HHS Public Access

Author manuscript

Am J Infect Control. Author manuscript; available in PMC 2021 July 01.

Published in final edited form as:

Am J Infect Control. 2020 July ; 48(7): 825–827. doi:10.1016/j.ajic.2020.01.021.

Preparing Your Healthcare Facility for the New Fungus Among Us: An Infection Preventionist's Guide to *Candida auris*

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Abstract

Candida auris is a multidrug-resistant yeast that has emerged in recent years as a serious global health threat. Unique challenges in identification, treatment, and cleaning and disinfection have contributed to its propensity to spread within healthcare settings. Familiarity with the organism and knowledge of appropriate methods for detection and management of infection and colonization is important for infection preventionists to prevent healthcare-associated transmission of this pathogen.

Keywords

Candida auris; Candida; Fungal infection; Epidemiology; Healthcare-associated; Infection control; Multidrug-resistance

In June 2016, the Centers for Disease Control and Prevention (CDC) issued an alert regarding an emerging multidrug-resistant yeast, *Candida auris*, which had been implicated in outbreaks of invasive healthcare-associated infections in several countries.(1) This new organism can be challenging to identify, resistant to multiple classes of antifungal agents, and associated with high mortality. The alert urged healthcare facilities and laboratories to report all cases of *C. auris* to local and state health departments and the CDC. In the three years since, more than 800 clinical cases of *C. auris* infection have been reported in the United States. In the CDC's recent report, "Antibiotic Resistance Threats in the United States, 2019," *C. auris* is listed as an urgent health threat requiring aggressive action.(2) News reports of this growing "superbug" threat have raised public concern as well as criticism over a perceived lack of communication and transparency between leaders in

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public health and healthcare facilities and the public. Infection preventionists (IPs) should be familiar with this organism in order to provide consistent and accurate messages to healthcare workers and hospital leadership, and to rapidly recognize its emergence in facilities where it has not previously been detected and control its spread in those where it has.

Background and Challenges

C. auris was first identified in 2009 from the external ear canal of a patient in Japan.(3) Retrospective evaluation of previously unidentified yeasts isolated from clinical specimens revealed *C. auris* infections that had occurred in South Korea as early as 1996. Subsequent review of an international collection of >15,000 *Candida* isolates collected between 2004 to 2015 found only 4 misidentified *C. auris* isolates, suggesting the prior scarcity and recent emergence of this species.(4)

C. auris is distinct from other *Candida* species in several ways that contribute to the unique challenges it poses to infection control and public health. First, misidentification of *C. auris* as other yeasts (such as *C. haemulonii, C. famata, C. guilliermondii, C. lusitaniae, C. parapsilosis*) is common in laboratories using standard biochemical methods.(5) Accurate identification currently requires either genetic sequencing or matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) techniques that are not available in many clinical laboratories.(6) In addition, many laboratories do not routinely identify yeasts to the species level when they are isolated from nonsterile body sites. This may be problematic as even asymptomatic colonization poses risk for *C. auris* transmission. The CDC recommends species-level identification of *Candida* isolates from nonsterile sites when *C. auris* has been previously detected in a facility or if the patient has had healthcare exposure in countries with documented *C. auris* transmission. In addition, when a laboratory's phenotypic testing identifies a fungal isolate as an organism that is known to represent potential misidentification of *C. auris*, (e.g., *C. haemulonii, C. guilliermondii, C. lusitaniae, C. parapsilosis)* further workup using other methodologies is recommended.(5) However, resource limitations may be a barrier to the implementation of these recommended strategies in some healthcare facilities.

C. auris is also able to enter an aggregative form resistant to physical and chemical disruption, allowing it to persist on surfaces for at least 4 weeks.(6,7) *C. auris* has been cultured from multiple locations in patient rooms, including both high-touch surfaces and more remote locations in the patient care environment such as windowsills and curtains.(8) One large outbreak in a neurological intensive care unit in the United Kingdom was linked to reusable axillary thermometer probes, highlighting the role that shared equipment may play in transmission.(9) If timely identification of the organism is not achieved with implementation of effective environmental disinfection, a persistent environmental reservoir may contribute to the spread of *C. auris* in healthcare facilities.

Resistance to multiple antifungal agents is another serious concern. While there are no established minimum inhibitory concentration (MIC) breakpoints for *C. auris*, tentative MIC breakpoints published by the CDC have been suggested based on those of closely related

species and expert opinion.(5) In one study, 93%, 35% and 7% of isolates were resistant to fluconazole, amphotericin B, and echinocandins, respectively. (4) Forty-one percent of these isolates were resistant to ≥2 drug classes. Isolates with elevated MICs to all three major antifungal drug classes have also been reported, but to date this has occurred primarily outside the US.(5)

Epidemiology

Since its first identification in 2009, *C. auris* has been identified in over 30 countries on 6 continents.(5) As observed with other multidrug-resistant organisms, the prevalence and spread of *C. auris* varies substantially around the world. A single-center study conducted in Kenya between 2010 and 2016 found that *C. auris* was the leading cause of candidemia, accounting for 38% of cases.(10) *C. auris* was the fifth most common cause of candidemia in 27 intensive care units in India, accounting for 5.3% of cases, and the sixth most common cause of all bloodstream infections in a tertiary care center in Venezuela.(11)

The introduction of *C. auris* to Europe and the U.S. is thought to be linked to travelers who received healthcare in countries with ongoing outbreaks, and travel continues to play a role in ongoing dissemination of the organism.(7,12) The recovery of nearly identical isolates from different hospitals within a geographic region suggests spread due to patients with overlapping contact across multiple long-term and acute care facilities.(4,7,13) Several large outbreaks in healthcare facilities in Europe have been reported.(7) In the U.S., 950 confirmed clinical cases of *C. auris* have been identified as of November 30,2019, with more than 1,900 additional persons found to be colonized. Cases have been identified in 14 states, with the majority reported from the New York City, New Jersey, and Chicago areas.(5)

Treatment

Because most U.S. isolates have been susceptible to echinocandins, the recommended empiric therapy for *C. auris* infections is an echinocandin, with antifungal susceptibility testing used to guide definitive therapy. Susceptibility testing should be performed on initial and subsequent *C. auris* isolates as resistance to echinocandins can develop while on therapy. Consultation with an infectious diseases specialist is recommended.(5) The overall mortality of *C. auris* infection is reported to be as high as 60%, but the mortality directly attributable to *C. auris* infection is difficult to discern because, similar to other multi-drug resistant organisms, *C. auris* primarily affects those with preexisting comorbidities rather than the healthy population. Most patients with *C. auris* have had extensive exposure to healthcare facilities and significant underlying medical conditions.(4,13)

Strategies for Infection Prevention & Control

IPs should understand the epidemiology of *C. auris* in their region and be familiar with the unique properties that distinguish this organism from other *Candida* species. Even if no cases have been detected in the region, patients may have read or heard about this organism from the news media or other sources. Informational documents may be useful to address potential patient concerns and the CDC provides several resources for this purpose.(14) If *C.*

auris cases are identified in a facility, IPs play an important role in guiding implementation of recommended infection control measures to prevent the spread of this pathogen. The identification of a patient with *C. auris* infection or colonization should trigger prompt notification of appropriate public health authorities, and proactive education of healthcare workers caring for patients with *C. auris* about the clinical and public health significance of this organism. Resources on infection prevention and control recommendations from the CDC can be found online at: https://www.cdc.gov/fungal/candida-auris/c-auris-infection-control.html.

Isolation.

Medical and nursing staff involved in the care of patients with *C. auris* should be alerted immediately and the patient should be placed in a single room on standard and contact precautions. The importance of following standard hand hygiene practices, and the appropriate use of cover gown and gloves for all patient contact should be reinforced. The implementation of contact precautions also requires the use of designated equipment such as blood pressure cuffs/machines, stethoscopes, thermometers, assisted devices, etc. whenever possible.(15) If equipment cannot be dedicated, then it must be cleaned and disinfected with an appropriate disinfectant (see “Cleaning and Disinfection” below) before use with another patient. In instances of ongoing transmission, complete discontinuation of all reusable equipment may be required to end outbreaks.(9)

While on isolation, the patient’s movement outside the room and throughout the facility should be limited to ensure receiving areas can implement appropriate contact precautions as well as provide effective environmental cleaning and disinfection. To assist in this, the patient’s medical record should be flagged to indicate the need for contact precautions throughout their current and subsequent hospitalizations. The CDC currently recommends maintaining isolation and contact precautions for as long as a person is colonized with *C. auris.* However, the duration for which patients remain colonized with *C. auris* is not well defined but believed to often be prolonged and perhaps, in some cases, indefinite.(5,16) Screening of patients in one study showed colonization up to at least 5 months.(8)

For patients requiring transfer between different healthcare facilities, coordination between the sending and receiving facilities is important in order to clearly communicate the patient’s *C. auris* status and the need for contact precautions. IPs can assist in this process by communicating directly with the Infection Prevention & Control (IPC) Department of the receiving facility.(17) This step ensures that appropriate infection control measures are maintained during the transfer and upon arrival of the *C. auris* patient. For patients being discharged home, communication between the IP and the local public health authorities is essential.

Cleaning and Disinfection.

Cleaning and disinfection of the environment and shared mobile equipment is a critical aspect of managing and preventing the spread of *C. auris*.(18,19) Rooms of patients with *C. auris* infection or colonization should undergo daily and discharge cleaning with the use of a disinfectant with activity against *C. auris*. Widely used quaternary ammonium disinfectants

are largely ineffective against most *C. auris* and the organism appears to be relatively resistant to UV irradiation.(20,21) The CDC currently recommends use of an Environmental Protection Agency (EPA) List-K disinfectant with activity against *Clostridiodes difficile* spores.(18) New products designed to target *C. auris* are being evaluated and may become available in the future (22).

A collaborative effort by IPC and the Environmental Services Department should be made to establish an environmental cleaning and disinfection protocol that includes the frequency of cleaning and the disinfectant used. The CDC recommends that all areas, including patient rooms as well as diagnostic and procedural area, occupied by patients with *C. auris* undergo daily cleaning and disinfection with attention to high-touch surfaces, at a minimum, and thorough terminal cleaning upon patient discharge.(16) The use of disposable or dedicated equipment whenever possible for patients with confirmed or suspected *C. auris* is recommended. Any shared mobile equipment that is either not disposable or cannot be dedicated should be cleaned thoroughly and undergo low-level disinfection according to manufacturer's instructions before use on another patient.(23)

Surveillance.

In healthcare facilities where a *C. auris* patient with infection or colonization has been identified, screening other patients to detect previously unrecognized *C. auris* colonization should be considered. The CDC recommends screening of close healthcare contacts, including all recent roommates of the index patient as well as more critically ill patients (i.e. those requiring mechanical ventilation) who overlapped on the same unit as the index patient for 3 or more days. Screening should also be considered for patients who have had overnight stays in healthcare facilities outside of the U.S. in the past year, especially in countries with documented *C. auris*. Healthcare facilities with multiple patients with *C. auris* should strongly consider more extensive investigation, such as a point prevalence survey.(5) Screening should be performed using a swab of the patient's bilateral axilla and groin, given these have been identified as the most common sites of *C. auris* colonization. The identification of a patient with *C. auris* colonization using these methods should prompt implementation of the infection control measures detailed above. Due to the propensity for *C. auris* to be misidentified, all healthcare facilities with or without previous patients with *C. auris* infection or colonization should be aware of situations in which *C. auris* might be suspected. Additional information on surveillance from the CDC can be accessed here: https://www.cdc.gov/fungal/candida-auris/c-auris-surveillance.html.

Conclusions

C. auris continues to pose challenges across the healthcare continuum. Despite increasing study of and clinical experience with *C. auris* in recent years, many unanswered questions remain. Additional research is needed to address certain topics such as duration of colonization and need for isolation, screening strategies, and appropriate environmental cleaning and disinfection. Remaining informed of current and future information released by the local public health authorities and the CDC is important for IPs in helping to implement best practices for the care of patients infected and colonized with *C. auris*. Finally,

communication remains paramount in the fight against *C. auris*. IPs are uniquely positioned to facilitate the education of various members of the healthcare team involved with the care of a *C. auris* patient and, in doing so, aid in the prevention of spreading the new fungus among us.

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Highlights:

1. Infection preventionists should be aware of the epidemiologic and clinical features of the emerging fungal pathogen *Candida auris*.
2. *C. auris* presents several distinct challenges in identification, treatment, and prevention.
3. Timely recognition of cases is key to preventing the spread of *C. auris*.
4. Infection preventionists have a vital role in facilitating the implementation of infection prevention and control strategies.