# Revisiting legacy IPC Cleaning: Does it still meet today's Infection Control Risks?

**Marija Juraja, Advanced Nurse Unit Manager, RN, GCNS Inf Ctrl, CICP-E, NWCH Project.**

**5th May 2025**

**Shaping the future of health**
**with world-class care and world-class research**

Government of South Australia
Health
Central Adelaide Local Health Network

# Acknowledgement of Country

We acknowledge that this land we meet, work, live and play on is the traditional lands of the Kaurna people, and we respect their spiritual relationship with this country.

We pay our respects to their leaders, past, present and emerging and acknowledge that their language, cultural and traditional beliefs held for over 60,000 years are still as important and relevant to the living Kaurna and all Aboriginal people today.

Artwork

**Wardli Purrutinthi**,"*Place to live or to be alive*"

Designed by accomplished Aboriginal South Australian artist Allan Sumner, a descendant of the Ngarrindjeri, Kaurna and Yankunytjatjara people.

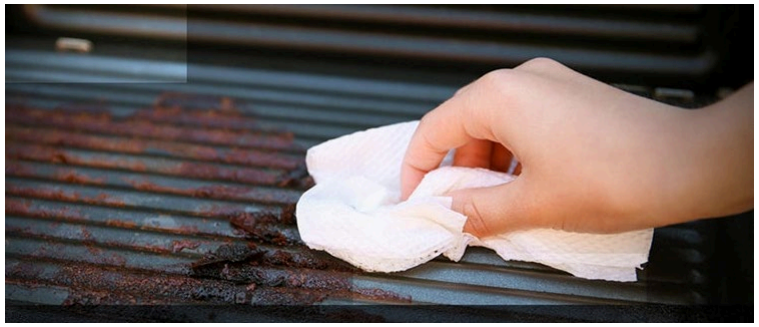
# Presentation Overview

- Governance framework for cleaning products and procedures in Australia
- A lookback at past, and present cleaning products in healthcare

- What about Multirestant pathogens survival and biofilm?
- Is a future of cleaning products in healthcare?

- Sustainability and the future?
- Other considerations?

# Quick reminder - Cleaning vs Disinfection



- **Cleaning:** Physical removal of soil and microbes

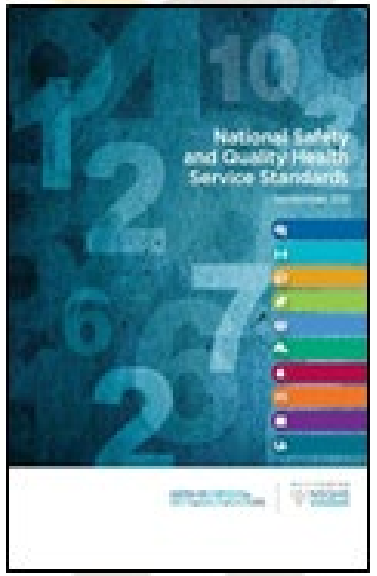
- **Disinfection:** Killing/inactivation of microbes

Dancer, S. Hospital cleaning: past, present and future.. Antimicrob Resist Infect Control. 2023 Aug 22;12:80.Accessed 28/04/2026: https://pmc.ncbi.nlm.nih.gov/articles/PMC10464435/

# Governance Framework in Australia

Hospital cleaning chemicals are not governed by a single standard, but by a framework:

- Australian Guidelines for the Prevention and Control of Infection in Healthcare (NHMRC / ACSQHC) – sets when and why disinfection is required
- Therapeutic Goods Administration (TGA) – regulates what products can legally claim disinfection activity
- TGO 104 (Therapeutic Goods Order 104) – minimum performance, labelling, and claims for disinfectants
- AS 5369:2023 – governs cleaning and chemical use for medical device reprocessing, not routine environmental cleaning [legislation.gov.au]



# Pre Scientific Era (Antiquity – 17th Century)

Common substances used:

- **Water, vinegar, wine** – used by Egyptians, Greeks, and Romans for surface cleaning and wound care
- **Sulphur fumes** – burned to “purify” spaces (recorded in classical literature)
- **Mercury compounds** – used historically as antiseptics despite toxicity
- **Ashes and fats (early soaps)** – rudimentary detergents in medieval settings

Smith, P. Watkins, K. Hewlett, A. Infection Control through the ages. AJIC. V40, 1, 35-42. Feb 2012. Accessed on line 28/04/2026 https://www.ajicjournal.org/article/S0196-6553(11)00184-2/abstract

Stowe, C. History and Evolution of Surface Disinfectants, 2018. Blog. Accessed on line 28/04/2026. https://pdihc.com/blog/history-and-evolution-of-surface-disinfectants/

# Early Scientific Era (Late17th- Mid- 19th Century)

**Chemicals and practices**

- **Vinegar** confirmed to kill some microorganisms
- **Chlorinated lime** used sporadically for odour and decay control
- Continued reliance on soaps, water, and airing of wards

# Florence Nightingale – Pioneer of "clean" hospitals

Florence launched the most significant campaigns to improve health care and prevent patients dying from causes which could have been prevented. She strove to learn from the past in order to save lives in the future. It was her goal to ensure that those who had suffered in Crimea had not suffered in vain. She changed forever the status of the nurse and the fate of the solider

- Due to overcrowding and malnutrition
  - Cleanliness
  - Fresh air and ventilation
  - Light and warmth
  - Quiet and rest
- Outcome:
  - Increased recovery time
  - Huge emphasis on cleaning

Dancer SJ. Mopping up hospital infection. J Hosp Infect. 1999;43(2):85–100. Accessed on line 28/04/2026.
https://www.sciencedirect.com/science/article/abs/pii/S0195670199906163
Nightingale F. Notes on nursing: what it is and what it is not, D. Appleton & Co, London, UK, 1860.

# Antiseptic Revolution (Mid- to Late- 19th Century)

## Dominant chemicals

- **Phenols (carbolic acid)** – surfaces, instruments, wounds
- **Alcohols** – skin antisepsis and surfaces


McDonnell, G. Russell, AD. Antiseptics and Disinfectants: Activity, Action, and Resistance. Clin Microbiol Rev. 1999 Jan;12(1):147–179. Accessed on line 28/04/2026. https://pmc.ncbi.nlm.nih.gov/articles/PMC88911/
Smith, P. Watkins, K. Hewlett, A. Infection Control through the ages. AJIC. V40, 1, 35-42. Feb 2012. Accessed on line 28/04/2026 https://www.ajicjournal.org/article/S0196-6553(11)00184-2/abstract
Stowe, C. History and Evolution of Surface Disinfectants, 2018. Blog. Accessed on line 28/04/2026. https://pdihc.com/blog/history-and-evolution-of-surface-disinfectants/

# Post World War II to 1970s: Infection Control Programs

**Chemicals widely used**

- **Phenolics** (declining by 1970s due to carcinogenic concerns)
- **Chlorine compounds** – broad-spectrum, sporicidal activity
- **Alcohols and iodophors** – skin and equipment

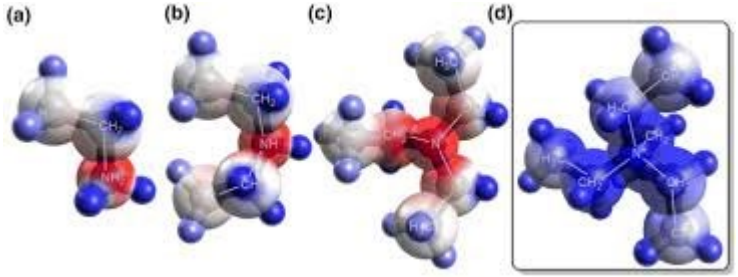
- Large reliance on nursing workforce to support the cleaning

# A snippet in nursing history cleaning time

- “Cleaning the bed tables and lockers of patients, scraping the polish from the dents in the linoleum where the bed wheels had been, cleaning bed frames with carbolic acid to rid them of bacteria, cleaning toilets, scrubbing bedpans until they shone and the steel sputum cups!”
- Disposable was not a word in our vocabulary and rubber gloves were only worn by theatre staff (sterile). Infection was almost unheard of however! Antibiotics were still fairly new.
- You cleaned with your hands and cloth, till it shone. The pan room was the best place and worst place to escape too!

Patricia’s story: 50 years of nursing **Nurse Uncut Editor** - November 24, 2016
Accessed on line 02/04/2019: https://www.nurseuncut.com.au/patricias-story-50-years-of-nursing/

# Early 20th Century: Industrial and Chemical Revolution




**Key chemicals introduced**

- **Quaternary ammonium compounds (QACs)** – discovered 1916, adopted from 1930s (e.g. benzalkonium chloride
- **Chlorine disinfectants (bleach/sodium hypochlorite)** – surface and spill disinfection
- **Formaldehyde** – fumigation and sterilisation (later reduced due to toxicity), considered also due to the nature of how it works to be sporicidal

# Late 20th Century (1980s- 2000s):

# Evidence- Driven Cleaning

**Common chemicals**

- **Sodium hypochlorite (bleach)** – especially for *C. difficile*
- **Quaternary Ammonium Compounds (QACs)** – routine environmental cleaning
- **Hydrogen peroxide** (liquid and vapour forms)
- **Steam**- especially for chemical sensitivity

**New Tools**

- Microfiber cloths
- Standardised disinfectant testing
- Early automation (fogging and vapour systems)
- Pre-moistened disinfectant wipes

Hans, Z *et al.* Environmental cleaning and disinfection of hospital rooms: A nationwide survey. AJIC. V49, 34-39. Jan 2021. Accessed on line 28/04/2026. https://www.ajicjournal.org/article/S0196-6553(20)30776-8/abstract
McDonnell, G. Russell, AD. Antiseptics and Disinfectants: Activity, Action, and Resistance. Clin Microbiol Rev. 1999 Jan;12(1):147–179. Accessed on line 28/04/2026. https://pmc.ncbi.nlm.nih.gov/articles/PMC88911/
Abreu, AC. Et Al. Current and emergent strategies for disinfection of hospital environments. Journal Antimicrobial Chemotherapy. V 68; 12; 2718-2732. Dec 2013. Accessed on line 28/04/2026. https://academic.oup.com/jac/article/68/12/2718/698356#12279994

# 21st Century (2000s–Present): Risk Based and Regulated Cleaning

**Current chemical landscape**

- **Chlorine agents** – outbreak control and isolation rooms
- **QACs and hydrogen peroxide combinations** – routine cleaning
- **Peracetic acid** – high-level disinfection and sterilisation
- **Low-toxicity and residue-free formulations** – staff and patient safety

**Emerging trends**

- **UV-C and hydrogen peroxide vapour systems**
- Environmentally sustainable and material-compatible chemistries
- Greater recognition of environmental cleaning teams or services (EVS) and clinical partners

Hans, Z *et al.* Environmental cleaning and disinfection of hospital rooms: A nationwide survey. AJIC. V49, 34-39. Jan 2021. Accessed on line 28/04/2026. https://www.ajicjournal.org/article/S0196-6553(20)30776-8/abstract

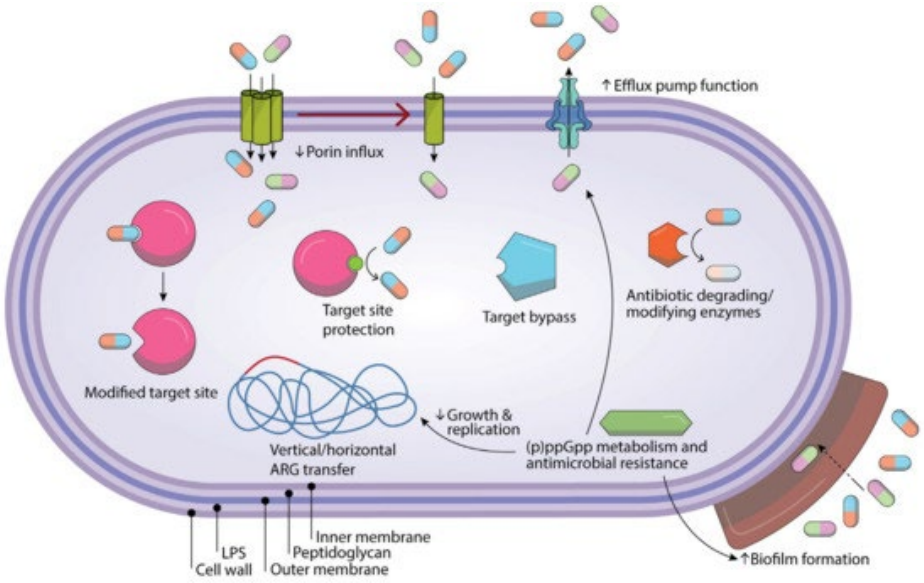
# Recap

- **Ancient** → Ritual & visible cleaning
- **19th century** → Antiseptics and germ theory
- **20th century** → Industrial chemicals and infection control programs
- **21st century** → Risk-based, evidence-driven, regulated systems

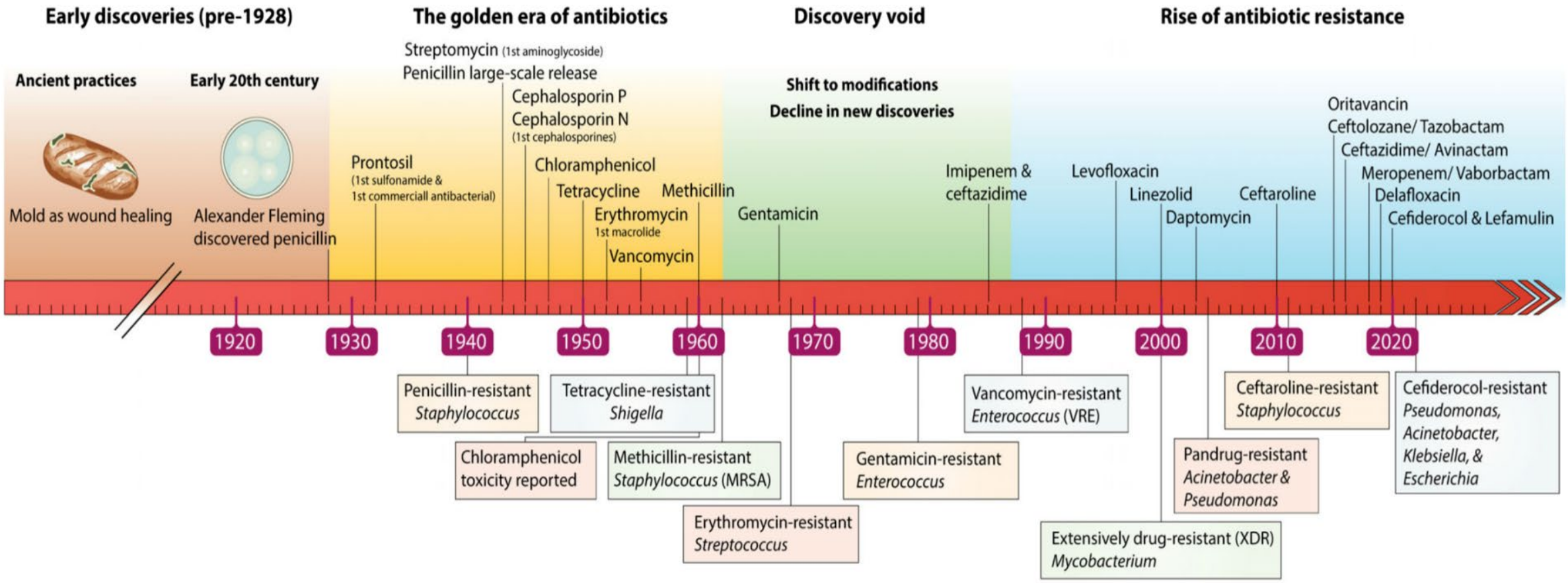
# So, what disposable wipes did we start with?

- PDI Healthcare (Sani-Cloth)
  - 1988: Sani Cloth Wipes
  - 1991: Super Sani Cloth
  - 2003: Sani-Hands
- Whiteley:
  - 2010: V Wipes (re-listed as Class IIB in Feb 2021 with claims)
- GAMA Healthcare (Clinell)
  - 2006: Universal range
- Chlorox Healthcare
  - 2010- launch of healthcare- grade formulations including bleach wipes
- Tuffie Wipes
  - 2010s – Detergent and 70% IPA wipes, including Tuffie Wipes
  - 2020- Tuffie 5 variant Universal Sanitising Wipe re registered (claims)
- Kimberley-Clark (O &M Halyard)
  - 2006- 70 % Isowipe


# So, what about the pathogens out there?



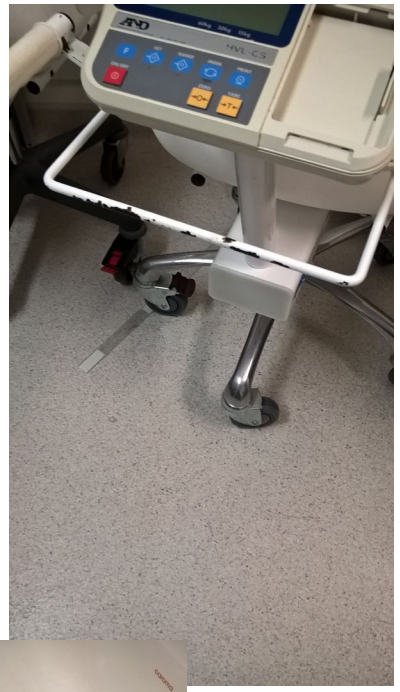
# Timeline of Antimicrobial Multiresistant Organisms

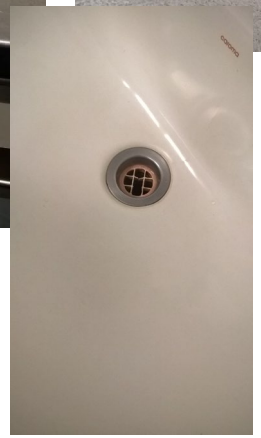



Tahmasebi, H. *et al.* From Cure to Crisis: Understanding the Evolution of Antibiotic-Resistant Bacteria in Human Microbiota. Biomolecules, 15 (1), 93, 2025. Accessed on line 28/04/2026. https://www.mdpi.com/2218-273X/15/1/93

# Factors Influencing Survival

- Surface type- erosion, corrosion, traps, connections = biofilm opportunity
- Humidity and temperature = biofilm opportunity
- Presence of organic material = biofilm opportunity





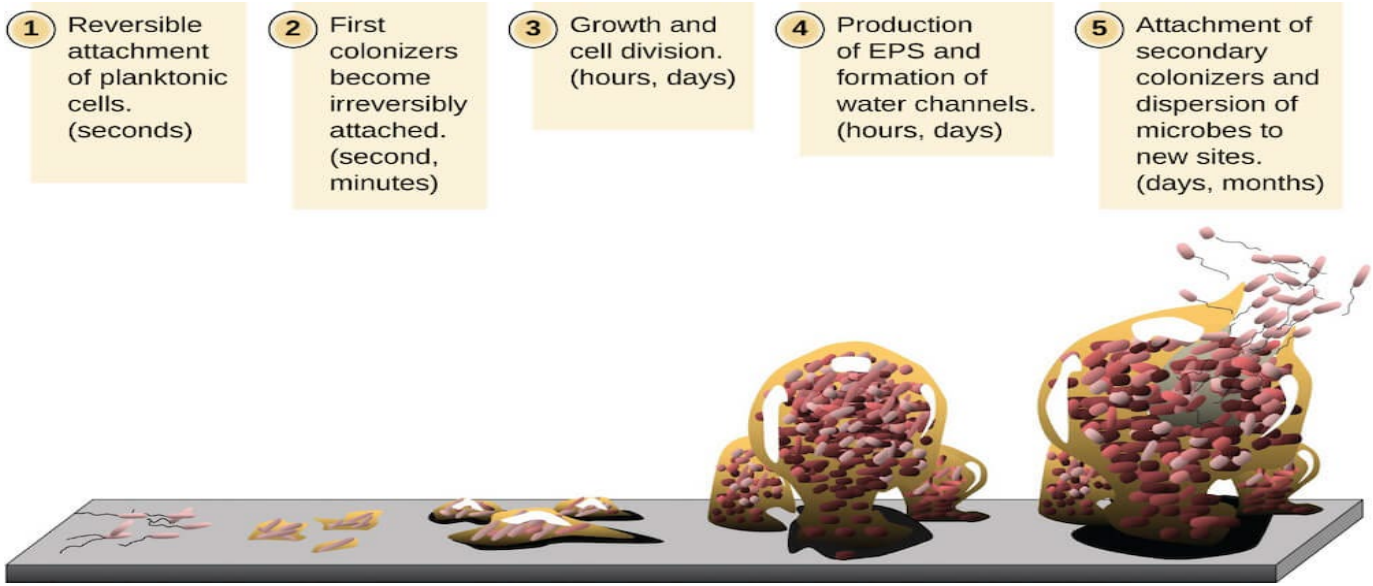
# Pathogen Surface Survival

| Organism | Survival time |
|---|---|
| *Clostridium difficile* (spores) | 5 months |
| *Acinetobacter* spp | 3 days to 5 months |
| *Enterococcus* spp including vancomycin-resistant *Enterococci* | 5 days to 4 years (Wagenvoort et al, 2011) |
| *Pseudomonas aeruginosa* | 6 hours to 16 months |
| *Klebsiella* spp | 2 hours to > 30 months |
| *Staphylococcus aureus*, including meticillin-resistant *Staphylococcus aureus* | 7 days to 7 months |
| Norovirus (and feline calicivirus) | 8 hours to > 2 weeks |
| Severe acute respiratory syndrome Coronavirus (SARS-CoV) | 72 hours to >28 days |
| Influenza | Hours to several days |

Source: Adapted from Kramer et al (2006)

# Biofilms

- Bacterial communities encased in a protective matrix
- Resistant to disinfectants
- Common in moist environments (e.g., drains)and can be found on many dry surfaces too




Prinzi, A. Rhode, R.E. The Role of Bacterial Biofilms in Antimicrobial Resistance. American Society of Microbiology. March 2023. Accessed on line 26/04/2026. https://asm.org/articles/2023/march/the-role-of-bacterial-biofilms-in-antimicrobial-re

# Future?

## Hypochlorous Acid (HOCl) Cleaning

Stabilised hypochlorous acid solutions used as surface disinfectants (sprays or wipes)

Electrolysed water systems that generate HOCl on-site for cleaning hospital surfaces


## Used for:

- Environmental surface disinfection
- Non-critical equipment cleaning


## Advantages:

- Broad-spectrum antimicrobial activity
- Low toxicity and residue
- Safer for staff and patients compared to harsher chemicals

## Limitations:

- Depending on the product used and how its delivered, it may impact on electrical circuitry

# Future?


## Ultraviolet Light (UV-C)Cleaning

UVC light (200–280 nm) is a highly effective, chemical-free disinfection method that destroys 99.9% of bacteria, viruses, and moulds by damaging their DNA/RNA.

## Could be used for:

- Discharge cleaning of rooms
- High-risk areas (ICU, isolation rooms, Operating Theatres)
- Outbreaks

*Note: Manual detergent clean still required prior to use*

## Advantages:

- No chemical residue
- Effective against a wide range of pathogens (including spores with correct dose)

## Limitations:

- Shadows and may not penetrate all areas of the room and equipment
- Safety precautions due to light exposure

# Future?

## Hydrogen Peroxide Vapour Cleaning

It operates by oxidizing microbial cell components, leaving behind only water and oxygen, making it eco-friendly and safe for sensitive environments.

Involves 4 stages – dehumidification, conditioning (injecting vapour), disinfection and aeration (removing vapour)

*Note: Manual detergent clean still required prior to use*

## Advantages:

- It is highly effective at reaching hard-to-access areas and provides broad-spectrum disinfection without leaving toxic residues.

## Limitations:

- Safe on surfaces but not to humans, so restricted access whilst in use.

# Future?

**Peracetic Acid**

- Effective on both clean and soiled surfaces
- Supplied as pods or wipes
- Effective against all pathogens including spores




**Chlorine dioxide**

- Can be supplied in tablet, foam or liquid form
- Effective against all pathogens including spores



Maillard, J.-Y. and Centeleghe, I. (2023). How biofilm changes our understanding of cleaning and disinfection. Antimicrobial Resistance and Infection Control, [online] 12(1), p.95. Accessed on line 26/04/2026. https://www.researchgate.net/publication/373753304_How_biofilm_changes_our_understanding_of_cleaning_and_disinfection

# Sustainability & future cleaning

- Our cleaning products are inevitably degrading our equipment
- Our MROs are significantly on the rise, especially outbreaks and contact tracing
- **Product consideration:**
  - Solutions that won't destroy material –metal, plastic, timber, electrical
  - Non-toxic and made from Australian products
  - Compostable
  - Decreases our carbon footprint
- **Healthcare facility management consideration:**
  - All discharge cleans using a:
    - cleaning and disinfectant solution
    - fogging or UVC
  - Investing in training for cleaners
  - Investing in more ward supports for cleaning reusable shared equipment

# Any other considerations?

- The cleaner, the environmental technician (EV)
  - Majority trained on the job
  - Undervalued
  - No career framework, structure
  - Lowest paid
  - Language and comprehension barriers
  - Risk of chemical overexposure, burns, infection exposures and falls

# In Closing……

**Modernising Hospital Cleaning**

- Traditional tools (mops, buckets, cloths, brooms) have remained largely unchanged since the time of Florence Nightingale
- Current methods rely heavily on manual cleaning practices
- There is a clear need to modernise cleaning approaches for the 21st century and maybe a shift towards a higher level of cleaning solution, moving away from detergent.

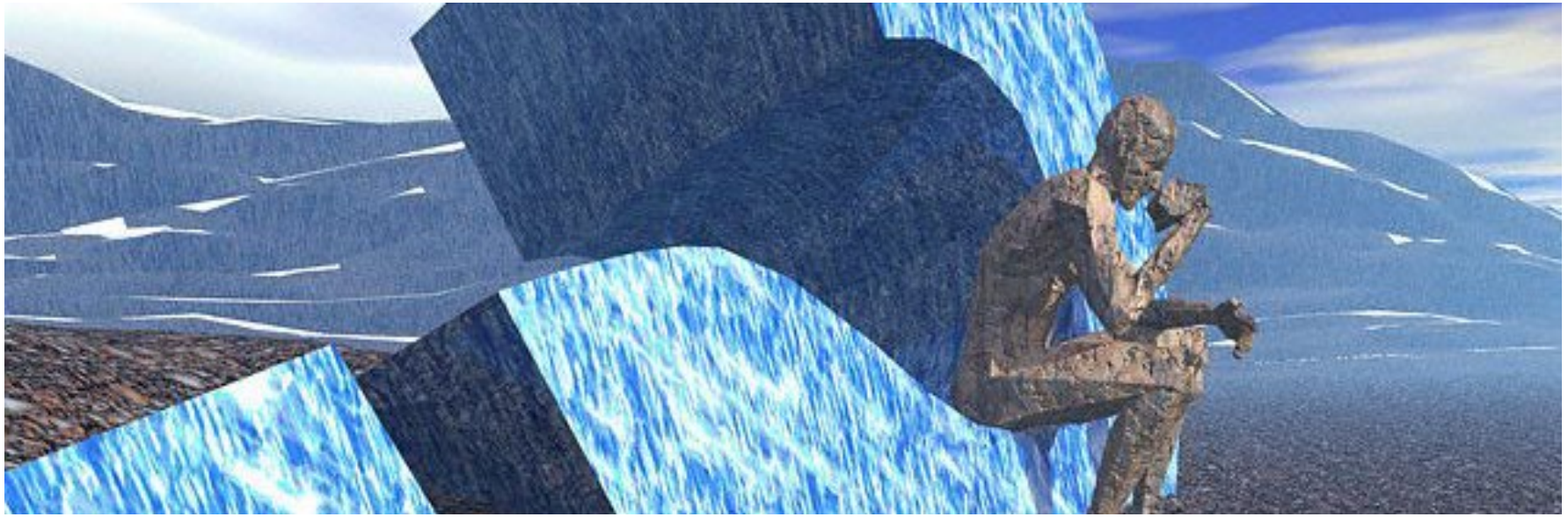
## Opportunities for Improvement

- Emerging technologies offer enhanced cleaning effectiveness
- Potential to significantly reduce environmental bioburden
- Can improve consistency and standardisation of cleaning

## Supporting the Workforce

- New systems can reduce physical workload for cleaning staff
- Enhance safety and efficiency
- Support better infection prevention outcomes

# Questions & Discussion



# Shaping the future of health with world-class care and world-class research

Government of South Australia

Health
Central Adelaide
Local Health Network