



# The Role of Environmental Cleaning & Disinfection on Candida auris



Candida Auris Prevention Strategies

General Directorate of Infection Prevention and Control



# Outlines



- Introduction.
- The significant of environmental cleaning & disinfection on Candia auris.
- Basic concepts.
- Type & selections of disinfectants/equipment's.
- Cleaning methods & measures.
- Monitoring and feedback.
- Conclusion.



# Introduction



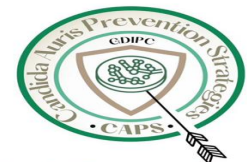
- There is increasing evidence that the healthcare environment is an important source of healthcare-associated infections. Every healthcare facility must thoroughly clean its environment to prevent it from developing into a reservoir for pathogens.



# Background



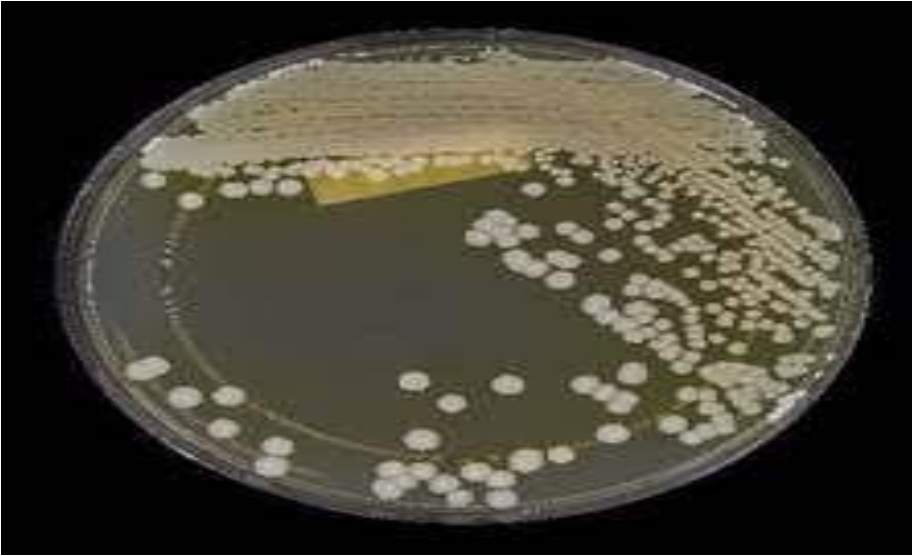
- Candida auris (C. auris) is a healthcare-associated, pathogenic organism that can cause significant morbidity and mortality among infected individuals and is often multidrug resistant.
- Patients with C. auris may be colonized without symptoms or infected with severe symptoms present. Both colonized and infected patients can spread C. auris directly (from direct contact, many times through patient care) and indirectly (from contaminated objects and the environment).





- C. auris is persistent and can remain in the environment for weeks & sometimes to years.





Candida Auris Prevention Strategies

General Directorate of Infection Prevention and Control

# The Significance of Environmental Cleaning & Disinfection on Candida auris

# "RESEARCH SAYS..."



National Library of Medicine  
National Center for Biotechnology Information

PMC PubMed Central®

Search PMC Full-Text Archive

Search in PM

[Journal List](#) > [Clin Microbiol Rev](#) > [v.31\(1\); 2018 Jan](#) > PMC5740969

As a library, NLM provides access to scientific literature. Inclusion in an NLM database does not imply endorsement of, or agreement with, the contents by NLM or the National Institutes of Health. [Learn more about our disclaimer.](#)



Clinical Microbiology  
Reviews®

[Clin Microbiol Rev](#). 2018 Jan; 31(1): e00029-17.

Published online 2017 Nov 15. doi: [10.1128/CMR.00029-17](#)

PMCID: PMC5740969

PMID: [29142078](#)

## *Candida auris*: a Review of the Literature

[Anna Jeffery-Smith](#)<sup>✉a,b,\*</sup>, [Surabhi K. Taori](#)<sup>c,\*</sup>, [Silke Schelenz](#)<sup>d,\*</sup>, [Katie Jeffery](#)<sup>e,\*</sup>, [Elizabeth M. Johnson](#)<sup>a,\*</sup>,  
[Andrew Borman](#)<sup>a,\*</sup>, *Candida auris* Incident Management Team, [Rohini Manuel](#)<sup>a,\*</sup> and [Colin S. Brown](#)<sup>✉a,f,\*</sup>





- *C. auris* has been demonstrated to survive on a range of surface types, including dry, moist, and plastic surfaces, with organisms being viable for up to 14 days on plastic.
- The rate of recovery of *C. auris* over a period of 7 days was higher than that of *C. albicans* on both moist and dry surfaces, indicating the potential significance of environmental contamination.



# For Further Exploring...



<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5740969/>





# How Does C.auris Spread?

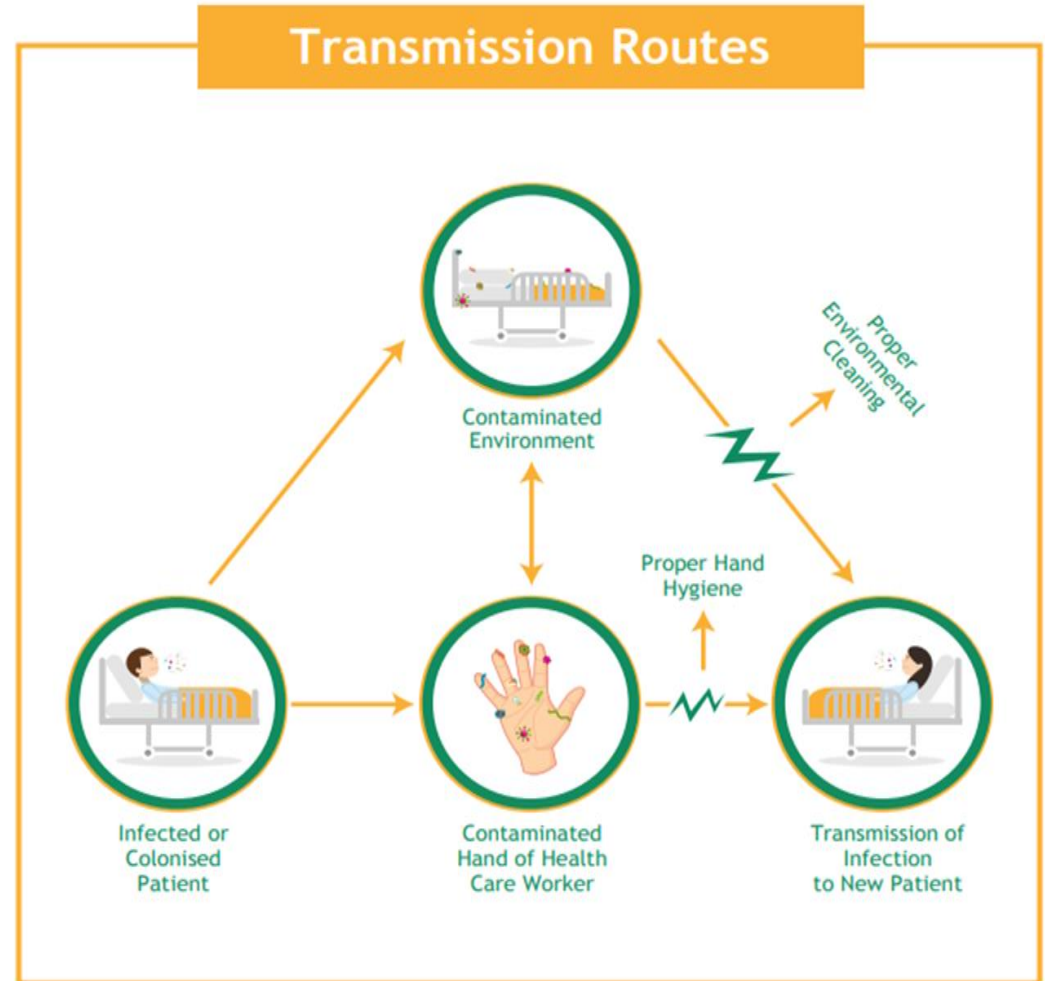


# Transmission Routes



Candida Auris Prevention Strategies  
General Directorate of Infection Prevention and Control

## Role of Environment in Transmission of Hospital Acquired Infections





# Basic Concepts of Environmental Cleaning & Disinfection





## **Cleaning:**

The physical removal of foreign material (e.g., dust, soil) and organic material (e.g., blood, secretions, excretions, microorganisms).

## **Disinfection:**

Disinfection describes a process that eliminates many or all pathogenic microorganisms, except bacterial spores.

## **Routine cleaning:**

The regular cleaning (and disinfection, when indicated) when the room is occupied to remove organic material, reduce microbial contamination, and provide a visually clean environment. Emphasis is on surfaces within the patient zone.

## **Terminal (discharge) cleaning:**

Cleaning and disinfection after the patient is discharged or transferred. Includes the removal of organic material and significant reduction and elimination of microbial contamination.



## Disinfectants:

Chemical compounds that inactivate (i.e., kill) pathogens and other microbes.

## Detergent:

A synthetic cleansing agent that can emulsify and suspend oil. Contains surfactant or a mixture of surfactants with cleaning properties in dilute solutions to lower surface tension and aid in the removal of organic soil and oils, fats, and greases.



***NB: Cleaning is the first step prior any disinfection or sterilization.***



***Why??***





## Contact time:

The time that a disinfectant must be in contact with a surface or device to ensure that appropriate disinfection has occurred.

## Material safety data sheet (MSDS):

A document by the supplier or manufacturer of a chemical product that contains information on the product's potential hazards (health, fire, reactivity, and environmental) and how to work safely with it. It also contains information on the use, storage, handling, and emergency procedures.



# Have a Look....



## SAFETY DATA SHEET Hydrogen Peroxide Solution (7.0%)

According to Preparation of Safety Data Sheets for Hazardous Chemicals Code of Practice, February 2016

### SECTION 1: Identification: Product identifier and chemical identity

#### Product identifier

**Product name** Hydrogen Peroxide Solution (7.0%)

#### Relevant identified uses of the substance or mixture and uses advised against

**Application** Water treatment.

**Uses advised against** For professional use only. This product is not recommended for any industrial, professional or consumer use other than the Identified uses above.

#### Details of the supplier of the safety data sheet

**Supplier** Autosmart Australia  
11 Darrambal Close  
Rathmines  
NSW 2283  
Australia  
[www.autosmartaustralia.com.au](http://www.autosmartaustralia.com.au)  
Tel: 02 49 75 14 88 (Mon to Fri, 08:00 - 16:00 AEST) (General Information. Transport Information. Mild Medical Information)  
[autosmart@autosmartaustralia.com.au](mailto:autosmart@autosmartaustralia.com.au)

**Contact Person** Mr. Russell Butler

#### Emergency telephone number

**Emergency telephone** Emergency No: +44 7808 971321 (24hrs) (Autosmart International, UK)  
General Information. Transport Information. Mild medical Information:-  
Tel: 02 49 75 14 88 (Mon to Fri, 08:00 - 16:00 AEST)

**National emergency telephone number** Poison Information Hotline: 13 11 26

### SECTION 2: Hazard(s) identification

#### Classification of the substance or mixture





# How to Read a Disinfectant Label

Read the entire label.

The label is the law!

Note: Below is an example of information that can be found on a disinfectant label

**Active Ingredients:**  
What are the main disinfecting chemicals?

**EPA Registration Number:**  
U.S. laws require that all disinfectants be registered with EPA.

**Directions for Use (Instructions for Use):**  
Where should the disinfectant be used?

What germs does the disinfectant kill?

What types of surfaces can the disinfectant be used on?

How do I properly use the disinfectant?

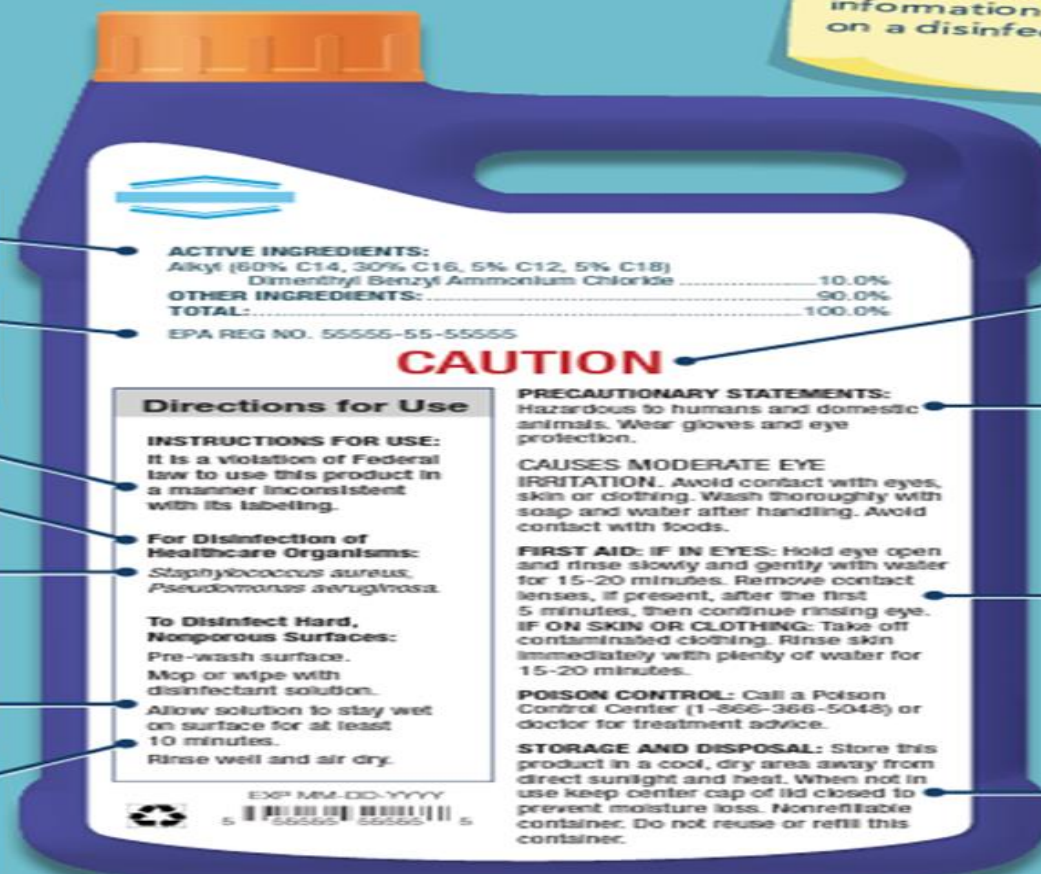
**Contact Time:**  
How long does the surface have to stay wet with the disinfectant to kill germs?

**Signal Words (Caution, Warning, Danger):**  
How risky is this disinfectant if it is swallowed, inhaled, or absorbed through the skin?

**Precautionary Statements:**  
How do I use this disinfectant safely? Do I need PPE?

**First Aid:**  
What should I do if I get the disinfectant in my eyes or mouth, on my skin, or if I breathe it in?

**Storage & Disposal:**  
How should the disinfectant be stored? How should I dispose of expired disinfectant? What should I do with the container?



U.S. Department of Health and Human Services  
Centers for Disease Control and Prevention



PROJECT FIRSTLINE



WWW.CDC.GOV/PROJECTFIRSTLINE

# Types of Surfaces



Types of surfaces



High touch surfaces or items

Low touch surfaces or items



## Curtains

- The use of privacy curtains varies by patient, and these curtains are often a high-touch item. The privacy curtains should be changed and cleaned on a routine schedule and when visibly soiled and after patient discharged.





# Types & Selection of Disinfectants or Supplies/Equipment's





# Product Evaluation

- A structured product evaluation program has a significant impact on patient care and contributes directly to providing safe and quality of care to our patients.
- The PEC is responsible for reviewing, evaluating, and selecting products for use within the facility or healthcare system based on the best evidence recommendations for these products.





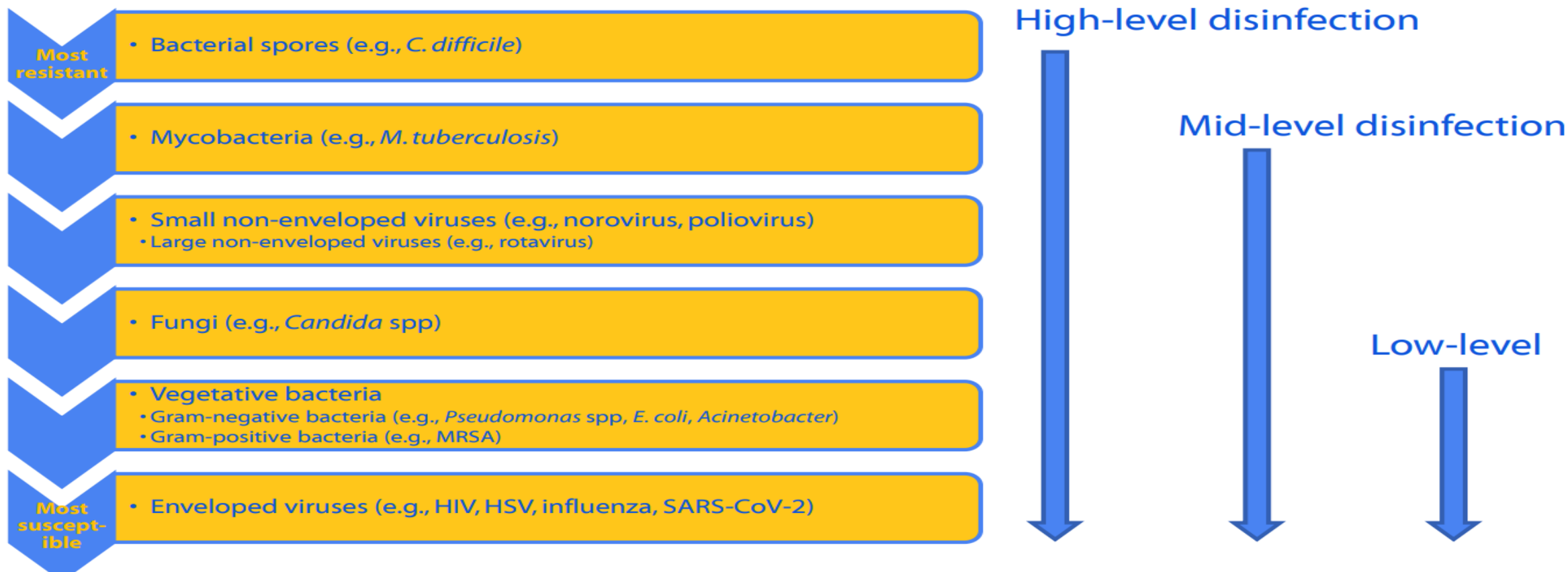
# Cleaning Supplies & Equipment's





# Remember to Have Look Disinfectant Hierarchy

## Microbial disinfectant hierarchy – intrinsic resistance





# Level of Disinfection

Disinfection level	Bacteria (vegetative)	Bacteria (Tubercle bacillus)	Bacteria (spores)	Fungi†	Viruses (lipid and medium size)	Viruses (nonlipid and small size)
High	+	+	<p>+</p> <p>High-level disinfectant chemicals possess sporicidal activity—only with extended exposure time are high level disinfections capable of killing high numbers of bacterial spores in laboratory tests.</p>	+	+	+
Intermediate	+	+	<p>-</p> <p>Some intermediate-level disinfectants (e.g., hypochlorites) can exhibit some sporicidal activity; others (e.g., alcohols and phenolics) have no demonstrable sporicidal activity.</p>	+	+	<p>±</p> <p>Variable killing effect Some intermediate-level disinfectants, although they are tuberculocidal, may have limited virucidal activity.</p>
Low	+	-	-	Variable killing effect	+	<p>±</p> <p>Variable killing effect</p>



<b>Active ingredient(s)</b>	<b>Spectrum of activity</b>	<b>Level of disinfection</b>
Quaternary ammonium compounds (e.g., alkyl dimethyl benzyl ammonium chloride) (0.1-1%) *newer formulations dimethyl ammonium bromide	Bactericidal Fungicidal	Low-level
Chlorine-releasing agents (e.g., sodium or calcium hypochlorite, sodium dichloroisocyanurate (NaDCC)) at 500ppm	Bactericidal Fungicidal	
Alcohols (60-80%) (e.g., isopropyl alcohol, ethyl alcohol/ethanol)  *Ethyl alcohol doesn't inactivate poliovirus or HAV, but does adenovirus, enterovirus, rhinovirus	Bactericidal Fungicidal Virucidal* Mycobactericidal	Mid-level
Chlorine-releasing agents (e.g., sodium or calcium hypochlorite, NaDCC) at 1,000ppm	Bactericidal Fungicidal Virucidal Mycobactericidal	
Improved hydrogen peroxide (e.g., 0.5% enhanced action formulation hydrogen peroxide, 3% hydrogen peroxide)	Bactericidal Fungicidal Virucidal Mycobactericidal	
Hypochlorite at 5,000ppm;  Hydrogen peroxide at 4-5%	Bactericidal Fungicidal Virucidal Mycobactericidal Sporicidal	High-level (Sporicidal) *not used routinely*

# Environmental Protection Agency (EPA)



## US Environmental Protection Agency

The screenshot shows the EPA website's navigation bar with 'Environmental Topics', 'Laws & Regulations', and 'About EPA'. Below the navigation is a search bar and social media icons. The main content area is titled 'Pesticide Registration' and features a sidebar with links to 'Pesticide Registration Home', 'About Pesticide Registration', 'Electronic Submission of Applications', 'Pesticide Registration Manual', 'Fees and Waivers', 'Registration Information by Type of Pesticide', 'Antimicrobial Registration', 'Biopesticide Registration', 'Conventional Registration', 'Inert Ingredient Regulation', 'Requirements and Guidance', 'Data', 'Forms', and 'Labeling'. The main content area is titled 'Selected EPA-Registered Disinfectants' and contains a paragraph of introductory text, a section for 'On this page' with links to antimicrobial products, a section for 'Antimicrobial Products Registered with EPA for Claims Against Common Pathogens' with a paragraph of text, and a section for 'Use of the listed EPA-registered products' with a paragraph of text. At the bottom, there is a paragraph about periodic updates to the lists and a note about product endorsement.

Information about listed products is current as indicated by the dates on the lists.

- [List A: EPA's Registered Antimicrobial Products as Sterilizers](#)
- [List B: EPA Registered Tuberculocide Products Effective Against \*Mycobacterium tuberculosis\*](#)
- **NEW** [List C: EPA's Registered Antimicrobial Products Effective Against Human HIV-1 Virus](#)
- [List D: EPA's Registered Antimicrobial Products Effective Against Human HIV-1 and Hepatitis B Virus](#)
- [List E: EPA's Registered Antimicrobial Products Effective Against \*Mycobacterium tuberculosis\* Human HIV-1 and Hepatitis B Virus](#)
- **NEW** [List F: EPA's Registered Antimicrobial Products Effective Against Hepatitis C Virus](#)
- **NEW** [List G: EPA's Registered Antimicrobial Products Effective Against Norovirus](#)
- [List H: EPA's Registered Antimicrobial Products Effective Against Methicillin Resistant \*Staphylococcus aureus\* \(MRSA\) and Vancomycin Resistant \*Enterococcus faecalis\* or \*faecium\* \(VRE\)](#)
- [List J: EPA's Registered Antimicrobial Products for Medical Waste Treatment](#)
- [List K: EPA's Registered Antimicrobial Products Effective Against Clostridium Difficile Spores](#)
- [List L: EPA's Registered Antimicrobial Products That Meet the CDC Criteria for Use Against the Ebola Virus](#)
- [List M: Registered Antimicrobial Products with Label Claims for Avian \(Bird\) Flu Disinfectants](#)
- [List N: Disinfectants for Use Against SARS-CoV-2](#)
- [List O: Disinfectants for Use Against Rabbit Hemorrhagic Disease Virus \(RHDV2\)](#)



# Products Used

- Must be approved by MoH Infection Prevention & Control General Directorate.
- Must be compatible with the surfaces/equipment and must be used according to the manufacturers' recommendations (e.g., for dilution, temperature, water hardness, contact time, etc.).
- Must be used according to the product's safety data sheet.
- Must be dedicated for hospital use.



# Responsibilities of Cleaning and Disinfection

- Housekeeping staff is responsible for decontamination of the environment mainly low touch surfaces.
- Nursing staff is responsible for decontamination of reusable clinical equipment's and disposal of single use equipment.





# Occupational Safety Considerations

- Always perform hand hygiene immediately before wearing gloves and immediately after removal.
- Train cleaning staff on appropriate use and removal of required PPE for all environmental cleaning procedures and tasks.





# Cleaning Carts & Trolleys

Cleaning carts and trolleys provide several benefits, such as the ability to carry and safely manage all the essential cleaning supplies and equipment and increased occupational safety for cleaning staff.





# Factors Impacting on the Effectiveness of Cleaning/Disinfection Process

- Type of cleaning /disinfection products
- Contact time
- Concentration of disinfectant
- Techniques and methods of cleaning
- Equipment used in cleaning/disinfection process
- Physical and chemical factors: (temperature, water hardness and PH)

## Personal Protective Equipment for Environmental Cleaning



CLEAN HANDS



GOWN



GLOVES

# Cleaning Methods and Measures



Candida Auris Prevention Strategies  
General Directorate of Infection Prevention and Control





- C. auris can persist on surfaces in healthcare environments including both high-touch surfaces, such as bedside tables and bedrails, and surfaces further away from the patient, such as window-sills.

# Types of Cleaning



**Routine  
Cleaning**

**Terminal  
Cleaning**



- Routine (at least daily or when required), and terminal cleaning and disinfection of patients' rooms and other areas where patients receive care (e.g., radiology, physical therapy) should be implemented applying an appropriate disinfectant that effective against *C. auris*.





### CDC Environmental Checklist for Monitoring Terminal Cleaning<sup>1</sup>

Date:	
Unit:	
Room Number:	
Initials of ES staff (optional): <sup>2</sup>	

Evaluate the following priority sites for each patient room:

High-touch Room Surfaces <sup>3</sup>	Cleaned	Not Cleaned	Not Present in Room
Bed rails / controls			
Tray table			
IV pole (grab area)			
Call box / button			
Telephone			
Bedside table handle			
Chair			
Room sink			
Room light switch			
Room inner door knob			
Bathroom inner door knob / plate			
Bathroom light switch			
Bathroom handrails by toilet			
Bathroom sink			
Toilet seat			
Toilet flush handle			
Toilet bedpan cleaner			

Evaluate the following additional sites if these equipment are present in the room:

High-touch Room Surfaces <sup>3</sup>	Cleaned	Not Cleaned	Not Present in Room
IV pump control			
Multi-module monitor controls			
Multi-module monitor touch screen			
Multi-module monitor cables			
Ventilator control panel			

Mark the monitoring method used:

- Direct observation     Fluorescent gel  
 Swab cultures         ATP system         Agar slide cultures

<sup>1</sup>Selection of detergents and disinfectants should be according to institutional policies and procedures

<sup>2</sup>Hospitals may choose to include identifiers of individual environmental services staff for feedback purposes.

<sup>3</sup>Sites most frequently contaminated and touched by patients and/or healthcare workers



# Terminal Cleaning Checklist





- MOH approved disinfectants (Sodium hypochlorite 1000 ppm, Hydrogen peroxide, etc.) as high-level disinfectants should be used with consideration of the manufacturer instructions (Refer to the Best Guidance for Selecting, Evaluating & Monitoring of the Infection Prevention & Control Supplies & Equipment's).



# Cleaning Methods

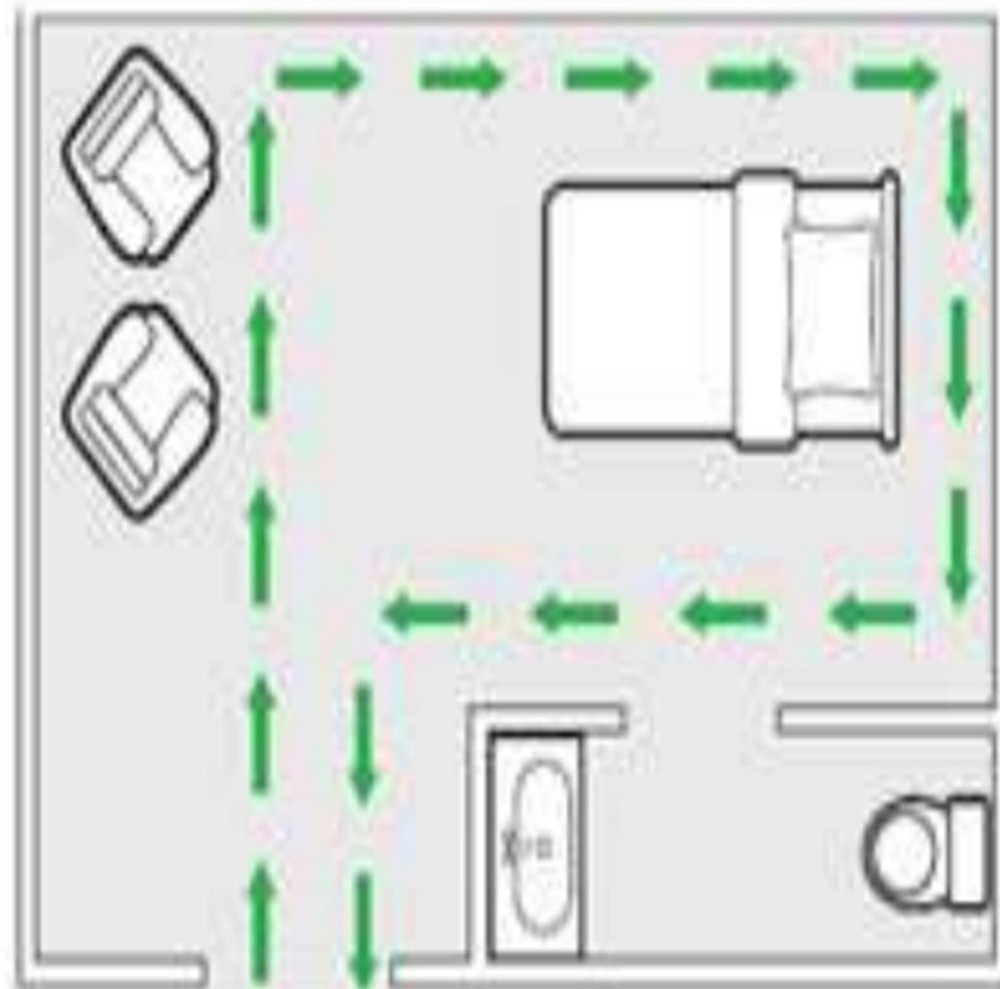
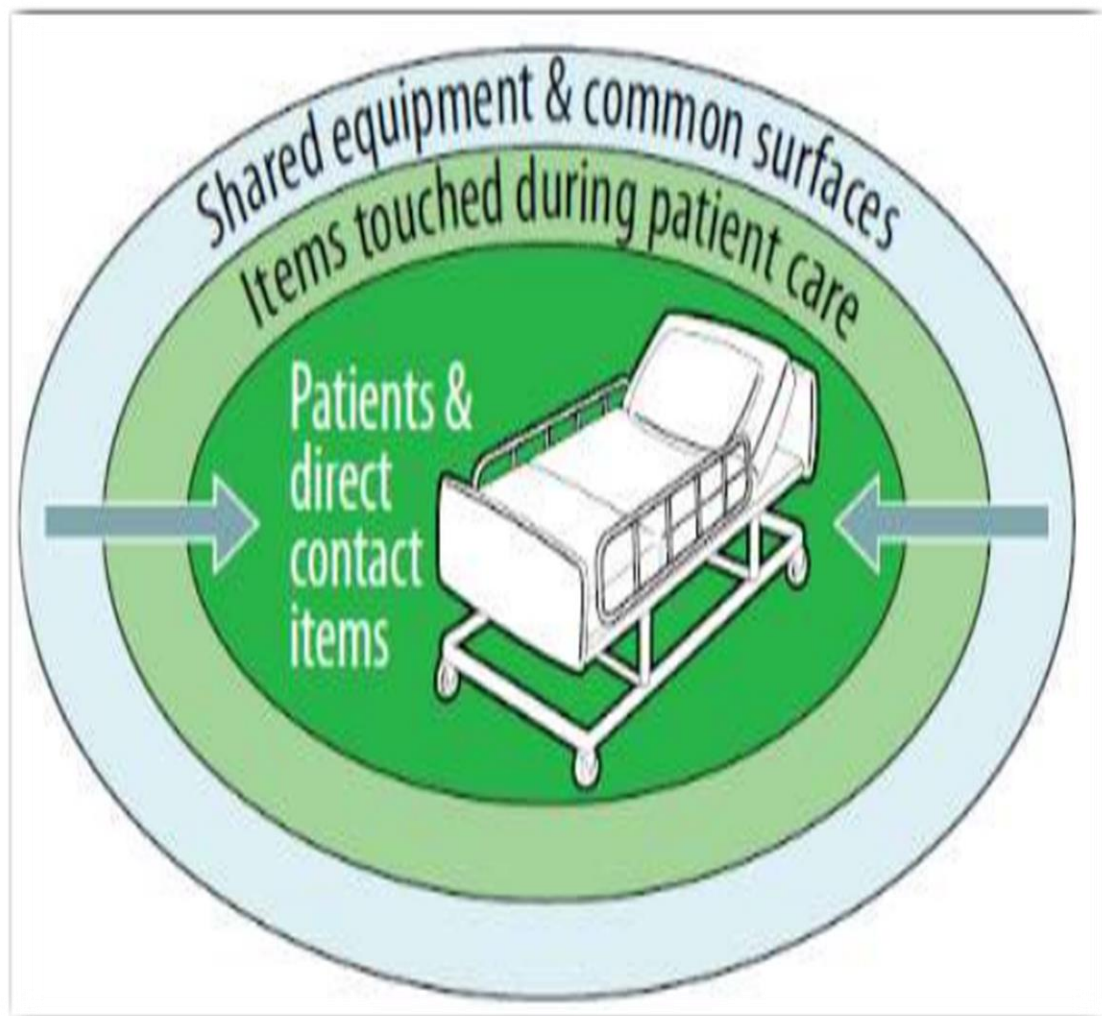


**Conduct Visual Preliminary Site Assessment.**

**Proceed from Cleaner to Dirtier**

**Proceed from High to Low (Top to Bottom)**

**Proceed in a Methodical, Systematic Manner**





# New and Evolving Technologies

- Disinfection using ultraviolet light
- Disinfection using hydrogen peroxide vapor or mist



## **FUMIGATION MACHINE**





# Ultraviolet Germicidal Radiation (UVGI)



Candida Auris Prevention Strategies  
General Directorate of Infection Prevention and Control

- Ultraviolet germicidal irradiation (UVGI) is the use of ultraviolet (UV) energy to kill or inactivate viral, bacterial, and fungal species.
- The UV spectrum is commonly divided into UVA (wavelengths of 400 nm to 315 nm), UVB (315 nm to 280 nm), and UVC (280 nm to 200 nm).
- The entire UV spectrum can kill or inactivate many microorganisms, but UVC energy provides the most germicidal effect, with 265 nm being the optimum wavelength.



# Hydrogen Peroxide Vapor or Mist

- The literature contains several accounts of the properties, germicidal effectiveness, and potential uses for stabilized hydrogen peroxide in the health-care setting.
- Published reports describe good germicidal activity to hydrogen peroxide and attest to its bactericidal, virucidal, sporicidal, and fungicidal properties.



Candida Auris Prevention Strategies  
General Directorate of Infection Prevention and Control



# Cleaning Methods Considerations

- Every healthcare facility must have written policies and procedures for cleaning and disinfection.
- The specific supplies and equipment needed for the cleaning and disinfection.
- Preparatory steps, including hand hygiene and required PPE.
- Step-by-step instructions on the cleaning process.
- Final steps, including a collection of soiled cleaning supplies for reprocessing or disposal, safe removal of PPE, and hand hygiene.





# Cleaning Methods Considerations

- Cleaning logs are job aids that can help guide the daily workflow for cleaning staff (location (i.e., room, ward), cleaning session (e.g., routine cleaning, terminal cleaning), date, and name/signature of cleaning staff.
- Cleaning job aids include posters, pictures guide, and other visual reminders for key cleaning tasks.
- ***NB: literacy levels and preferred language of cleaning staff should be taken into consideration***



# Monitoring and Feedback



Candida Auris Prevention Strategies  
General Directorate of Infection Prevention and Control



# Monitoring, Feedback, and Audit Elements



ndida Auris Prevention Strateg  
neral Directorate of Infection Prevention and Co

Direct

Indirect

Objective

Subjective



# Quality Monitoring and Auditing Component

- Visual assessment
- Environmental cleaning performance observation
- Environmental marking
- Adenosine triphosphate (ATP)







- A tracing agent (e.g., fluorescent material, chemical tracer) marks predetermined items and surfaces before cleaning.

After cleaning, a trained observer uses a detecting agent (e.g., ultraviolet light, enzymatic detector) to determine if any tracing agent is left.



# Quality monitoring and auditing component

- Adenosine triphosphate (ATP) is a substance present in all living cells and some organic materials, including food, and body fluids as the presence of ATP on a surface indicate that organic material remains on the surface.





# Feedback



## Provide multiple types of direct feedback to cleaning staff, including:

- Real-time feedback and coaching, during or following performance observations.
- Regular verbal debrief (e.g., monthly), usually during a one-on-one meeting between the cleaning staff and their direct supervisors.
- Performance reviews (written or verbal), usually on an annual basis.





Candida Auris Prevention Strategies  
General Directorate of Infection Prevention and Control

# Environmental Sampling



- Environmental sampling could be done only to support outbreak investigations, especially when epidemiologic evidence implicates an environmental reservoir in ongoing local transmission and based on the infection prevention & control recommendations.





# Conclusion

- The health care environment contains a diverse population of microorganisms and can be a reservoir for potential pathogens. Therefore, understanding the interaction of pathogens with potential environmental reservoirs is crucial to the control of pathogenic diseases of C.auris.
- Collaboration between infection prevention and control (IPC) and environmental services (EVS) staff limits the role of the health care environment in disease transmission of this yeast.





Candida Auris Prevention Strategies  
General Directorate of Infection Prevention and Control

# Together We Can Fight & Defeat Candida auris



# References



Candida Auris Prevention Strategies  
General Directorate of Infection Prevention and Control



## Key documents for environmental cleaning

**Essential environmental standards in health**  
Edited by John Adams, Jamie Bartram, Y...

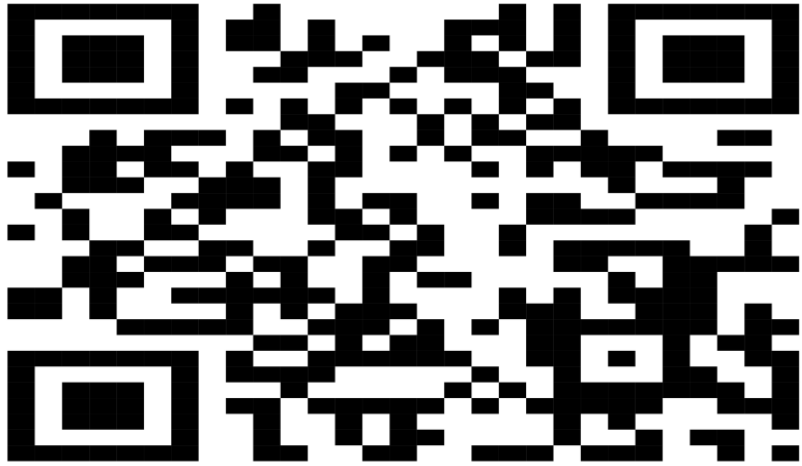
**وزارة الصحة  
Ministry of Health**  
الإدارة العامة لمكافحة عدوى المنشآت الصحية  
General Directorate of Infection Prevention and Control  
(GDIPC)  
Best Practices of Environmental Health for Prevention & Control of Infections in Healthcare Facilities Guidelines  
All Healthcare Providers Have a Role in Maintaining a Clean & Safe Environment  
August 2022  
Version 1.1

**Implementation manual to prevent and control the spread of carbapenem-resistant organisms at the national and health care facility level**  
Interim practical manual supporting implementation of the Guidelines for the prevention and control of carbapenem-resistant Enterobacteriaceae, *Acinetobacter baumannii* and *Pseudomonas aeruginosa* in health care facilities

**Best Practices for Environmental Cleaning in Healthcare Facilities: in Resource-Limited Settings**  
VERSION 2

**Guidelines for Environmental Infection Control in Health-Care Facilities**  
Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC)  
U.S. Department of Health and Human Services  
Centers for Disease Control and Prevention (CDC)  
Atlanta, GA 30329  
2003  
Updated: July 2019

**Centers for Disease Control and Prevention**  
National Center for Emerging and Zoonotic Infectious Diseases  
Division of Healthcare Quality Promotion



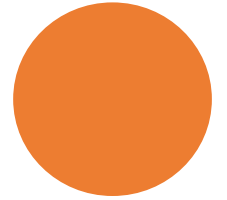
Visit GDIPC Website



[gdipc@moh.gov.sa](mailto:gdipc@moh.gov.sa)



Candida Auris Prevention Strategies  
General Directorate of Infection Prevention and Control



Contact Us

Thank  
you!



Candida Auris Prevention Strategies

General Directorate of Infection Prevention and Control in Healthcare Facilities