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A Review of Candida auris: Environmental Persistence and Evidence-Based Decontamination and Prevention Strategies

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Abstract

Background. *Candida auris* is an emerging, multidrug-resistant fungal pathogen of significant public health concern. Noted for its environmental persistence and high transmissibility, it poses a substantial threat in healthcare settings, particularly in intensive care units, driving the need for specific infection control protocols.
Aim. The aim of this study was a comparative analysis of environmental disinfection methods used in the prevention and control of *Candida auris* in various countries and healthcare facilities.
Material and methods. This review analyzed literature from 2016-2025, sourced from databases such as PubMed, alongside public health guidelines and epidemiological reports. A comparative analysis of the selected data was conducted.

Results. Disinfection strategies against *C. auris* primarily recommend chlorine- and hydrogen peroxide-based agents, with UV-C and vaporized hydrogen peroxide (VHP) noted as supplementary measures. A comparative analysis revealed significant international divergence, particularly regarding quaternary ammonium compounds (QACs), which are largely restricted except in specific contexts like India. Overall efficacy is highly variable and dependent on disinfectant selection, workflow, staff training, and the consistency of protocol implementation.
Conclusions. Chlorine- and peroxide-based disinfectants are most effective against *C. auris*, while QACs are discouraged despite their localized use. To counter variability in international guidelines, a unified regulatory framework is recommended. Key recommendations include standardizing procedures, enhancing staff training, and maintaining strict surveillance. Further research, including hospital case studies, is needed due to insufficient current data.

Key words: Candida auris, hospital disinfection, decontamination, institutional guidelines, hospital fungal infections.

1. Introduction

Candida auris is a multidrug-resistant yeast with a high epidemiological potential. “Similar to other multidrug-resistant organisms (MDROs), *C. auris* spreads easily in healthcare settings and can cause outbreaks” (CDC, 2024). The cited source also indicates that this yeast is capable of colonizing hospital environments, as it primarily settles on surfaces and remains resistant to standard cleaning and disinfecting agents. It might seem that the previously sufficient measures such as hand hygiene among staff and the sterilization of medical instruments would offer adequate protection. However, these measures are no longer enough.

The information presented in previous paragraph constitutes the basic data most commonly used in various types of scientific reports describing *C. auris*. The first patient was diagnosed in Japan in 2009. The infection spread relatively quickly, and the pathogen itself is now described as endemic and present in multiple regions. The number of cases continues to rise year by year, as demonstrated by German studies covering the period 2020–2023 (Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit, 2024). In the United States, the first cases were confirmed in 2015. By 2018, the number of those had increased by 318% compared with averages from previous years, including 2016 and 2018 (CDC, 2019).
This highlights the substantial threat and epidemiological risk concentrated within healthcare facilities. It poses a significant public health concern.

This pathogen may therefore be regarded as relatively new – possibly emerging alongside technological progress. It occurs not only on medical equipment but also on flat surfaces (for instance mattresses). It is transmitted mainly via the skin and is characterized by “high transmissibility” (Schelenz, 2016). The highest-risk group consists of individuals “undergoing prolonged hospitalization, especially in surgical and intensive care units,” often receiving broad-spectrum antibacterial antibiotic therapy. Another particularly vulnerable group includes individuals “after viral infections, people with weakened immunity, chronic comorbidities, immunosuppressed patients, those with HIV/AIDS, and patients undergoing invasive therapeutic or diagnostic procedures” (Grondalska & Kmieciak, 2017).

Four types of *C. auris* have been distinguished (CDC, 2019). They have been observed:

- in the USA (Florida, Illinois, Massachusetts) and in South America (Colombia and Venezuela),
- in the USA (Florida and Indiana) and in southern Africa (South Africa),
- in the USA (California, Connecticut, Florida, Maryland, New York, New Jersey, Oklahoma) and in Asian countries, primarily India and Pakistan,
- in the USA (New York and Florida) as well as in Japan and South Korea in Asia.

As indicated in the cited source, *C. auris* has spread as a result of patient travel. Due to the nature of this emerging epidemic, the implementation of appropriate cleaning methods and procedures is crucial to preventing pathogen transmission. Various forms of decontamination are used for this purpose. The concept has been described, among others, by Bandara and Samaranayake. It refers to a procedure guided by an environmental protocol that relies on “differing disinfectants” (Bandara & Samaranayake).

The first commonly used approach involves chemical disinfectants. The most effective agents against *C. auris* are chlorine-based preparations (for example sodium hypochlorite

solutions) and strong hydrogen peroxide-based agents. This was demonstrated in hospital studies conducted in the United Kingdom (European Centre for Disease Prevention and Control, 2016). The use of quaternary ammonium compounds (QACs) is discouraged due to insufficient evidence regarding their efficacy and, in some studies, demonstrated ineffectiveness. The cited thesis points examples such as "hydrogen peroxide with silver nitrate, phenolic compounds, glutaraldehyde, alcohols, acetic acid, peracetic acid, peracetic acid with hydrogen peroxide and acetic acid" (Mikołajczyk, 2018). For skin decontamination, other agents are used, mainly chlorhexidine gluconate, or the less studied povidone-iodine.

Given the earlier discussion regarding effectiveness, it is important to explain more precisely why QACs, among all the listed disinfectants, are insufficient. The information is confirmed primarily by the CDC, which clearly states that standard QAC-only products are ineffective against this species (CDC, 2024). These findings have also been confirmed by several countries, including the United Kingdom in the context of infection prevention and control (IPC): "avoid using quaternary ammonium compounds due to insufficient evidence of efficacy against *C. auris*" (UK Health Security Agency, 2025). The same has been emphasized in Polish studies (Skrzypiec, 2025), which note that the issue concerns not only *C. auris*: there are "no clear benefits alongside a higher risk of adverse effects, whereas properly optimized alcohol-based formulations provide the required effect without additional enhancers." Similar observations have been made in Germany (Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit, 2024). Despite consistent discouragement, some countries continue to use QACs. Their detailed use will be discussed later.

In the fight against *C. auris*, more specific and less conventional measures may also be used, such as physical no-touch methods. These "are considered beneficial for treating hospital surfaces after manual cleaning and/or disinfection has been employed as some areas might have been missed or cleaned improperly" (Omardien & Teska, 2024). Various types of these measures are distinguished, including ultraviolet radiation (also referred to as UV-C) and vaporized hydrogen peroxide. Laboratory studies show that PX-UV devices (with a pulsed lamp) can rapidly destroy *C. auris* – a 5-minute irradiation cycle reduced colony levels by approximately 99% at a distance of 1 meter. No further reduction was noted during subsequent 10 and 15-minute cycles. At a distance of 2 meters, effectiveness was also demonstrated, though at a lower level (Maslo, Plooy & Coetzee, 2019). The same study also highlighted the importance of using modern, high-quality equipment.

Another type is vaporized hydrogen peroxide (VHP) technology. Czajkowski advocated its implementation not only for *C. auris* but across the entire pharmaceutical sector. Hydrogen peroxide in gaseous form is also environmentally friendly (Czajkowski, 2025). Its effectiveness against *C. auris* has been demonstrated, however, it is a highly labor-intensive technique – the room must be tightly sealed, H_2O_2 concentration must be monitored, and staff is obligated to wait from 2 to 8 hours for the cycle to complete.

Nonetheless, physical methods can be "used only as an additional safety measure and not instead of full cleaning and disinfection." They therefore cannot replace chemical methods or routine cleaning. Before describing the latter in detail, it is essential to reference studies evaluating both the advantages and limitations of no-touch technologies. For example, despite considerable effectiveness and numerous studies supporting their usefulness, the strategy does not consistently outperform other disinfection methods, nor has it been fully evaluated with regard to pathogen transmission in certain specific scenarios. Likewise, "no similar decrease occurred when UV was added to routine use of bleach for the same high-risk rooms" (Weber et al., 2023).

The final type of intervention preventing the spread of *C. auris* involves cleaning procedures. Thorough, daily routine cleaning is essential – performed at least once a day, though more frequent cleaning is generally recommended. Surfaces should remain wet with disinfectant for the entire recommended contact time. Cloths must be changed between rooms to prevent cross-contamination, and mixing clean and dirty equipment must be strictly avoided (UK Health Security Agency, 2025). Even a single improper action can immediately reduce overall effectiveness.

Auditing and training related to the application of *C. auris* prevention measures remain important as well. An example could be found in guidelines from the CDPH or the Florida Department of Health (as Florida has reported a significant number of cases). Educational activities should incorporate logical reasoning, hazard anticipation, and knowledge of risk-limiting techniques (Florida Department of Health, 2025). Applying illustrated instructions is recommended too.

Based on a comprehensive analysis, it is evident that although similar guidelines exist internationally, they are not sufficiently well implemented in hospitals. This is reflected in the lack of detailed case studies and comparative analyses. Recognizing this research gap, the purpose of the present study is to compare environmental disinfection methods used to combat *C. auris* in various countries and healthcare facilities, with particular attention to:

- disinfectants and disinfection technologies used,
- recommendations and guidelines issued by national and international institutions,
- practices implemented in selected hospitals worldwide,
- the effectiveness of these measures and barriers to their implementation.

To support this aim, the following research questions were formulated:

1. What environmental disinfection agents and methods are recommended by major public health institutions with regard to *C. auris*?
2. Do significant differences exist between specific national guidelines?
3. Which disinfection methods are actually used in practice across different healthcare facilities?
4. Which of these methods demonstrate the highest effectiveness in eliminating *C. auris* from surfaces?
5. What difficulties or limitations do facilities encounter when implementing effective disinfection procedures?

Corresponding hypotheses were assigned to each question. Some of them appear verifiable now. However, national guidelines must first be compared with those of other countries to ensure the representativeness of the findings.

1. The most commonly recommended disinfectants against *C. auris* are chlorine-based and hydrogen peroxide-based agents.

2. Significant differences exist between national guidelines regarding environmental disinfection methods for *C. auris*.
3. Disinfection methods used in practice differ from official guidelines and depend on organizational capacity and available resources within facilities.
4. The greatest effectiveness in eliminating *C. auris* is demonstrated by chlorine and hydrogen peroxide-based agents, provided the full contact time is maintained.
5. Healthcare facilities encounter substantial challenges in fully implementing effective disinfection procedures against *C. auris*.

Verification of the hypotheses and answers to the research questions are presented in Chapter 3.

2. Research materials and methods

The research material was collected through a literature review combined with elements of comparative analysis. The selection of data was based on the assumption of maximum source diversity while maintaining thematic consistency. Guidelines and recommendations issued by the CDC, ECDC, PHE, ICMR, and LGL were referenced. Review data as well as documentation from hospital from 2016–2024 were also used. The analysis focused on aspects of environmental disinfection, the effectiveness of individual methods, implemented practices, and barriers to their execution.

2.1. Procedure

The research process consisted of three stages. In the first stage, sources were selected according to pre-established thematic and linguistic criteria. Polish, English, and Germanlanguage sources were used. To be included in the analysis, a document had to contain information on chemical or physical agents used against *C. auris*, official recommendations issued by national or international institutions, and practical implementations in healthcare facilities. Sources were searched through databases and official repositories.

In the second stage, data were categorized into three main research areas:

- disinfectants and disinfection technologies used,
- recommendations and guidelines,
- clinical practice data, including procedural aspects.

In the third stage, a comparison was conducted between selected countries. The research focused on the regulations and contextual aspects of the USA, the UK, Germany, India, and Poland. These countries were selected due to their diverse geographical locations, availability of data, and varying degrees of industrialization. A coherence analysis was performed. In cases of discrepancies, potential causes were examined, such as systemic, organizational, or epidemiological differences.

2.2. Data collection and analysis

Data were collected systematically using a keyword-based search strategy. Keywords included: “Candida auris,” “disinfection,” “hospital cleaning,” “infection control,” “environmental decontamination,” as well as names of relevant institutions. Articles that lacked reference to disinfection methods or demonstrated low methodological reliability were excluded. The collected data were analyzed qualitatively through document comparison and classification. The results were compiled into a comparative table in the following chapter. The tabular format enabled the identification of dominant trends and gaps. Additionally, elements of desk research analysis were used (Bednarowska-Michaiel, 2015).

3. Research results

Discussion of the practices implemented in healthcare facilities requires beginning the analysis with major countries that demonstrate significant industrial development. United States case is the first example. In American hospitals, recommendations issued by the CDC are routinely implemented. According to these procedures, patients are placed in singleoccupancy rooms. The overall approach to maintaining public health policy assumes that measures against *C. auris* involve not only actions directed at patients but also specific procedures for healthcare personnel. These relate primarily to maintaining cleanliness and using the disinfectants previously discussed, including wipes containing H_2O_2 and sodium hypochlorite solutions (CDC, 2024).

The CDC website also provides recommendations regarding all “products with EPAregistered claims for *C. auris*,” known as List P. Methods included in this list are supplemented by the use of no-touch devices (CDC, 2024). Some of the restrictions stem from the demands identified during long-term outbreaks. An example is an incident in Illinois, where a strict sanitary regime was introduced “storage cabinets were installed in patient rooms. Black-light audits on discharge cleans were required on every terminal discharge to monitor cleaning practices, and environmental service staff received coaching when cleaning failures were identified” (Barbian et al., 2025).

Despite implementing those solutions, the containment of *C. auris* remained insufficient, as the pathogen reappeared in the environment – approximately four hours after cleaning (Barbian et al., 2025). This case study is one of the few that discusses such significant events in detail. Moreover, it is a relatively new publication (from 2025). It is analyzing practices from 2021, 2022, and 2023. This simultaneously indicates a high level of awareness among healthcare personnel, yet still insufficient effectiveness in combating *C. auris*. For this reason, many facilities maintain enhanced cleaning standards on a long-term basis. Special training sessions are also conducted for staff. However, despite increasing educational levels, numerous organizational challenges persist. The primary issue involves the division of responsibilities among personnel.

Another highly developed country discussed in this analysis is Germany. The experience of German healthcare facilities remains limited, as the first infections were confirmed in 2022. In response to the growing threat, and in light of the epidemic situation in the USA and other countries, Germany has begun preparing procedures in line with RKI recommendations. These apply primarily to intensive care units (Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit, 2024). According to the cited source, “*C. auris* can be detected through culture on standard culture media or fungal-specific media. For reliable identification, mass

spectrometry methods such as MALDI-TOF or molecular biology techniques are recommended."

Restrictions are implemented at varying levels. For example, in Bavaria, a "Merkblatt" was issued requiring twice-daily wiping of frequently touched surfaces, the use of alcoholbased products for cleaning equipment on the patient side, and the avoidance of QAC. Carrier detection is already possible through screening tests. It should be emphasized that all implemented measures are aligned with RKI guidelines (Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit, 2024).

The next example is India. According to widely held assumptions, this is a country characterized by relatively weak medical ethics and many diseases, influenced by local climate conditions and lifestyle. *C. auris* has long been a serious problem in many Indian hospitals. Therefore, national ICMR guidelines must be followed, including daily cleaning with effective disinfectants and mandatory terminal cleaning for patients with confirmed *Candida* (ICMR, 2017). Sodium hypochlorite is commonly used, particularly on specific surfaces. At the same time, hydrogen peroxide is applied to portable medical equipment. In the event of an outbreak, vaporized H_2O_2 fumigation is routinely used. This combined approach increases safety, especially following the period in which hospitals implemented strict isolation and masking protocols for *C. auris*. Patients are often treated individually rather than in multi-bed wards.

Major challenges reported by Indian specialists include shortages of disinfectants, which affect the overall effectiveness of the system. For instance, it is difficult to maintain high H_2O_2 concentrations in high temperatures. Climate and environmental factors are therefore decisive. Additionally, there is a risk that spilled concentrated H_2O_2 may react with metal. When comparing the Polish and Indian environments, it may be noted that Poland has not yet isolated *C. auris* at all. Some preventive approaches exist, but large-scale clinical practices are currently absent (ICMR, 2017). Nevertheless, it is necessary for Polish institutions to prepare for possible cases. Due to insufficient information, reliance on foreign practices is recommended (Mikołajczyk, 2018). Media reports have also appeared, especially in connection with cases recorded in Germany in 2025.

For this reason, many hospitals have adopted the rule that every patient returning from abroad or from an ICU undergoes screening for *Candida*. In the event of confirmed colonization, strict procedures are implemented. These include, in some cases, isolation as well as all required disinfection measures. Additionally, "an essential component in reducing the number of *C. auris* infections is raising awareness among all healthcare workers, not only physicians, regarding hand hygiene, the use of personal protective equipment, and the proper implementation of recommendations for decontamination of shared equipment, including small medical devices (...) and maintaining hygiene in the patient's surroundings." Such practices will gradually increase awareness of this issue in Poland.

Restrictions concerning the UK and related examples were already discussed earlier and will therefore not be addressed again. Table 1 presents a general summary of all issues discussed. The criteria used for comparison included method, country, institution, and implemented actions.

Table 1. Comparative analysis of preventive measures against the spread of *C. auris*

Method / country	**CDC**	**ECDC i PHE**		**ICMR**	**NPOA**
	USA	**UE**	**UK**	**Indie**	**Polska**

Chlorine	Recommended. EPA List P products	Recommended	Recommended	Recommended.
H2O2	Recommended. EPA List P products	Recommended	Recommended	Recommended. Based on foreign guidelines
VHP	Supplementary	Supplementary in UE and used in UK	Considered supplementary	Considered supplementary
UV-C	Supplementary	Supplementary in UE and used occasionally in UK	Supplementary	Supplementary
QAC	Not recommended	Not recommended	Allowed if used correctly	Ineffective against *C. auris*
Alcohol	Recommended for hand hygiene	Recommended for hand hygiene	Recommended for hand hygiene, equipment cleaned with approved agents	Recommended for hand hygiene, equipment cleaned with approved disinfectants
Other agents	No specific recommendations	Peroxides and peracetic acid preferred in EU, in UK phenols and aldehydes show antifungal activity	No guidelines	Under evaluation
Cleaning	Both daily and terminal cleaning after each patient	Daily or more frequent	Regular	Regular

Source: (CMC, 2024; European Centre for Disease Prevention and Control, 2016; ICMR, 2017; UK Health Security Agency, 2025; Mikołajczyk, 2018).

Considering all aspects of the analysis, all hypotheses were confirmed, as outlined below:

1. The most commonly recommended disinfectants against *C. auris* are chlorine-based and hydrogen peroxide-based agents – confirmed. All major public health institutions recommend chlorine and hydrogen peroxide as the most effective agents for environmental disinfection against *C. auris*. These substances appear

consistently across national guidelines and outbreak reports. Products containing these agents are also included on EPA's List P for *C. auris* efficacy.

2. Significant differences exist between national guidelines regarding environmental disinfection methods for *C. auris* – confirmed. Notable differences exist, particularly regarding QACs. Guidelines from the US, UK, and Germany advise against QACs due to low efficacy, whereas India's ICMR allows their use under strict application protocols. The specificity and rigor of procedural recommendations also vary widely across countries.

3. Disinfection methods used in practice differ from official guidelines and depend on organizational capacity and available resources within facilities – confirmed. Case studies and outbreak reports from USA and India show that implementation of official disinfection protocols often faces logistical and organizational constraints. Issues include unclear division of cleaning responsibilities, inadequate staff training, limited access to effective disinfectants and lack of auditing procedures.

4. The greatest effectiveness in eliminating *C. auris* is demonstrated by chlorine and hydrogen peroxide-based agents, provided the full contact time is maintained – confirmed. Laboratory studies and hospital interventions confirm that chlorine and H_2O_2-based disinfectants are highly effective in removing *C. auris* from surfaces. However, several sources emphasize that efficacy depends on full adherence to the manufacturer's instructions, especially regarding contact time. Inadequate application or early wiping significantly reduces biocidal activity.

5. Healthcare facilities encounter substantial challenges in fully implementing effective disinfection procedures against *C. auris* – confirmed. Multiple reports highlight operational difficulties in implementing environmental cleaning protocols. Challenges include lack of proper equipment, staff shortages,

inconsistent cleaning routines, insufficient supervision, and rapid recontamination of environments.

4. Discussions

The comparative analysis made it possible to confirm the most commonly used methods as well as the differences between national and universal recommendations. In all examined regions, the use of strong chemical agents is emphasized – primarily chlorine-based formulations and those containing hydrogen peroxide. At the same time, all guidelines consistently highlight the importance of rigorous cleaning procedures. A noticeable difference concerns the assessment of QACs. It should be noted, however, that the criteria influencing such perspectives and decision-making are shaped not only by medical knowledge and organizational structures but also by the availability of certain disinfection options.

Furthermore, the British and German guidelines allow the use of sporicidal agents, including peracetic acid. Their recommendations for disinfection are partly based on protocols developed for *C. difficile* (UK Health Security Agency, 2025). These approaches, however, are neither prominently emphasized nor accepted in the United States. Regarding no-touch technologies, recommendations from the CDC and PHE indicate that such devices should be used only as supplementary methods, viewed as less effective alternatives. UV-C lamps are the most frequently mentioned, yet their application requires keeping them in perfect technical condition and ensuring a clean environment, as well as their relatively recent technological standards.

In practice, despite the availability of certain information resources, difficulties persist. Medical staff do not always properly allocate cleaning tasks. Additional challenges arise from ambiguity surrounding the cleaning of portable equipment and certain specialized devices. Another barrier is insufficient access to appropriate disinfectants. As a result, *C. auris* may fill hospital rooms within a matter of hours. Continuous and systematic supervision is therefore becoming increasingly important in order to eliminate outbreaks completely.

5. Conclusions

The objectives of the article were achieved, and the research questions and hypotheses were addressed and solved. Chemical methods remain the most essential tools, with certain physical alternatives gaining importance. Chemical disinfectants demonstrate effectiveness both in routine daily cleaning and in terminal cleaning after patient discharge. No-touch technologies represent a contemporary innovation that continues to evolve. Although they may eventually become primary methods, at present they remain financially demanding and too costly for many healthcare facilities.

Disinfectants based on QACs remain controversial – some countries allow their use under specific conditions, whereas others unequivocally discourage them. It is possible that this trend may shift in the future as a result of further research and evaluations. These approaches may also vary between more and less developed countries.

In summary, differences between national recommendations arise from resource availability, epidemiological context, and experiences with outbreak management. In countries with a high number of cases recommendations are highly detailed and facilities develop tailored procedures based on local capacities. USA is an example. In Europe, where cases occur less frequently, preventive and preparedness-oriented guidelines dominate the researches. It is important to emphasize that the effectiveness of implemented measures depends not only on the disinfectant used but also on consistent adherence to procedures and staff training.

According to the collected data, *C. auris* should be regarded as a pathogen requiring a multilayered approach, encompassing appropriate disinfectant selection, environmental assessment, microbiological surveillance, staff responsibility, and systematic execution of procedures. Gaps in the implementation of even the best guidelines may lead to rapid recolonization of the environment and increased transmission. Future research should focus on validating specific cleanliness-management models and assessing their impact on reducing outbreak occurrence under various clinical conditions.

Disclosure

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Conflict of Interest

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References

1. Association for Professionals in Infection Control and Epidemiology (2025). About Candida auris, https://apic.org/candida-auris
2. Bandara, N. & Samaranayake, L. P. (2022). Emerging strategies for environmental decontamination of the nosocomial fungal pathogen Candida auris. Journal of Medical Microbiology, 71(6), 1-10, https://doi.org/10.1099/jmm.0.001548
3. Barbian, H. J., Liel, L., Kittner, A., Harrington, A., Carson, J., Frias, M., Slade, D. H., Kim, D. Y., Black, S., Parada, J. P. & Hayden, M. K. (2025). Candida auris Outbreak and Epidemiologic Response in Burn Intensive Care Unit, Illinois, USA, 2021–2023. Emerging Infectious Diseases, 31(3)
4. Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit (2024). Merkblatt Candida auris für Krankenhäuser.
5. Bednarowska-Michaiel, Z. (2015). Desk research - wykorzystanie potencjału danych zastanych w prowadzeniu badań marketingowych i badań społecznych. Marketing i Rynek, 7, 18-26
6. CDC (2019). Drug-resistant Candida Auris. Antibiotic Resistance Threats Report
7. CDC (2024). Infection Control Guidance: Candida auris, https://www.cdc.gov/candida-auris/hcp/infection-control/index.html

8. Czajkowski, J. (2025). Zastosowanie technologii biodekontaminacji VHP (gazowy nadtlenek wodoru) na rynku farmaceutycznym, w przemyśle oraz sektorze naukowobadawczym. Steris
9. European Centre for Disease Prevention and Control (2016). Candida auris in healthcare settings – Europe. Stockholm
10. Florida Department of Health (2025). Candida auris Mini Education Facilitator Guide.
11. Grondalska, D. & Kmieciak, W. (2017). Candida auris - nowy patogen grzybiczy, Postępy Mikrobiologii - Advancements of Microbiology, 56(3), 282-288, https://doi.org/10.21307/PM-2017.56.3.282
12. Indian Council of Medical Research (2017). Candida auris in healthcare settings – India.
13. Maslo, C., Plooy, M., & Coetzee, J. (2019). The efficacy of pulsed-xenon ultraviolet light technology on Candida auris. BMC Infectious Diseases, 19(540), https://doi.org/
    a. 10.1186/s12879-019-4137-6
14. Mikołajczyk, A. (2018). Candida auris – nowe zagrożenie ze strony drobnoustrojów. Aktualności Narodowego Programu Ochrony Antybiotyków, 2, 1-5.
15. Omardien, S. & Teska, P. (2024). Skin and hard surface disinfection against Candida auris – What we know today. Front. Med, 11, https://doi.org/10.3389/fmed.2024.1312929
16. Schelenz, S., Hagen, F., Rhodes, J. L., Abdolrasouli, A., Chowdhary, A., Hall, A., Ryan, L., Shackleton, J., Trimlett, R., Meis, J. F., Armstrong-James, D., & Fisher, M. C. (2016). First hospital outbreak of the globally emerging Candida auris in a European hospital. Antimicrobial Resistance & Infection Control, 5(35), https:// doi.org/10.1186/s13756-016-0132-5
17. Skrzypiec, P. (2025). Elementy szpitalnej strategii higieniczno-dezynfekcyjnej. Obszar: ręce. Wrocław: Uniwersytet Medyczny im. Piastów Śląskich we Wrocławiu
18. UK Health Security Agency (2025). Infection prevention and control (IPC), https://www.gov.uk/government/publications/candida-auris-laboratory-investigationmanagement-and-infection-prevention-and-control/infection-prevention-and-controlipc

19. Weber, D. J., Rutala, W. A., Anderson, D. J., & Sickbert-Bennett, E. E. (2023). “No touch” methods for health care room disinfection: Focus on clinical trials. American Journal of Infection Control, 51, 134-143, https://doi.org/10.1016/j.ajic.2023.04.003
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