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Candida auris: another frontier in the battle against antimicrobial resistance

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The spread of multi-drug resistant *Candida auris* in the US is a worrying development in antimicrobial resistance, but we can take action now to curb its spread, writes Tina L Joshi

Recently there has been increased news coverage of a drug-resistant fungus infecting patients across the US.[1] This is the well known *Candida auris*. It was first isolated from a patient's ear canal in 2009 [2]—hence the Latin name *auris*. Given the pathogen's rapid transmission and outbreak potential, public health officials and the US Centers for Disease Control and Prevention have declared *C. auris* a "serious threat to human health" and the WHO has added it to its Fungal Priority pathogen list. [3]

Cases of *C.auris* infection in the US have tripled with a 44% increase in 2019 to a 95% increase in 2021.[4] Usually, the yeast is harmless but in unhealthy patients, the pathogen opportunistically infects wounds, the ear canal, and causes dangerous bloodstream infection.[5] Concerningly, certain strains of *C. auris* can resist the three main antifungal medications used to clear infection: polyenes, azoles, and echinocandins.[6] Thus, for susceptible patients in hospitals and healthcare facilities, contracting this infection may be fatal. Statistics show one in three deaths in hospitals in the US are associated with invasive drug resistant *C. auris*.[1,4] The fungus can survive on a variety of surfaces and is known to resist disinfection with certain oxidising agents including bleach.[7,8]

While we know that the fungus transmits easily, it is unclear how it evolved. Somehow the pathogen independently emerged in five separate lineages in a range of locations around the globe. Research, using sequencing, has sought to determine a common ancestor, but, as yet knowledge of the fungus' evolutionary history has eluded us.[9] This information would allow us to understand the pathogenicity and dissemination of *C. auris*, aiding efforts to develop strategies to limit its spread and kill the pathogen.

Accurate and timely diagnosis of *C. auris* is important to manage infection. One of the issues with *C. auris* is that current laboratory diagnostic methods are unable to discriminate between the pathogen and other Candida species given their phenotypic growth similarities.[10,11] Molecular diagnosis is a more precise way to diagnose infections but not all laboratories are equipped with this technology. Thus, misdiagnosis of infection, combined with lack of molecular testing, can delay antimicrobial treatment of patients. This, coupled with a lack of appropriate infection prevention and control (IPC) measures, can create a "perfect storm" for any pathogen with the ability to transmit quickly. We saw this recently with the covid-19 pandemic, and broadly, the same IPC rules apply.[12] To prevent and control an infection it is essential to employ appropriate disinfection and hygiene measures and use accurate, specific, and sensitive diagnostic methods to identify the causative agent.

Infection prevention and control is the cornerstone of infection management. Handwashing, disinfection, and decontamination of surfaces using effective biocides, disposal of PPE, and cleaning of infection sites are crucial to limit pathogen spread.[13] There has been an argument that the root of the rapid spread of *C. auris* in US hospitals lies in reduced compliance to

general IPC, such as regular handwashing.[4] Therefore, reiterating to healthcare professionals the importance of adherence to hand hygiene and infection control measures could help to reduce incidence of infections.[14]

Climate change is causing a rise in temperatures that, in turn, are resulting in an increase of infections.[15] *C. auris* has higher thermotolerance than related Candida species, and this is thought to have increased its ability to disseminate through intermediate hosts.[16] Simultaneously, antimicrobial resistance is increasing. In 2019, 1.27 million deaths globally were attributed directly to antibiotic resistant bacterial infections[17], and we simply do not have enough working antibiotics left to solve the problem.[18] It has become generally accepted that we must now control and manage antimicrobial resistant infections using a range of strategies including: antibiotic stewardship, vaccine development, alternative therapies, investing in next generation diagnostics, and seeking new antimicrobial drugs. The compounding issue preventing some of this innovation is that there is no economic impetus or drive to develop new diagnostics and antimicrobials as they provide limited long-term profit for pharmaceutical companies. Investment in the global antimicrobial economic pipeline is necessary to mitigate the risks that anti-microbial resistant pathogens pose to humans.

Considering the above, when we hear news of multi-drug resistant pathogens like *C. auris* spreading across the US, we should be equally as concerned in the UK. Given the current pressures[19] on the NHS and its workforce, are we truly prepared to tackle an emerging resistant pathogen like *C. auris* if it were to spread throughout the UK? In my humble opinion, the answer is no. In the event of an outbreak, we should seek to rapidly identify infected patients, use genomic surveillance and epidemiological studies to ascertain spread of infection, and determine each patient's antimicrobial susceptibility profile. Rapid, accurate and sensitive diagnostics, combined with appropriate infection control measures, are key to controlling the spread of infection.

We have a lot of work to do to future-proof our healthcare services to be able to effectively prevent transmission of infection and preserve our current antimicrobials. The puzzle of antimicrobial resistance is complex; but what we do know is that we can reduce infection incidence and mortality by implementing effective IPC measures.

With the rise in antimicrobial resistance, we must urgently pay attention to global trends in infection and take tangible action to prevent a future "Last of Us" scenario. A key strategy to future-proof healthcare is to plan and prepare effective strategies to tackle drug resistant infections on all microbial fronts from bacteria to fungi.

Competing interests: TJ is employed as an Associate Professor of Molecular Microbiology at the University of Plymouth, UK. She is an unpaid member of the Microbiology Society Council and sits unpaid on the Science Committee of charity Antibiotic Research UK. TJ has provided voluntary expert opinion, written thought leadership pieces, blogs and given media interviews on the topic of AMR internationally. She is Deputy Editor-in-Chief of the Journal of Medical Microbiology and reviews international research grants.

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