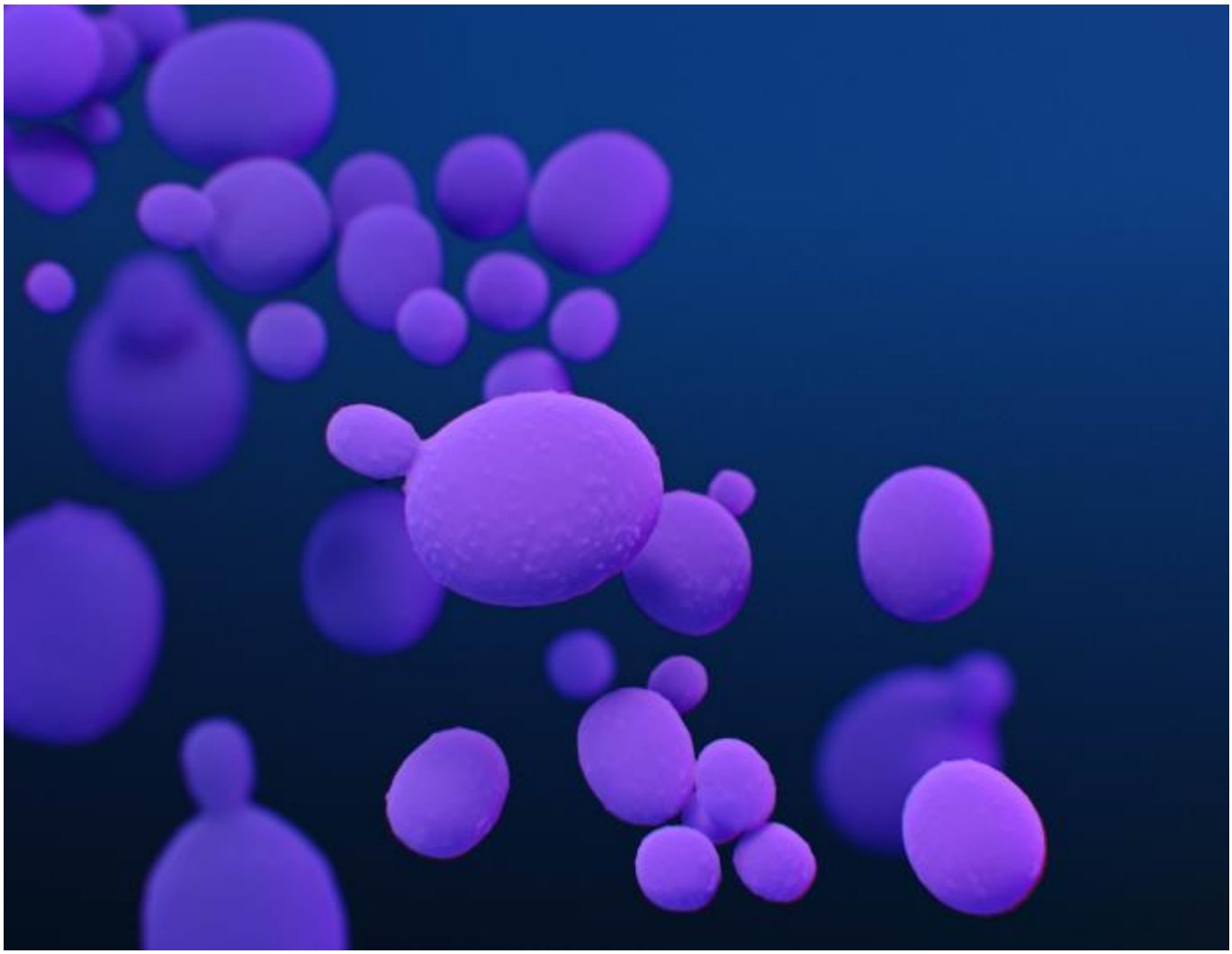
PUBLIC HEALTH COMMUNICATION CENTRE AOTEAROA



The arrival of Candida auris in Aotearoa NZ: risk assessment and actions needed

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Summary
Aotearoa New Zealand recently recorded its first case of *Candida auris*: a pathogen that is difficult to contain in healthcare settings. Since its first detection in 2009, cases of *C. auris* have become more widespread globally. In this Briefing we evaluate the risk of *C. auris* to New Zealanders and outline how best to control its spread.

Transmission of *C. auris* occurs mainly through contact with contaminated surfaces and medical equipment. Standard hospital-grade disinfectants are not effective at killing *C. auris*: instead, agents with sporicidal activity are needed. We recommend that rigorous screening and surveillance measures are reinforced to prevent *C. auris* spread in New Zealand.

Diagnostic microbiology laboratories should establish and validate methods for the screening of *C. auris,* including rapid identification of suspected isolates and pathways to ensure prompt susceptibility results are available. We recommend mandatory notification of confirmed *C. auris* cases to support control and epidemiological surveillance.

Candida auris is a yeast fungal pathogen that primarily causes healthcare-associated infections, particularly in intensive care units and aged residential care facilities.[1 2] Invasive *C. auris* infections can result from the use of invasive medical devices that are contaminated with *C. auris*.[1 2] These infections have case fatality estimates ranging from 30-70%.[3-7] As co-morbidities are common however, the mortality that is directly attributable to *C. auris* invasive infection is unclear.[1] Hospital outbreaks of *C. auris* are difficult to contain.[8-13] Most clinical isolates have some form of resistance to antifungal agents.[14]

Epidemiology and impact

This pathogen was first identified in Japan in 2009 [15], and since then cases have been reported in more than 40 countries across all populated continents.[1 16] The Centers for Disease Control (CDC) in the US recently reported a rapid rise in *C. auris* infections in that country.[17] This included a threefold increase in infections resistant to echinocandins- the preferred antifungal drug for *C. auris* infection treatment.[17] *C. auris* clinical isolates with pan-drug-resistance to the four major classes of antifungal agents have been described in the US recently.[18] The COVID-19 pandemic has expanded the patient population at risk of infections caused by *C. auris.*[19 20]

Risk of *C. auris* infection in Aotearoa NZ

The risk of *C. auris* infection to healthy, non-hospitalised New Zealanders is minimal as this pathogen typically only causes infections in individuals in hospitals or residential care. Following initial diagnosis, it is possible that colonisation may continue for months, including after patient discharge.[21 22] To date, most confirmed cases of *C. auris* in Australian and New Zealand hospitals have had a history of overseas hospitalisation.[23 24] *C. auris* survives well in dry biofilms in the hospital environment.[2] See more detailed risk assessment in the Appendix.

Recommended prevention and control measures for Aotearoa New

Zealand

A. Control measures aimed at detecting and managing cases

C. auris can persist on surfaces and medical equipment for several months through biofilm formation.[2] Standard hospital grade disinfectants are not effective at killing *C. auris.*[25] Cleaning of the environment with disinfectants with sporicidal activity (able to kill fungal and bacterial spores) is required, for example those with 0.1% sodium hydroxide and peracetic acid 2000ppm.[26] Updated guidelines on the disinfection of *C. auris* has been made available by the CDC and medical mycologists.[25 27] We make more detailed recommendations on *C. auris* disinfection in the Appendix.

Recent *C. auris* disease control practises adopted by the CDC and Victoria Department of Health in Australia have been effective in managing *C. auris* infection risks.[27 28] History of *C. auris* infection, locally or overseas, should be recorded upon admission of patients. We recommend screening of patients with a history of overseas hospitalisation for *C. auris* along with screening for other multi-drug resistant organisms (MRO). Patients with past *C. auris* colonisation or infection should be managed adhering to Contact Precautions; this includes placement in a single room, healthcare workers wearing appropriate personal protective equipment (PPE), dedicated patient equipment in the room, appropriate waste and linen handling and the use of disinfectants with sporicidal activity to clean surfaces in the room. In the event of a newly diagnosed *C. auris* case, the patient should be managed adhering to Contact Precautions as above. See discussion of population-level prevention measures below for more on the management of close contacts.

Early isolation and identification are key factors in the treatment of *C. auris* infections. Culture-based methods remain the main method for isolation of *Candida* species [16 29], but may present a significant time delay (2-8 days for a result) which can impact on treatment outcomes.[30-32] However, in cases of candidaemia, *C. auris* can be isolated within 48-72 hours. Increasingly, more rapid biochemical, genome sequencing and mass spectrometry-based (MALDI-TOF) methods have been used to identify *C. auris* cases.[16 33] Antifungal susceptibility testing should be performed on *C. auris* clinical isolates.[25] The New Zealand Microbiology Network is well placed to guide *C. auris* diagnostic pathways. We discuss these practices, along with other testing possibilities, in the Appendix.

B. Population-level prevention measures aimed at reducing the risk of infection

Following the detection of *C. auris* in 2018, the Victoria Department of Health established healthcare guidelines aimed at improving the screening and surveillance of *C. auris* colonisation or infection.[28] We recommend that the current Ministry of Health guidelines for 'Infection Prevention and Control and management of Carbapenemase-producing Enterobacteriaceae' (2018) be updated to include all MROs of concern, including *C. auris*. The principles for preventing cross-transmission of these pathogens are similar and the data collected would support a better understanding of the impact of MRO cross-transmission in healthcare settings.

We further recommend that *C. auris* is made a notifiable disease.

The National Medical Warning System can be used to identify patients colonised or infected with *C. auris.* It allows for an alert to be placed against a patient's national health index number indicating that they are colonised or infected with *C. auris* or that they have a history of sharing rooms with confirmed *C. auris* cases indicating that they need to be screened for this pathogen if readmitted.

The risk of introduction of *C. auris* into our hospitals can be reduced by risk assessing all admissions to hospital for MRO colonisation or infection. Patients with identified risk factors, including hospitalisation overseas in the previous twelve months, should be screened for MRO colonisation or infection accordingly.

What is new in this Briefing

- The first case of *C. auris* infection was reported in New Zealand recently. This pathogen is known to cause hospital outbreaks worldwide and is difficult to contain.
- While the risk to healthy New Zealanders is minimal, *C. auris* can cause life-threatening infection in immunocompromised patients in hospitals and aged residential care facilities.
- We outline a strategy to prevent transmission of *C. auris* infections within New Zealand hospitals, and minimise risk associated with patients with a history of hospitalisation overseas.

Implications for public health

- Hospital outbreaks can be avoided through carefully considered disinfection procedures that are required to eliminate *C. auris*, which may otherwise persist on surfaces for months.
- A cohesive strategy for screening of high-risk patients, including close contacts of *C. auris* cases, can help to identify cases promptly, enhance treatment effectiveness, and prevent transmission.
- Case detection and surveillance would be supported by mandatory notification of confirmed *C. auris* cases and updated *C. auris* testing guidelines.

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Appendix:

A. Risk assessment for *C. auris*

Sources of infection

C. auris survives well in the environment, unlike many other pathogenic *Candida* species where humans are the reservoir and are commonly colonised.[2] The precise environmental source of *C. auris* remains unknown, although investigations have uncovered isolates from the coastal wetlands of the Andaman Islands [34] and commercial apples [35]. Genome analyses of *C. auris* isolates revealed that four distinct clades exist, each previously arising in four distinct geographic locations.[36 37] There is variation in the mutations that confer antifungal resistance among these clades.[37]

Transmissibility

High-risk patient groups for *C. auris* infection include those receiving immunosuppressive therapies, those recovering from invasive surgery, and those with diabetes mellitus.[1 36] Transmission between hospitalised patients can occur though contact with a contaminated surface or object.[25] Transmission risk appears to be highest in healthcare settings [38] and it is not clear whether community transmission of *C. auris* occurs.[39] Including *C. auris* in existing screening and surveillance programmes for MROs will enhance our understanding of *C. auris* transmission in New Zealand.

Severity

Invasive *C. auris* infections are normally seen in critically ill patients, for example those receiving immunosuppressive therapy or recovering from invasive surgery.[1] Resistance to antifungal drugs (in particular fluconazole and amphotericin B) is common.[14] Due to lower resistance to echinocandins, these antifungal drugs have been the recommended treatment for *C. auris* infection.[1 2 14] A substantial increase in resistance to this class of antifungal drug is now being reported in *C. auris* infections in the US.[17] These infections have case fatality estimates ranging from 30-70%.[3-7]

Controllability

The use of disinfectants with sporicidal activity will be critical to avoid *C. auris* outbreaks in New Zealand hospitals [25]. Considerations for hospital disinfection procedures are outlined below. Prompt implementation of Contact Precautions and placement of the patient in a single room, healthcare staff use of PPE and excellent hand hygiene will also help to contain the pathogen [25].

Certainty of knowledge

Despite its recent emergence (2009) the healthcare risks of *C. auris* are well defined. The mode of transmission (contact with contaminated surfaces) and disinfection requirements are also well-researched. Less is known about the environmental source, or whether community transmission can occur.

Overall response strategy

C. auris is not established in Aotearoa New Zealand. Following infections in Melbourne in 2018, urgent action led to elimination of infection, and that should be the goal here. We expect that with increasing spread within overseas hospitals, as with other MROs, there is a high risk of further introductions of *C. auris* within New Zealand healthcare settings. *C. auris* infection can be eliminated through rigorous case surveillance, appropriate disinfection protocols in hospitals and ensuring that there is a rapid, yet sensitive, diagnostic pipeline.

B. Current strategies that are critical in the management of *C. auris* infection risk

Incident management

An urgent incident management response would be required if *C. auris* infection is diagnosed in a patient with no prior overseas hospitalisation. The coordinated incident management systems (CIMS) approach may be used to establish a cohesive strategy in minimising transmission and preventing further *C. auris* cases.

C. auris diagnosis

Effective *C. auris* isolation has been described well [16 25 40] and is practised by the National Mycology Laboratory at Te Toka Tumai Auckland. Antifungal resistance among *C. auris* clinical isolates is the norm rather than the exception.[14] Antifungal susceptibility testing of all *C. auris* isolates, as practised by the National Mycology Laboratory, is therefore critical.

Hospital disinfection protocols

Evidence suggests that quaternary ammonia compound (QAC)-based disinfectants are not effective in disinfecting *C. auris.*[26] The use of 0.1% sodium hypochlorite or peracetic acid (PPA)-based disinfectants is strongly recommended.[25 26] These disinfectants should be used to clean patient room surfaces twice daily, including the floor, for the duration of the patient's stay. The use of vapourised hydrogen peroxide systems and alcohol-based disinfectants is recommended for shared medical equipment.[25] For guidance on contact times: the US Environmental Protection Agency has an index of disinfectants that may be used for *C. auris* decontamination, along with the appropriate contact time.[41]

Screening of patients

For patients identified on admission as high risk for MRO colonisation or infection, screening for all MROs, including *C. auris,* should occur. Patients transferred from overseas hospitals may be colonised or infected with several MROs. If the patient was identified as a close contact of a patient colonised or infected with *C. auris* in a healthcare setting, screening for *C. auris* alone may be performed.

References

1. Jeffery-Smith A, Taori SK, Schelenz S, et al. Candida auris: a review of the literature. *Clinical microbiology reviews* 2018;31(1):e00029-17.
2. Ahmad S, Alfouzan W. Candida auris: Epidemiology, diagnosis, pathogenesis, antifungal susceptibility, and infection control measures to combat the spread of infections in healthcare facilities. *Microorganisms* 2021;9(4):807.
3. Sarma S, Kumar N, Sharma S, et al. Candidemia caused by amphotericin B and fluconazole resistant Candida auris. *Indian journal of medical microbiology* 2013;31(1):90.
4. Vallabhaneni S, Kallen A, Tsay S, et al. Investigation of the first seven reported cases of Candida auris, a globally emerging invasive, multidrug-resistant fungus—United States, May 2013–August 2016. *Morbidity and Mortality Weekly Report*

2016;65(44):1234-37.
5. Lee WG, Shin JH, Uh Y, et al. First three reported cases of nosocomial fungemia caused by Candida auris. *Journal of clinical microbiology* 2011;49(9):3139-42.
6. Al Maani A, Paul H, Al-Rashdi A, et al. Ongoing challenges with healthcare-associated Candida auris outbreaks in Oman. *Journal of Fungi* 2019;5(4):101.
7. Adams E, Quinn M, Tsay S, et al. Candida auris in healthcare facilities, New York, USA, 2013–2017. *Emerging infectious diseases* 2018;24(10):1816.
8. Schelenz S, Hagen F, Rhodes JL, et al. First hospital outbreak of the globally emerging Candida auris in a European hospital. *Antimicrobial Resistance & Infection Control* 2016;5(1):1-7.
9. Villanueva-Lozano H, Treviño-Rangel RdJ, González GM, et al. Outbreak of Candida auris infection in a COVID-19 hospital in Mexico. *Clinical Microbiology and Infection* 2021;27(5):813-16.
10. Ruiz-Gaitán A, Moret AM, Tasias-Pitarch M, et al. An outbreak due to Candida auris with prolonged colonisation and candidaemia in a tertiary care European hospital. *Mycoses* 2018;61(7):498-505.
11. Van Schalkwyk E, Mpembe RS, Thomas J, et al. Epidemiologic shift in candidemia driven by Candida auris, South Africa, 2016–2017. *Emerging Infectious Diseases* 2019;25(9):1698.
12. Zhu Y, O'Brien B, Leach L, et al. Laboratory analysis of an outbreak of Candida auris in New York from 2016 to 2018: impact and lessons learned. *Journal of clinical microbiology* 2020;58(4):e01503-19.
13. Chowdhary A, Tarai B, Singh A, et al. Multidrug-resistant Candida auris infections in critically ill coronavirus disease patients, India, April–July 2020. *Emerging Infectious Diseases* 2020;26(11):2694.
14. Lockhart SR. Candida auris and multidrug resistance: Defining the new normal. *Fungal Genetics and Biology* 2019;131:103243.
15. Satoh K, Makimura K, Hasumi Y, et al. Candida auris sp. nov., a novel ascomycetous yeast isolated from the external ear canal of an inpatient in a Japanese hospital. *Microbiology and immunology* 2009;53(1):41-44.
16. Keighley C, Garnham K, Harch S, et al. Candida auris: Diagnostic challenges and emerging opportunities for the clinical microbiology laboratory. *Current Fungal Infection Reports* 2021;15(3):116-26.
17. Lyman M, Forsberg K, Sexton DJ, et al. Worsening Spread of Candida auris in the United States, 2019 to 2021. *Annals of Internal Medicine* 2023
18. Jacobs SE, Jacobs JL, Dennis EK, et al. Candida auris pan-drug-resistant to four classes of antifungal agents. *Antimicrobial Agents and Chemotherapy* 2022;66(7):e00053-22.
19. Seagle EE, Jackson BR, Lockhart SR, et al. The landscape of candidemia during the COVID-19 pandemic. *Clinical Infectious Diseases* 2021
20. Kayaaslan B, Eser F, Kaya Kalem A, et al. Characteristics of Candidemia in COVID-19 Patients; Increased Incidence, Earlier Occurrence, and Higher Mortality Rates Compared to Non-COVID-19 Patients. *Mycoses* 2021
21. Candida auris colonization after discharge to a community setting: New York City, 2017–2019. Open Forum Infectious Diseases; 2021. Oxford University Press US.
22. Pacilli M, Kerins JL, Clegg WJ, et al. Regional emergence of Candida auris in Chicago and lessons learned from intensive follow-up at 1 ventilator-capable skilled nursing facility. *Clinical Infectious Diseases* 2020;71(11):e718-e25.
23. Lane CR, Seemann T, Worth LJ, et al. Incursions of Candida auris into Australia, 2018. *Emerging Infectious Diseases* 2020;26(6):1326-28.
24. New Zealand Ministry of Health Press Release on the Detection of a case of C. auris 2023 [Available from:

www.health.govt.nz/news-media/news-items/one-case-candida-auris-detected-new-zealand2023.
25. Aldejohann AM, Wiese-Posselt M, Gastmeier P, et al. Expert recommendations for prevention and management of Candida auris transmission. *Mycoses* 2022;65(6):590-98.
26. Cadnum JL, Shaikh AA, Piedrahita CT, et al. Effectiveness of disinfectants against Candida auris and other Candida species. *infection control & hospital epidemiology* 2017;38(10):1240-43.
27. CDC Infection Prevention and Control for Candida auris 2023 [Available from: www.cdc.gov/fungal/candida-auris/c-auris-infection-control.html2023.
28. Victoria Department of Health Guidelines on Candida auris for Health Services 2019 [Available from: www.health.vic.gov.au/infectious-diseases/victorian-guideline-on-candida-auris-for-health-services 2023.
29. Pappas PG, Kauffman CA, Andes DR, et al. Clinical practice guideline for the management of candidiasis: 2016 update by the Infectious Diseases Society of America. *Clinical Infectious Diseases* 2016;62(4):e1-e50.
30. Clancy CJ, Nguyen MH. Finding the “missing 50%” of invasive candidiasis: how nonculture diagnostics will improve understanding of disease spectrum and transform patient care. *Clinical infectious diseases* 2013;56(9):1284-92.
31. Morrell M, Fraser VJ, Kollef MH. Delaying the empiric treatment of Candida bloodstream infection until positive blood culture results are obtained: a potential risk factor for hospital mortality. *Antimicrobial agents and chemotherapy* 2005;49(9):3640-45.
32. Garey KW, Rege M, Pai MP, et al. Time to initiation of fluconazole therapy impacts mortality in patients with candidemia: a multi-institutional study. *Clinical infectious diseases* 2006;43(1):25-31.
33. Caceres DH, Forsberg K, Welsh RM, et al. Candida auris: a review of recommendations for detection and control in healthcare settings. *Journal of Fungi* 2019;5(4):111.
34. Arora P, Singh P, Wang Y, et al. Environmental isolation of Candida auris from the coastal wetlands of Andaman Islands, India. *MBio* 2021;12(2):e03181-20.
35. Yadav A, Jain K, Wang Y, et al. Candida auris on apples: diversity and clinical significance. *MBio* 2022;13(2):e00518-22.
36. Lockhart SR, Etienne KA, Vallabhaneni S, et al. Simultaneous emergence of multidrug-resistant Candida auris on 3 continents confirmed by whole-genome sequencing and epidemiological analyses. *Clinical Infectious Diseases* 2017;64(2):134-40.
37. Chow NA, Muñoz JF, Gade L, et al. Tracing the evolutionary history and global expansion of Candida auris using population genomic analyses. *MBio* 2020;11(2):e03364-19.
38. Atrubin KE, Murphy C, Silbert S. Initiation of a Candida Auris Screening Program at a Large, Academic Medical Center. *American Journal of Infection Control* 2022;50(7):S12.
39. Forsberg K, Woodworth K, Walters M, et al. Candida auris: The recent emergence of a multidrug-resistant fungal pathogen. *Medical mycology* 2019;57(1):1-12.
40. CDC Guidance for Detection of Colonization of Candida auris 2022 [Available from: www.cdc.gov/fungal/candida-auris/c-auris-guidance.html2023.
41. US Environmental Protection Agency List of Products Registered for use with Candida auris 2023 [Available from: www.epa.gov/pesticide-registration/list-p-antimicrobial-products-registered-epa-claims-against-candida-auris2023.

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