



# Patient Equipment and Surface Disinfection

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ANIPIO Oct 2019



icon made by Smashcons from pexels



# Disclosures

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- Associate Clinical Director; Gama Healthcare, Senior Associate Lecturer; Robert Gordon University and Scientific Programme Committee Member; Infection Prevention Society Scientific
- I am a **nurse** with personal experience of:
  - Ever-changing guidance on how to clean
  - Trying to clean equipment that can't be cleaned
  - Seeing equipment being destroyed through cleaning
  - Equipment being purchased and never being asked if it can be cleaned or shown how to clean it
  - Reading varying levels of manufacturers cleaning instructions (**or** chasing manufacturers for cleaning instructions)
- Sadly I don't speak Italian

# Aim of the session

- To be aware of some of the current challenges in Infection Prevention and Control
- To understand the importance of cleaning and disinfection
- To appreciate the role the environment plays in transmission of infection
- To understand the importance of cleaning & disinfection to both protect equipment and surfaces and reduce Healthcare Associated Infections
- To be aware of the questions to ask when selecting a disinfecting product so you make an informed choice

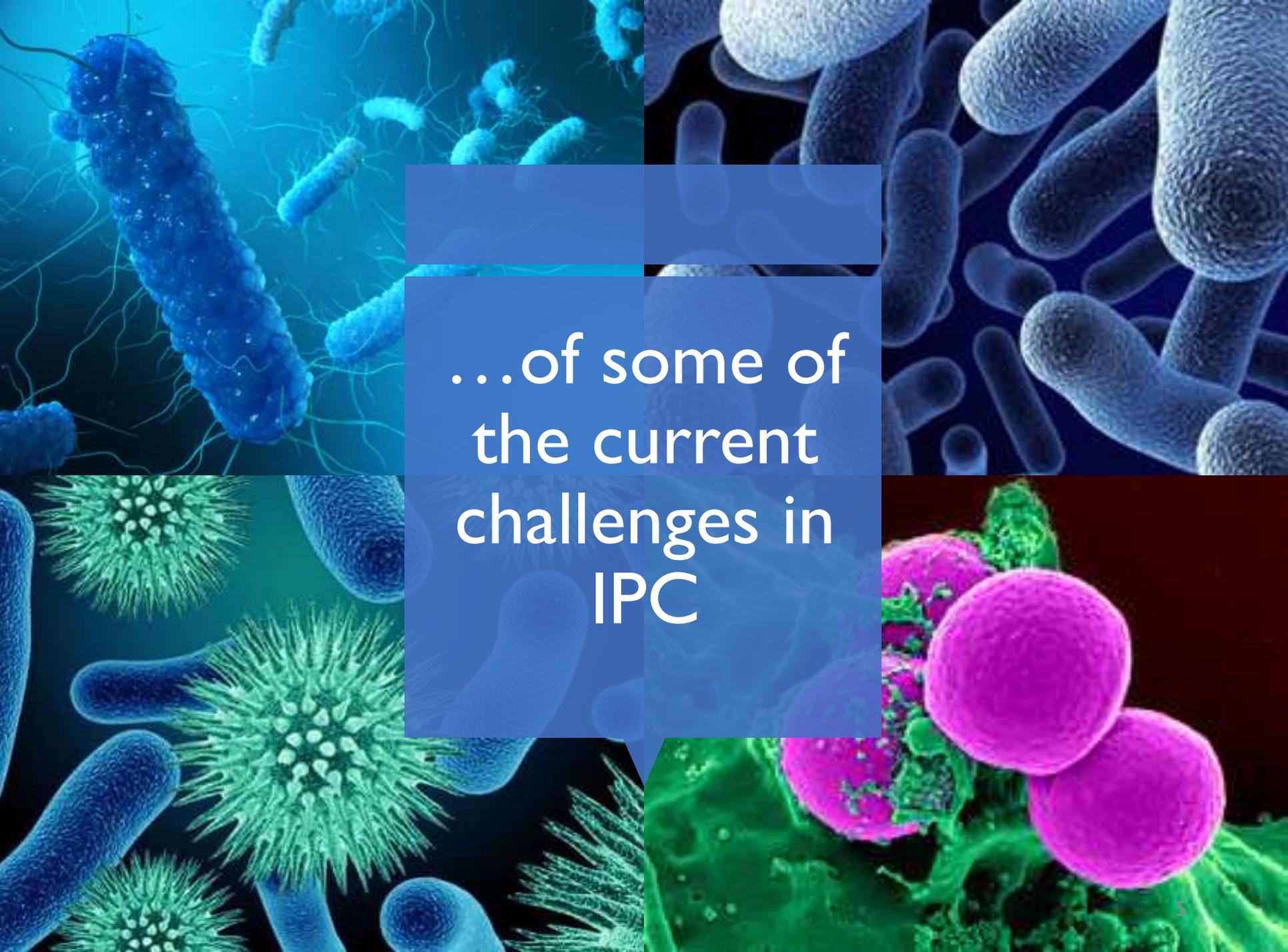


# Why is a clean environment so important?

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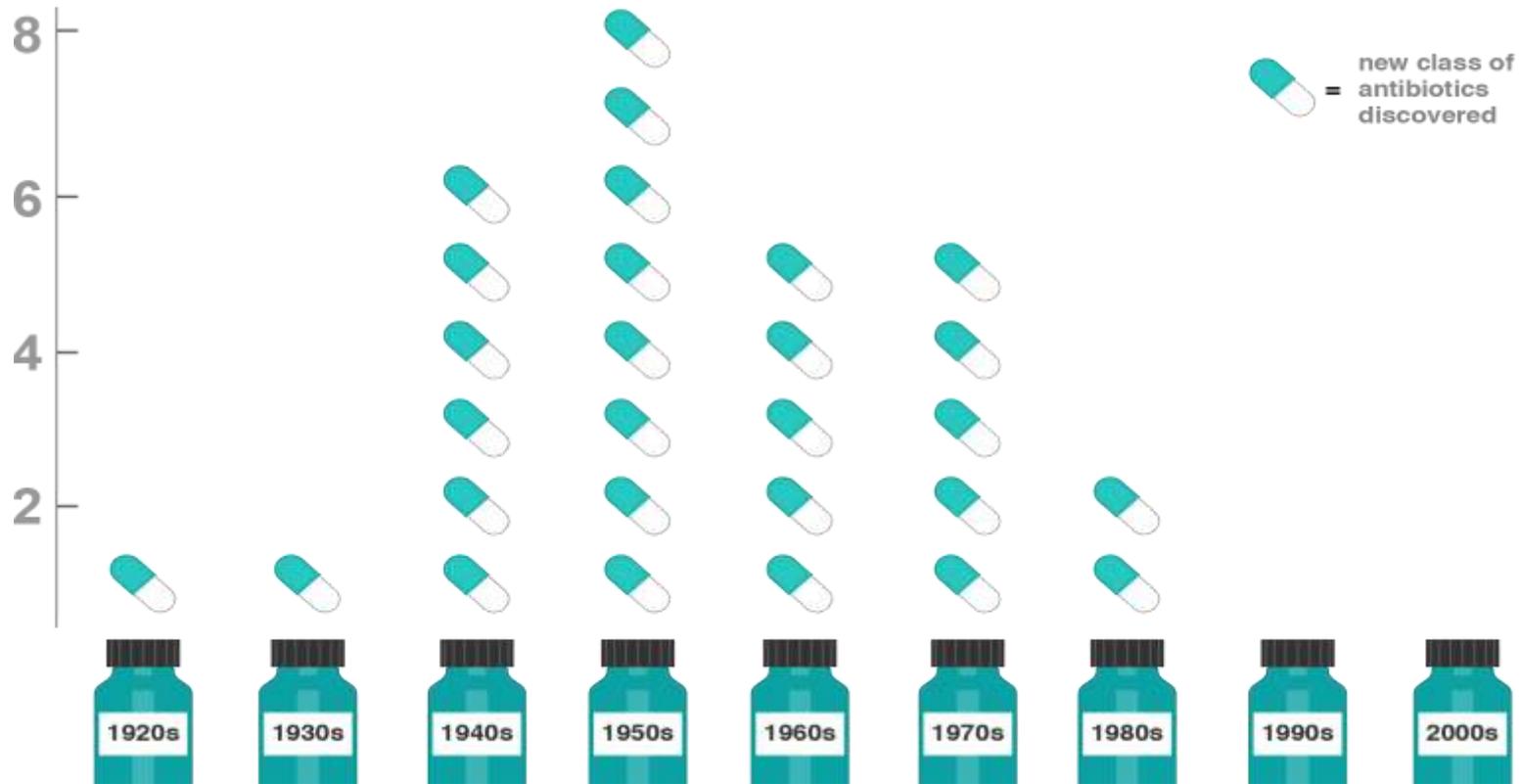
- First and subsequent impression of standard of care
- Engenders confidence in patients, the public and staff
- Facilitates delivery of an efficient service
- Plays an important role in **preventing the spread of infection** and enhancing the safety of your patients
- **AND ALSO BECAUSE...**



A composite image showing various types of microorganisms. The top left shows blue, rod-shaped bacteria with flagella. The top right shows larger, grey, rod-shaped bacteria. The bottom left shows green, spiky spherical viruses and blue rod-shaped bacteria. The bottom right shows large, pink, spherical bacteria. A central blue speech bubble contains the text.

...of some of  
the current  
challenges in  
IPC

# Our antibiotics are running out



Data source: Adapted from Silver, L.L. Challenges of Antibacterial Discovery. In *Clinical Microbiology Reviews*, 2011, 24:71-109.

# Antimicrobial resistance is a global threat

*“Antimicrobial resistance poses a catastrophic threat. If we don't act now, any one of us could go into hospital in 20 years for minor surgery and die because of an ordinary infection that can't be treated by antibiotics. And routine operations like hip replacements or organ transplants could be deadly because of the risk of infection. That's why governments and organisations across the world, including the World Health Organization and G8, need to take this seriously. This is not just about government action. We need to encourage more innovation in the development of antibiotics – over the past two decades there has been a discovery void around antibiotics, meaning diseases have evolved faster than the drugs to treat them.*

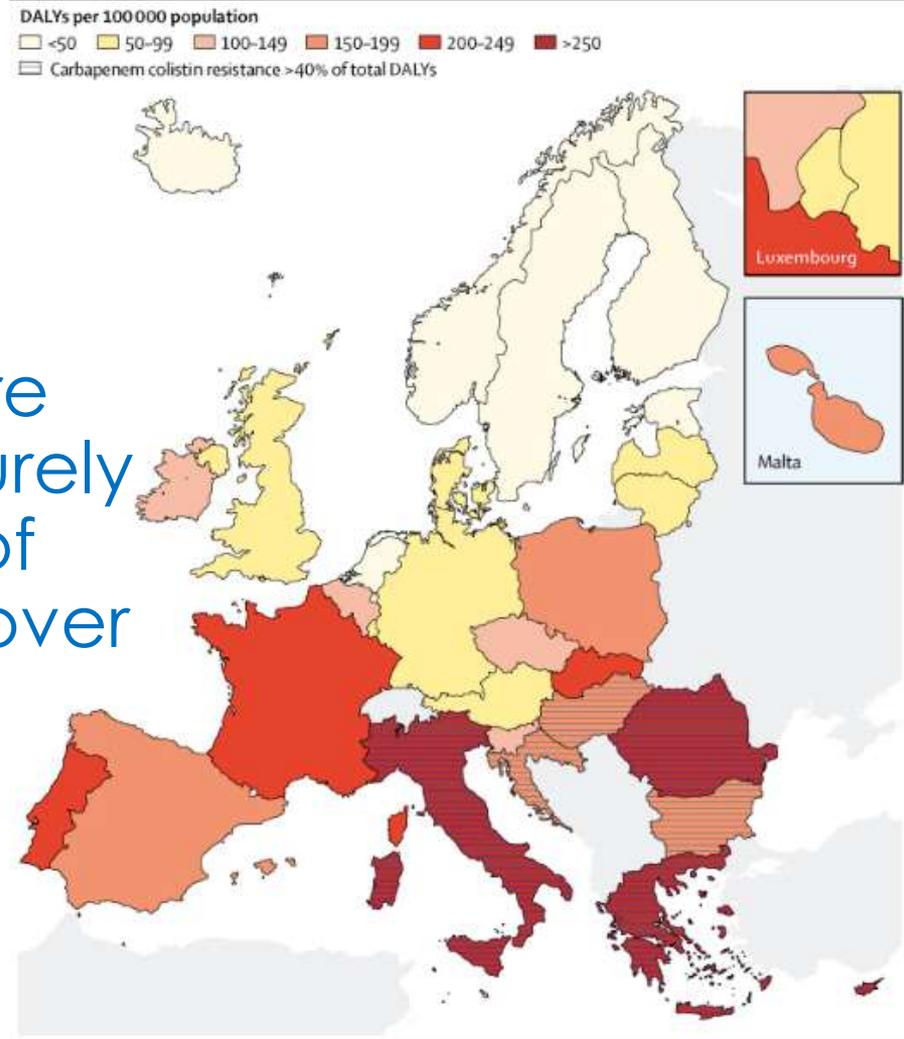
Dame Sally Davies, Chief medical officer to the U.K. Government

The harsh reality is that infections are increasingly developing that cannot be treated. The rapid spread of multi-drug resistant (MDR) bacteria means that we could be close to reaching a point where we may not be able to prevent or treat everyday infections or disease's.

*UK 5 Year Antimicrobial Resistance Strategy 2013 to 2018*

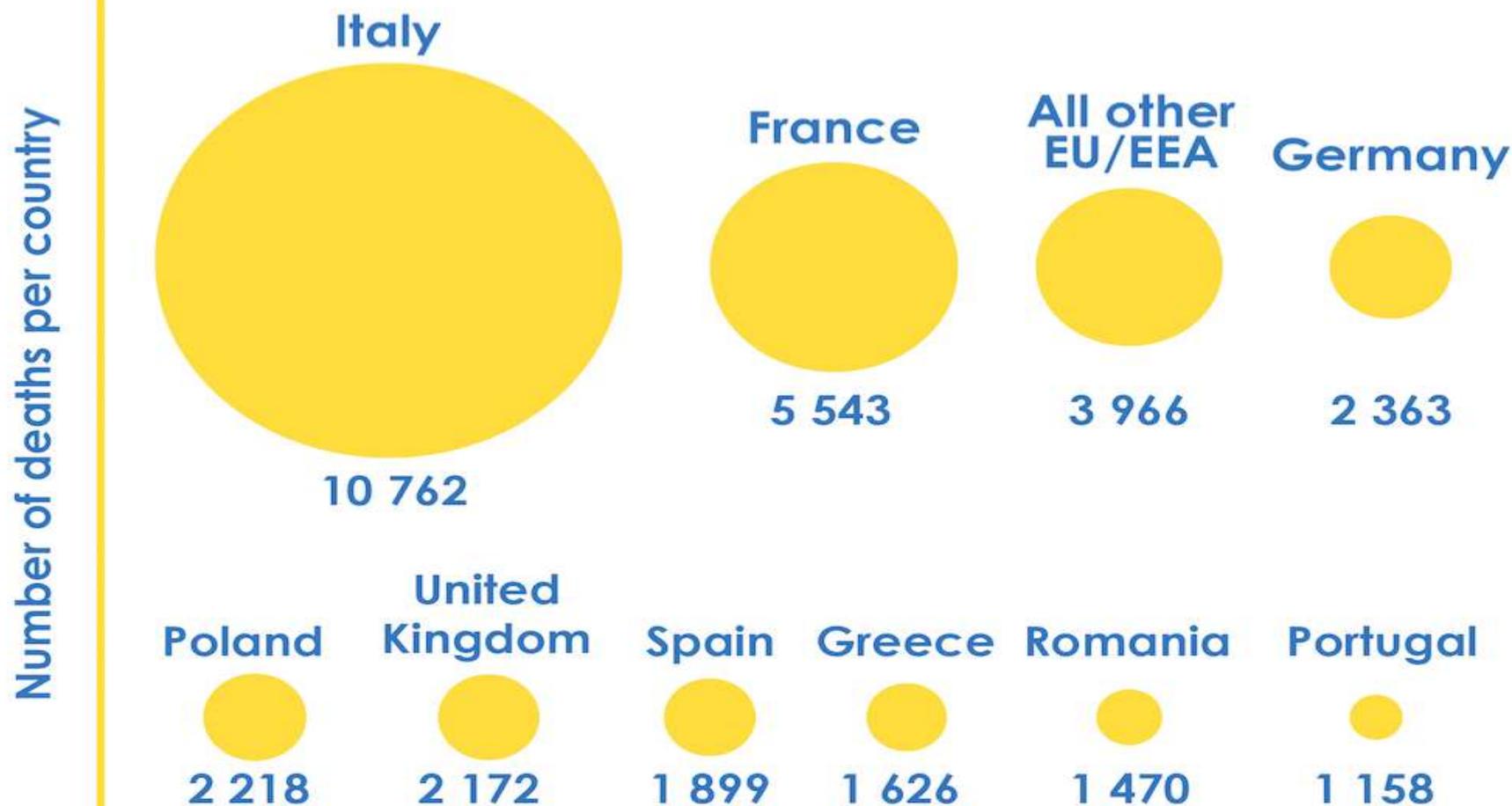
# In fact, it's estimated that.....

**'300 million** people are expected to die prematurely worldwide as a result of antimicrobial resistance over the next 35 years'



Estimates of the burden of infections with selected antibiotic-resistant bacteria of public health importance in DALYs per 100 000 population, EU and European Economic Area, 2015

# Estimated burden of infections with antibiotic-resistant bacteria by country, EU/EEA 2015



# Dry surface biofilms in healthcare settings

Ledwoch et al (2018) J Hosp Infect 100:3:e47-e56

- Dry surface biofilms are **widespread** on surfaces in hospitals
- They colonize **various materials** from textile (chair), hard surfaces including plastic (PVC, PP), lacquered wood, wood, metal (stainless steel) to many others
- They contribute to pathogens survival and HAIs
- They **cannot be detected** by swabbing or contact plates
- They **regrow within one day** when provided with nutrients

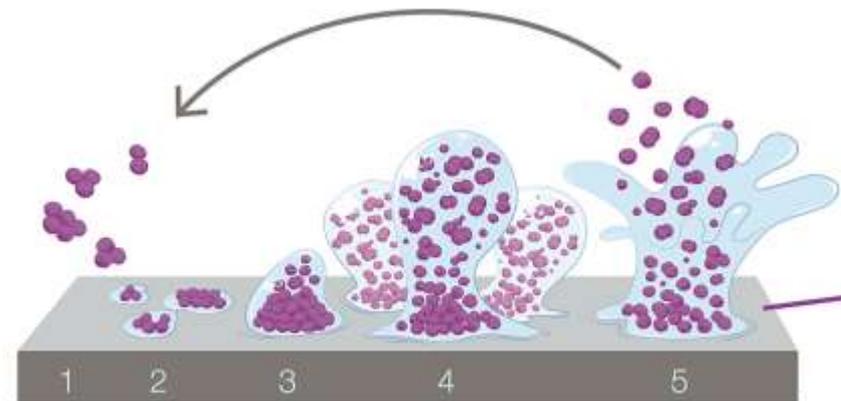
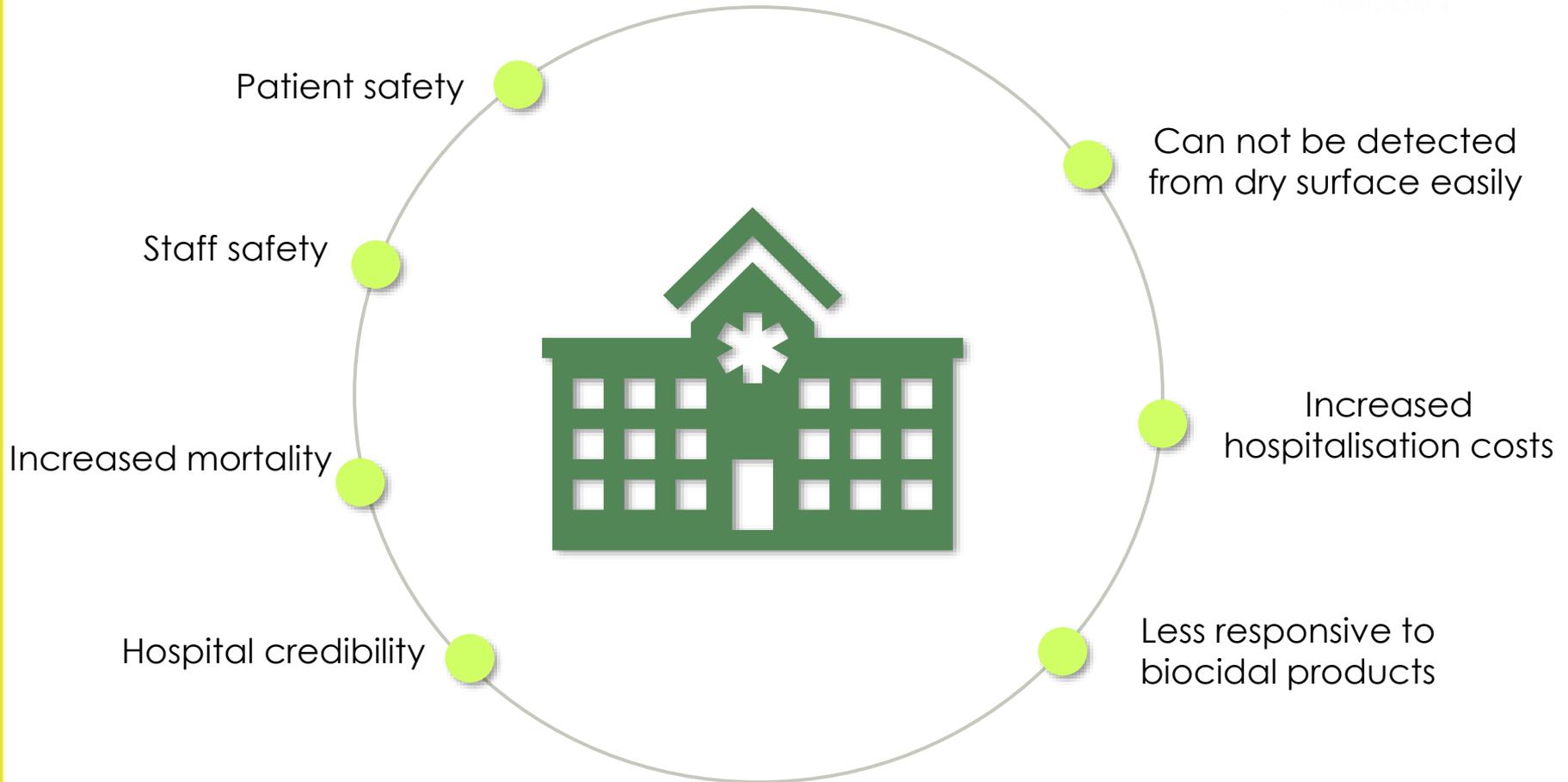


Figure 1 - Biofilm formation. 1: Initial attachment of cells to the surface. 2: Production of extracellular matrix. 3: Early biofilm architecture. 4: Maturation of biofilm architecture. 5: Dispersal of planktonic cells from mature biofilm<sup>16</sup>.

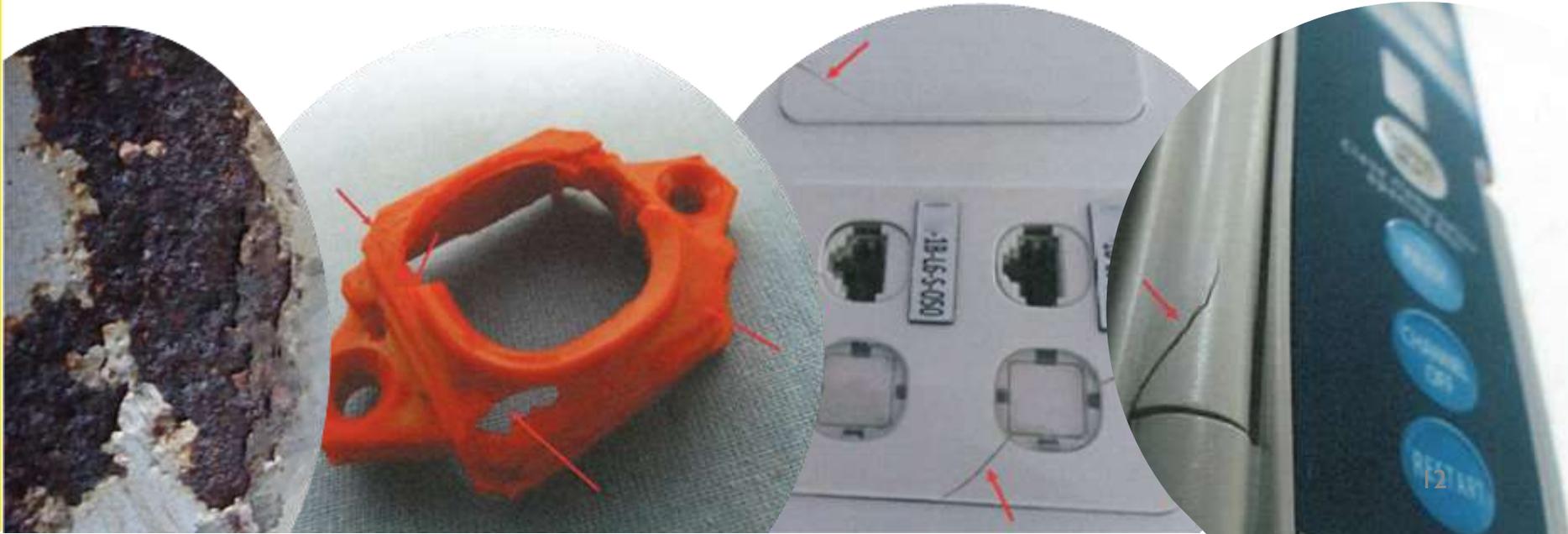
# Why are dry surface biofilms a problem?



# Surface integrity issues

- Repeated contact with a wide variety of detergent and disinfection chemicals may contribute to deterioration of plastics/polymers, and can have detrimental effects on component and surface performance.
- Due to rigorous cleaning of items that were not designed for exposure to disinfectants
- We need compatibility between manufacturers of equipment and disinfection products – it takes two to tango!

Cracks, broken, damage surfaces and rust cannot be cleaned or disinfected effectively!





Robust cleaning and  
disinfection of  
patient equipment  
and surfaces is  
needed to help  
tackle these  
challenges in IPC!

# Definitions of Cleaning and Disinfection

## **CLEANING**

process which removes dust, soil, large numbers of microorganisms (germs) and the organic matter that protects them e.g. saliva, blood.

## **DISINFECTION**

process that reduces the number of microorganisms to a level at which they do not present a risk to patients or clients.

## **HIGH LEVEL DISINFECTION**

process designed to kill bacteria, viruses and spores, however, it is only sporicidal under certain conditions



# Why clean and disinfect?

Macduff, C et al Arts & Health 6 (2) 2014

We can't visualise the invisible!

Surfaces will have become contaminated during patient care so must be thoroughly cleaned/disinfected immediately following each patient treatment.

To reduce the likelihood of the development of biofilms.

Strict and systematic cleaning/disinfecting will reduce the risk of infection to patients and staff.



# Environmental survival of key pathogens on hospital surfaces

Pathogen	Survival Time
<i>S. aureus</i> (including MRSA)	>12 months
<i>Enterococcus</i> spp. (including VRE)	>48 months
<i>Acinetobacter</i> spp	3 days to 11 months
<i>Clostridium difficile</i> (spore form)	>5 months
Norovirus	8 hours to 28 days (Temp dependent)
<i>Pseudomonas aeruginosa</i>	6 hours to 16 months
<i>Klebsiella</i> spp.	>30 months

# Choice of surface cleaning/ disinfectant product

Choice will depend on intended use e.g. if you want rid of spores use sporicidal agent

Manufacturers instructions need to be followed

Delivery method: Spray vs Wipe

Wipes common in the NHS

You can place them at point of use

No preparation needed

Reduce the reliance on getting correct disinfectant dilution

Low risk of exposure

# Why did the UK change to wipes?

- Over recent years, wipes have become firmly established in clinical areas in the UK and other countries
  - Collecting mop, bucket, cloths and cleaning agent took a lot of time **plus** time to clean them and put them away again
  - Too many products, complicated to know what to use for what purpose
  - Cloths/paper towels often left marks or streaks across surfaces.
  - Did not know how wet a cloth/paper towel should be used to ensure good coverage and contact time
  - Diluting chlorine tablets/powder. Often got the wrong concentration.
  - Did not like the smell of the cleaning products
  - Concerns around aerosols from spray bottles leading to asthma and hypersensitivity reactions



# Why are wipes so popular?

- Advantages relate to human factors
  - Convenient – can be placed at point of care
    - Which is what we do with alcohol hand rub
  - Premixed and premeasured dose of agents
  - Testing has been done on the wipe itself – you know what you are using is working as per the test result.
  - Ready to use
  - Increases staff compliance meaning staff will clean more often as easy to do – one step process.
  - Using a wipe with detergent and disinfectant properties means you can clean and disinfect in one step as opposed to a two step procedure.
  - Easy to train staff on their use
  - Less waste
  - Cost effective



# Are all wipes the same?

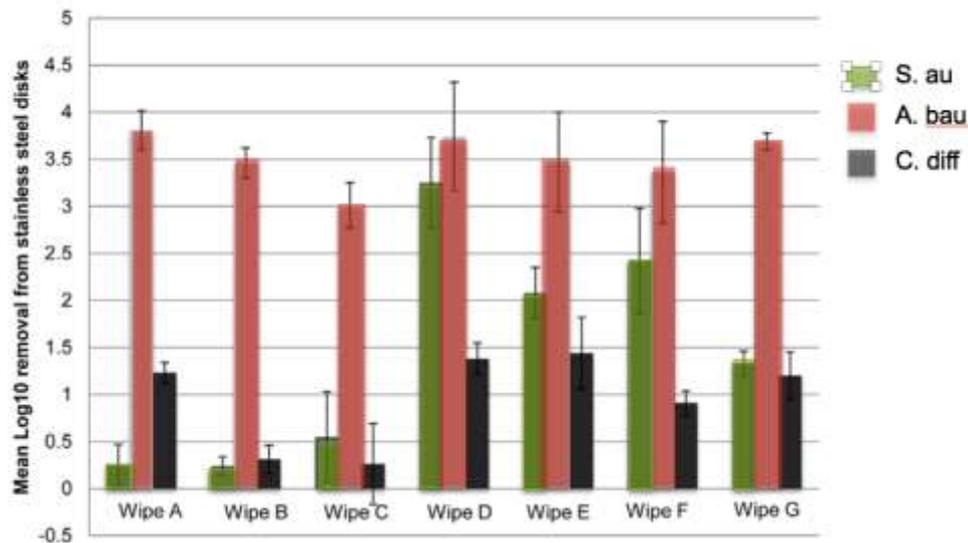
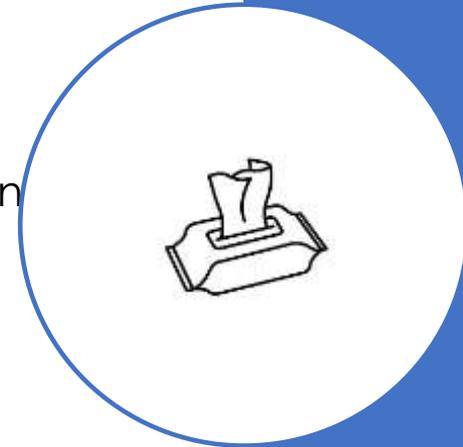
- **NO!**
- Most think that all wipes are similar
- You have different types of wipe – detergent, disinfectant, combined detergent/disinfectant, sporicidal...
- In reality they have various physical variables do make a difference to wipe properties and selection
  - Wet strength
  - Absorbency
  - Weight (grams)
  - Size
  - And....price



# A wipe is a wipe is a wipe

Ramm et al, (2015) AJIC 43(7)

- Study comparing seven detergent wipes composed of non-ionic surfactants, preservatives, and perfume
- Significant differences in performance
  - Transfer and removal
  - Performance of wipes may be influenced by
    - Type of material
    - Quality of the raw materials and non-woven
    - Liquid to wipe ratio
    - Product packaging



# What questions should you ask?

What is the active ingredient / chemical/s of the disinfectant?

Does the product clean before disinfecting?

Evidence of testing - accreditation:  
Which laboratory was the product tested in? UKAS?

What microorganisms its affective against?

Log reduction rates of specific organisms

Does it state the contact times of specific organisms.

In use testing or just laboratory testing?

Tested in 'Clean' or 'Dirty' conditions?

What exactly was tested?

Does it state clearly how to use the product?

What is the shelf-life of the product?

I suspect we'll get more questions around plastics and sustainability...



# Importance of contact times



Contact time is the time needed for a disinfectant to be in contact with a microorganism to kill it.

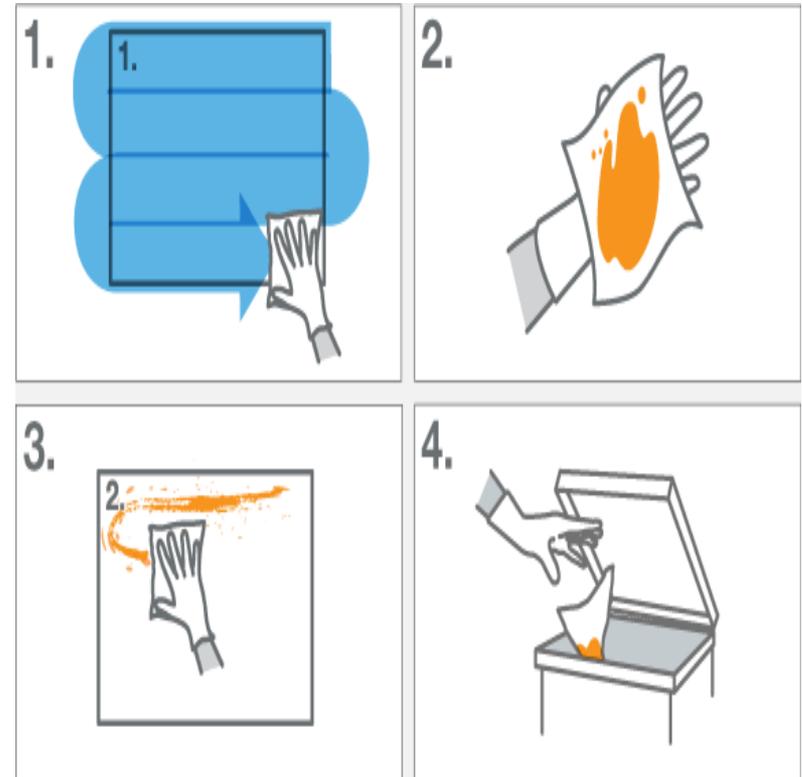
If a disinfectant claims to kill 99.9% of clostridium difficile in 1 minute, in order for it to kill the bacteria the surface needs to be visibly wet for at least 1 minute, therefore the contact time is 1 minute.

It is important when using disinfectant wipes to leave the surface to air dry naturally. this allows maximum contact time for the disinfectant to kill the most pathogens. never dry the surface.

Wet wipes are preloaded with the correct concentration of disinfectant needed to achieve the claims on the pack.

# How should I use a wipe?

- It is important not to use the same wipe for different surfaces or different pieces of equipment. Once you finish cleaning one item or area, discard the wipe and use a new one.
- Microorganisms are retained in the wipe material after cleaning and you can transfer microorganisms from one surface to another.
- Always dispose of a wipe after it becomes dry or soiled or in between the cleaning of two surfaces to avoid transferring microorganisms from one area to the next. Never turn the wipe over or rewet.



**One wipe, One surface, One direction**

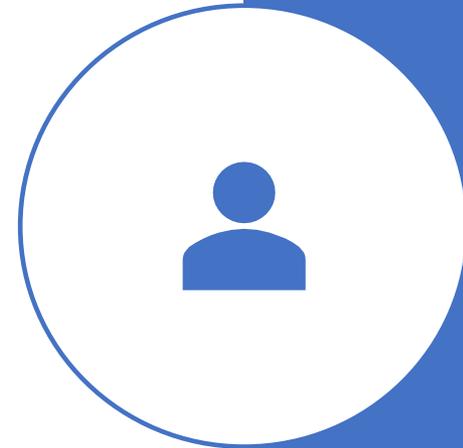
# What does the evidence say?



# What do staff know about cleaning?

Bowe et al, AJIC (2018) 47(2) 220-1

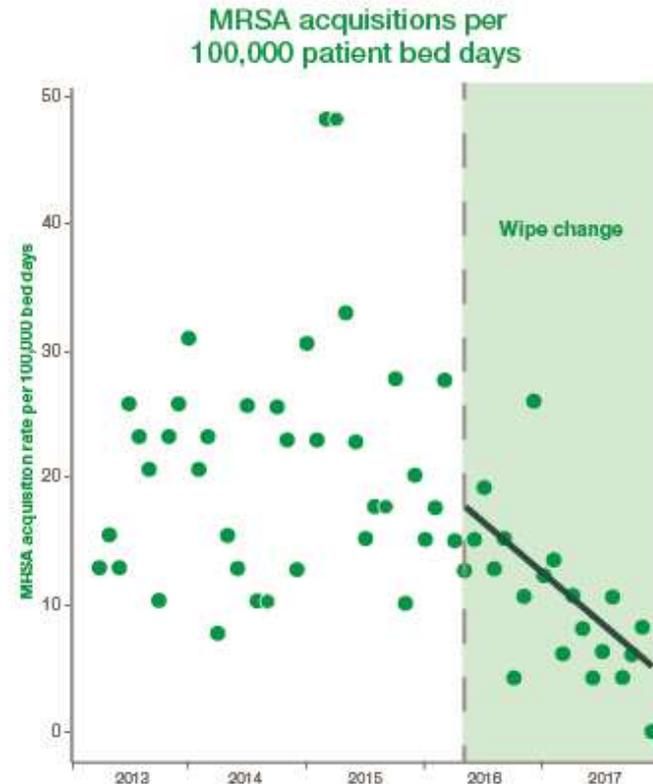
- Study looking at staff knowledge. 146 responses – 71 ICU staff 75 staff non-ICU
- Anonymous questionnaire found
  - Over 50% of ITU staff did not know who is responsible for cleaning “non-critical” items (NCI) - items that come into contact with intact skin only
  - only 6% of respondents could correctly identify an NCI
- 27% of staff did not know the difference between cleaning, disinfecting and sterilising
  - outside ICU, 44% did not know
- 47% did not know how to determine shelf life for disinfectants



# Change in practice and behaviour

Garvey et al *Antimicrobial Resistance & Infection Control* 7(1) 2018

- From April 2013 to April 2016 ward areas cleaned by nursing staff involved using a two-wipe system. Firstly, a detergent wipe (mixture of detergents and surfactants) was used which was followed by a disinfection step using an alcohol wipe (50-80% propan-2-ol)
- May 2016 Queen Elizabeth Hospital Birmingham (1400 beds) changed to a one wipe system
  - Retrospective review of data to detect significant changes in the monthly numbers of MRSA acquisitions per 100,000 bed days from April 2013 – December 2017 across QEHB



# Change in practice and behaviour results

Garvey et al *Antimicrobial Resistance & Infection Control* 7(1) 2018

- MRSA acquisitions across UHB decreased from 20.7 to 9.4 per 100,000 patient bed days ( $p < 0.005$ )
- Average hospital acquisition rate of MRSA/100,000 patient bed days reduced consistently by 6.3% per month after the introduction of the wipe
- Data suggest the use of a one wipe regime is associated with reducing the incidence of MRSA across the whole hospital
- This shows a change in practice to something which is simpler and 'time-saving' can have a result!



**We saw a 55% reduction in MRSA acquisitions.**

Mark Garvey, Consultant Clinical Specialist, University Hospitals Birmingham

# Residual activity in a Clinical Setting

Casini, B., et al., *Int J Environ Res Public Health*, 2018. 15(10)

- Evaluated effectiveness and residual disinfectant activity of disposable quaternary ammonium compounds-based pre-impregnated wipes (Modified Operative Protocol, MOP) in reducing environmental bioburden versus a two-step Standard Operative Protocol, alcohol-based cleaning and chlorine-based disinfection (SOP) in a 12-bed Intensive Care Unit
- Sampling performed before each procedure and at 0.5, 2.5, 4.5 and 6.5 hr for Total Viable Count (TVC)
- Hygiene failure defined as TVC >50 CFU/24 cm<sup>2</sup>



# Results

- The difference between TVC before procedure and after was significant only for MOP ( $p < 0.05$ )
  - 7.4% of sites failed versus 18.9% after SOP ( $p < 0.05$ ), a 61% reduction
  - On infusion pumps a higher number of failures was observed after the SOP (15.9%) compared with the MOP (8.9%), a 44% reduction
  - % decrease in TVC after SOP was 38%, after MOP was 71%, an 89% improvement
  - Maintained for up to 6.5 h, showing a long residual disinfection activity
- Use of disposable wipes by in-house auxiliary nurses on near-patient inanimate surfaces may represent a more effective alternative to the two-step procedures performed by outsourced cleaning services in reducing the microbial contamination



# Efficacy of Peracetic Acid Wipes compared with Chlorine

Siani, H., R. Wesgate and J.Y. Maillard (2018) [Am J Infect Control](#) 46(10): 1180-1187

Double-crossover study: 2 wards, 1,000-bed teaching hospital over 29 weeks

- 5-week baseline: combination of detergent cleaning with cloth soaked in 1,000 ppm chlorine and assessment of microbial bioburden on surfaces
- Intervention was surface decontamination with pre-impregnated wipes (PAA) or cloth soaked in chlorine
- PAA wipes produced the largest reduction in total aerobic and anaerobic counts when compared with the baseline data or the use of 1,000 ppm chlorine
- Reversion to 1,000 ppm chlorine resulted in number of sites positive for MDROs rising again



# Final Points

- **Cleaning is a science**, the science is getting better with multi-centre RCT-level evidence on environmental decontamination and clinically significant reductions in infection.
- It is **cost-effective** to clean effectively
- Cleaning is an essential part of patient safety and should be important to **everyone**.
- We need to remember that quality of care and **safety of patients** is at the heart of everything we do!
- Consider changing the language
  - Do not say 'Has that been cleaned?', say "**is that room/piece of equipment safe?**"
- Train everyone!
- Make processes simple to make it easy for people **to do the right thing**.





# Thank you for listening.

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