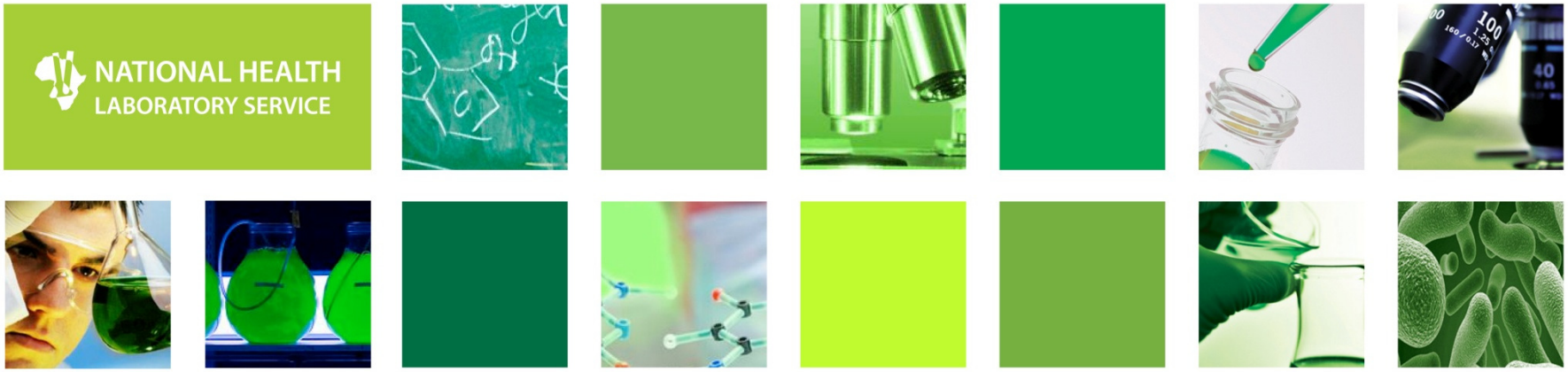

Candida auris management:
Strategies to Prevent Transmission of *C.auris* in Healthcare Settings

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Strategies to Prevent Transmission of *Candida auris* in Healthcare Settings

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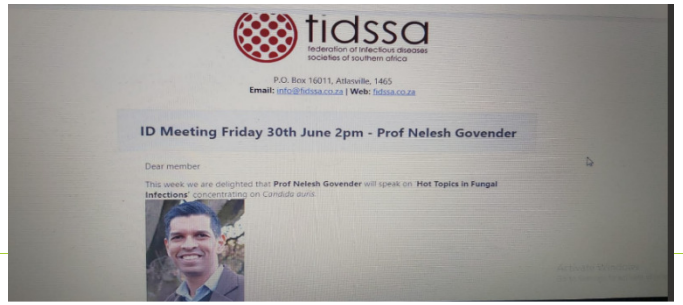
Abstract

Purpose of Review *Candida auris*, a recently recognized yeast pathogen, has become a major public health threat due to the problems associated with its accurate identification, intrinsic and acquired resistance to antifungal drugs, and its potential to easily contaminate the environment causing clonal outbreaks in healthcare facilities. These outbreaks are associated with high mortality rates particularly among older patients with multiple comorbidities under intensive care settings. The purpose of this review is to highlight strategies that are being adapted to prevent transmission of *C. auris* in healthcare settings.

Recent Findings Colonized patients shed *C. auris* into their environment which contaminates surrounding equipment. It resists elimination even by robust decontamination procedures and is easily transmitted to new patients during close contact resulting in outbreaks. Efforts are being made to rapidly identify *C. auris*-infected/*C. auris*-colonized patients, to determine its susceptibility to antifungals, and to perform effective cleaning and decontamination of the environment and isolation of colonized patients to prevent further transmission.

Summary Rapid and accurate identification of hospitalized patients infected/colonized with *C. auris*, rapid detection of



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- Purpose of the review
- Introduction
- Global Epidemiology of *C.auris* infections
- Challenges identified
- Strategies to Prevent Transmission of *C.auris* in Healthcare Settings
- Future Perspectives
- Experience
- Conclusion

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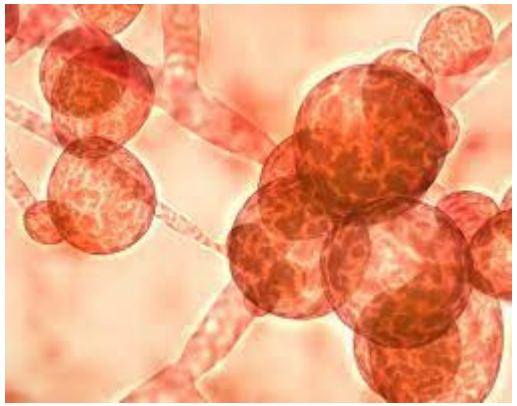
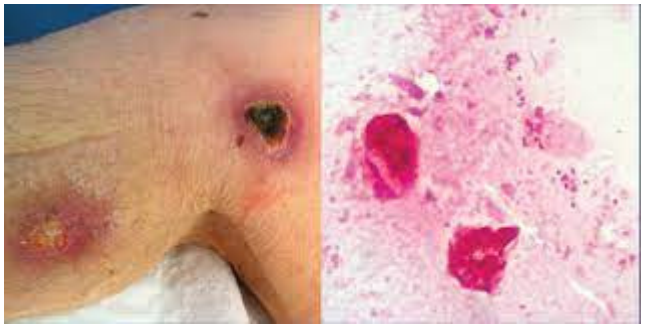
Purpose of the review

- *C.auris* recognized **yeast pathogen**,
- **Major public health threat** due to the problems associated with its **accurate identification**, intrinsic.
- **Acquired resistance** to antifungal drugs.
- Easily **contaminate the environment** causing **clonal outbreaks** in healthcare facilities.
- These outbreaks are associated with **high mortality rates** particularly among **older** patients with **multiple comorbidities** under intensive care settings.
- **The purpose of this review is to highlight strategies that are being adapted to prevent transmission of *C. auris* in healthcare settings**.



https://www.ucsfbenioffchildrens.org/medical-tests/candida-auris-infection



https://journals.asm.org/doi/10.1128/jcm.01588-17

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Introduction

- **Important risk factors for invasive candidiasis include**
  - extremes of age;
  - admission into intensive care units (ICUs);
  - total parenteral nutrition;
  - multiple comorbidities such as diabetes mellitus,
  - chronic pulmonary,
  - cardiovascular,
  - or kidney disease,
  - neutropenia, and
  - malignancy;
  - presence of central venous/urinary catheters; and
  - prior use of broad-spectrum antibiotics/ antifungal agents.

- Invasive *Candida* infections have an attributable mortality of **nearly 30% in adults and nearly 15% in neonates**.
- *Candida albica*ns is usually the most common cause of invasive candidiasis; however, majority **(> 50%)** of *Candida* infections are now caused **by non-albicans *Candida species.***

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Global Epidemiology of *C.auris* infections

- First described as a novel *Candida species* in 2009 was *Candida auris*, **isolated** from the **external ear canal** of a Japanese patient.
- Fifteen other *C. auris* isolates, **misidentified earlier** as *C. haemulonii*, were also identified 2004–2006.
- First outbreak was reported from the UK.
- Over the past 10 years as several **thousand sporadic or outbreak isolates** have been **recovered from blood and other specimens** mostly from hospitalized patients in > **50 countries.**
- A **fluconazole-resistant** *C. auris* belonging to clade V and isolated from fungal otitis has also been described recently.
- **Environmental isolation** of *C. auris* has also been described recently, first from the **tropical marine ecosystems** in the Indian Ocean and subsequently from a coastal habitat in Colombia.
- *C. auris* has been isolated from **apples previously treated with fungicidal agents**, and this practice in food industry may have been responsible for the selection of drug resistant *C. auris*.

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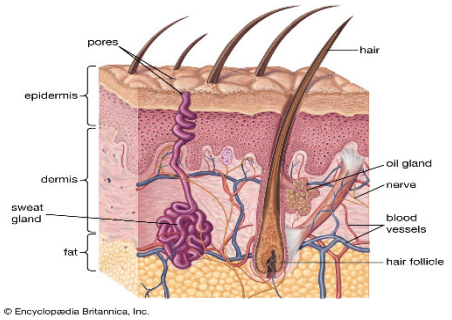
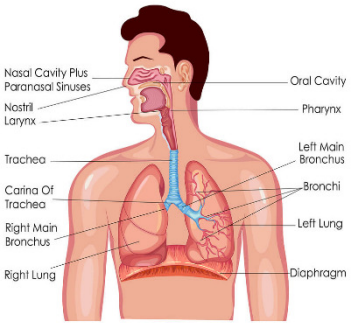
Challenges identify *C.auris* in Healthcare Settings

- Characteristics with other closely related species compromising its **rapid identification**.
- Ability to **resist killing by common disinfectants**, persist and remain viable for weeks to months, mostly due to biofilm formation.
- **Intrinsic resistance** to some drugs and ability to rapidly acquire resistance to other antifungals, often resulting in a multidrug-/pan-resistant phenotype.
- **Colonizes the skin, respiratory tract, and urinary tract.**
- **Shed** from the skin into the environment contaminating surfaces/equipment.
- This causes **direct and indirect contact** transmission of infection in hospital settings.



Respiratory System



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Strategies to Prevent Transmission of *C.auris* in Healthcare Settings

- **Rapid diagnosis in cultures**: Skin and rectal colonization- axilla, groin and sites like urine, throat, wounds and other devices.
- **Single occupancy rooms or cohorted** with allocated toilet facilities.
- **Hand hygiene-** transmission various environmental surfaces/equipment:
  - Walls/floors, mattresses/pillows/ bed sheets, **bed side trolleys**, **sinks**, door and faucet handles, disposable/reusable equipment (**oxygen mask**, temperature/ blood pressure monitors), and other objects (intravenous pole, personal **mobile phones**, cloth lanyards, etc.)
  - Since new patients are colonized with this **yeast with a contact time** of just 4 h.
  - Invasive infections have occurred in patients **within 48 h of admission** in ICU settings
  - According to the 5 moments use **alcohol-based hand rubs**,
  - **Soiled hands** should be thoroughly cleaned with soap and water.
  - Don personal protective equipment **(PPE)** while attending the patients.
  - **Disposable/single used items/equipment** whenever it is feasible to do so.

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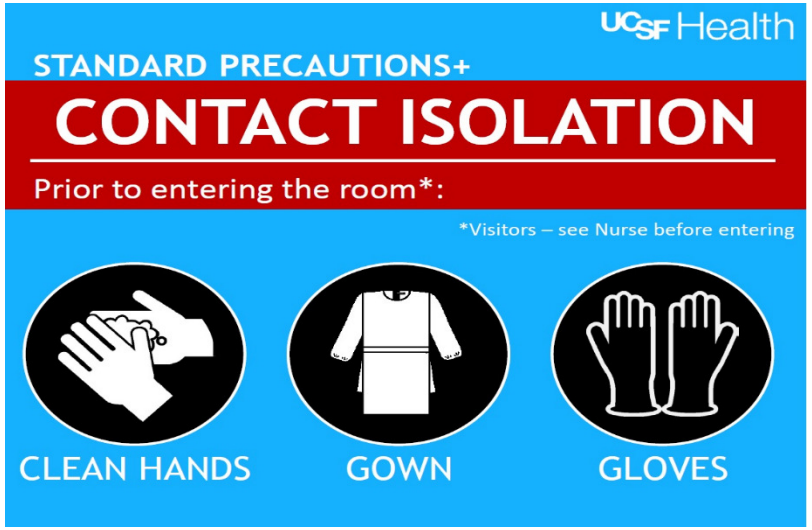
Strategies to Prevent Transmission of *C.auris* in Healthcare Settings

- **Hand hygiene-** transmission various environmental surfaces/equipment:
  - **Minimum number** of HCWs should be designated.
  - Wearing of a **face mask** by HCWs may also be helpful in preventing their own colonization with *C. auris*
  - **Rooms housing** *C. auris* -infected patients should be **clearly marked**.
  - **Limited entry by visitors** should be allowed only after adherence to PPE.
  - **Colonized** patients should be **followed until discharge** from the facility or when they have turned culture-negative during regular screening.



Glove from box of gloves outside a isolation cubicle

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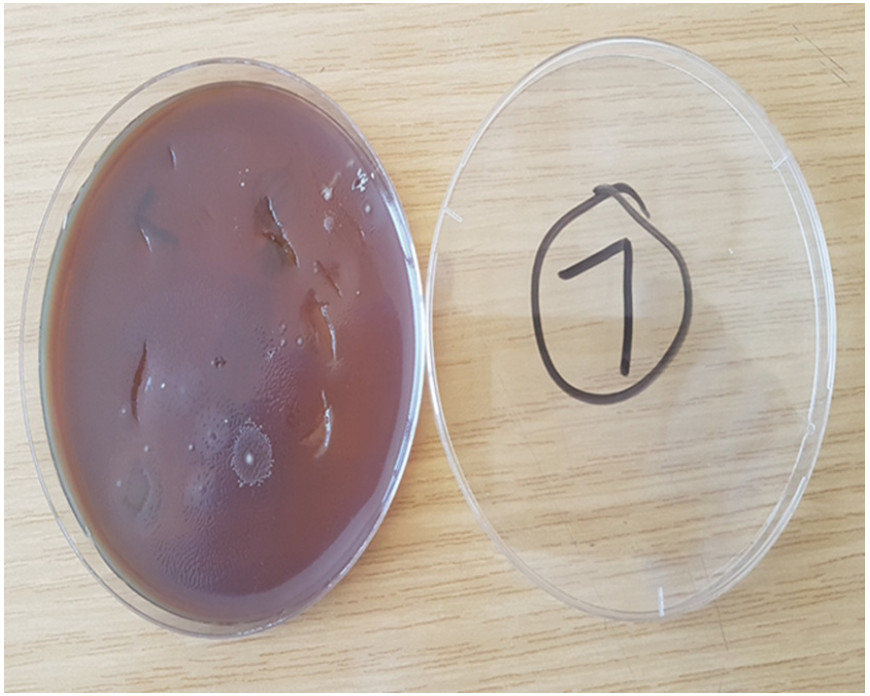
Staff member was busy in the cubicle to pack away the patient toiletries and touch varies areas around the patient. Staff member was asked to print their hands(7) and remove the gloves and perform a hand print again (8)



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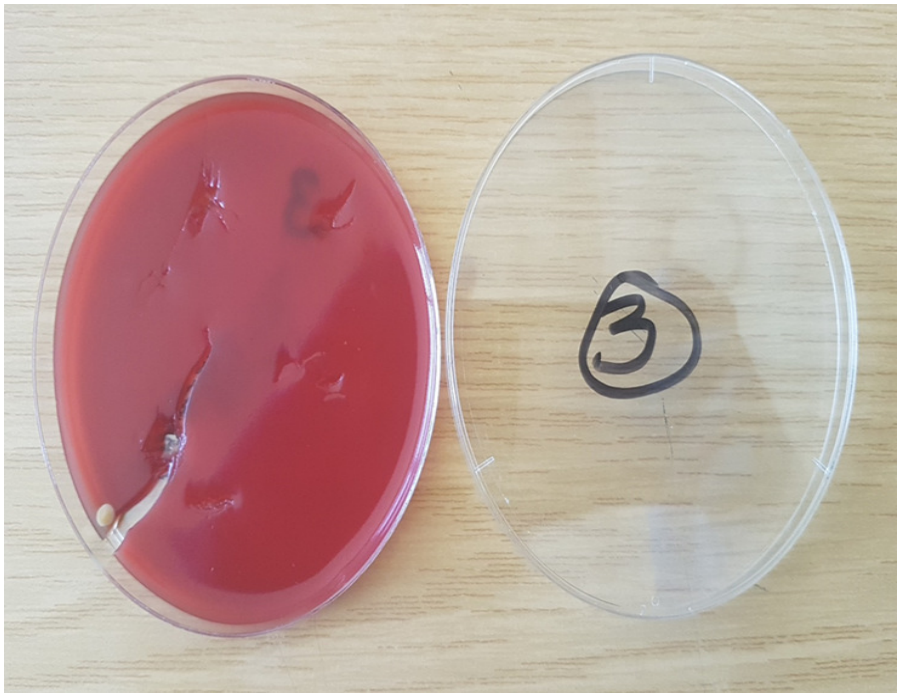
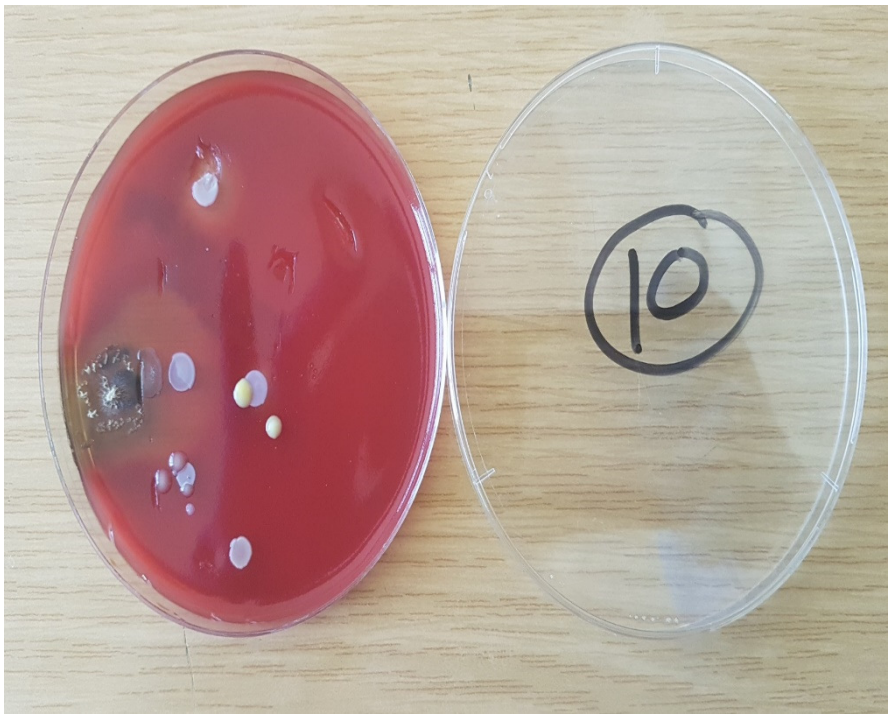
Patient is colonized with *C.auris*. Staff members was busy rubbing hands with alcohol after performing a procedure. The staff member wears a ring.



Staff member was busy writing report and wear a ring.



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Strategies to Prevent Transmission of *C.auris* in Healthcare Settings

- **Cleaning and disinfection of Environment and Reusable Equipment:**
  - Recommended disinfection of **high touch areas** and **reusable equipment**.
  - **Cleaning surfaces twice or three times daily** in rooms with chlorine-based or other **sporicidal disinfectants** is **highly effective** in controlling cross-transmission of infection.
  - Single use items (**pillows, bedding material, and fiber cloth wipes for cleaning**), and equipment (**thermometers, blood pressure cuffs, etc**.) should be preferred for *C. auris* -positive patients.
  - Twice daily **skin decontamination** with disposable wash cloths (wipes) soaked in 2% chlorhexidine gluconate or 4% chlorhexidine solution
  - **Mouth washing** of patients on ventilator support with 0.2% chlorhexidine.
  - **Chlorhexidine-soaked disks** for central vascular catheter exit sites

Strategies to Prevent Transmission of *C.auris* in Healthcare Settings

- **Cleaning and disinfection of Environment and Reusable Equipment:**
  - Isopropanol augments the activity of chlorhexidine for **decolonization of from skin.**
  - **Both tea tree and lemongrass oil** further enhanced the decolonization by chlorhexidine/isopropanol combination.
  - **Recolonization** may occur soon afterwards from the bedding material, pillows, or other personal items.
  - The **efficacy and minimum contact time for different formulations of disinfectants and antiseptics effective against *C. auris* planktonic cells and biofilms are listed in Table 3.**

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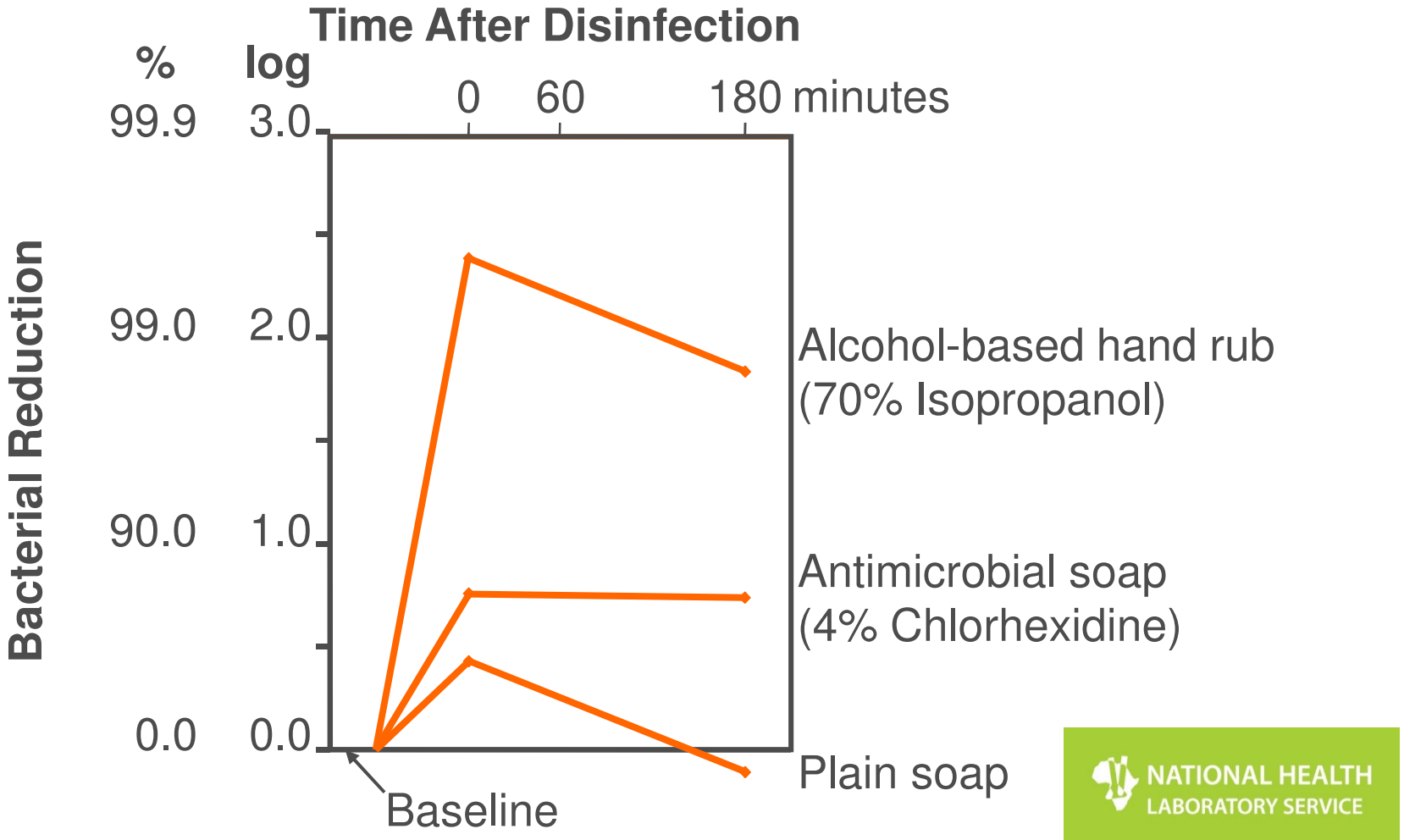
Ability of Hand Hygiene Agents to Reduce Bacteria on Hands



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Adapted from: *Hosp Epidemiol Infect Control*, 2nd Edition, 1999.

Strategies to Prevent Transmission of *C.auris* in Healthcare Settings

- Cleaning and disinfection of Environment and Reusable Equipment

Table 3 Efficacy of common disinfectants and antiseptics against planktonic cells and biofilms of *C. auris*

Disinfectants and antiseptics	Concentration	CFU reduction or % killing	Minimum contact time (min)
For planktonic cells			
Sodium hypochlorite	1000 ppm	> 6 Log_{10} CFU reduction	5
Sodium hypochlorite	4000 ppm	> 3 Log_{10} CFU reduction	1
Sodium dichloroisocyanurate	1000 ppm	> 6 Log_{10} CFU reduction	4
Sodium dichloroisocyanurate	4000 ppm	> 3 Log_{10} CFU reduction	1
Peracetic acid	2000 ppm	100%	5 to 10
Chlorhexidine gluconate in 70% IPA	2%	> 5 Log_{10} CFU reduction	2
Isopropyl alcohol	70%	> 3 Log_{10} CFU reduction	1
Povidone-iodine	10%	> 4 Log_{10} CFU reduction	2
Hydrogen peroxide	1.4%	> 5 Log_{10} CFU reduction	1
Hydrogen peroxide (vaporized)	8 g/m^3	96.6 to 100%	3 to 5
Ozone	300 mg/m^3	> 3 Log_{10} CFU reduction	40
Ozonated water for bathroom sinks	2.5 ppm	Undetectable level	30 s/4 h, 2 days
Ultraviolet (UV-C) light	254 nm	> 6 Log_{10} CFU reduction	30
For biofilms			
Sodium hypochlorite, pH 13.13	1000 ppm	> 7 Log_{10} CFU reduction	2
Hydrogen peroxide	3%	90%	5
Peracetic acid, pH 8.82	3500 ppm	> 7 Log_{10} CFU reduction	2.2
Sodium dichloroisocyanurate, pH 5.64	1000 ppm	> 7 Log_{10} CFU reduction	2.2
Ultraviolet (UV-C) light	267 nm	99.90%	0.4
Silver nanoparticles	2.3 ppm	> 80%	24 h
For medical/dental devices			
Glutaraldehyde	2.4%	> 4 Log_{10} CFU reduction	1
Peracetic acid	3500 ppm	> 7 Log_{10} CFU reduction	5 to 10

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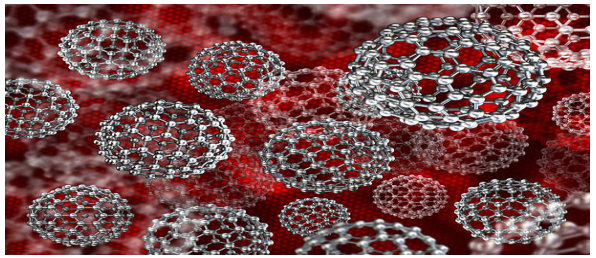
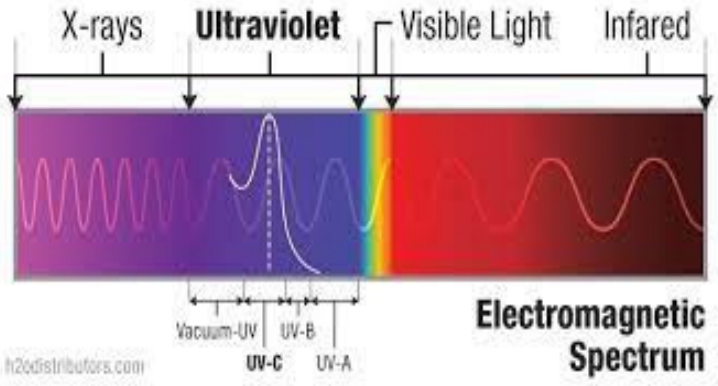
Strategies to Prevent Transmission of *C.auris* in Healthcare Settings

- **Cleaning and disinfection of Environment and Reusable Equipment:**
  - Chlorine-based products such as sodium hypochlorite (**≥ 1000 parts per million**, **ppm**) are effective against planktonic cells and, at pH of 13.13, against *C. auris* **biofilms**.
  - **Very high concentrations (≥ 6000 PPM)** are irritating to some patients/HCWs and **corrosive for medical/dental devices.**
  - **Peracetic acid at 2000 ppm and sodium dichloroisocyanurate at 4000 ppm** are also effective against planktonic cells of *C. auris* (Table 3)
  - Sodium dichloroisocyanurate (1000 ppm, pH 13.13) are also effective as **prevented the transfer and regrowth** of *C. auris.*
  - **Chlorhexidine gluconate (2%) in 70% isopropanol** and **povidone-iodine (10%)** are **yeasticidal for planktonic cells** of *C. auris* .

Future Perspectives

- New rapid, sensitive, and more specific **point-of-care tests** are being developed.
- Advances are also being made in *C. auris* **eradication from patients' rooms**.
- In addition to silver nanoparticles, silver functionalized nanostructured titanium has recently been recognized as a **promising antifungal** agent against growth and biofilm formation of *C. auris* on medical and environmental surfaces.
- Far ultraviolet subtype C (222 nm) (Far-UVC) has recently been shown to destroy **airborne pathogens** nearly instantly in room-sized chambers.
- Major developments are also underway in the discovery of new **drugs/drug combinations** to improve treatment of *C. auris* infections.





Experience

1. Hand Hygiene
2. Prompt isolation.
3. Cleaning the environment 2x day- stethoscopes
4. Chlorine solution >1000ppm.
5. Patient in the bed for more than 2 weeks – curtains need to be replace.
6. Post discharge terminal cleaning and fogging or UVGI.
7. Allocate staff to specific patient.
8. Identify the rooms
9. Cleaning needs to take place last in Isolation rooms.
10. All staff needs to know isolation measures from cleaner to res of the multi-disciplinary team.

Conclusion

- The patients most commonly affected include:
  - Elderly patients with multiple comorbidities,
  - Exposure to broad-spectrum antibiotics/ antifungal drugs,
  - Arterial or central venous catheters,
  - Major surgery, and
  - Prolonged stay in the ICU.
- More specific point-of-care tests for identification of *C. auris* in yeast cultures and clinical specimens, susceptibility testing to guide treatment,
- Infection control measures offer hope that *C. auris* infections/outbreaks can be controlled or even prevented in the near future.

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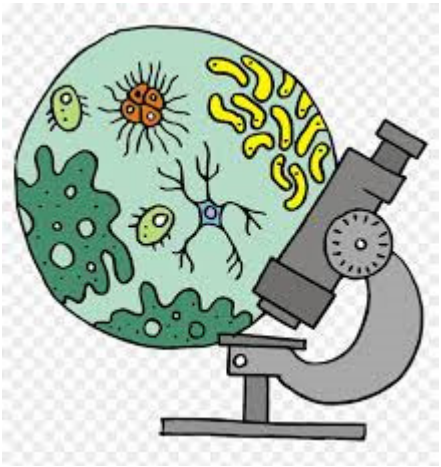
Thank you



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