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The National Center for Disease Prevention and Control

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Infection prevention and Control recommendations for Candida auris

NATIONAL ANTIMICROBIAL RESISTANCE COMMITTEE

Infection prevention and Control recommendations for *Candida auris*

Introduction:

Candida auris is an emerging multidrug-resistant pathogen that has been associated with infection and outbreaks in healthcare sittings in several countries. A high percentage of clinical *C. auris* strains demonstrate resistance to fluconazole and show variable resistance to other antifungals belonging to the three major classes (azoles, polyenes, echinocandins), thereby limiting treatment options. Since *Candida auris* was first reported in Japan in 2009, cases have been increasingly documented worldwide making the organism an emerging global health threat.

C auris has been recovered from a range of body sites including blood, catheter tips, skin, ear discharge, urogenital tract and respiratory tract. Clinically, *C. auris* is capable of causing serious invasive fungal infections such as candidemia, pericarditis, osteomyelitis, pneumonia and urinary tract infections. One of the most common problem to manage *C. auris* infections is to identify the organism in the routine laboratory which required specialized laboratory methods. Like other organisms associated with nosocomial infections, it can be transmitted among patients and from contaminated environments, giving the importance of effective infection prevention and control practices.

I. Laboratory Diagnosis

The first step in controlling *C auris* is identification. According to the CDC, more than 54% of *C. auris* cases were isolated from blood; 46% were recovered from other body sites such as wound, sputum and urine.

A- Specimen selection and collection

All specimens must be accompanied with the **referral** form filled with patient's name, sex, age, specimen source and patient's history **(refer to Appendix A)**. The most common specimens where *Candida species* including *C. auris* can be isolated are shown on table.1 below:

Table 1 General Guidelines for Specimen collection, storage and transport

Specimens	Collection methods	Storage/Transport
CSF	5 ml is recommended in a sterile container	Hold and transport ambient (15-30°C); avoid freezing
Blood	In adult with bloodstream infection,10 ml should be obtained into culture bottle (one aerobic and one anaerobic culture bottle)	Hold and transport ambient (15-30°C); avoid freezing
In subcutaneous infections, scrapings, crust, aspirated, pus or tissue biopsies, Skin, nail clipping and hair	should be removed aseptically and placed in a suitable container and sealed properly	Hold 2-8°C or ambient and transport ambient (15-30°C); avoid freezing
Mucous membranes	to be collected in a sterile container	Hold and transport ambient (15-30°C); avoid freezing
In systemic infections	specimen can be collected from blood, CSF or other areas directly into sterile blood culture bottle	Hold and transport ambient (15-30°C); avoid freezing
Urine	To be collected in a sterile container	Hold 2-8°C and transport ambient (15-30°C); avoid freezing

(NH DHHS, 2008) **Notes:** all dry swabs are unacceptable

B- Specimen processing:

1. It is very important that any *Candida spp* isolates associated with **invasive infections** to be analyzed to the species and susceptibility level.
2. *C. auris* grows on Blood agar as all other *Candida.* species. But for sub-culturing please use Sabouraud's agar.
3. Growth at 40-42^{o}C is useful to differentiate it from many other Candida Species.
4. CHROM agar is widely used as a differentiation medium, *C. auris* appear pale purple or pink colonies.
5. Microscopically is indistinguishable from other *Candida* species, but it is germ tube negative budding yeast
6. It is commonly misidentified with other yeast (especially *Candida haemulonii*) in: VIEK-2 YST, API 20C, Microscan and BD phoenix yeast identification system.

   Note: As it is a newly recognized species, laboratories are advised to update identification database in their diagnostic devices such as VITEK-2 and VITEK-MS. For more information, please see Figure.1 in **Appendix B** (algorithm to confirm commonly misidentified yeast as *C. auris*)

7. Confirmatory test can be achieved by VITEK MS (bioMerieux, France) and MALDI Biotyper system (Bruker Corporation, USA) or by DNA sequencing of the D1/D2 domain.

8. Laboratories with no capability to do further characterizations, referral of Candida non- albicans and invasive isolates to a reference laboratory are advisable

   Note: Any suspected *Candida* non-albican isolates must be pure culture on Sabouraud's slopes attached with a referral form (**Appendix A**).

C- Antifungal susceptibility testing for *Candida auris*

1. As there are no defined breakpoints for *C. auris*, breakpoints of related *Candida* species have been defined for the interpretation of antifungal susceptibility testing (Table2).

Table 2 General guidelines of *Candida auris* MIC breakpoints

Class/Drug	Tentative MIC Breakpoints (µg/mL)	Comment
Triazoles		
Fluconazole	≥32	Modal minimum inhibitory concentration (MIC) to fluconazole among isolates tested at CDC was ≥256; isolates with MICs ≥32 were shown to have a resistance mutation in the *Erg11* gene, making them unlikely to respond to fluconazole.
Voriconazole and other second generation triazoles	N/A	Consider using fluconazole susceptibility as a surrogate for second generation triazole susceptibility assessment. However, isolates that are resistant to fluconazole may respond to other triazoles occasionally. The decision to treat with another triazole will need to be made on case-by-case basis.
Polyenes		
Amphotericin B	≥2	**isolates with an MIC of ≥2** should now be considered resistant. If using E-test for amphotericin B and an MIC of 1.5 is determined, that value should be rounded up to 2.
Echinocandins		
Anidulafungin	≥ 4	Tentative breakpoints are based on the modal distribution of echinocandin MICs of approximately 100 isolates from diverse geographic locations.
Caspofungin	≥ 2	
Micafungin	≥ 4	

(CDC,2018)

D. Reporting Confirmed cases of C. auris

1. Any confirmed cases of *C. auris* should be reported with its susceptibility testing to General Directorate of Prevention and Control (GDIPC) (**see Appendix C and D**).
2. All reports should be generated within 24 hours of identification.

II. Infection Control measures in the Healthcare Setting

A. Notification

1. The Microbiology laboratory will notify the following:

    a. Nurse-in-Charge of the ward/unit where the patient was admitted
    b. Infection Control department/Infection Control Practitioner(ICP)

2. Infection Control Practitioner /department notifies:

    a. Nursing Manager
    b. Housekeeping Manager.

B. Infection Control Measures

1. Educate all healthcare workers, including environmental cleaning services staff about the need for Contact precautions.

2. ICP to **flag** the patient's medical record to institute the recommended isolation precautions.

3. Patient placement
   a. Place patient in a single room with a private bathroom.
   b. Strict Contact precautions.
   c. Post the appropriate English and Arabic isolation signage outside the room.

4. Cohorting of patients
   a. Patients with *C. auris* can be placed with other patients with same organism.
   b. It is not recommended to cohort patients colonized with *C. auris* with patients with other types of multidrug- resistant organisms (MDROs)
   c. If a limited number of single rooms are available, they should be reserved for patients who may be at highest risk of transmitting *C. auris*, particularly patients requiring higher levels of care (e.g., bed-bound).

5. For extra precautionary measures and to protect other patients where the confirmed case is in, keep the ward/unit in empiric Contact isolation
   a. No transferring of patient out of the ward/unit
   b. Optimizing hand hygiene practices
   c. Wearing of gown and gloves whenever in direct contact with any of the patients in the unit.
   d. Utilize a dedicated isolation cart

   Application of empiric Contact isolation in the unit will be continued until the unit has no more positive case or when the index case has been discharged.

6. Principles of Personal Protective Equipment (PPE)

   a. All healthcare workers assigned to care for *C. auris* patient must observed appropriate donning and doffing of PPEs.

   b. A mask and eye protection or face shield should be worn if performing procedures likely to generate splash or splatter (e.g., wound manipulation, suctioning) of contaminated material (e.g., blood, body fluids, secretions, excretions).
   c. IPC shall ensure training for healthcare workers for proficiency and competency in the use of PPE.

      i. In the PPE removal area, provide supplies for performing hand hygiene.
      ii. Ensure adequate supplies of PPEs are available.
      iii. Strict monitoring to adherence to infection control measures.

7. Nursing / Medical Staff

    a. Dedicate the nursing staff caring for patients with *C. auris.*
    b. If multiple *C. auris* patients are present in a facility, consider cohorting staff who care for these patients.
    c. It is not recommended to accept nurse floaters in and out of the ward/ unit where the confirmed case is until cleared by IP&C.
    d. Staff assigned with the patient will be monitored by IP&C department regularly and to be screened if needed.

8. Patient care equipment

    a. Utilize a dedicated isolation cart to keep all routine supplies for the patient outside of the isolation room.
    b. Patient care equipment should be dedicated (preferably disposable).
    c. All non-dedicated and non-disposable medical equipment used for confirmed or suspected cases should be cleaned and disinfected twice for extra precaution, using the recommended hospital-approved disinfectants and follow manufacturer's instruction.

9. Restriction of visitors:

    a. Entry to the patient's room is restricted.
    b. Exceptions may be considered on a case-to-case basis with due notification from IP&C Department.

C. Monitoring and Management of Potentially Exposed Staff

Consider HCWs to be exposed if they had a direct and prolonged interaction (e.g. bedside care, medical examination, physiotherapy) with the positive case before identification. Review list of exposed HCWs for the last four weeks.

1. How to screen:

    a. Sites to screen:

        i. Using a composite swab for axilla and groin
        ii. Nares

2. Once a staff has been found to be colonized with C. auris, he/she needs to be off from work and to be referred to Surveillance or Staff Clinic for assessment and recommendation.

    Note: Send the tracing form **Appendix E** for exposed HCWs to Surveillance clinic.

D. Monitoring and Management of Potentially Exposed Patient

Because patients with *C. auris* could have been colonized for months prior to detection of the organism, there is a potential transmission of *C. auris* to other patients. Therefore, it is important to identify the patient's possible prior healthcare exposures and contacts.

1. Screen roommate(s) going back 4 weeks from the date of positive culture.
2. To screen all patients in the unit if the patient was housed for more than 3 days undiagnosed. Defer transfer to other areas/wards until the results of the initial screening has been found to be negative.
3. Sites to screen:
   a. Composite swab for axilla and groin
   b. Nares
   c. Stool culture
4. Screening additional patients can be considered if transmission is documented in this higher risk group.

   Note: Fill the tracing form **Appendix F** for exposed patients and send to IP&C.

E. Decolonization Protocol for 5 days

1. Use 2% Chlorhexidine gluconate (CHG)wipes or bath using 4% CHG soap twice a day to reduce or inhibit skin colonization.
2. Use 0.2 % Chlorhexidine mouthwash for patients on ventilator.
3. Oral Nystatin if oropharyngeal is colonized.

F. Duration of Isolation Precautions for Patients and Staff

A**.** For patients:

1. Periodic reassessments for presence of *C. auris* colonization every month for a patient with known *C. auris* colonization and every two weeks for positive HCW. Sites to screen:

   a. Nares
   b. Axilla and groin
   c. Previous positive cultures (e.g. urine, sputum).
2. The patient should not be on antifungal medications active against *C. auris* at the time of these assessments.
3. The optimal time between last receipt of antifungal medications and testing for *C. auris* is one week. Wait at least 48 hours after administration of topical antiseptic (e.g., chlorhexidine gluconate).
4. If a patient's swab is positive, there is no need to repeat sampling for at least another month for patients and every two weeks for HCWs.
5. Discontinue Contact isolation after obtaining two negative cultures from the previous positive site one week apart.
6. Clearance of the admitting unit from the empiric isolation would be done by IP&C.

G. Environmental Cleaning

C. auris can persist on surfaces in healthcare environments. Quaternary ammonia products that are routinely used for disinfection are not effective against *C. auris.* Educate environmental cleaning staff and implement supervised cleaning.

1. If to use hands-free disinfection methods, like UV light it would require longer cycle times when used for *C. auris.*
2. We recommend use of a hospital-approved disinfectant effective against *Clostridium difficile* spores.
3. If not available a solution of 1:50 household bleach for daily general cleaning and a solution of 1:10 for terminal cleaning can be used.
4. Follow recommendation for contact time of ten (10) minutes.

5. Use the 1:50 household bleach chlorine disinfectants solution for cleaning and disinfection of areas outside of their rooms where they receive care (e.g., radiology, physical therapy).
6. Housekeepers performing environmental cleaning should wear the recommended PPEs described above.
7. Use designated cleaning equipment (e.g., mop, buckets, etc.) and disposable cleaning materials in the isolation room/unit.
8. Clean and disinfect equipment and furniture upon patient discharge.
9. The need for environmental screening would be performed after consultation with the IP&C department.

H. Monitoring Cleanliness

1. Each hospital needs to establish a monitoring tool for assessing cleanliness and quality control. Checklist and audit tools will assist supervisory staff in monitoring and documenting cleaning and disinfection of environmental surfaces and medical equipment.
2. Refer to **Table 3** for examples of high touch surfaces and refer to **Table 4** checklist from CDC Environmental *Checklist for Monitoring Terminal Cleaning*.

Table 3: Examples of High-Touch Surfaces

Patient room	**Bathroom**	**Operating room**
Bed controls	Bedpan cleaners/flushers	Anesthesia equipment & controls
Bed rails	Call light	Anesthesia supply cart
Bedside table	Doorknobs	Arm boards
Over bed table	Faucet handles	Autoclave door handles
Cabinet knobs	Handrails	Back table
Call light	Hand held shower handles	Computer keyboard
Doorknobs	Light switch	Door handles
IV poles	Sinks	IV poles
Chair	Toilet flush	Light switches
Room sink	Toilet seat	Mayo stand
Telephone		Medication cart
Chair arms/seat		Operating bed
Computer keyboard		Operating bed controls
Handheld Television controls		Operating bed straps
Ventilator controls		Overhead surgical lights
Thermometer		Patient monitors
Blood pressure cuff		Ring stand
		Sponge counter
		Storage cabinet door handles
		Telephone
		Warm door handles

Table 4: CDC Environmental Checklist for Monitoring Terminal Cleaning1

Date:	
Unit:	
Room Number:	
Initials of ES staff (optional):[2]	

Evaluate the following priority sites for each patient room:

High-touch Room Surfaces[3]	Cleaned	Not Cleaned	Not Present in Room
Bed rails / controls			
Tray table			
IV pole (grab area)			
Call box / button			
Telephone			
Bedside table handle			
Chair			
Room sink			
Room light switch			
Room inner door knob			
Bathroom inner door knob / plate			
Bathroom light switch			
Bathroom handrails by toilet			
Bathroom sink			
Toilet seat			
Toilet flush handle			
Toilet bedpan cleaner			

Evaluate the following additional sites if this equipment are present in the room:

High-touch Room Surfaces[3]	Cleaned	Not Cleaned	Not Present in Room
IV pump control			
Multi-module monitor controls			
Multi-module monitor touch screen			
Multi-module monitor cables			
Ventilator control panel			

Mark the monitoring method used:

☐ Direct observation ☐ Fluorescent gel
☐ Swab cultures ☐ ATP system ☐ Agar slide cultures

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[1]Selection of detergents and disinfectants should be according to institutional policies and procedures.
[2]Hospitals may choose to include identifiers of individual environmental services staff for feedback purposes.
[3]Sites most frequently contaminated and touched by patients and/or healthcare workers.

I. Patient Transfer Between Healthcare Facilities

1. When transferring patients to other healthcare facilities, receiving facilties should receive notification of the patient's *C. auris* infection or colonization recommended infection control precautions.

References and further reading:

1. Center for Disease Prevention and Control (CDC), Recommendations for Infection Prevention and Control for *Candida auris*. Download: https://www.cdc.gov/fungal/diseases/candidiasis/c-auris-infection-control.html

2. Gov. UK (2016). The characteristics, diagnosis and management of Candida auris (C. auris). https://www.gov.uk/government/collections/candida-auris
3. Center for Disease Prevention and Control (CDC), Global Emergence of Invasive Infections Caused by Multidrug-resistant Yeast *Candida auris*. Download: http://www.cdc.gov/fungal/diseases/candidiasis/candida-auris-alert.html Candida

4. NH DHHS, Division of Public Health Services, Public Health Laboratories Mycology Specimen Collection and Transport .Download: https://www.dhhs.nh.gov/dphs/lab/documents/mycology.pdf

5. Interim guidance for management of *Candida auris* infections in South African hospitals. Download: http://www.nicd.ac.za/assets/files/2016-12-22%20InterimNICDRecommdtnsCAuris.pdf

7. Center for Disease Prevention and Control (CDC), Recommendations for Identification of Candida Auris . https://www.cdc.gov/fungal/diseases/candidiasis/candida-auris-ganda.html

8. Chelenz S, Hagen F, Rhodes JL, Abdolrasouli A, Chowdhary A, Hall A, Ryan L, Shackleton J, Trimlett J, et al. First hospital outbreak of the globally emerging *Candida auris* in a European hospital. *Antimicrobial Resistance & Infection Control, BMC* 20165:35 https://doi.org/10.1186/s13756-016-0132-5

Appendices:

Appendix A

Laboratory referral form for identification of Candida non-albican isolates

Sender's information

Requesting Hospital/Lab	
Contact no.	
E-mail	

Patient information

Medical no.	
Family name	
First name	
Gender	
Age	
ID no.	
Relevant clinical details/primary diagnosis	
Date of onset	
Antifungal therapy	
Pre-collection antifungal therapy Yes/No	

Sample and isolate information

Requesting lab, no	Date /time collected
Number of Candida isolate	Sample type/source
Diagnostic device used (Vitek, Microscan,etc,)	
Antifungal susceptibility (MIC) (if available)	

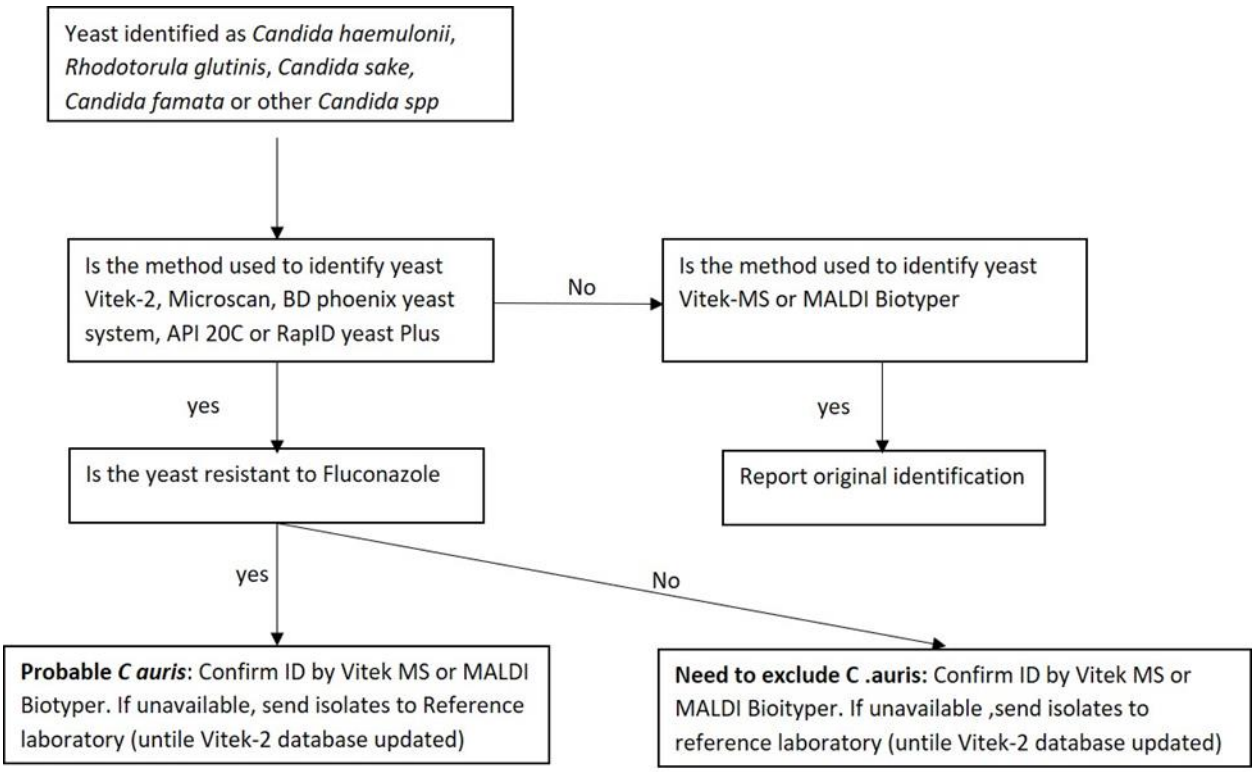
Test required for:

Isolate identification and susceptibility Yes/No	
Surveillance Yes/No	

Additional Information

Appendix B

Figure 2: Laboratory algorithm to confirm commonly misidentified yeast as *C. auris*



Appendix C:

Reporting form

Ministry of Health

General Directorate for Infection Control and Prevention

Region:
Healthcare facility:
Bed capacity:
Operating Bed capacity:

Cumulative Antimicrobial Susceptibility Report for *Candida auris* **Month:** **year:**

Hospital	File No	Date of Admission	Sex	Specimen collected date	Specimen type	MIC-Fluconazole	MIC-Voriconazole	MIC-Amphoteracin B	MIC-Anidulafungin	MIC-Sapofungin	MIC-Micafungin

Appendix D:

Ministry of Health **Outbreak Report to MOH:**		
OUTBREAK NOTIFICATION FORM		
Unit/Dept:	**Hospital:**	**Region:**
DEMOGRAPHIC DATA		
Patient Name	Age	Sex
Address	Home Tel	Mobile
CASE IDENTIFICATION*		
Symptom onset date		
Symptoms		
Medical Devices		
Number of Positive Cases		
Provisional Diagnosis		
Patient pathway		
Reported by	**Signature**	**Date**
IC Responsible in Health Facility		
Reported to	**Hospital Directorate**	
	Directorate of Health Region	
	General Directorate of Infection Prevention and Control MOH	

APPENDIX E
CONTACT TRACING FORM FOR EXPOSED HEALTHCARE WORKERS

CONTACT TRACING FORM FOR EXPOSED HEALTHCARE WORKERS								
INDEX PATIENT:								
#	**NAME**	**MRN**	**BADGE NUMBER**	**POSITION**	**DEPARTMENT**	**CONTACT #**	**DATE OF EXPOSURE**	**COMMENTS**
1								
2								
3								
4								
5								
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8								
9								
10								
11								
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14								
15								
16								
17								
18								
19								
20								

APPENDIX F
CONTACT TRACING FORM FOR EXPOSED PATIENTS

CONTACT TRACING FORM FOR PATIENTS						
INDEX PATIENT:						
#	**NAME**	**MRN**	**RELATIONSHIP**	**CONTACT #**	**DATE OF EXPOSURE**	**COMMENTS**
1						
2						
3						
4						
5						
7						
8						
9						
10						
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