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Interim Guide for Infection Prevention and Control of *Candida auris*

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PIDAC | Provincial Infectious Diseases Advisory Committee

Infection Prevention and Control

Public Health Ontario

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About PIDAC-IPC

The Provincial Infectious Diseases Advisory Committee on Infection Prevention and Control (PIDAC-IPC) is a multidisciplinary scientific advisory body that provides evidence-based advice to Public Health Ontario (PHO) regarding multiple aspects of infectious disease identification, prevention and control.

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This document was developed by the Provincial Infectious Diseases Advisory Committee on Infection Prevention and Control (PIDAC-IPC). PIDAC-IPC is a multidisciplinary scientific advisory body that provides evidence-based advice to Public Health Ontario (PHO) regarding multiple aspects of infectious disease identification, prevention and control. PIDAC-IPC's work is guided by the current best available evidence at the time of publication and updated as required. Best Practice documents and resources produced by PIDAC-IPC reflect consensus positions on what the committee deems prudent practice and are made available as a resource to public health and health care providers.

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Glossary of Terms

Audit: A systematic and independent examination to determine whether quality activities and related results comply with planned arrangements, are implemented effectively and are suitable to achieve objectives.[1]

Cleaning: The physical removal of foreign material (e.g., dust, soil) and organic material (e.g., blood, secretions, excretions, microorganisms). Cleaning physically removes rather than kills microorganisms. It is accomplished with water, detergents and mechanical action.

Colonization: The presence and growth of a microorganism in or on a body with growth and multiplication but without tissue invasion or cellular injury or symptoms.

Contact Precautions: Used in addition to Routine Practices to reduce the risk of transmitting infectious agents via contact with an infectious person.

Contamination: The presence of an infectious agent on hands or on a surface such as clothes, gowns, gloves, bedding, toys, surgical instruments, patient care equipment, dressings or other inanimate objects.

Disinfectant: A product that is used on surfaces or medical equipment/devices which results in disinfection of the equipment/device. Disinfectants are applied only to inanimate objects. Some products combine a cleaner with a disinfectant.

Disinfection: The inactivation of disease-producing microorganisms. Disinfection does not destroy bacterial spores. Effective disinfection is only possible when medical equipment/devices are cleaned thoroughly beforehand. See also Disinfectant.

Endemic: The constant presence of a disease or infectious agent within a certain area.

Fomites: Objects in the inanimate environment that may become contaminated with microorganisms and serve as vehicles of transmission.

Hand hygiene: A general term referring to any action of hand cleaning. Hand hygiene relates to the removal of visible soil and removal or killing of transient microorganisms from the hands. Hand hygiene may be accomplished using soap and running water or an alcohol-based hand rub. Hand hygiene includes surgical hand antisepsis.

Health care facility: A set of physical infrastructure elements supporting the delivery of health-related services. A health care facility does not include a client/patient/resident's home or physician/dentist/other health offices where health care may be provided.

Health care provider: Any person delivering care to a client/patient/resident. This includes, but is not limited to, the following: emergency service workers, physicians, dentists, nurses, respiratory therapists and other health professionals, personal support workers, clinical instructors, students and home health care workers. In some non-acute settings, volunteers might provide care and would be included as health care providers. See also, staff.

Health care setting: Any location where health care is provided, including settings where emergency care is provided, hospitals, complex continuing care, rehabilitation hospitals, long-term care homes, mental health facilities, outpatient clinics, community health centres and clinics, physician offices, dental offices, offices of other health professionals and home health care.

Improved hydrogen peroxide: A formulation of hydrogen peroxide that contains surfactants, wetting agents and chelating agents. The resulting synergy makes it a powerful oxidizer that can rapidly achieve broad-spectrum disinfection for environmental surfaces and noncritical devices. In high concentrations (2%-7%) it has a sporicidal claim.

Infection: The entry and multiplication of an infectious agent in the tissues of the host. Asymptomatic or subclinical infection is an infectious process running a course similar to that of clinical disease but below the threshold of clinical symptoms. Symptomatic or clinical infection is one resulting in clinical signs and symptoms (disease).

Infection prevention and control: Evidence-based practices and procedures that, when applied consistently in health care settings, can prevent or reduce the risk of infection in clients, patients, residents, health care providers and visitors.

Point prevalence: The surveillance for all existing and new nosocomial infections and/or colonizations in a health care setting on a single day. It can provide a rapid way to estimate the magnitude of health care-associated infections in a health care setting at a single point in time (e.g., testing all patients or residents in a defined area, such as a specific unit, at a single point in time to determine how many are colonized with a specific microorganism).

Provincial Infectious Diseases Advisory Committee (PIDAC): A multidisciplinary scientific advisory body which provides to Public Health Ontario evidence-based advice regarding multiple aspects of infectious disease identification, prevention and control.

Public Health Agency of Canada: An agency of the Government of Canada which promotes improvement in the health status of Canadians through public health action and the development of national guidelines.

Public Health Ontario (PHO): Public Health Ontario is the operating name for the Ontario Agency for Health Protection and Promotion.

Routine Practices: The system of infection prevention and control practices recommended by the Public Health Agency of Canada to be used with all clients/patients/residents during all care to prevent and control transmission of microorganisms in all health care settings.

Screening: A process to identify clients/patients/residents at risk for being colonized with antibiotic-resistant organisms and, if risk factors are identified, obtaining appropriate specimens.

Sensitivity: Percentage of persons with true positive results among persons known to have a disease.

Sentinel event: A colonization/infection in which the occurrence of even a single case requires immediate investigation and the implementation of control measures.

Staff: Anyone conducting activities in settings where health care is provided, including health care providers. See also health care provider.

Preamble

About This Document

Candida auris is an emerging fungal pathogen capable of causing invasive disease, particularly in critically ill patient populations. This document is primarily targeted to those who have a role in infection prevention and control in all Ontario health care facilities to ensure that they are prepared to identify and prevent the spread of this pathogen. In addition, microbiologists, administrators and clinicians will also find the information in this document useful.

Evidence for Recommendations

Recommendations in this document are based on interim professional guidance for infection prevention and control for cases of *C. auris*, reports of outbreak investigations for this pathogen and expert opinion. As there is currently limited evidence upon which to base recommendations for *C. auris* control, the recommendations in this document will be revised as new information becomes available.

1. Background and Purpose

Candida auris is an emerging fungal pathogen capable of causing invasive disease, particularly in critically ill patient populations. Following recognition of this pathogen in Japan in 2009,[2] it has spread globally resulting in persistent and difficult to control hospital outbreaks.[3-20] These outbreaks have resulted in long-term endemic disease in the affected facilities,[8-15,18,20] dissemination of infection to other facilities[9,16,17] and regional or country-wide spread within health care facilities.[21-23]

Unlike *Candida albicans*, the majority of *C. auris* isolates are resistant to fluconazole.[11,24-30] Resistance to other azoles, polyenes (e.g., amphotericin B) and echinocandins also occurs.[11,15,17,21,25,26,28,30-49] There is little available information on how antifungal resistance is acquired in *C. auris* but the development of resistance while on therapy has been observed.[12]

Invasive disease resulting from *C. auris* is similar to that seen with other *Candida* species. Catheter-associated bloodstream infection in critically ill patients is a common presentation, but a wide variety of organ systems can be infected.[2,3,7,8,11,15-17,24,25,28,31,32,35,36,38,49-52] Mortality rates greater than 50% have been reported,[3,30,53] but as invasive disease typically occurs in critically ill patient populations, the baseline mortality is expected to be high. The attributable mortality related to *C. auris* is not yet known and may vary depending on the resistance profile of the infecting organism.[3,15,16,33-36,45]

As of August 31, 2018, over 1,100 patients infected or colonized with *C. auris* have been identified in health care facilities in eleven states in the United States (U.S.), with the majority identified in New York, New Jersey and Illinois.[54] The index cases have been linked to patients with health care contact in countries where *C. auris* has been reported, followed by transmission within U.S. health care facilities.[37,54]

Accurate data on the incidence of *C. auris* in Canada are not available; published data have identified cases in Manitoba, Québec, British Columbia and Ontario and transmission in hospitals has been documented.[31,55-57]

2. Interim Guide

2.1 Facility Preparedness

C. auris has disseminated globally;[54,58] cases have been identified in Ontario,[55,57] and the overall burden of disease within the province is likely to increase over time. Health care facilities and microbiology laboratories should be prepared to identify and care for patients and residents with *C. auris* colonization or infection.

All health care facilities should develop policies and procedures for the recognition, investigation and care of patients or residents colonized or infected with *C. auris*.[6,7,59,60]

2.2 Microbiological Detection

Most standard phenotypic and biochemical methods for identifying yeast are currently not able to identify *C. auris* or may misidentify *C. auris* as other uncommon non-albicans candida (e.g., *C. haemulonii*, others).[3,4,61,62] MALDI-TOF MS may also misidentify *C. auris*[63,64] although this can be corrected with database updates which include *C. auris* spectra.[11,26,28,50,63,65-68] Laboratories should be familiar with the capabilities and the limitations of their yeast identification systems. Additionally, most microbiology laboratories do not identify *Candida* isolates collected from nonsterile sites to the species level.[62,69] This may be reasonable but facilities should be aware that this can result in delays in the recognition of *C. auris* cases.

To ensure that patients and residents with *C. auris* infection are identified, microbiology laboratories should be capable of accurately identifying *C. auris* from appropriate specimens,[58,60,62] or should forward relevant specimens to Public Health Ontario's (PHO) laboratory, Toronto location, for definitive identification.[58] Laboratories capable of accurate identification of *C. auris* should still send confirmed isolates to PHO's laboratory, Toronto location, for surveillance purposes. Further details on appropriate methods for microbiological testing, and for which specimens to refer, can be found in the PHO laboratory Labstract *Candida auris* Reference Identification and Susceptibility Testing.

Appropriate specimens for which identification of *C. auris* is essential include:

- All candida isolated from sterile site specimens.[58,62,70]
- Screening specimens collected from patients and residents identified as high risk for *C. auris* infection or colonization (see 2.3 Screening for *C. auris*)

2.3 Screening for *C. auris*

Specific guidance regarding who should be tested for *C. auris* colonization, what specimens to collect, and when, are likely to change rapidly as more information about this emerging pathogen accumulates. In principle, testing should target patient or resident populations at highest risk for colonization.

As with other antimicrobial-resistant organisms such as methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant enterococci and carbapenemase-producing *Enterobacteriaceae*, there are more patients colonized with *C. auris* than there are infected patients. Failure to identify colonized patients will allow nosocomial *C. auris* transmission and will make it harder to control *C. auris* in Ontario.

2.3.1 WHO SHOULD BE TESTED FOR COLONIZATION?

1. In an outbreak, test current and previous roommates, all current ward mates and any other patient or resident who may have had a significant exposure based on the epidemiology of the outbreak.
2. When a single case of *C. auris* is identified (unless the case was identified and isolated promptly upon facility admission), test current and previous roommates and all current ward mates.
3. Test patients or residents transferred from a facility with recent *C. auris* transmission or with endemic *C. auris*.
4. Consider testing patients or residents admitted to a health care facility outside of Canada within the previous 12 months.

2.3.2 HOW TO TEST FOR COLONIZATION?

For patients and residents requiring testing for *C. auris* colonization, we recommend the following specimens be collected, at a minimum:

- a nasal swab plus a combined bilateral axillary and groin swab* [7,22,71,72]
- other sites as indicated (i.e., wound,[7,58,69] urine,[7,58] line exit site[58,69])

* Inclusion of additional swabs from other sites (e.g., perirectal or stool,[7,69] throat[7,58,69]) may increase the yield of testing.

When indicated, initial testing should be performed as soon as possible. When testing patients or residents at high risk of *C. auris*, testing should be repeated if initial results are negative as the sensitivity of a single screen is limited.[18] One approach is to perform additional testing at 7 and 14 days to maximize sensitivity.

Note that PHO's laboratory does not accept screening specimens directly. Only isolates for which *C. auris* is suspected will be accepted for identification by PHO's laboratory. For further details refer to the PHO Labstract *Candida auris* Reference and Susceptibility Testing .

2.4 Case Management

A positive microbiological result for *C. auris* should be considered a sentinel event. Infection prevention and control should be notified about all new cases and control measures aimed to identify and interrupt transmission should be implemented immediately.[58]

2.4.1 INFECTION PREVENTION AND CONTROL PRECAUTIONS

Patients and residents identified as colonized or infected with *C. auris* should be placed into a single (i.e., private) room with dedicated toileting facilities (toilet or commode) not shared with other patients or residents; staff and visitors entering the room should use both Routine Practices and Contact Precautions (See PIDAC's *Routine Practices and Additional Precautions in All Health Care Settings* for details on the elements of Routine Practices and Contact Precautions).[5,7,58,73,74]

2.4.2 EQUIPMENT AND ENVIRONMENTAL CLEANING AND DISINFECTION

Persistent environmental contamination despite routine cleaning and disinfection,[22] and contaminated medical equipment (e.g., axillary thermometer probes[18]) and other fomites are believed to play a role in nosocomial *C. auris* transmission.[10,11,13,18,34,75] Rigorous attention to environmental cleaning may be important to preventing transmission within a health care facility.[8,58,74,76] In vitro data suggest that both sodium hypochlorite and improved hydrogen peroxide (0.5%, 1.4%) are effective agents against *C. auris* while quaternary ammonium compounds are not.[5,8,11,13,58,73,75,77-79] Therefore, quaternary ammonium compounds should not be used for disinfection of the environment or medical equipment potentially exposed to *C. auris.*

Rooms housing patients or residents colonized or infected with *C. auris* should be cleaned and disinfected daily (at a minimum**) and upon discharge, following PIDAC's best practices for environmental cleaning of rooms for patients and residents on Contact Precautions. Medical equipment should be dedicated to the patient or resident, should not be used on other patients or residents, and should be cleaned and disinfected at least daily and upon discharge.[7,58,69,73,76]

** Some facilities have employed twice-daily cleaning and disinfection for *C. auris*.

There is some evidence that hydrogen peroxide vapour and ultraviolet light can reduce levels of environmental contamination with *C. auris*;[11,34,80,81] whether this will result in reduced transmission has not been confirmed.[11,12,34,74,76,81] Facilities that have already adopted these technologies should prioritize rooms housing *C. auris* patients or residents for ultraviolet light or hydrogen peroxide vapour disinfection. However, it is essential that the room is first cleaned and disinfected using standard processes.

2.5 Case Investigation

> **Every identified case of *C. auris* requires immediate investigation to determine the probable source of *C. auris* and to assess the risk of transmission within the facility.[58,69]**

Every identified case of *C. auris*, regardless of the degree of antimicrobial resistance, requires immediate investigation to determine the probable source of *C. auris* and to assess the risk of transmission within the facility.[58,69] Risk factors for *C. auris* acquisition should be identified for any patient or resident who tests positive for *C. auris*, including prior hospitalization or receipt of health care (e.g., dialysis, day surgery) at a Canadian health care facility where *C. auris* transmission has occurred, or a health care facility outside Canada. Microbiology records should be reviewed to determine if the patient or resident had a previous isolate positive for *C. haemulonii* or other non-albicans candida that may have been

misidentified.[58] For patients and residents transferred from, or recently admitted to, another health care facility within Canada, that facility should be contacted to inform them that the patient or resident tested positive for *C. auris*,[7,8,69,74] to identify if the facility has had known *C. auris* cases or transmission events, and to allow the facility to conduct its own investigation to rule out transmission.

C. auris can be transmitted rapidly within the health care setting, with one facility documenting *C. auris* transmission between patients based on exposures as short as 4 hours.[7,11] Thus, when facilities identify patients or residents with *C. auris,* all roommates and contacts should have testing performed for *C. auris* regardless of the duration of exposure (see 2.3 Screening for *C. auris*) and Contact Precautions should be initiated pending the results. Because persistent environmental contamination has been documented,[11,13,18,82] admission to a room previously occupied by a patient or resident with *C. auris* may be a risk factor for *C. auris* acquisition.[13] Consideration should be given to testing "room" contacts (i.e., patients or residents who received care in the same room as the *C. auris* patient before the room received enhanced cleaning and disinfection for *C. auris* even though they were not admitted to the room at the same time as the *C. auris* patient or resident).

Given the ability of *C. auris* to spread rapidly between patients, if a patient or resident is identified as *C. auris*-positive more than 24 hours after facility admission, or if appropriate infection control precautions were not implemented promptly within 24 hours of admission, a point prevalence study should be conducted where all patients or residents on the unit are tested for *C. auris* colonization, both to identify a potential source of exposure for the identified case, and to ensure that the identified case has not transmitted to other patients or residents on the unit.[74,76,83,84] Even if a point prevalence study is conducted, repeated testing of roommate contacts remains important as these contacts are at highest risk and may have been transferred to other wards or facilities prior to the point prevalence study (see 2.3 Screening for *C. auris*).

2.6 Outbreak Management

For facilities that have never identified *C. auris*, the identification of a single case is a sentinel event that should trigger a full investigation,[58,69] and the identification of two cases—even if they are on different units and present months apart—should be considered an outbreak even if no direct linkage between cases is apparent. For all *C. auris* outbreaks, advice from infection prevention and control experts with experience managing outbreaks should be sought.

While there are many publications describing *C. auris* outbreaks, there are few that describe infection control interventions associated with the complete cessation of *C. auris* transmission.[5,8,10-14,18] These recommendations are, therefore, based both on learnings from reported *C. auris* outbreaks and strategies that have proven effective in controlling other pathogens (e.g., vancomycin-resistant enterococci, carbapenemase-producing *Enterobacteriaceae* and methicillin-resistant *Staphylococcus aureus*) that result in nosocomial outbreaks, can be transmitted from person to person, on medical equipment and via environmental contamination, and that can cause both colonization and clinical infection.

Initial outbreak management efforts should focus on case identification and prompt initiation of Contact Precautions to rapidly interrupt transmission and avoid dissemination of the outbreak to other units or facilities.[12,69,85] For ward-level outbreaks, strong consideration should be given to closing the unit to new admissions until the burden of disease on the unit is clearly established and effective control measures implemented.[12]

Early point prevalence testing of all patients or residents on the unit is essential to ensure that all patients or residents colonized with *C. auris* are rapidly recognized and placed on Contact Precautions.[58,76,83,84] We recommend weekly point prevalence testing after the initial point prevalence as a minimum. In one reported outbreak, three times weekly testing was employed[18] and facilities may wish to consider this if significant transmission is identified on weekly point prevalence studies despite implementation of control measures.

Patients and residents from an outbreak unit should not be transferred to a non-outbreak unit unless medically necessary. For patients and residents who are or have been transferred from an outbreak unit to another facility, or required internal transfer, the receiving facility or unit should be notified of the outbreak, and the patient or resident should be placed on Contact Precautions and be tested at the receiving facility.[69,73,74] All discharged patients and residents should be flagged and should also be placed on Contact Precautions and tested for *C. auris* upon hospital re-admission.[7,69,74]

For all *C. auris* outbreaks, investigations should also assess for potential causes of transmission including inadequate hand hygiene performed by health care providers and lack of appropriate equipment or environmental cleaning and disinfection.[69,74] General infection prevention and control issues should be promptly addressed; in addition, investigators should focus on identifying epidemiological linkages between cases, as identification and removal of a specific contaminated source (e.g., axillary thermometers in one outbreak[18]) may be the most effective strategy to rapidly interrupt transmission. Investigation of ongoing transmission should include an assessment of any equipment that can be moved from patient to patient or resident to resident and an assessment for epidemiological links between affected patients and front-line staff. Where sufficient numbers of cases have occurred, a case-control study should be conducted to identify potential sources of infection.

Enhanced environmental cleaning may be a critical element of outbreak control for *C. auris*. Outbreak wards should ensure that environmental cleaning and disinfection are being performed as described in PIDAC's *Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Health Care Settings* and the approach to cleaning and disinfection described above (see 2.4.2 Equipment and Environmental Cleaning and Disinfection). In addition, consideration should be given to increasing the frequency of cleaning and disinfection to twice daily. Audit and feedback of cleaning thoroughness should be performed regularly during an outbreak. Facilities with access to no-touch disinfection technologies (e.g., hydrogen peroxide vapour, ultraviolet light disinfection systems) could use these systems for environmental disinfection as an adjunct to enhanced standard methods.[11,34,80,81]

An outbreak should only be declared over when no new patient or resident has been identified on clinical or screening specimens over a three-week period, and at least three unit-wide prevalence studies have been conducted and are negative. Given our limited understanding of *C. auris* epidemiology and control and its potential for persistence within the environment, it may be prudent to continue repeated point prevalence studies at a lower frequency (e.g., every two to four weeks) for an additional two to three months after outbreak control is achieved.

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