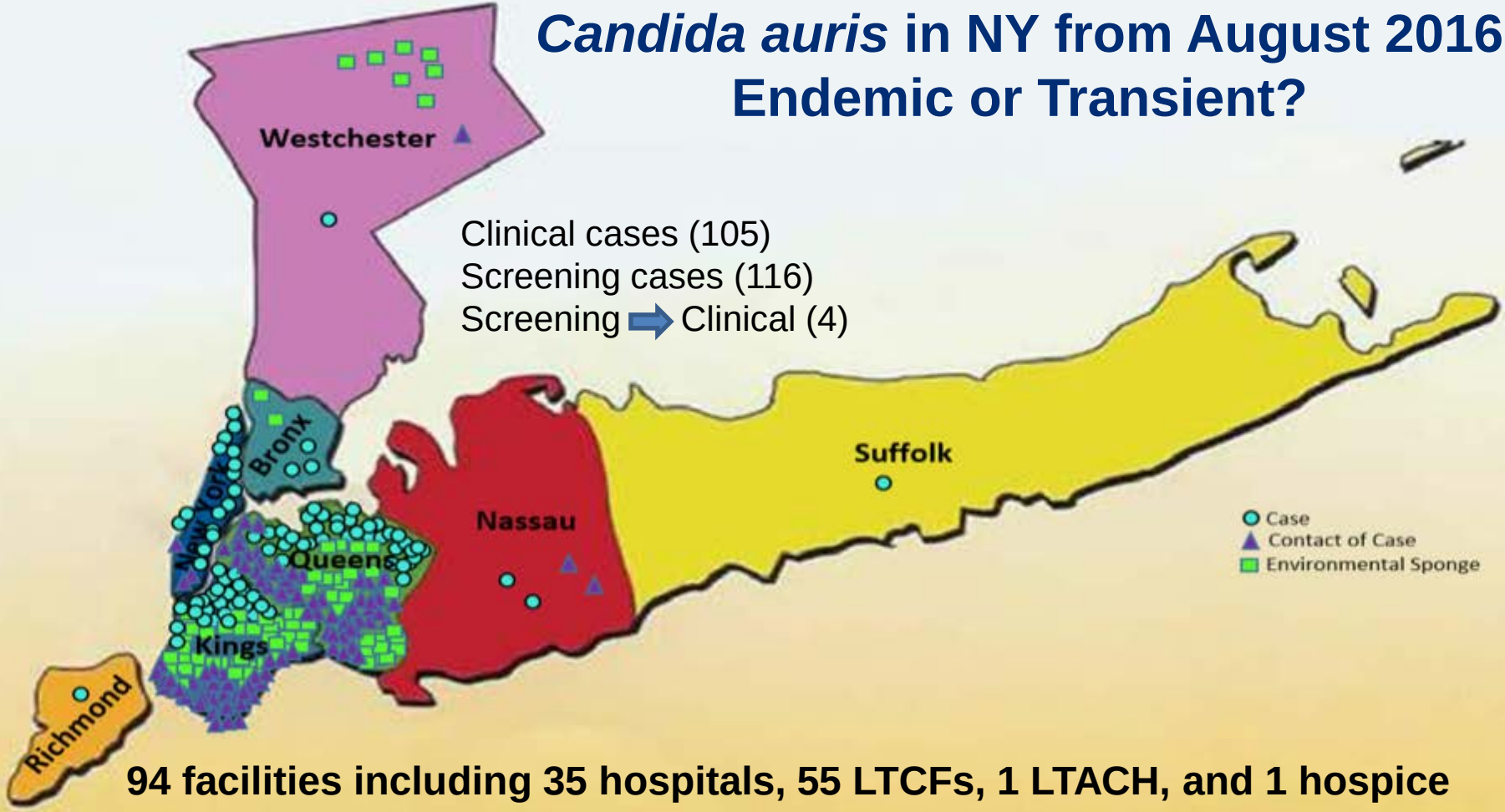


Sequencing-Ribosomal gene ITS & D1/D2

VITEK 2 YST with Ver 8.01 software (BIOMERIEUX)

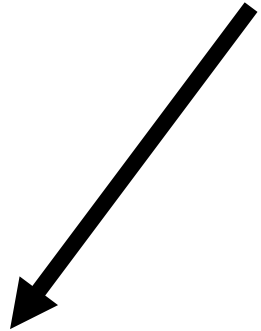
Candida auris in NY from August 2016 Endemic or Transient?

Clinical cases (105)
Screening cases (116)
Screening ➡ Clinical (4)



94 facilities including 35 hospitals, 55 LTCFs, 1 LTACH, and 1 hospice

Candida auris misidentified



Candida haemulonii
(VITEK2)

(MALDI-TOF MS)

- ***C. auris*** **(92%)**
- ***C. duobushhaemulonii*** **(7%)**
- ***C. haemulonii*** **(1%)**

Candida famata **=** ***C. auris*** **(single isolate)**

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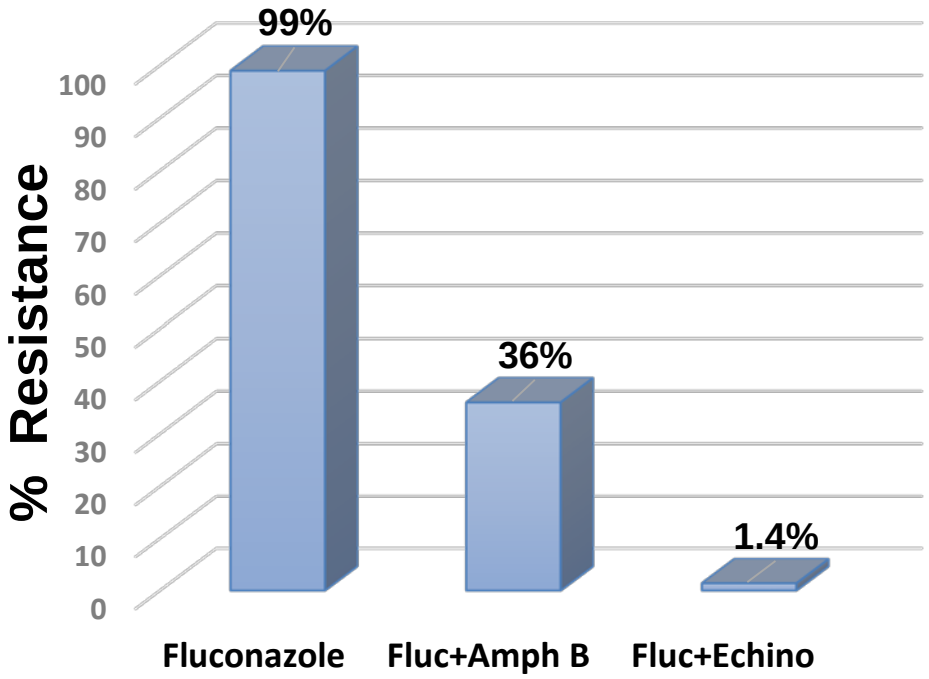
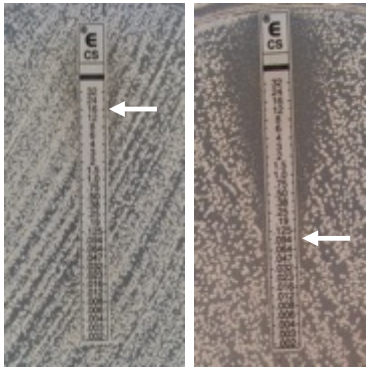
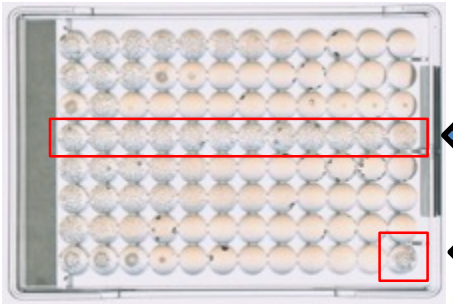
C. auris Resistance Profile



Caspofungin



Resistant Sensitive



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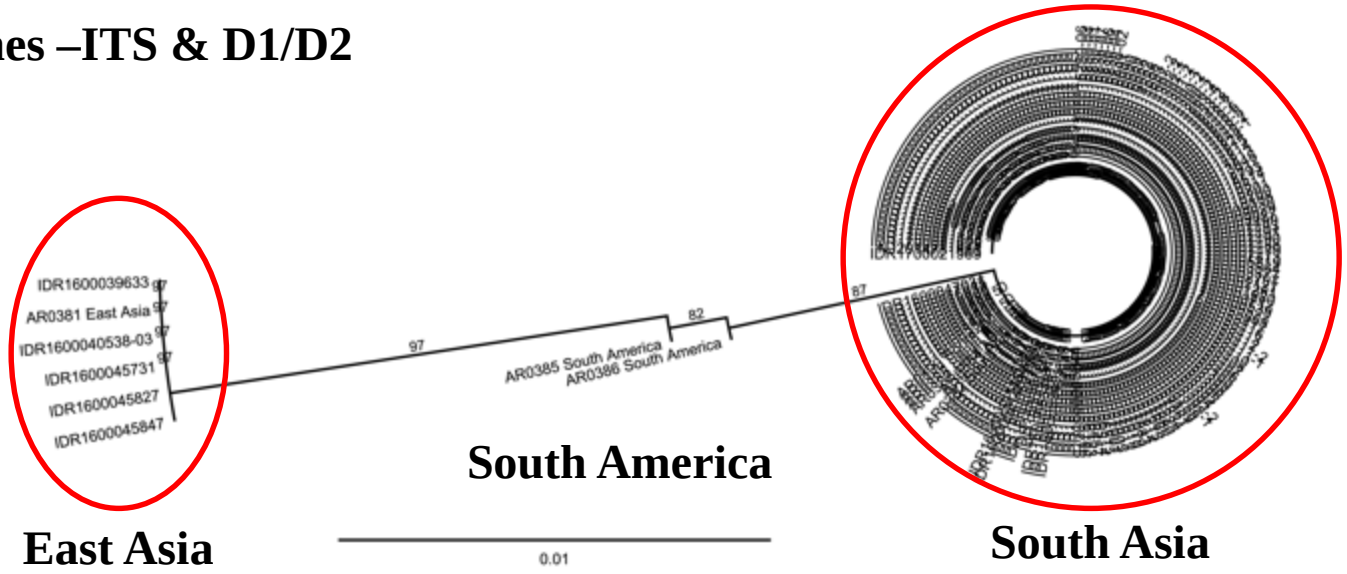
Majority of NY Isolates belong to the South Asia Clade

Ribosomal genes –ITS & D1/D2



East Asia **South America** **South Asia**

Point Prevalence Survey (August 2016…..

SWABS

Initial Screening

- Axilla/Groin composite Swab
- Nares

Advance Screening

- Axilla
- Groin
- Nares
- Rectal
- Wound (if any)
- Urine

SPONGES

- Healthcare objects
- Pre and Post-cleaned

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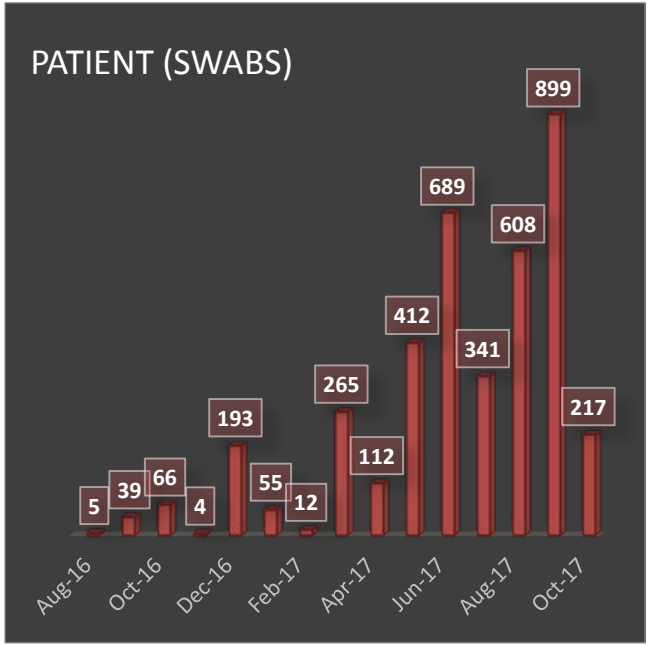
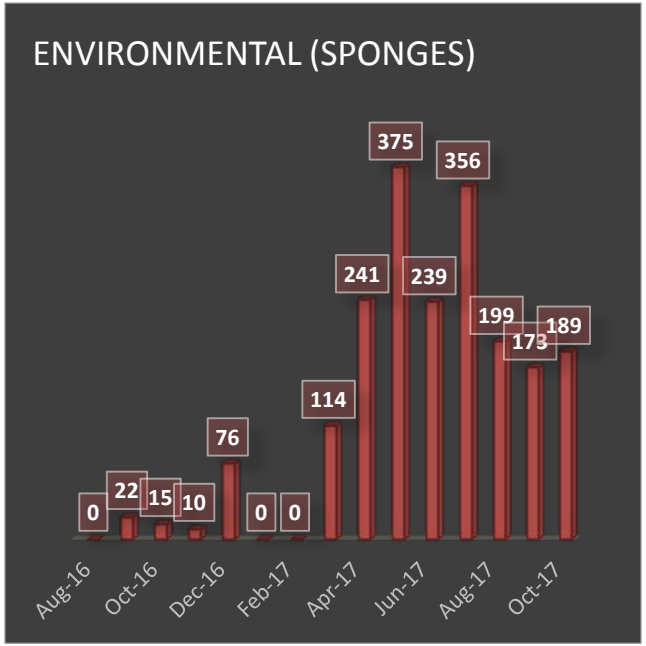
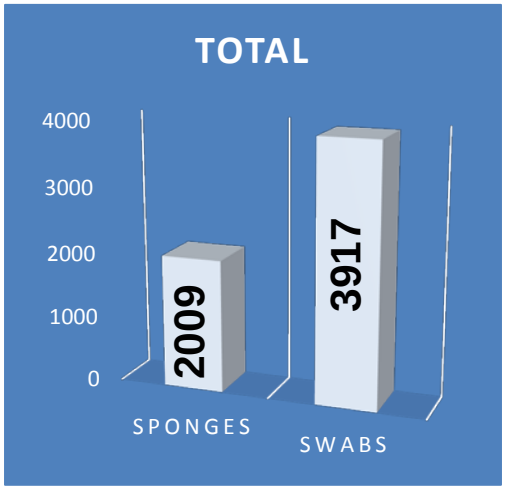
Surveillance Samples: Aug 2016 - Oct 2017







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Laboratory Workflow

Surveillance samples (sponges & swabs)

Non selective agar medium (SAB+)

Selective agar (salt+dulcitol)

Selective broth (salt + dulcitol)

Real-time PCR assay

TAT = 4 h

Growth

Growth

No Growth

Cloudy

MALDI

MALDI

SAB+

Candida auris & *Candida* spp.

Candida auris

Negative culture

No Growth

Growth

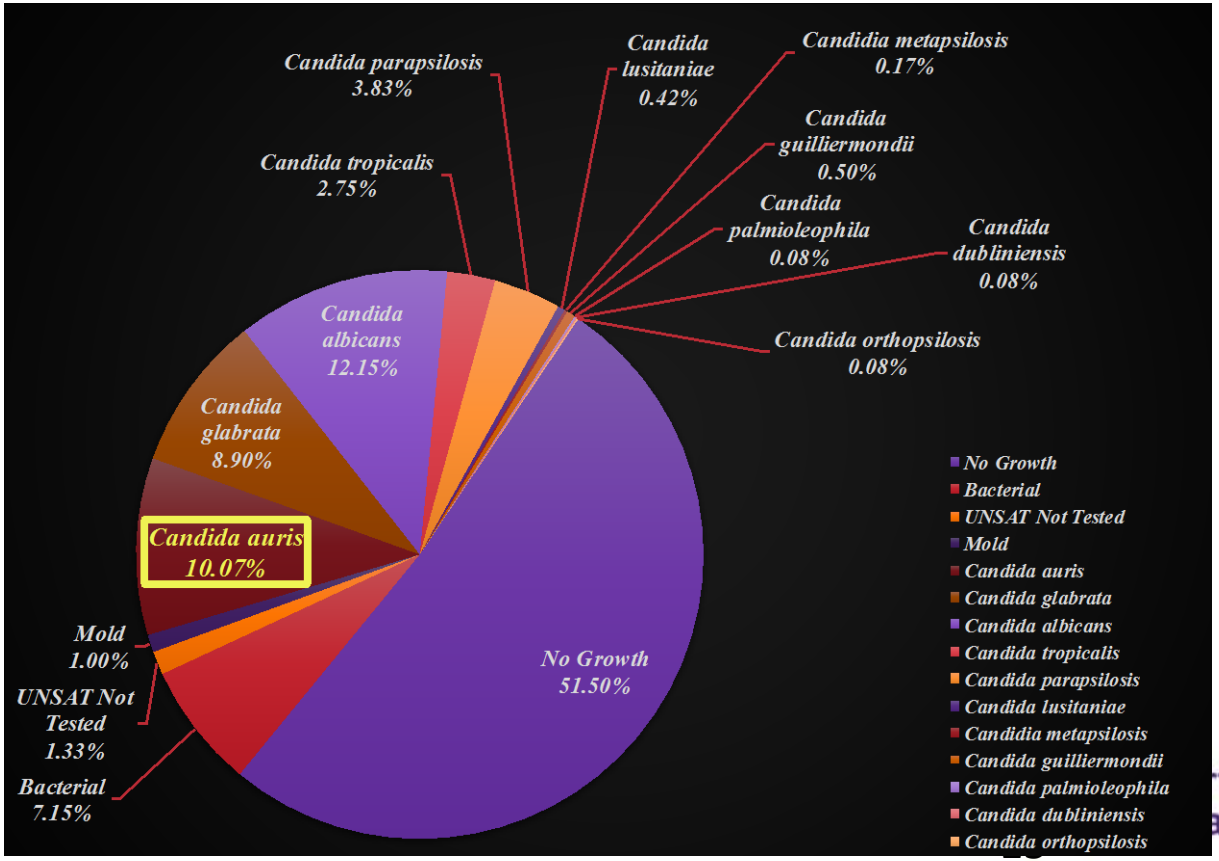
MALDI

Candida auris

Sequencing of the ribosomal gene (ITS)
(Phylogenetic Analyses)

Antifungal susceptibility testing

Candida spp. Identified from Surveillance Samples



Journal of Clinical Microbiology (*in press*)

Development and validation of a real-time PCR assay for rapid detection of *Candida auris* from surveillance samples

L. Leach, Y. Zhu, S. Chaturvedi

Patient Swabs

Real-time PCR results	Culture results: Positive	Culture results: Negative	Sensitivity (95% CI)	Specificity (95% CI)	PPV	NPV
Positive	46	3	89 (77 - 96)	99 (97 - 100)	94	98
Negative	6	310				

Environment Sponges

Real-time PCR results	Culture results: Positive	Culture results: Negative	Sensitivity (95% CI)	Specificity (95% CI)	PPV	NPV
Positive	32	26	100 (89 - 100)	89 (84 - 92)	55	100
Negative	0	200				

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What We Have Done in Last One Year

- Developed protocol for sample collection (swabs and sponges) for the Point Prevalence Study
- Developed protocol for sample collection (swabs) for the Admission Screening
- Implemented protocol for culture of surveillance samples with selective and non-selective media
- Expanded MALDI-TOF database for *C. auris* by addition of well-known clades and NY isolates
- Implemented microbroth dilution and E-test methods for antifungal susceptibility testing
- Developed *C. auris* real-time PCR assay for quick presumptive diagnosis

Community Outreach: Alerts and Webinar

8/17/16 - “Global Emergence of Invasive Infections Caused by the Multidrug-Resistant Yeast *Candida auris*”

11/3/16 - “Identification and Reporting of Suspected *Candida auris* Isolates”

8/30/17 - Webinar – “*Candida auris* Epidemiology and Laboratory Testing for Addressing this Emerging Pathogen”

Outreach: Public Health Laboratories

- PCR protocol & webinar slides - New York City Public Health Laboratory – (September 2017)
- PCR protocol, *C. auris* isolates, other *Candida* spp., positive & negative swabs - Memorial Sloan Kettering Cancer Center (August 2017)
- *Candida* spp. for MALDI validation – New York Presbyterian Hospital (November 2017)
- *Candida* Survey - Public Health Laboratories in the Northeast Region for wet workshop (September 2017)
- MALDI, PCR protocols, *C. auris* isolates, other closely related *Candida* spp. & bicoid plasmid - Connecticut Department of Public Health Laboratory (August 2017)
- *C. auris* isolation protocol (January 12, 2017), PCR protocol & bicoid plasmid - CDC (July 2017)

Continuing Challenges

- *Candia auris* real-time PCR – Manual Extraction - Need high throughput approaches (Currently underway)
- Commercial media containing dulcitol not available
- Clinical laboratories need to update their VITEK 2 YST with Ver 8.01 software (BIOMERIEUX)
- Do not report *Candida* spp. (especially from sterile sites). If you cannot, send to Reference Laboratories

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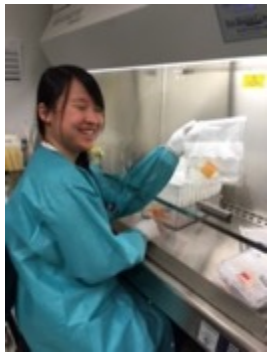
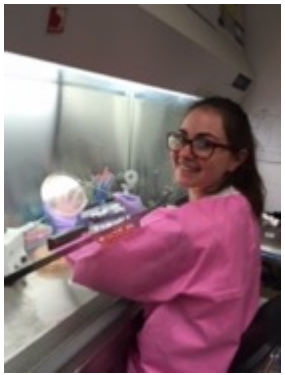
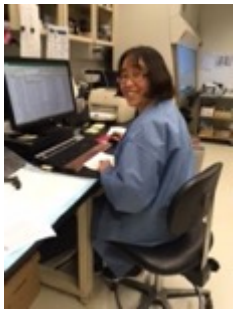


YanChun Zhu



Brittany O'Brien

Lynn Leach



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