gama healthcare | ACIPC Australasian College for Infection Prevention and Control

Welcome to the **IPC Tour 2024!**

Amanda Hill

Staffing and IPC department post pandemic

Government of **Western Australia**
North Metropolitan Health Service
Mental Health, Public Health and Dental Services

Staffing an Infection Prevention and Control Department post pandemic

Amanda Hill A/Coordinator of Nursing IPC NMHS MHPHDS
Jenna Ricciardi Clinical Nurse IPC NMHS MHPHDS

Disclosure of Interest

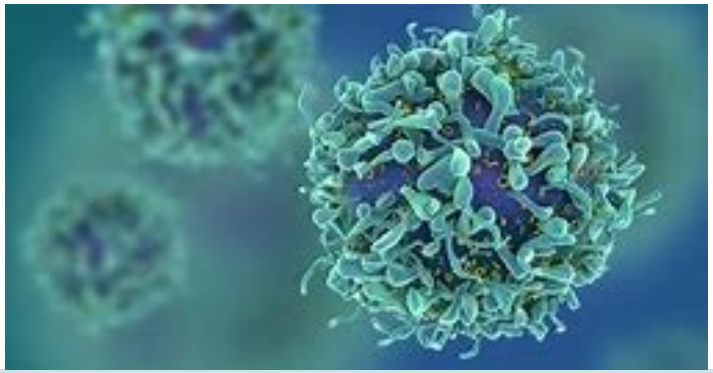
I have no conflicts of interest to disclose

Acknowledgement of Country

We acknowledge the Noongar people as the traditional owners and custodians of the land on which we work, and pay respect to their elders both past and present.

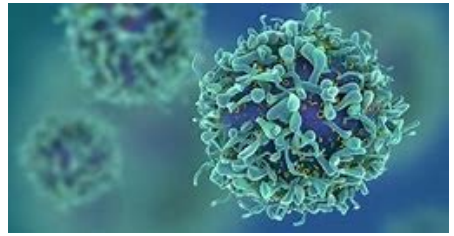
North Metropolitan Health Service recognises, respects and values Aboriginal cultures as we walk a new path together.

Background



- Clinical Nurses (CN) entry level for Infection Prevention and Control (IPC)
- COVID!
- Staffing increase was required to meet demand
- Paucity of experienced employees with IPC exposure

Post Pandemic – so where now



- Staff all returned to clinical areas
- No experienced IPC staff left anywhere…….
- Lots of staff who have great skills in contact tracing, vaccinations and fit testing

Re modelling of the IPC department

- Registered Nurses
- Newly Qualified Nurses
- Infection Control Officers

- Return to work staff

New IPC department staffing model

IPC team now includes:

- Coordinator of Nursing
- Clinical Nurse Manager
- Clinical Nurse Specialists
- Clinical Nurses
- Registered Nurses
- Infection Control Officers (ICO)

Divided staff into teams (pods) CNS, CN, RN, ICO

Role of the RN and ICO

RN

- Patient vaccinations
- Staff vaccinations
- Ward rounds
- Micro checks
- AT training/assessing
- Quality Improvements
- Staff education
- Pre employment health assessments
- Hand hygiene auditing

ICO

- Fit testing
- PPE training/assessing
- Contact tracing
- Environmental auditing
- Patient education
- Staff education
- Hand hygiene auditing

Jenna’s story

- RN previously working clinically
- Came into IPC as a return to work
- Gained experience in IPC prior to moving into a CN role

Moving forward

- Recognised the value of diverse team
- Needs of the service post pandemic response
- Skill sets of staff

Conclusion

Building capacity within the Department

Staff retention and promotional opportunities

Broadening the healthcare workforce

Morning Tea

Prof Brett Mitchell (AM)

Hidden threats of pathogens in the environment

Disclosures

- Current recipient of NHMRC Investigator Grant
- Current recipient MRFF funding

- No payment or fees related to this talk

Podcast: https://infectioncontrolmatters.com

Pathogens in the environment – why a potential problem

Survive for long periods of time

Epidemiological studies the risk of prior room occupancy

Survival of pathogens in the environment

- Systematic search of literature
- 62 papers, in which the survival of 31 pathogens was undertaken in 572 tests.
- The studies spanned 1963 to 2023, in 14 countries

Journal of Hospital Infection 147 (2024) 25–31

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

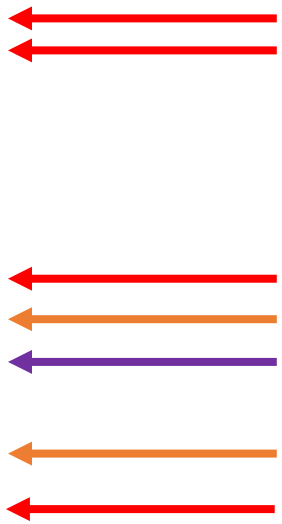
Review

How long do nosocomial pathogens persist on inanimate surfaces? A scoping review

L. Porter [a,b,†], O. Sultan [a,b,†], B.G. Mitchell [c,d,e], A. Jenney [f], M. Kiernan [g], D.J. Brewster [h,i], P.L. Russo [a,b,c,*]

Table II
Range of survival by pathogen

	Pathogen	Range of survival in days (unless otherwise indicated)
Gram positive	*Staphylococcus aureus*	<1 min to 318
	Clostridioides difficile	0.13–140
	Coagulase-negative *Staphylococcus*	<1 min to 28
	Micrococcus spp.	10–10
	Streptococcus mutans	0.13–0.2
	Bacillus spp.	1–28
	Enterococcus spp.	0.02–287
Gram negative	*Acinetobacter* spp.	0.04–90
	Burkholderia cepacia	0.13–8
	Citrobacter freundii	0.06–0.11
	Escherichia coli	<1 min to 56
	Klebsiella pneumoniae	0.57–600
	Proteus mirabilis	0.16–0.16
	Pseudomonas spp.	0.08–7
	Salmonella spp.	0.29–5
	Serratia spp.	0.29–20
	Stenotrophomonas maltophilia	0.29–1
	Haemophilus influenzae	1–1
Fungi	*Candida auris*	14–14
	Candida spp.	0.13–28
Virus	Animal virus	0.5–7
	Coronavirus	0.04–20
	Cytomegalovirus	<1 min to 0.01
	Human virus	<1 min to 12
	SARS-CoV	1–2

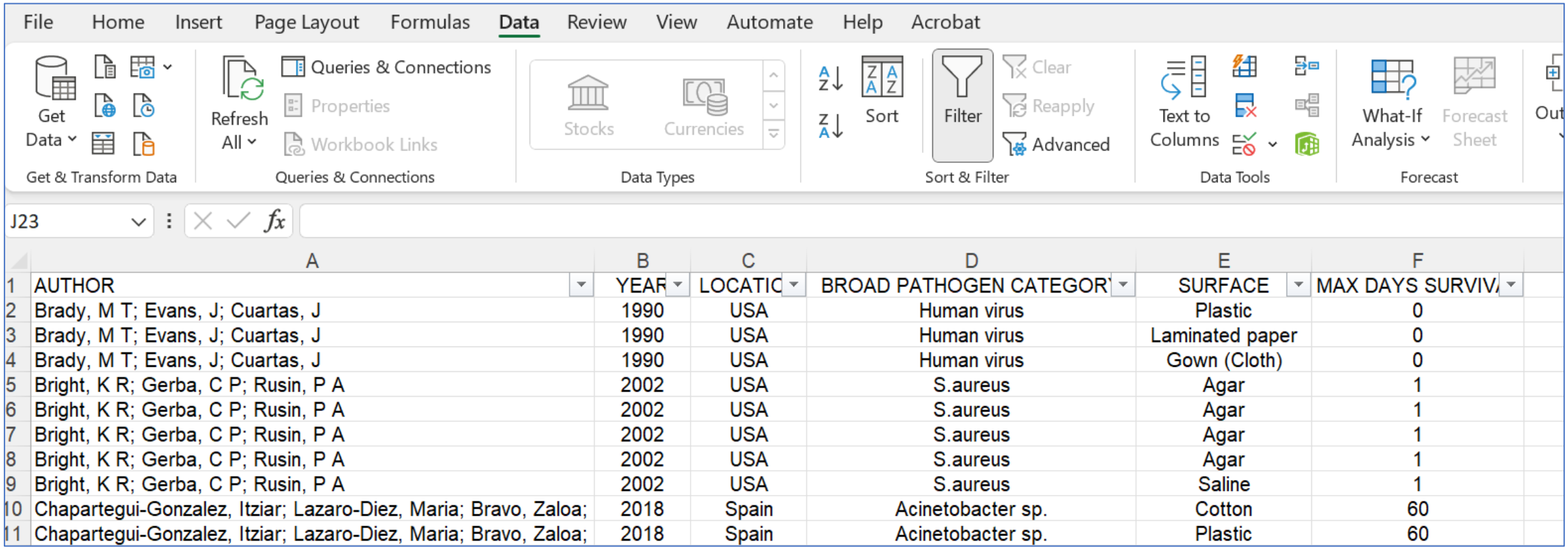


Survival time by surface type

Table III
Range of survival time by pathogen and surface

Surface	Pathogens of interest [c]	Range of survival in days (across studies)
Non-porous[a]	*Acinetobacter* spp.	0.29–60
	Clostridioides difficile	0.13–140
	Escherichia coli	0.25–11
	Klebsiella pneumoniae	2–2
	Pseudomonas spp.	0.21–7
	Staphylococcus aureus	0.04–60
Porous[b]	*Acinetobacter* spp.	1.5–90
	C. difficile	0.25–3
	E. coli	0.29–25
	K. pneumoniae	4–600
	Pseudomonas spp.	0.08–7
	S. aureus	1–168

Supplementary material: something useful?



	A	B	C	D	E	F
1	AUTHOR	YEAR	LOCATIC	BROAD PATHOGEN CATEGOR	SURFACE	MAX DAYS SURVIV
2	Brady, M T; Evans, J; Cuartas, J	1990	USA	Human virus	Plastic	0
3	Brady, M T; Evans, J; Cuartas, J	1990	USA	Human virus	Laminated paper	0
4	Brady, M T; Evans, J; Cuartas, J	1990	USA	Human virus	Gown (Cloth)	0
5	Bright, K R; Gerba, C P; Rusin, P A	2002	USA	S.aureus	Agar	1
6	Bright, K R; Gerba, C P; Rusin, P A	2002	USA	S.aureus	Agar	1
7	Bright, K R; Gerba, C P; Rusin, P A	2002	USA	S.aureus	Agar	1
8	Bright, K R; Gerba, C P; Rusin, P A	2002	USA	S.aureus	Agar	1
9	Bright, K R; Gerba, C P; Rusin, P A	2002	USA	S.aureus	Saline	1
10	Chapartegui-Gonzalez, Itziar; Lazaro-Diez, Maria; Bravo, Zaloa;	2018	Spain	Acinetobacter sp.	Cotton	60
11	Chapartegui-Gonzalez, Itziar; Lazaro-Diez, Maria; Bravo, Zaloa;	2018	Spain	Acinetobacter sp.	Plastic	60

Pathogen survival

- Pathogens survive for various period of time, depending on the pathogen and surface
- Some pathogens can survive for extended periods of time
- Survival in the environment can serve as a potential reservoir for ongoing transmission.

Pathogens in the environment – why a potential problem

Survive for long periods of time

Epidemiological studies the risk of prior room occupancy

Epidemiological studies – risk of prior room occupancy

Acquires the same pathogen

Epidemiological studies – risk of prior room occupancy

Table 1 Overview of studies.

Study	Publication year	Study duration	Study setting (country)	Study design	Organisms evaluated
Huang et al. [13]	2005	20 months	USA	Cohort	VRE, MRSA
Mitchell et al. [16]	2014	24 months	Australia	Cohort	MRSA
Datta et al. [12]	2011	20 months	USA	Cohort	VRE, MRSA
Ajao et al. [24]	2013	93 months	USA	Cohort	ESBL-producing Gram negative
Drees et al. [20]	2008	14 months	USA	Cohort	VRE
Nseir et al. [14]	2011	12 months	France	Cohort	*A. baumannii*, ESBL-producing Gram negative *P. aeruginosa*
Shaughnessy [25]	2011	16 months	USA	Cohort	*C. difficile*
Zhou [19]	2019	72 months	USA	Cohort	VRE
Anderson [2,3]	2017 & 2018	28 months	USA	RCT	VRE, MRSA, *C. difficile*
Ford [17]	2016	93 months	USA	Cohort	VRE
Fraenkel [15]	2021	72 months	Sweden	Cohort	Norovirus

Note: VRE, vancomycin-resistant enterococci; MRSA, meticillin-resistant *Staphylococcus aureus*; ESBL, extended spectrum b-lactamase; *C. difficile*, *Clostridioides difficile*. Anderson 2017 and 2018 are the same study. Data from both of Anderson's papers were used to provide data to answer the research question.

Infection, Disease & Health 28 (2023) 290–297

Available online at www.sciencedirect.com

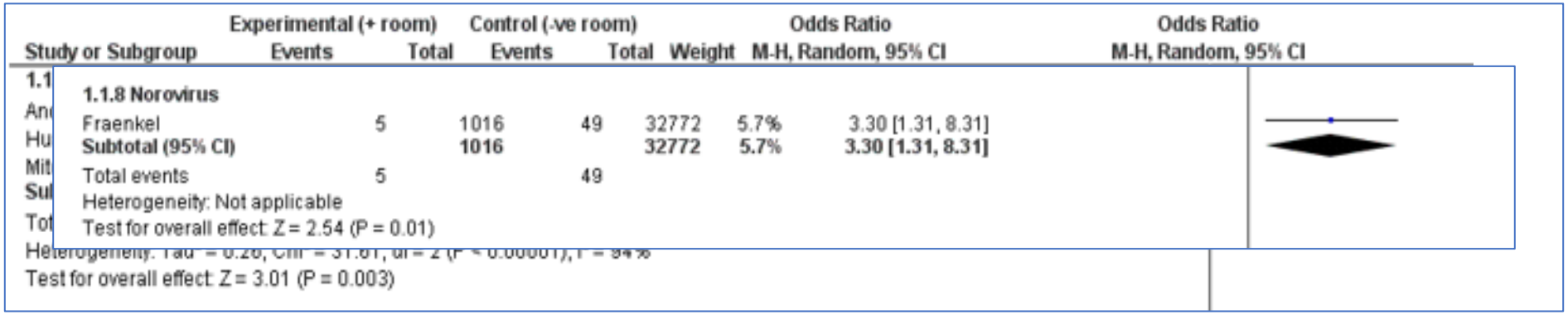
ScienceDirect

journal homepage: http://www.journals.elsevier.com/infection-disease-and-health/

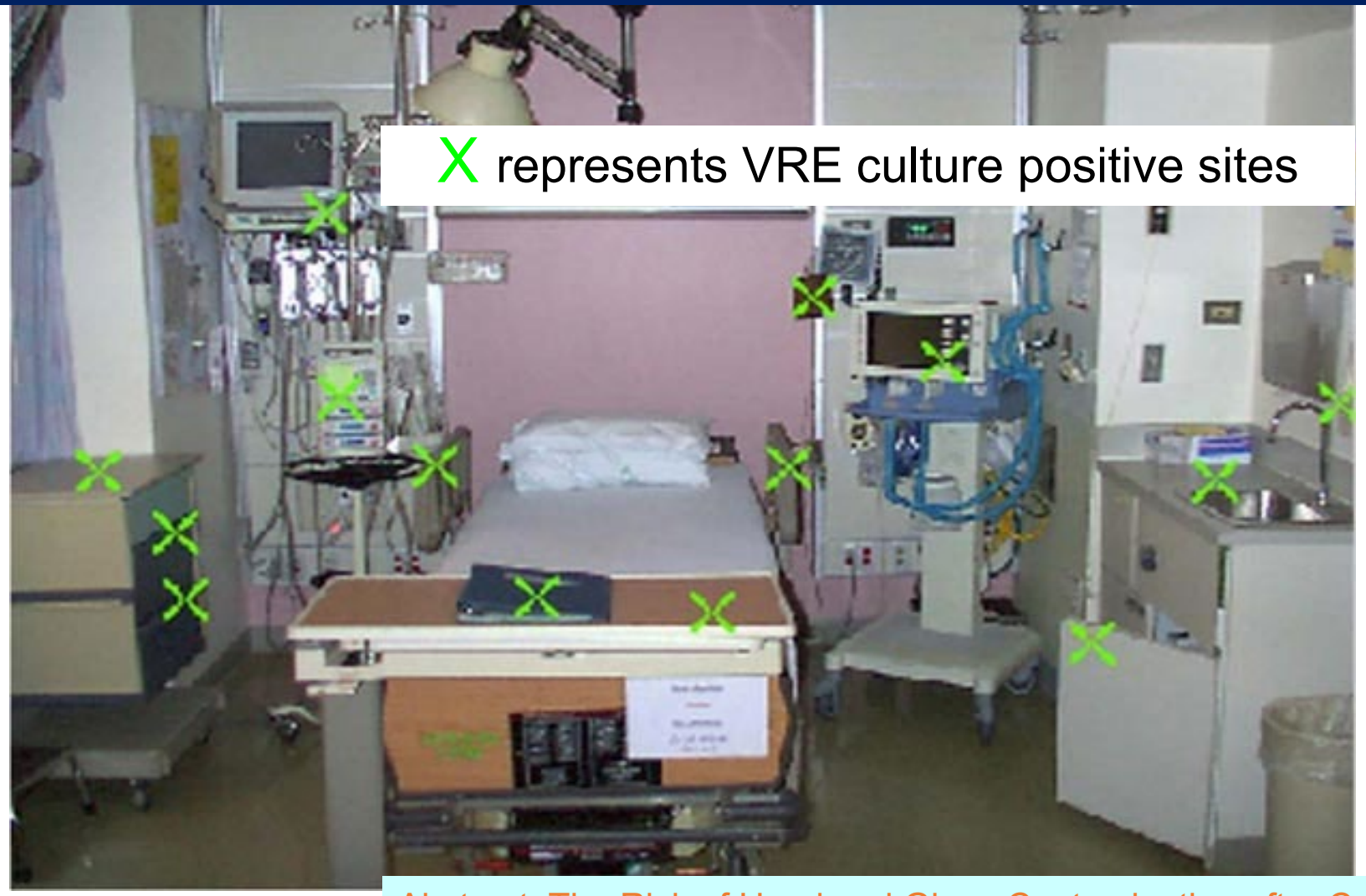
Review

Risk of organism acquisition from prior room occupants: An updated systematic review

Brett G. Mitchell [a,b,c,d,*], Julee McDonagh [e,f], Stephanie J. Dancer [g], Sindi Ford [h,i], Jenny Sim [j,k,l,m], Bismi Thottiyil Sultanmuhammed Abdul Khadar [d,k], Philip L. Russo [b,n,o], Jean-Yves Maillard [p], Helen Rawson [q], Katrina Browne [a,b], Martin Kiernan [b,r]

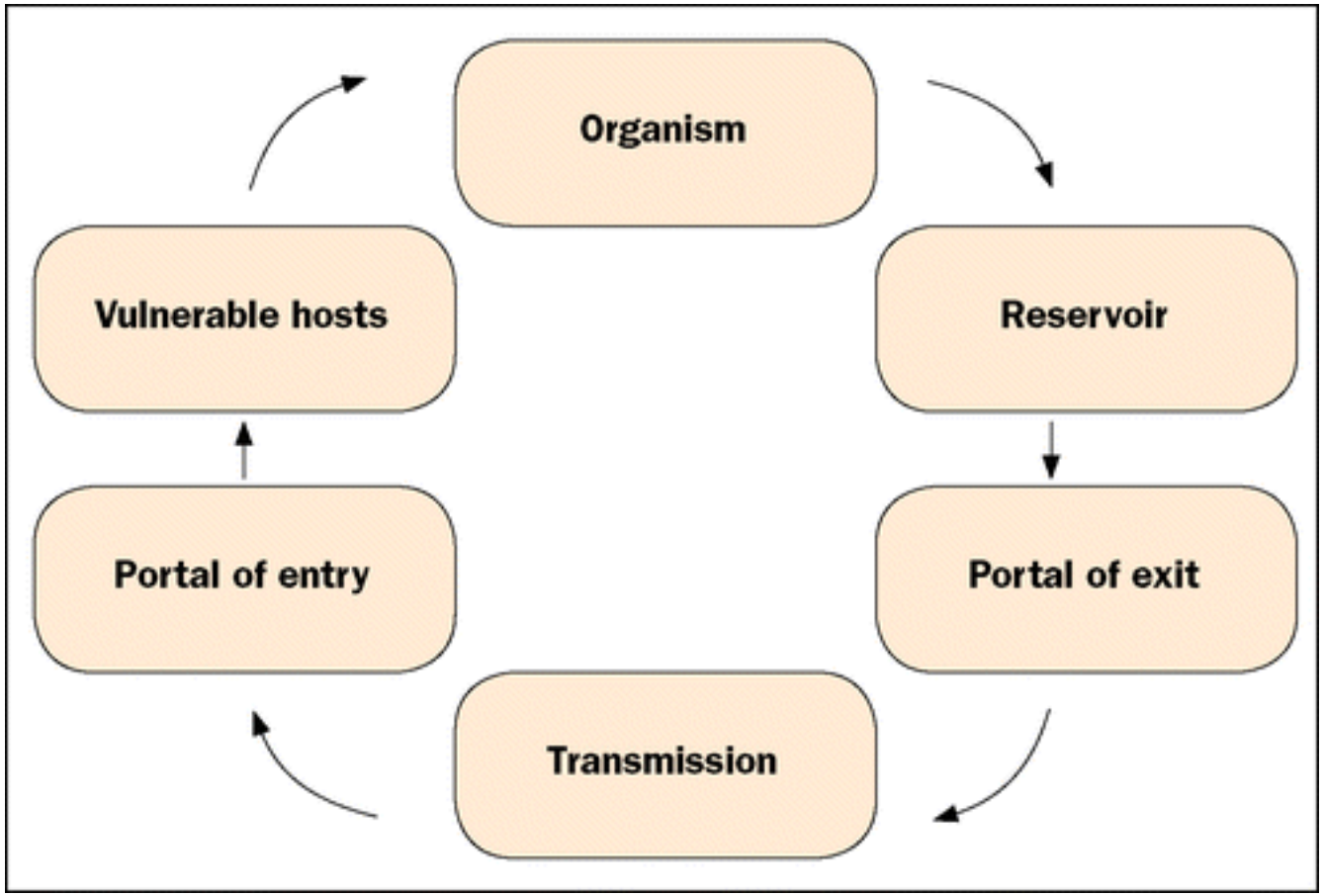


Case study: VRE and environmental contamination



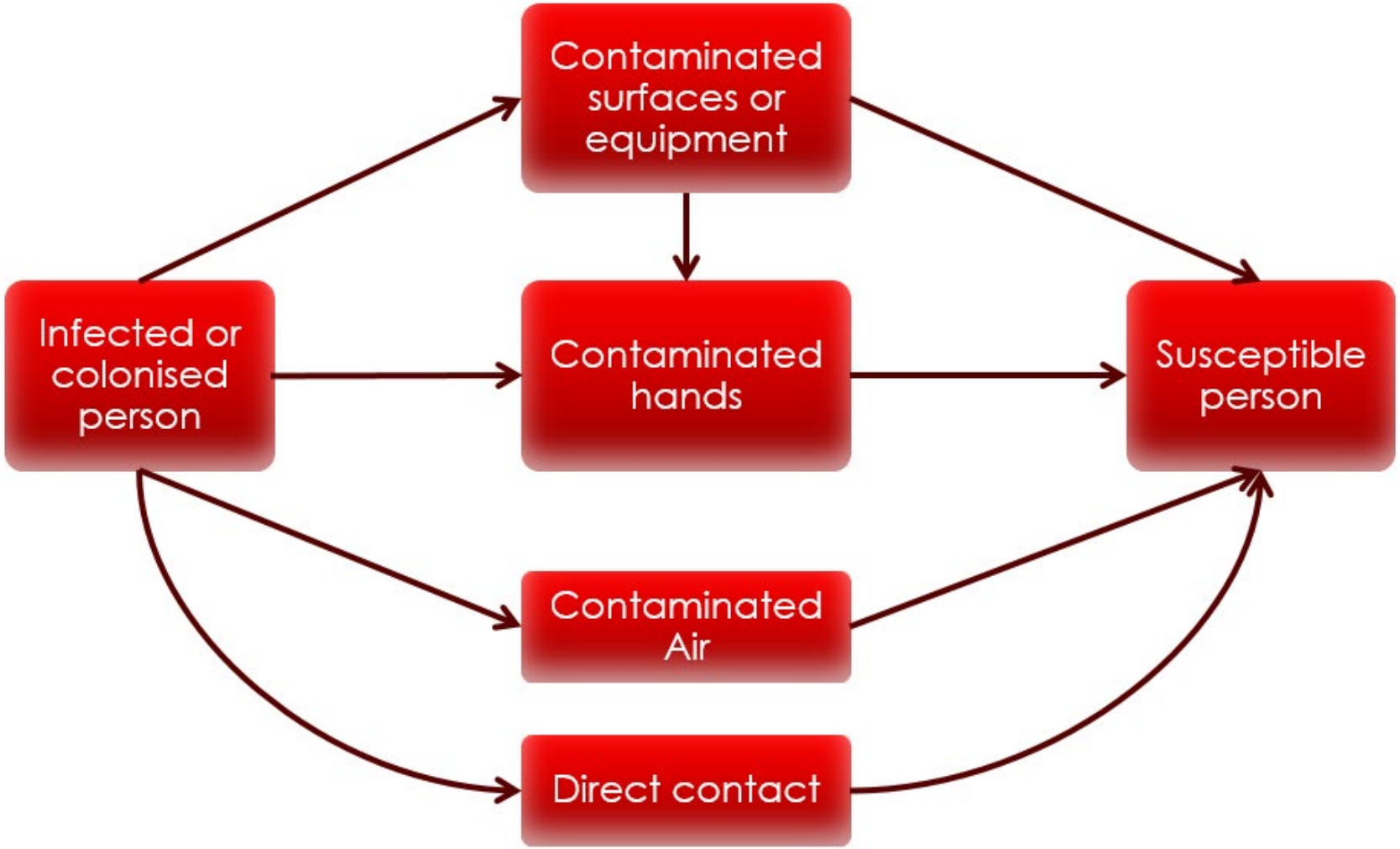
Abstract: The Risk of Hand and Glove Contamination after Contact with a VRE (+) Patient Environment. Hayden M, ICAAC, 2001, Chicago, IL.

Just because it is in the environment.....



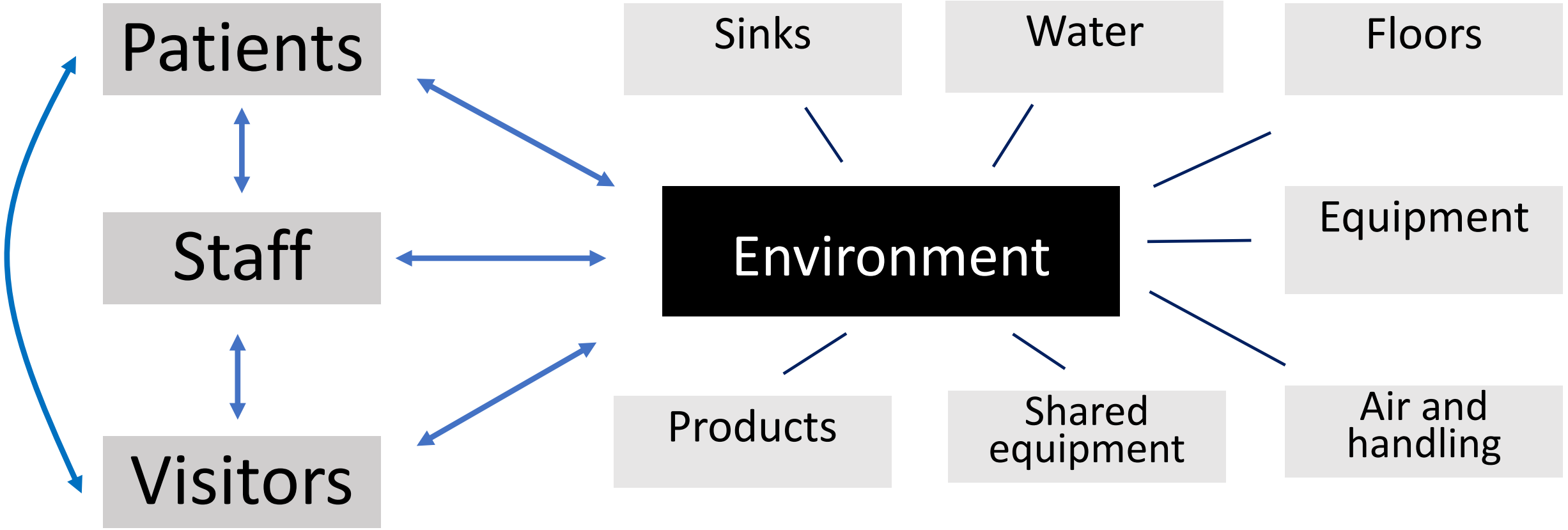
NHMRC (2019), Australian guidelines for the prevention and control of infection in health care

Interaction of cleaning with hand and people

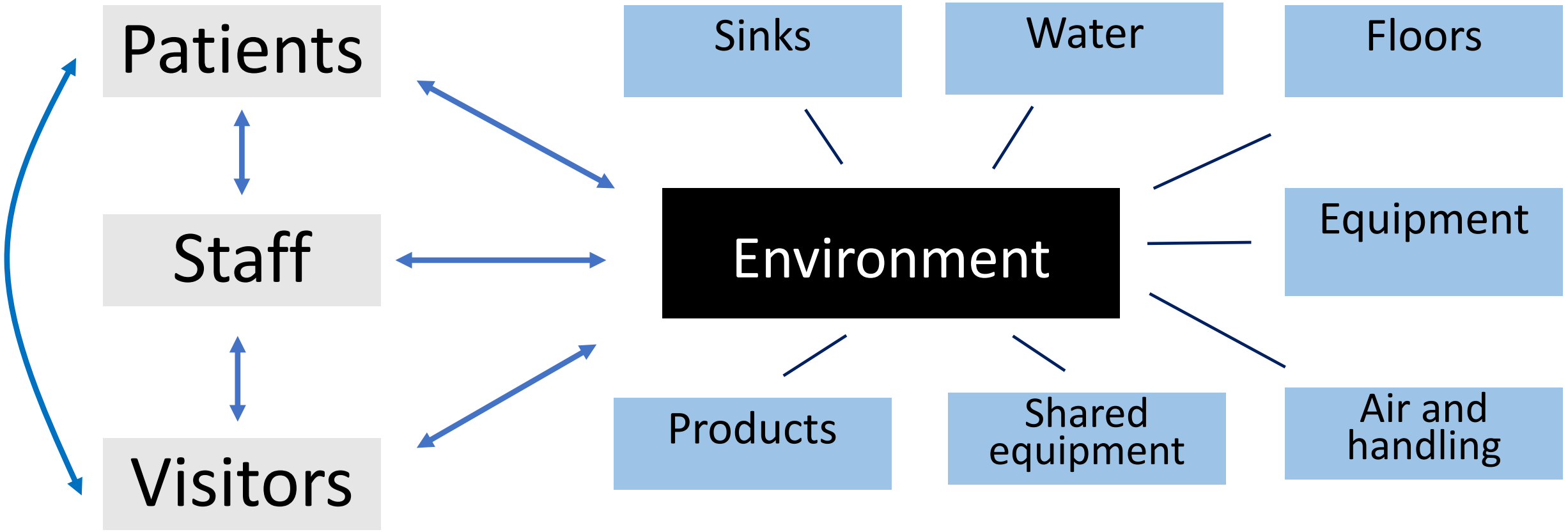


Otter JA et al. (2011). Infect Control Hosp Epidemiol 32(7):687-99

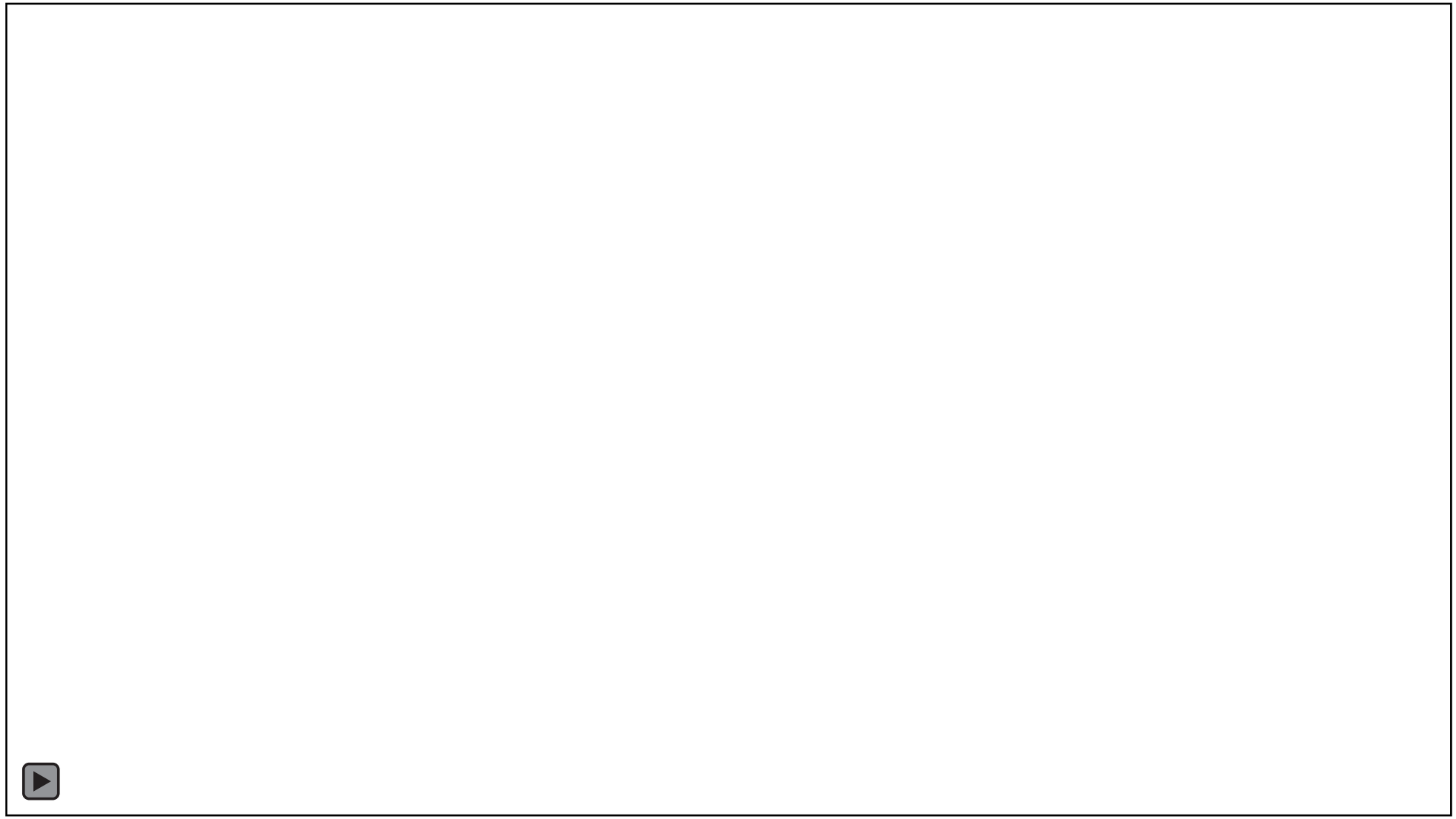
Even more complex interactions…



Even more complex interactions…



Equipment: Toilets



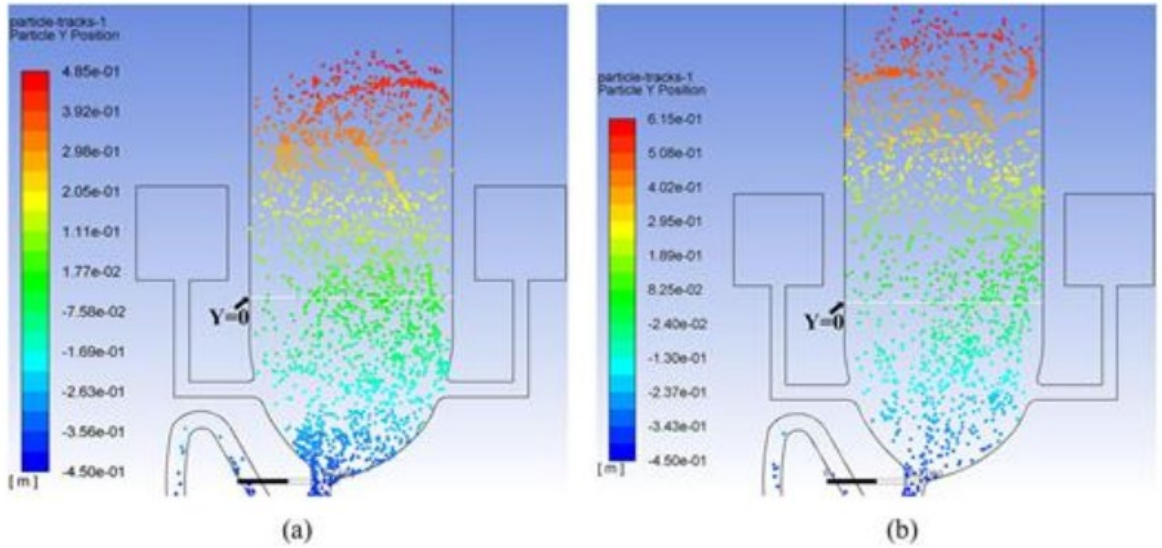
Equipment: Toilets

- It is clear from daily experience that flushing a toilet generates strong turbulence within the bowl.

- Will this flushing-induced turbulent flow expel aerosol particles containing viruses out of the bowl?

Equipment: Toilets

- Strong turbulence has been observed
- An upward velocity of as much as 5 m/s is produced, which is certainly capable of expelling aerosol particles out of the toilet bowl.
- Some 40%–60% of total particles can rise above the toilet seat to cause large-area spread, height can reach 106.5 cm from the ground



Equipment: Toilets

- When faecal matter is in a toilet bioaerosol particles produced, majority being 0.3 µm in diameter.

Knowlton *et al. Antimicrobial Resistance and Infection Control* (2018) 7:16
DOI 10.1186/s13756-018-0301-9

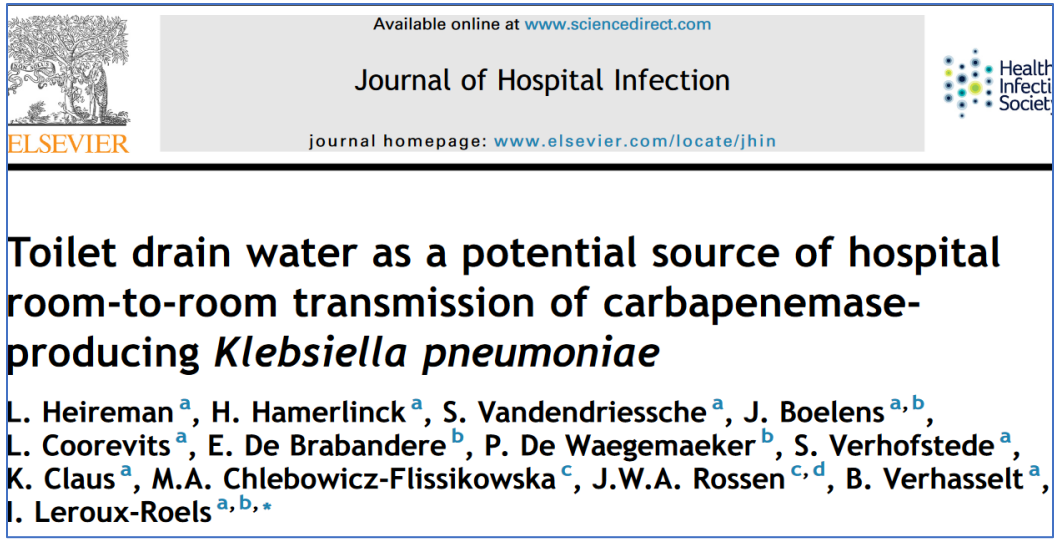
Antimicrobial Resistance and Infection Control

RESEARCH Open Access

Bioaerosol concentrations generated from toilet flushing in a hospital-based patient care setting

Samantha D. Knowlton[1], Corey L. Boles[1], Eli N. Perencevich[2,3], Daniel J. Diekema[2,3], Matthew W. Nonnenmann[1*] and CDC Epicenters Program

- Hospital experienced an outbreak of OXA-48- producing Klebsiella pneumoniae that affected five patients staying in three different rooms.



Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

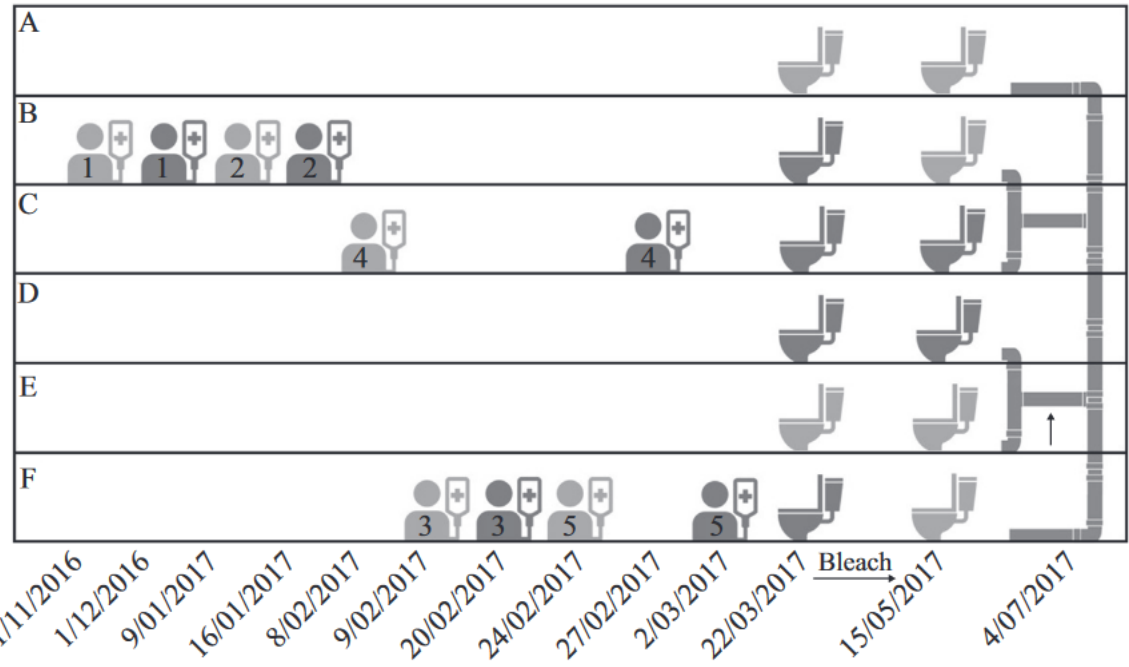
ELSEVIER

Toilet drain water as a potential source of hospital room-to-room transmission of carbapenemase-producing *Klebsiella pneumoniae*

L. Heireman[a], H. Hamerlinck[a], S. Vandendriessche[a], J. Boelens[a,b], L. Coorevits[a], E. De Brabandere[b], P. De Waegemaeker[b], S. Verhofstede[a], K. Claus[a], M.A. Chlebowicz-Flissikowska[c], J.W.A. Rossen[c,d], B. Verhasselt[a], I. Leroux-Roels[a,b,*]

Equipment: Toilets

- OXA-48-producing K. pneumoniae was detected in toilet water in four of six rooms, drain water between two rooms.



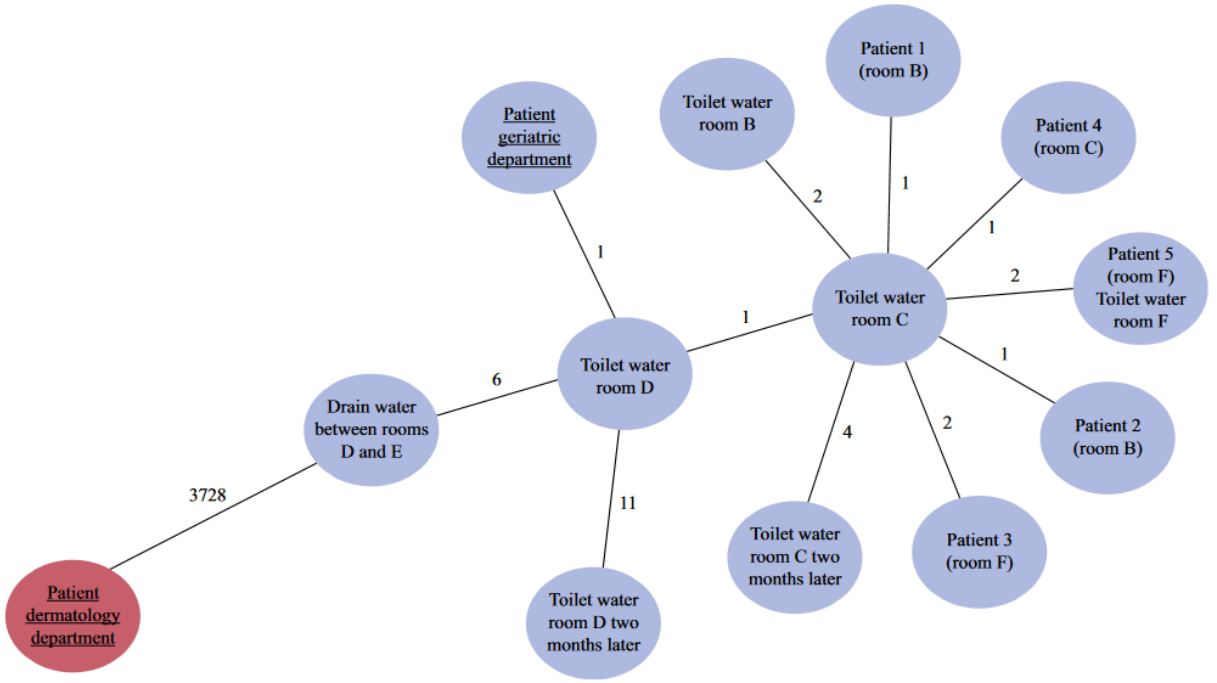


Figure 2. Phylogenetic tree (wgMLST analysis) of *Klebsiella pneumoniae* isolates with isogenic isolates indicated in blue, the non-isogenic isolate in red, control isolates underlined, and number of allele differences presented on the branches.

Equipment: Toilets

- Toilet plume bioaerosols are complex in nature, thus, measured bioaerosol concentrations in these settings depend on many variables and may differ for every pathogen
- The contact and airborne transmission risks posed by toilet plume bioaerosols also remain unquantified.
- They are an important pathway that can increase exposure to enteric and airborne pathogens.

Contents lists available at ScienceDirect

American Journal of Infection Control

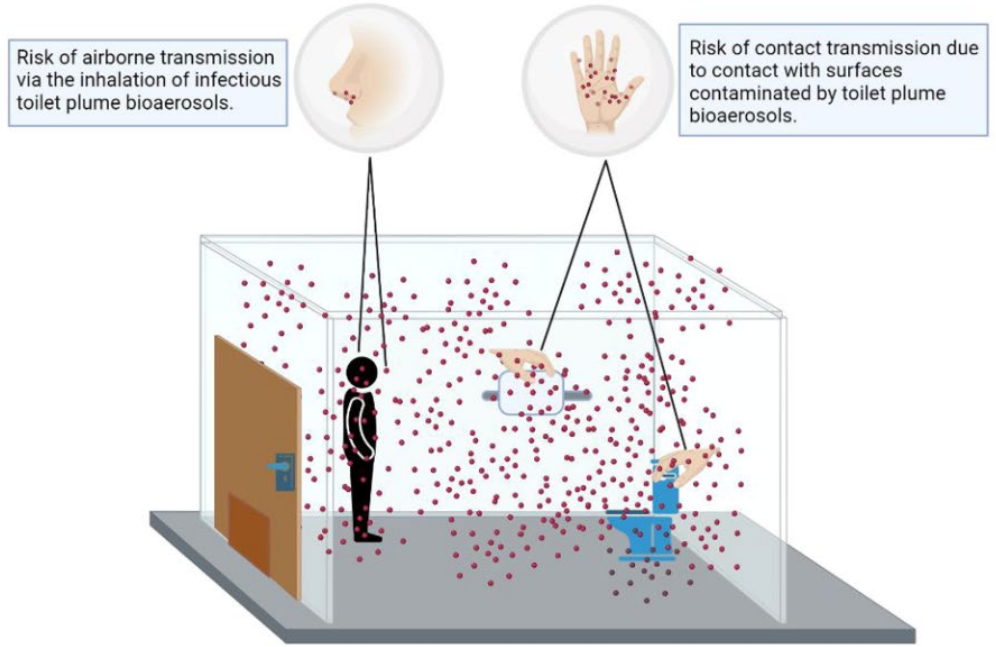
journal homepage: www.ajicjournal.org

State of the Science Review

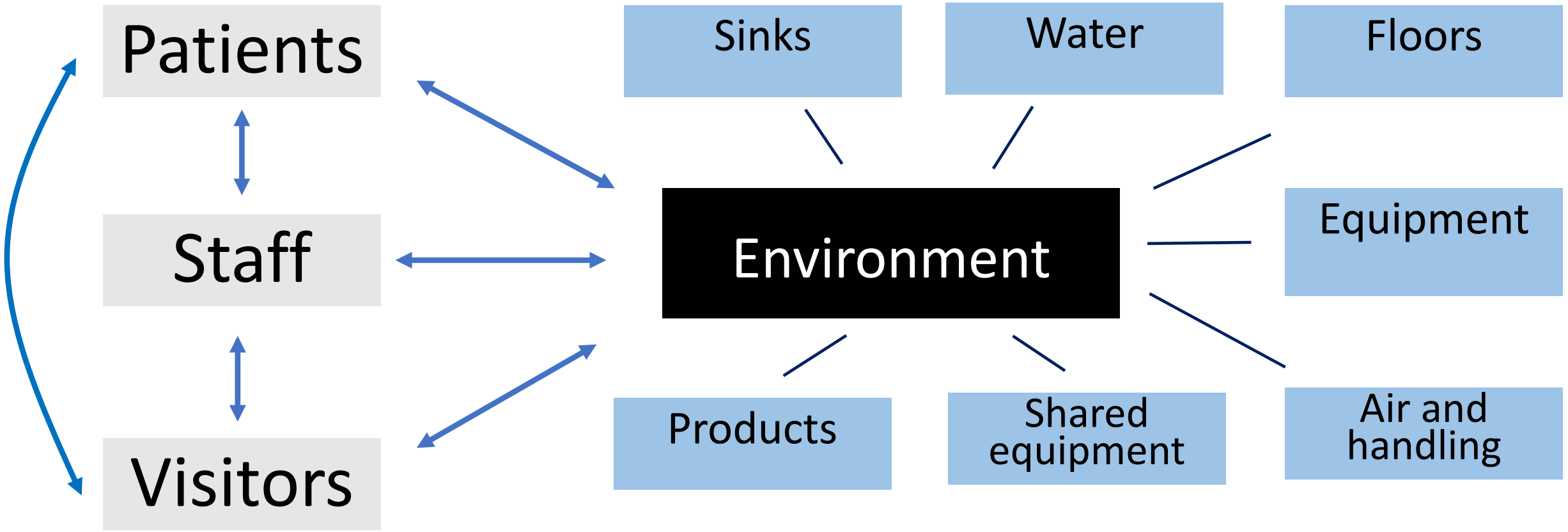
Toilet plume bioaerosols in health care and hospitality settings: A systematic review

Elizabeth N. Paddy BSc, MSc *, Oluwasola O.D. Afolabi BEng, MSc, PhD, M. Sohail BEng, MSc, PhD

School of Architecture, Building and Civil Engineering, Loughborough University, Loughborough, Leicestershire, United Kingdom



Even more complex interactions…



Products: soap

- Three-month period, five infants were colonised or infected by a single strain of S. marcescens

- Hypothesised that the soap dispenser acted as a continuous source of S. marcescens, facilitating hand transmission of S. marcescens by healthcare workers (HCWs)

- Design of the soap dispenser was an important factor in the spread

Journal of Hospital Infection (2009) 72, 17–22

Available online at www.sciencedirect.com

ScienceDirect

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www.elsevierhealth.com/journals/jhin

Outbreak of *Serratia marcescens* in a neonatal intensive care unit: contaminated unmedicated liquid soap and risk factors

S. Buffet-Bataillon [a,*], V. Rabier [b], P. Bétrémieux [b], A. Beuchée [b], M. Bauer [a], P. Pladys [b], E. Le Gall [b], M. Cormier [a,c], A. Jolivet-Gougeon [c]

Products: other

- Outbreak of R. ma
  five patients admit
  unit over 1 month

- Environmental cult
  saline bottles used
  drugs as the source

- 4 cases of bacteremia, fentanyl ampoules culprit

Highlights a few things

- Importance of design
- Human factors
- Manufacturing – “upstream”

a mannitolilytica Infection in
nit: Case Series and Review

hinmoy Sahu[2] Nihar Desai[1] Soniya Nityanand[1]

aduate Institute
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Address for correspondence Anshul Gupta, MD, DNB, FIAP, Department of Haematology, I block, Ground Floor, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Raebareli Road, Lucknow 226014, India (e-mail: anshulhaemat@gmail.com).

al Infection from an Unusual Source

rghese[2], J Vinoth Kumar[3], Kukku Tresa Mathew[4]

22; *Published on:* 31 August 2022

ng concern in the medical field, as it increases mortality and incurs longer hospital stays and higher medical costs. Infection control practices and antimicrobial stewardship are thought to be emergent measures to curtail hospital-acquired infections, but adherence to such standard practices has been a concern globally, ultimately leading to poor clinical outcomes. Organisms isolated from rare sources have been reported to cause pathogenic infections in humans. Instances such as contamination of intravenous fluids and parenteral medications with gram-negative bacteria and fungus have been reported in the past. We present here, a rare outbreak of *Ralstonia pickettii* bacteremia from an unthought source among four critically ill patients. The epidemiological investigations confirmed the source of contagion to be fentanyl ampoules. The immediate action of disusing the batch of fentanyl ampoules was taken. Timely action and isolation precautions prevented a major outbreak within the intensive care unit (ICU).

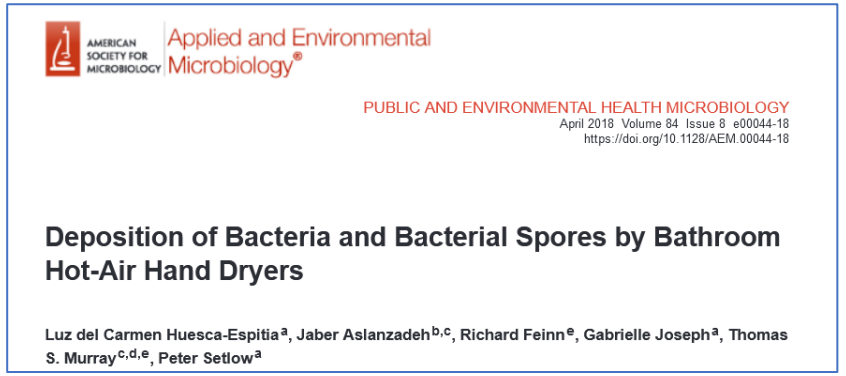
Keywords: Bacteremia, Fentanyl, *Ralstonia pickettii*.

Indian Journal of Critical Care Medicine (2022): 10.5005/jp-journals-10071-24308

Equipment: hand dryers (& air)

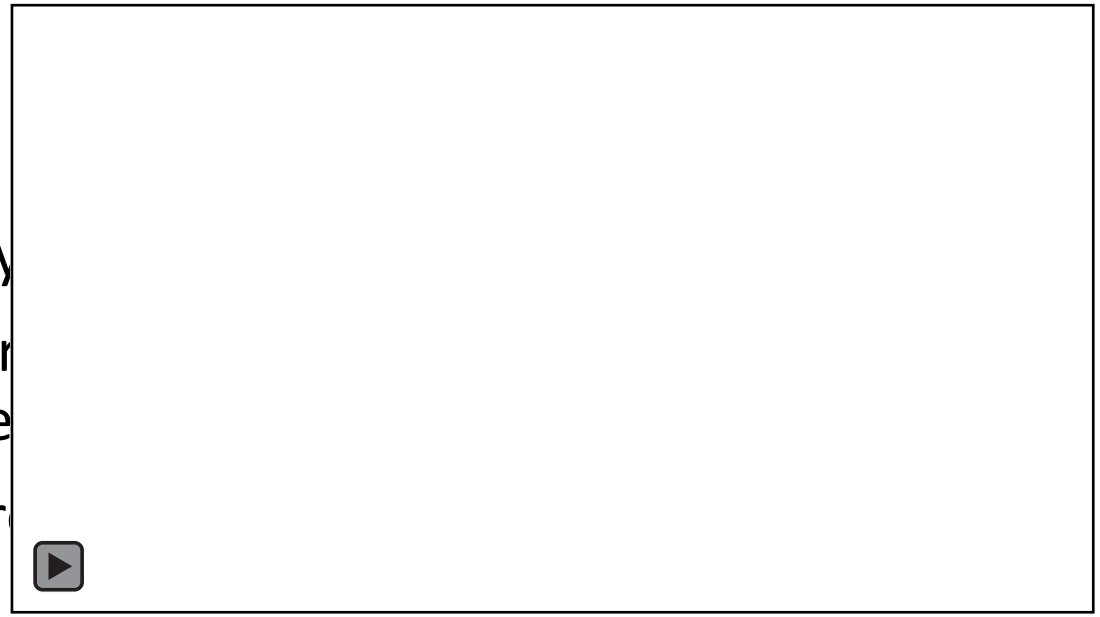
Plates exposed to

- hand dryer air for 30 s averaged 18 to 60 colonies/plate
- bathroom air for 2 min with hand dryers off averaged ≤1 colony
- bathroom air moved by a small fan for 20 min had averages of 15 and 12 colonies/plate in two buildings tested

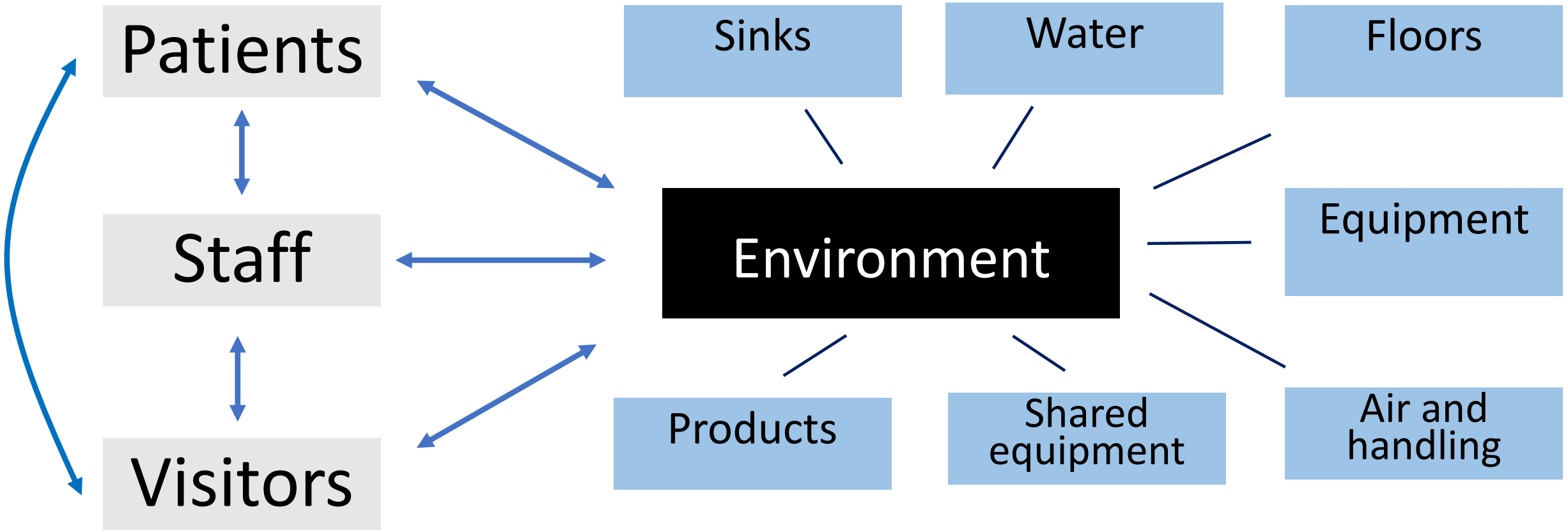


Questions remain

- organisms dispersed by
- hand dryers provide a r
  large amounts of bacte
- whether bacterial spor
  dryers?



Even more complex interactions…



Floors

How important do you think floors are?

American Journal of Infection Control 45 (2017) 336-8

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Brief Report

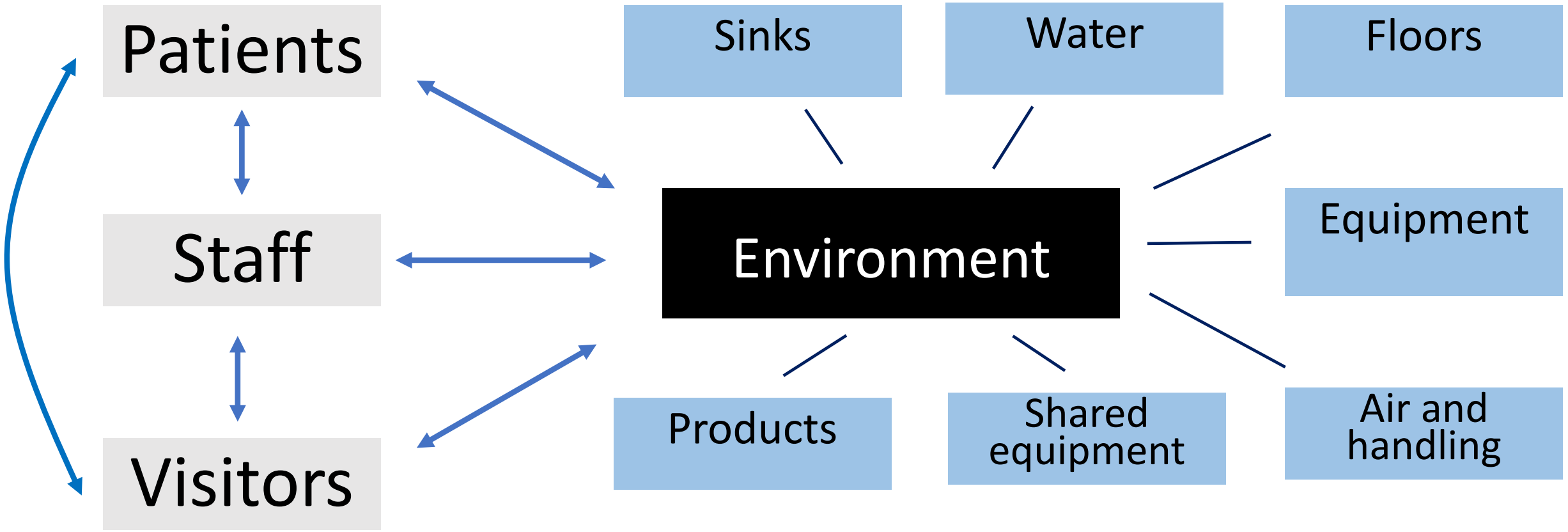
Are hospital floors an underappreciated reservoir for transmission of health care-associated pathogens?

Abhishek Deshpande MD, PhD [a,b], Jennifer L. Cadnum BS [b,c], Dennis Fertelli BS [b,c], Brett Sitzlar BS, MPH [b,c], Priyaleela Thota MD [b,c], Thriveen S. Mana MS, MBA [b,c], Annette Jencson MT, CIC [c], Heba Alhmidi MD [c], Sreelatha Koganti MD [c], Curtis J. Donskey MD [b,d,*]

Floors

- Sampled rooms (318 floor sites)
- Survey: 100 occupied rooms surveyed, 41% had 1 or more high-touch objects in contact with the floor
- 31 of the high-touch objects present on floors, bare or gloved hand cultures were collected to determine the frequency of transfer of pathogens to hands after picking up the objects.
  - MRSA (18%), VRE (6%) , and C difficile (3%) were recovered

Even more complex interactions…



Air: Oxygen mask

- Oxygen ofter
infection

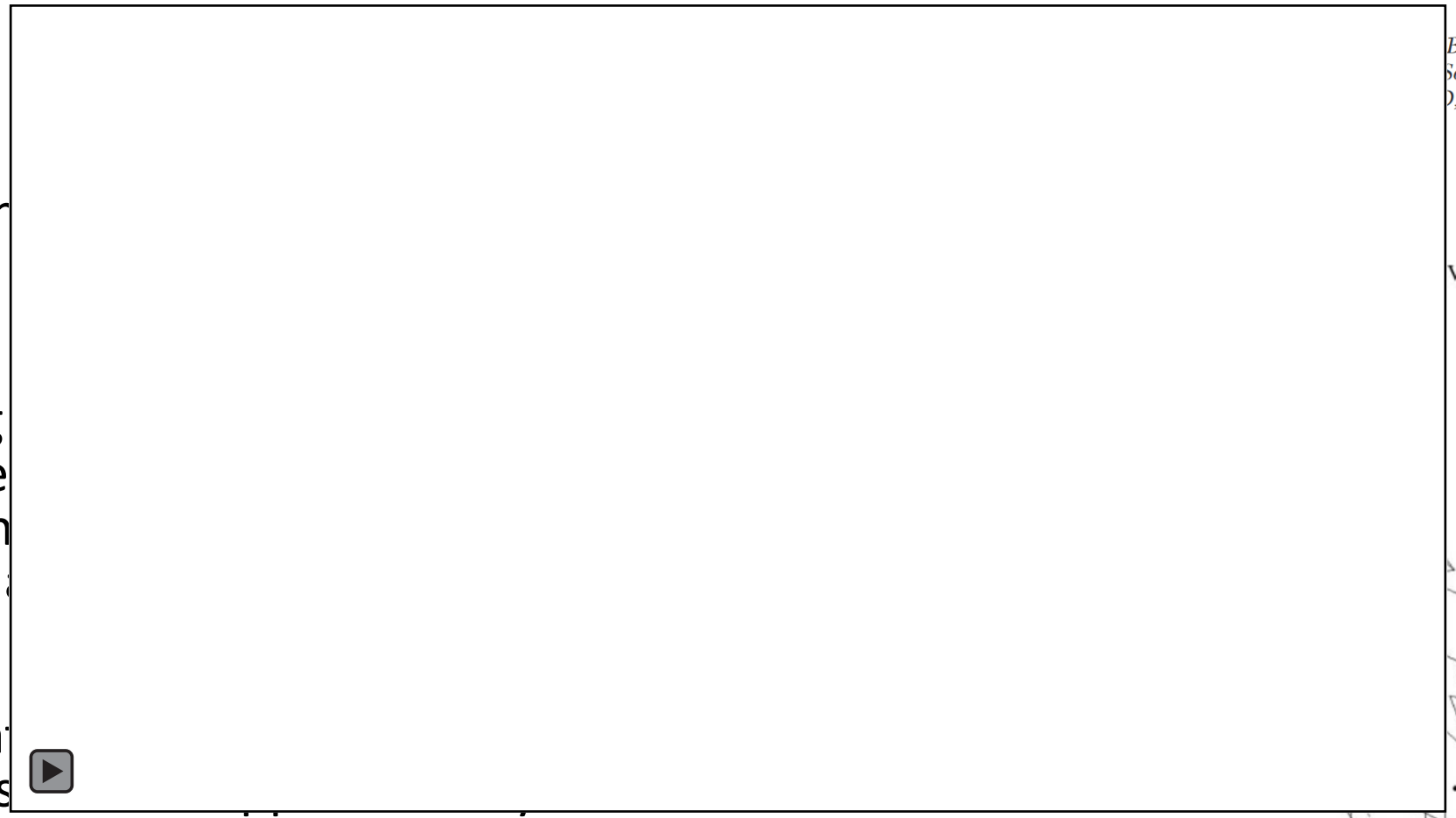
- Human lung
simple oxyge
potentially in
surrounding

- Exhaled air a
reached a dis

Original Research
RESPIRATORY CARE

Airflows Around Oxygen Masks*

A Potential Source of Infection?



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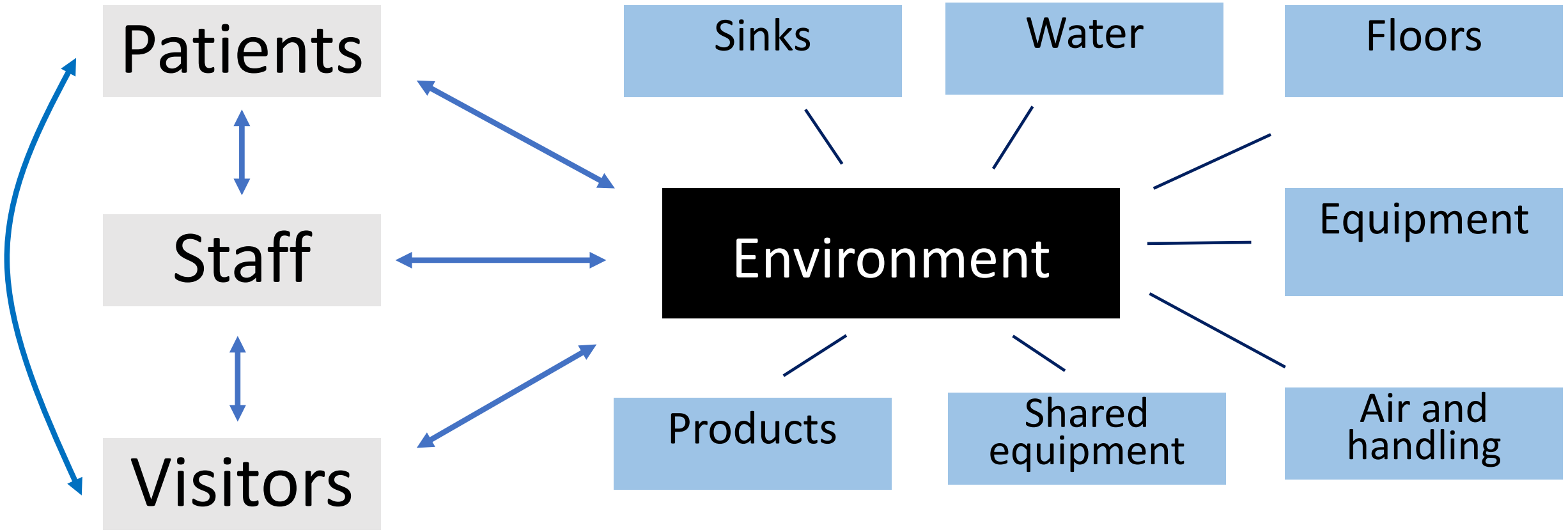
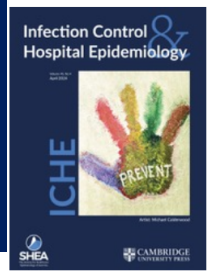


Shared medical equipment



Infection Control &
Hospital Epidemiology

Defining the Role of the Environment in the Emergence and Persistence of *vanA* Vancomycin-Resistant Enterococcus (VRE) in an Intensive Care Unit: A Molecular Epidemiological Study

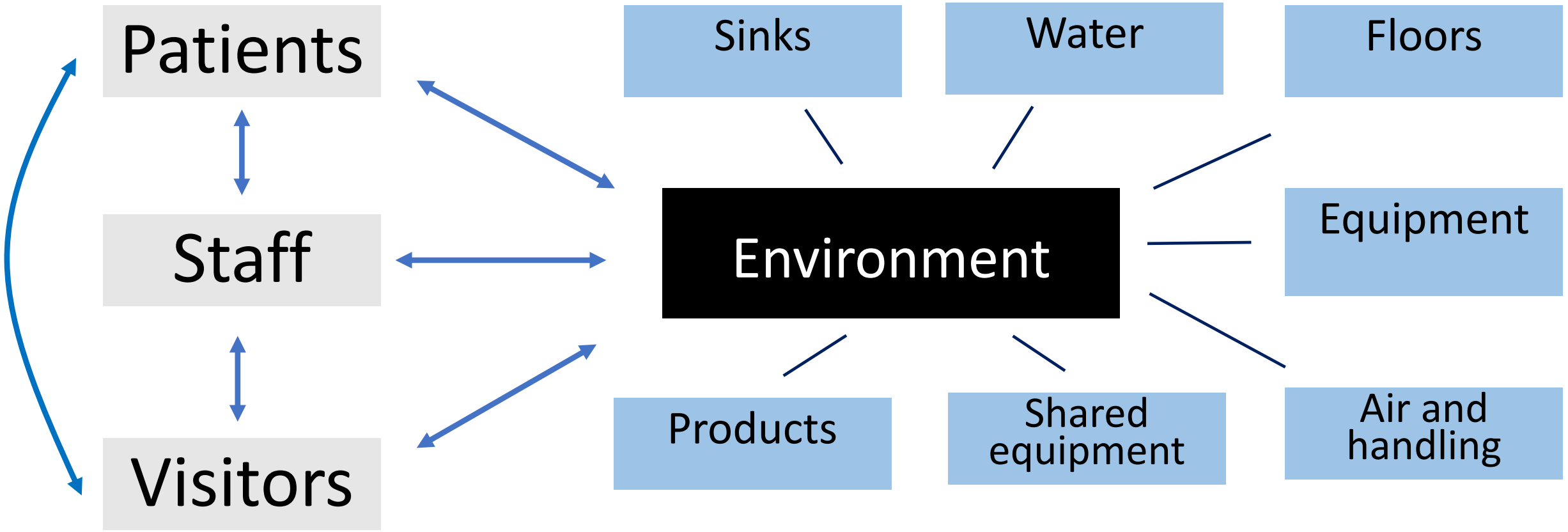
Published online by Cambridge University Press: **03 April 2018**

Andie S. Lee, Elizabeth White, Leigh G. Monahan, Slade O. Jensen, Raymond Chan and Sebastiaan J. van Hal

Show author details

- ICU, Sydney, 11 month
- 31 patients had VRE (VanA)
- Phylogeny from sequencing data confirmed several VRE clusters
- Directionality indicated that colonised patients contaminated environmental sites (colonisation and infection).
- The environmental reservoir, particularly from shared equipment, played a key role in ongoing VRE spread.

Even more complex interactions…



Sinks

Available online at www.sciencedirect.com
Journal of Hospital Infection
journal homepage: www.elsevier.com/locate/jhin

Sinks in patient rooms in ICUs are associated with higher rates of hospital-acquired infection: a retrospective analysis of 552 ICUs

G-B. Fucini[a,b,*], C. Geffers[a,b], F. Schwab[a,b], M. Behnke[a,b], W. Sunder[c], J. Moellmann[c], P. Gastmeier[a,b]

- In 2021, participating ICUs were surveyed about the presence of sinks in their patient rooms.
- ICUs were then divided into two groups: the no-sink group (NSG) and the sink group (SG).
- Primary and secondary outcomes were total HAIs and HAIs associated with Pseudomonas aeruginosa (HAI-PA).

Sinks were found to be an independent risk factor for HAI

Table IV
Adjusted incidence rate ratios (aIRR) for all hospital-acquired infections on intensive care units (ICU) according to the presence of a sink in patient room and further risk factors or confounders

Parameter	Category	aIRR	95% CI	*P*-value (type III)
Presence of sink in patient room	Sink group	1.21	(1.01–1.45)	0.039
	No-sink group	1=reference		

Sinks

- Handwashing sinks linked with numerous MRO outbreaks in critical care settings[1]
- Spread from sink to patient has been prospectively demonstrated[2]
- P-trap biofilm difficult to eradicate[3]
- Upward growth of biofilm & involvement of sink grate can result in environmental contamination[4]

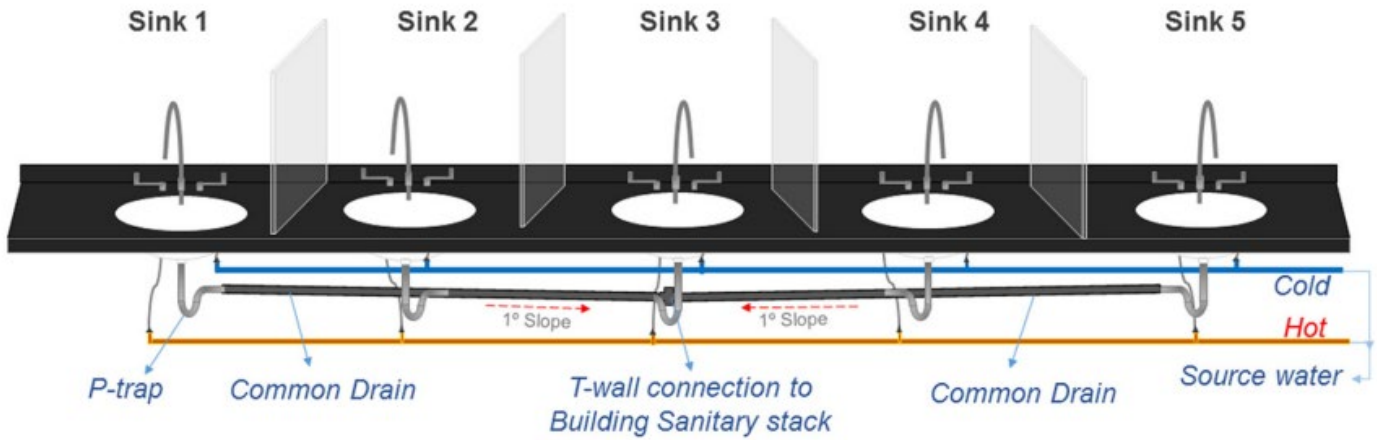


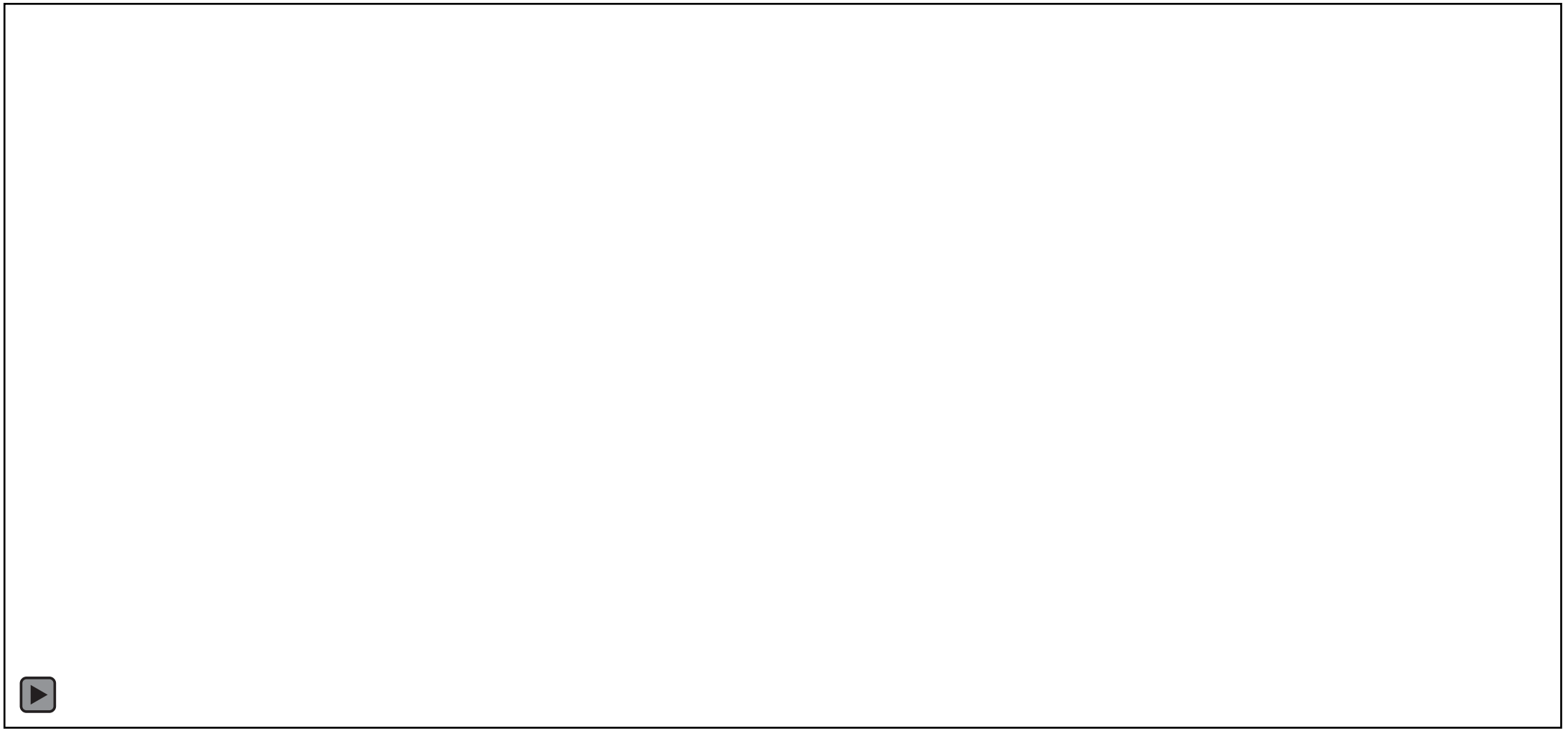
FIG 4 Layout of the sink gallery comprising the 5 sink modules and the associated plumbing.

1. Infect. Control Hosp. Epidemiol. 2018;39(8):972-9
2. J. Hosp. Infect. 2014;87(2):126-30
3. Infect. Control Hosp. Epidemiol. 2009;30(1):25-33.
4. Appl. Environ. Microbiol. 2017;83(8):e03327-16.
5. PloS one. 2023;18(3):e0282090.

Discussion points

- Pathogens all around us in healthcare
- Presence doesn’t necessarily concur with infection risk
- Need to consider how pathogens may move from one source to another
- Open mind to sources of infection

Discussion



Discussion

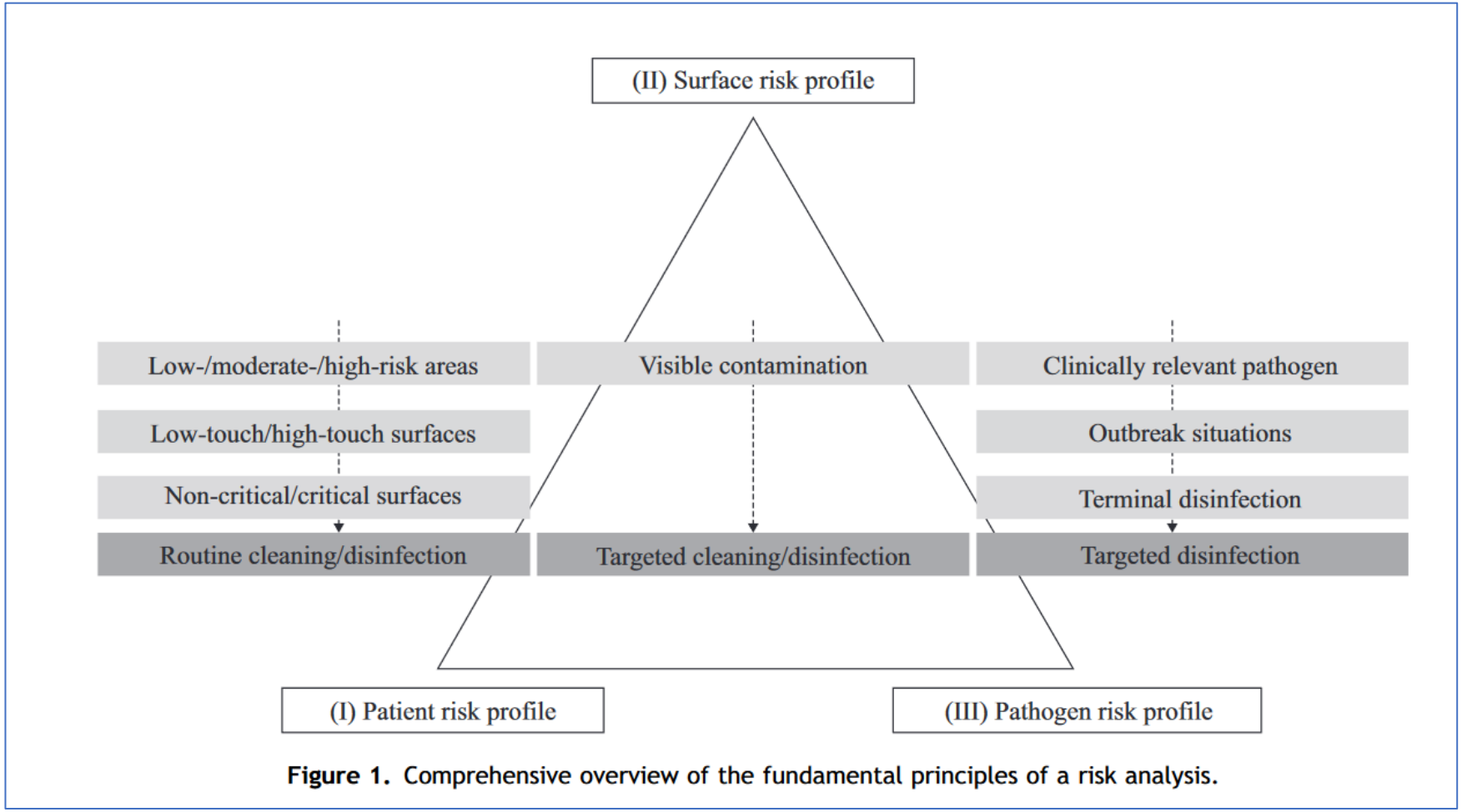


Figure 1. Comprehensive overview of the fundamental principles of a risk analysis.

Assadian et al. / Journal of Hospital Infection 113 (2021) 104e114

Discussion

Browne and Mitchell *Antimicrobial Resistance & Infection Control* (2023) 12:83
https://doi.org/10.1186/s13756-023-01274-4

Antimicrobial Resistance & Infection Control

COMMENT Open Access

Multimodal environmental cleaning strategies to prevent healthcare-associated infections

Katrina Browne[1,2] and Brett G Mitchell[1,2,3,4*]

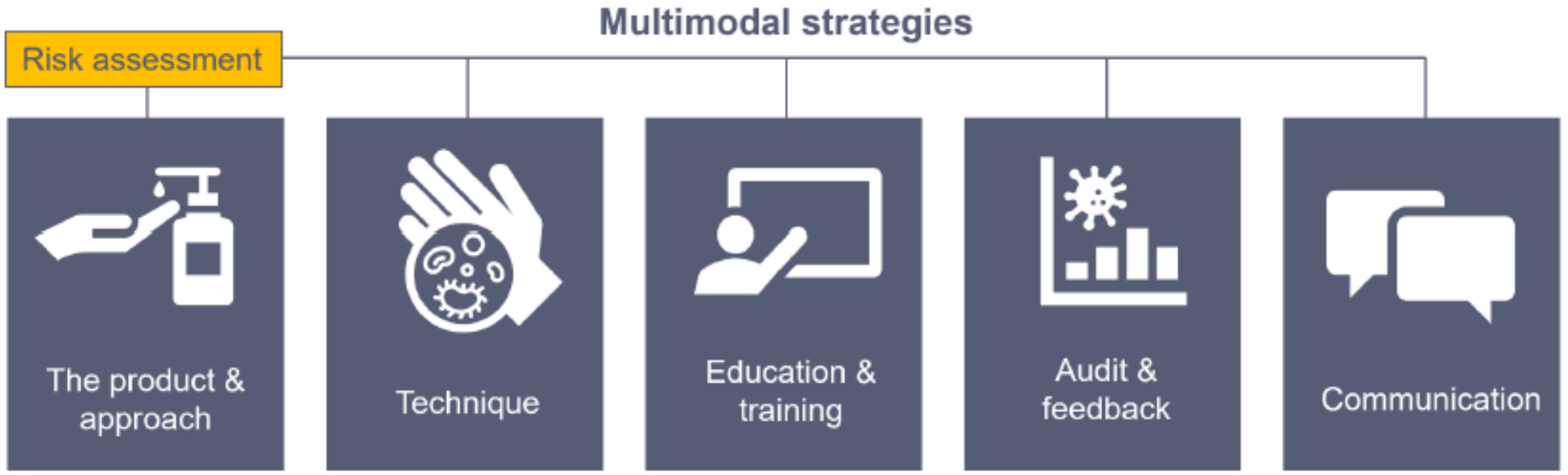


Fig. 1 A multimodal approach to environmental cleaning in healthcare facilities encompasses five key strategies: the product and approach used for cleaning, technique, education and training, audit and feedback, and communication (adapted from REACH study [7]).

Conclusion

- Pathogens can survive for long period of time
- Environment can serve as a reservoir
- Many different ‘things’ have been implicated in the literature
- Complex dynamic between environment and humans

Hidden threats of pathogens in the environment

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Hunter Medical Research Institute

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Sharon Kenny

Sustainable infection prevention solutions

SUSTAINABLE INFECTION PREVENTION SOLUTIONS

WHERE THERE IS A WILL…… IS THERE A WAY??

SHARON KENNY
CNC IPC WACHS
APRIL 2024

SOME IPC HUMOUR TO START WITH…

Bacteria and viruses are a great example of sustainability!!

GREEN MATTERS OR GREENWASHING ....

Who feels that they understand the terminology related to sustainability to enable appropriate decision making??

Greenwashing

The practice of conveying a false or misleading impression that a company's products or policies are environmentally friendly when they are not.

- Exaggerating environmental benefits of a product
- Using vague or ambiguous terms without providing evidence
- Focusing on minor eco-friendly aspects while ignoring more significant environmental impacts.

DEFINITIONS

- **Sustainability –** Ability to meet needs of the present without compromising the ability of future generations to meet their own needs by balancing economic, social, and environmental considerations to ensure resources are used efficiently and equitably, and that the impacts of human activities on the planet are minimised.

- **Degradable -** All plastics undergo some degradation, either physicochemical (weathering / hydrolysis / oxidation) and/or biological and are the primary cause of microplastics.

- NB - the ACCC considers it misleading to claim that a product is ‘degradable’ without qualifying how the process occurs.

BIODEGRADABILITY

Ability of organic substances to be broken down by micro-organisms in the presence of oxygen (aerobic) to carbon dioxide, water, biomass and mineral salts or any other elements that are present (mineralization). Alternatively, the breakdown of organic substances by micro-organisms without the presence of oxygen (anaerobic) to carbon dioxide, methane, water and biomass.

Considered environmentally friendly as they:

- do not persist in the environment for long periods
- can contribute to reducing pollution and waste accumulation.

NOT ALWAYS BIO, NOT ALWAYS DEGRADABLE

- Biodegradable products - could be any material which breaks down and degrades in the environment over time - but is it 50 or 150 years?
- Biodegradable plastic products - made from plant-based materials or petroleum-based plastics. Sometimes oxo-degradable plastics - conventional plastics mixed with additives and when exposed to light / heat breaks down. Seems good but fragments into microplastics.

“Bioplastics” may refer to biodegradable or biobased plastics, or both.

Why are we confused?

Plastic	Definition
bio-based	a plastic made from renewable resources, namely biomass or waste
bio-degradable	a plastic that can be assimilated by bacteria and/or fungi to give environmentally friendly products
oxo-degradable	a plastic whose degradability is induced by additives that initiate oxidation reactions
hydro-degradable	a plastic whose degradability is induced by the polar groups susceptible to hydrolysis

Consumers often confuse biodegradable plastics with bio-based plastics.

The latter are plastics made from biomass, generally related to the use of plants as feedstock. Given their natural origin, one could erroneously assume that these plastics are also biodegradable.

However, biodegradability depends on the properties of the plastic at hand, including chemical structure and crystallinity.

Biodegradable plastics are defined by their ability to break down completely into natural substances, according to the Australasian Bioplastics Association.

CHALLENGES FOR BIODEGRADABLE PLASTICS

Discrepancies between popular public opinion and industrial reality:

- 1st issue is cost - requires chemistry, chemical engineering and assessment of environmental and socio-economic impacts.
- 2nd – is large-scale production comes with a host of technical challenges - Bio-based plastics are more expensive than petro-based ones.
- 3rd is the human element of fear of change. Biodegradable plastics are an easy media sell - eco-friendly plastic made from plants, zero CO_2 footprint - but turning this into reality is a huge challenge.

Tougher government regulations, higher carbon taxes and

a change in public opinion may help.

BIODEGRADABLE AND COMPOSTABLE

- **Biodegradable**: Items naturally break down over time.
- **Compostable**: Organic matter that can be transformed into nutrient-rich compost through a controlled process. The majority of biodegradable plastics on the market are compostable plastics. Most of these will only break down in industrial composting facilities, with some also breaking down in home compost.
  Compostable plastics are a very specific definition of plastics.
- **Timeframe**: Biodegradable materials can take an undetermined time to break down, while compostable materials decompose within a specific time frame.
- **End product**: Composting benefits the environment by adding nutrients to the soil, whereas biodegrading may leave harmful residue.

COMPOSTABLE PRODUCTS

Compostable products must be certified as either **"Compostable"** or **"Home Compostable"** to meet Australian standards:

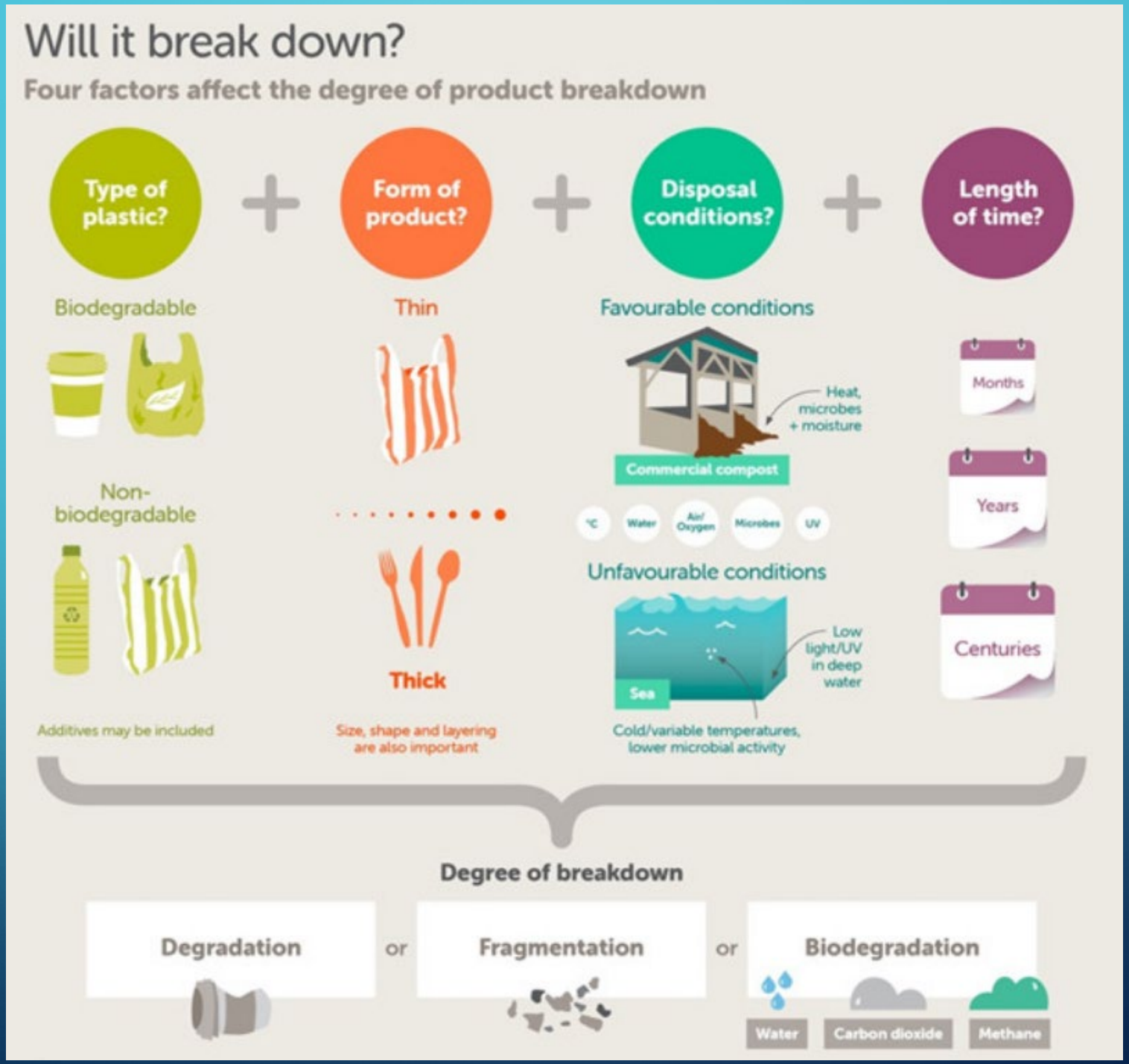
- AS4736-2006 - Biodegradable plastics suitable for composting and other microbial treatment. **Industrial composters** use temperatures of > 55 °C along with moisture and oxygen to breakdown compostable plastics quickly.
- Requires compostable plastics to disintegrate after 12 weeks (<2mm pieces) and completely biodegrade after six months, with no toxic effect of the resulting compost on plants and earthworms. i.e., 90 percent or more of the plastic material will have been converted to CO2.

Beware - packaging labelled "compostable" can't be composted in your own compost bin at home!

COMPOSTABLE?

The AS for Home Compostability AS5810-2010 “Biodegradable plastics – biodegradable plastics suitable for home composting” requiring at least 90% degradation in 12 months at ambient temperature.

For homes and workplaces AS 5810-2010 standard is preferred as industrial compost facilities are still uncommon.


Will it break down?
Four factors affect the degree of product breakdown
Type of plastic?
Form of product?
Disposal conditions?
Length of time?
Biodegradable
Non-biodegradable
Additives may be included
Thin
Thick
Size, shape and layering are also important
Favourable conditions
Heat, microbes + moisture
Commercial compost
°C
Water
Air/ Oxygen
Microbes
UV
Unfavourable conditions
Low light/UV in deep water
Sea
Cold/variable temperatures, lower microbial activity
Months
Years
Centuries
Degree of breakdown
Degradation
or
Fragmentation
or
Biodegradation
Water
Carbon dioxide
Methane

Ref: CSIRO

PLASTICS – ADVANTAGES?

Low production energy requirement, low maintenance, corrosion resistance, light weight and durability have made them ubiquitous. e.g., Plastic packaging increases shelf life of products without using preservatives.

Food for thought.....

- In 1950, each person used an average of 1.7 kg of plastics per annum.
- By 2007, annual consumption per capita rose to 100 kg.
- Today the figure is >140 kg.

THE PROBLEM WITH PLASTICS

- Plastic contributes to climate change through greenhouse gas) emission, marine pollution, food security, and freshwater scarcity.
- Latest estimates suggest the number of plastic micro-pieces in the oceans exceed 5×10^{12}.
  - 1° microplastics (synthesized microbeads from cosmetic products).
  - 2° microplastics are formed by the degradation of a plastic product.

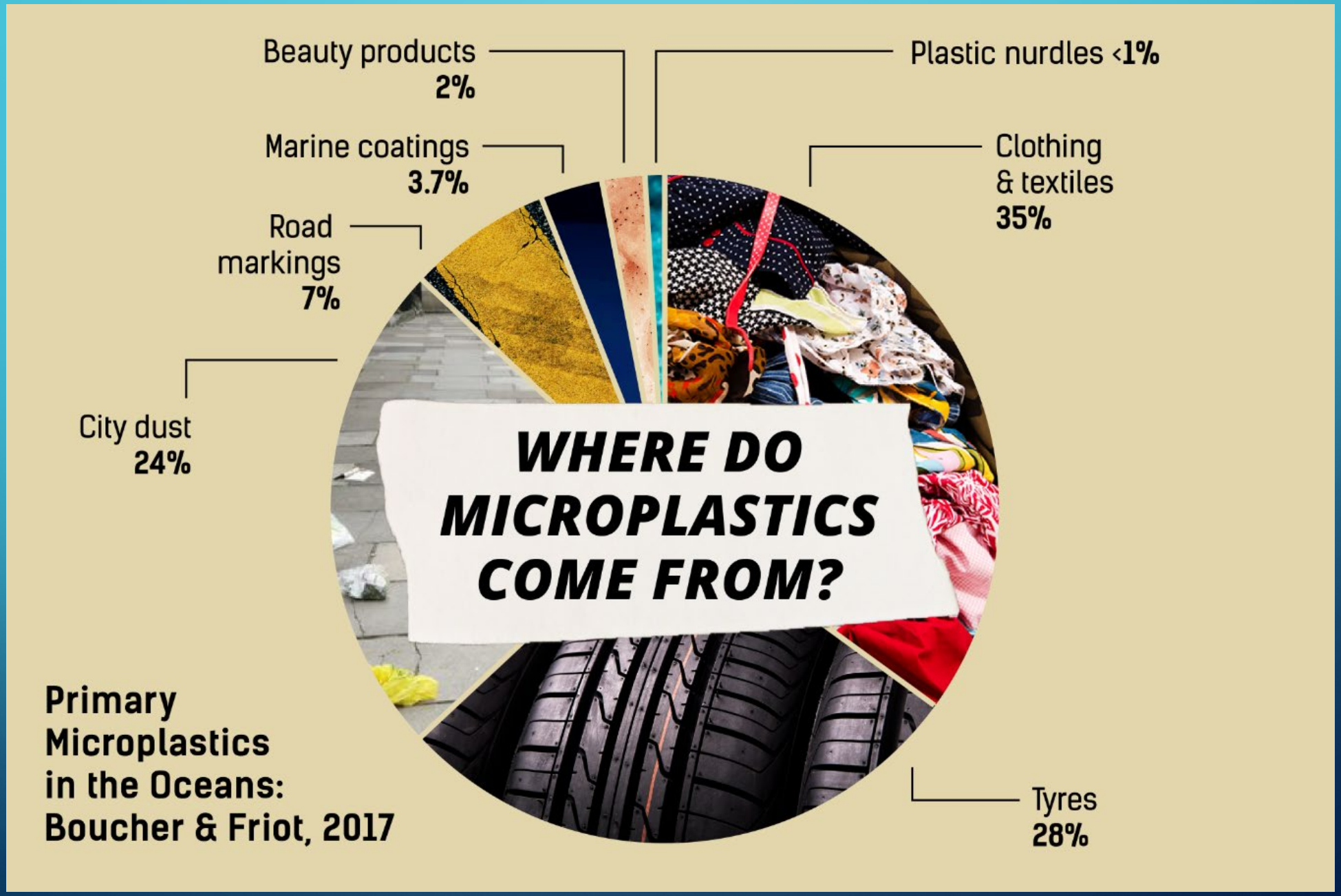
Surprisingly, a major sources of microplastics is synthetic clothing

Mismanaged plastic waste will eventually form microplastics that will build up in the environment and become part of our food chain, thus, reducing *any* type of microplastics will bring benefits.

THE PROBLEM IS REAL.....

Maritime terms used to describe floating debris from a ship.

- “Flotsam” - debris left without intent, often due to an accident or shipwreck.
- “Jetsam” - debris abandoned on purpose.


Beauty products
2%
Plastic nurdles <1%
Marine coatings
3.7%
Clothing
& textiles
35%
Road
markings
7%
City dust
24%
WHERE DO MICROPLASTICS COME FROM?
Tyres
28%
Primary Microplastics in the Oceans: Boucher & Friot, 2017

PPE WASTE

- The World Health Organization (WHO) estimates tens of thousands of tons of PPE used during the COVID-19 pandemic have ended up as waste.

- Scientists from Nanjing University in China and Scripps Institution of Oceanography at the University of California San Diego created a model that projected about 8 million tons of pandemic-related plastic waste was generated globally as of **August 2021**, with about 25,000 tons of that ending up in the oceans.

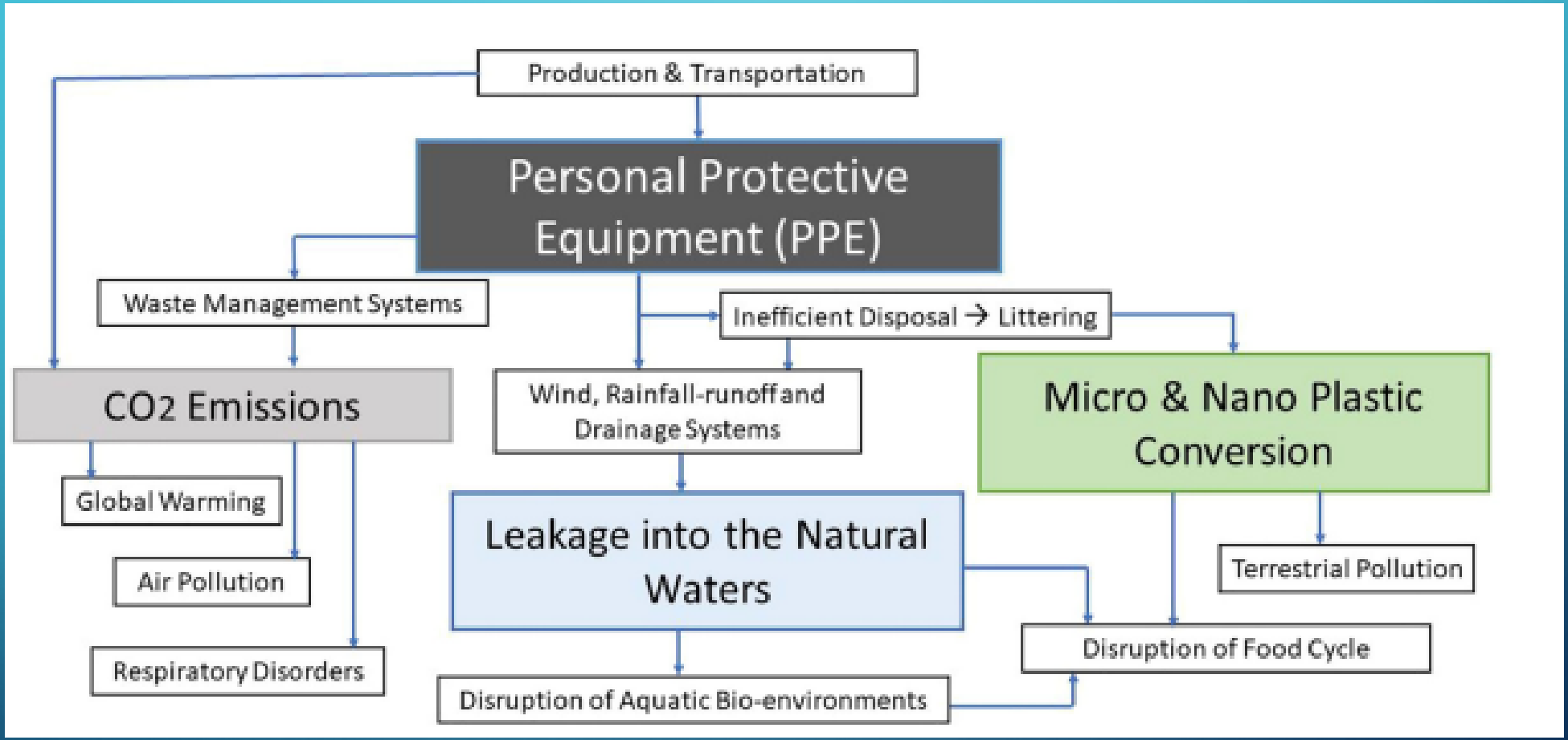
Scientists estimate that most of the waste came from hospitals.

PPE WASTE .....

During the pandemic much PPE waste was disposed of as clinical waste which is costly both economically and environmentally.

- Facilities reported clinical waste increases of > 50% in the first months of the pandemic
- According to the WHO, 85% of waste generated in health care settings is not infectious or toxic.
- The Centers for Disease Control and Prevention also notes that research shows most medical waste is no more dangerous than residential waste, but misconceptions continue.

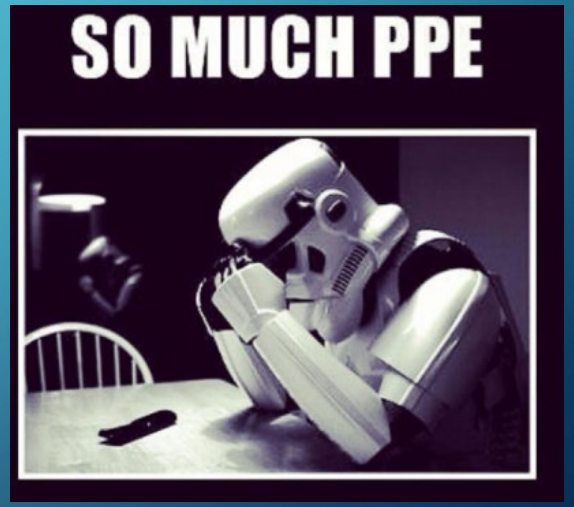
SINGLE USE PPE



Impacts of PPE on aquatic, atmospheric and terrestrial environments.

SINGLE USE PPE REDUCTION - ? REUSABLE

- Health services have adopted policies such as restricting glove use supported by propositions that eliminating glove use can reduce the carbon footprint of PPE by 45%.
- Reduction strategies and inconsistencies in IPC recommendations, lead to HCW confusion and anxiety regarding safety and concerns that the changes are driven for financial reasons.
- Acquiring trust and confidence of HCWs for PPE reuse remains a challenge.
- Guidelines for PPE usage driven by environmental benefits without compromising HCWs' safety should be standardised and propagated to alleviate anxiety and encourage compliance.



THE 3 R'S – REDUCE, REUSE, AND RECYCLE

- **Gloves off campaigns** – significant reported success in the NHS pre-pandemic to reduce glove use from ~ 1.4 billion gloves in 2019 - saved 21 tonnes of plastic and reported improved HCW skin integrity. Perhaps will be assisted by our latest TBP guidance? Waste concerns…?

Glove awareness | Campaigns | Royal College of Nursing

- **Single use gowns / aprons vs r**eusable fluid resistant washable up to 75 times? Limited use "reusable" items provide traceability issues?
- **Compostable or biodegradable PPE options** – cost, HCW acceptance and waste disposal considerations?

REDUCE, REUSE, AND RECYCLE

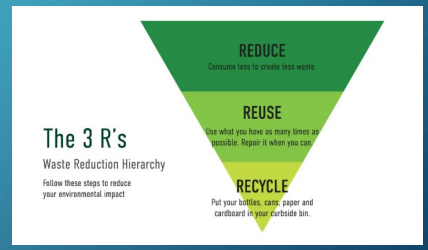
- **Think before you "bluey" campaigns** – encouraging reduced use / more sustainable options? / waste concerns?
- **Single use non-critical medical devices** vs reusable medical device options / ability to reprocess effectively between patient use e.g, Tourniquets, BP cuffs, Stethoscopes, Thermometers, Flowtrons, Limb splints, suction equipment vs true risk of cross transmission

  Any difficult to clean / disinfect / sterilise medical device – need

  single use or improved design??
- **Single use semi-critical and critical medical devices** vs reusable medical device options / consider actual reprocessing impacts on the environment vs waste concerns with single use (e.g, endoscopes / speculums / laryngoscopes / surgical instruments)

REDUCE, REUSE, AND RECYCLE

- **Reusable vs Disposable privacy screens -** – cost and waste disposal considerations
- **Medical device single use covers -** e.g, temperature probes, plastic sheeting on procedural / diagnostic equipment e.g., dental / theatres
- **Single use cleaning products vs reusable -**
  - Pre-impregnated wipes – better if compostable?
  - Single use cleaning cloths / mops vs reusable – laundering / traceability issues? waste considerations?



Access to appropriate waste stream disposal – particularly in rural and remote settings

NSQHS STANDARD 3 - PREVENTING AND CONTROLLING INFECTIONS STANDARD

Intention of this standard

To reduce the risk to patients, consumers and members of the workforce of acquiring preventable infections; effectively manage infections, if they occur; prevent and contain antimicrobial resistance; promote appropriate prescribing and use of antimicrobials as part of antimicrobial stewardship; and promote appropriate and **sustainable** use of infection prevention and control resources.

- 3.03, 3.Clinical governance and quality improvement systems are in place to prevent and control infections, and support antimicrobial stewardship and **sustainable** use of infection prevention and control resources

IS THIS STATEMENT STRONG ENOUGH?

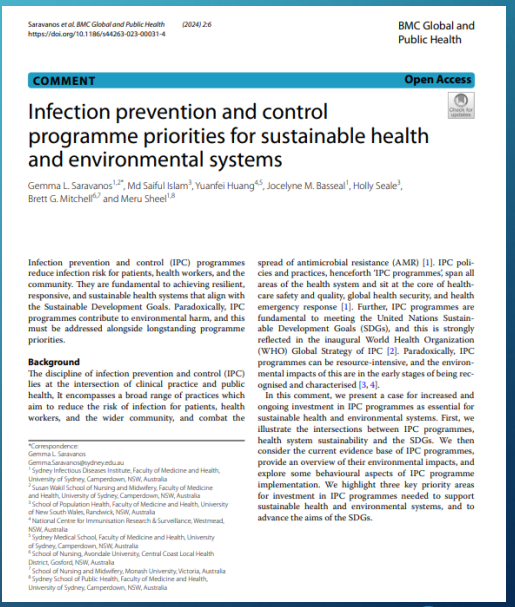
Explicit reference to sustainable use of IPC resources has been included to highlight the importance of delivering high-quality health care by protecting natural, financial and human resources as much as possible, and minimising environmental damage.

The concept of sustainability is implicit in the Clinical Governance Standard, especially in relation to the governance, leadership and culture and organisational leadership items.

Do we need some clearer guidance for Sustainability programmes, like provided for AMS back in 2011?

RESOURCING IPC PROGRAMMES - THE SOLUTION?

- Robust IPC programmes are integral to achieving resilient, responsive, and sustainable health systems that align with sustainable development goals, reduce health costs, and deliver safer health care for all.
- Paradoxically, IPC programmes are an important contributor to health sector emissions, waste, and ecosystem contamination.
- Increased and equitable investment needed to innovate and evaluate IPC programmes with regard to key health and environmental outcomes in all settings.
- Must be underpinned by effective governance and leadership, strong multi-stake-holder partnerships, and health community activation.



Saravanos et al. BMC Global and Public Health (2024) 2:6
https://doi.org/10.1186/s44263-023-00031-4

BMC Global and Public Health

COMMENT Open Access

Infection prevention and control programme priorities for sustainable health and environmental systems

Gemma L. Saravanos[1,2*], Md Saiful Islam[3], Yuanfei Huang[4,5], Jocelyne M. Basseal[1], Holly Seale[3], Brett G. Mitchell[6,7] and Meru Sheel[1,8]

Infection prevention and control (IPC) programmes reduce infection risk for patients, health workers, and the community. They are fundamental to achieving resilient, responsive, and sustainable health systems that align with the Sustainable Development Goals. Paradoxically, IPC programmes contribute to environmental harm, and this must be addressed alongside longstanding programme priorities.

Background

The discipline of infection prevention and control (IPC) lies at the intersection of clinical practice and public health. It encompasses a broad range of practices which aim to reduce the risk of infection for patients, health workers, and the wider community, and combat the spread of antimicrobial resistance (AMR) [1]. IPC policies and practices, henceforth 'IPC programmes', span all areas of the health system and sit at the core of healthcare safety and quality, global health security, and health emergency response [1]. Further, IPC programmes are fundamental to meeting the United Nations Sustainable Development Goals (SDGs), and this is strongly reflected in the inaugural World Health Organization (WHO) Global Strategy of IPC [2]. Paradoxically, IPC programmes can be resource-intensive, and the environmental impacts of this are in the early stages of being recognised and characterised [3, 4].

In this comment, we present a case for increased and ongoing investment in IPC programmes as essential for sustainable health and environmental systems. First, we illustrate the intersections between IPC programmes, health system sustainability and the SDGs. We then consider the current evidence base of IPC programmes, provide an overview of their environmental impacts, and explore some behavioural aspects of IPC programme implementation. We highlight three key priority areas for investment in IPC programmes needed to support sustainable health and environmental systems, and to advance the aims of the SDGs.

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for
listening ☺

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Prof Brett Mitchell (AM)

Latest research and updates from an Australian IPC research program

Latest research and updates from an Australian IPC research program

Prof Brett Mitchell (AM)
Central Coast Local Health District, Gosford Hospital, NSW.
Avondale University
Monash University
Hunter Medical Research Institute, NS

Disclosures

- Current recipient of NHMRC Investigator Grant
- Current recipient MRFF funding (HAPPEN study)

- No payment or fees related to this talk

- Work alongside a large number of collaborators in different countries
  - 50+ collaborators across on the talks presented today

Podcast: https://infectioncontrolmatters.com

Latest research and updates from an Australian IPC research program

Overview & results

Overview & some results

Overview

IPC workforce

CLEEN study

CATION study

PhD students

Pathogen survival

HAPPEN study

HIPPS study

Accelerometer hand hygiene usage study

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HAPPEN study

HIPPS study

Accelerometer hand hygiene usage study

Infection Prevention and Control Workforce

Purpose and methods

Purpose

In the Australian and NZ IPC workforce, wanted to understand:

- Levels of stress
- Resilience
- Personality traits
- Workforce views

Methods

- Cross sectional anonymous online survey of ICPs
- Conducted in quarter two of 2023
- Used ACIPC list, social media and snowballing approach
- Brief resilience scale
- Work Stress Screener
- Big 5 personality test

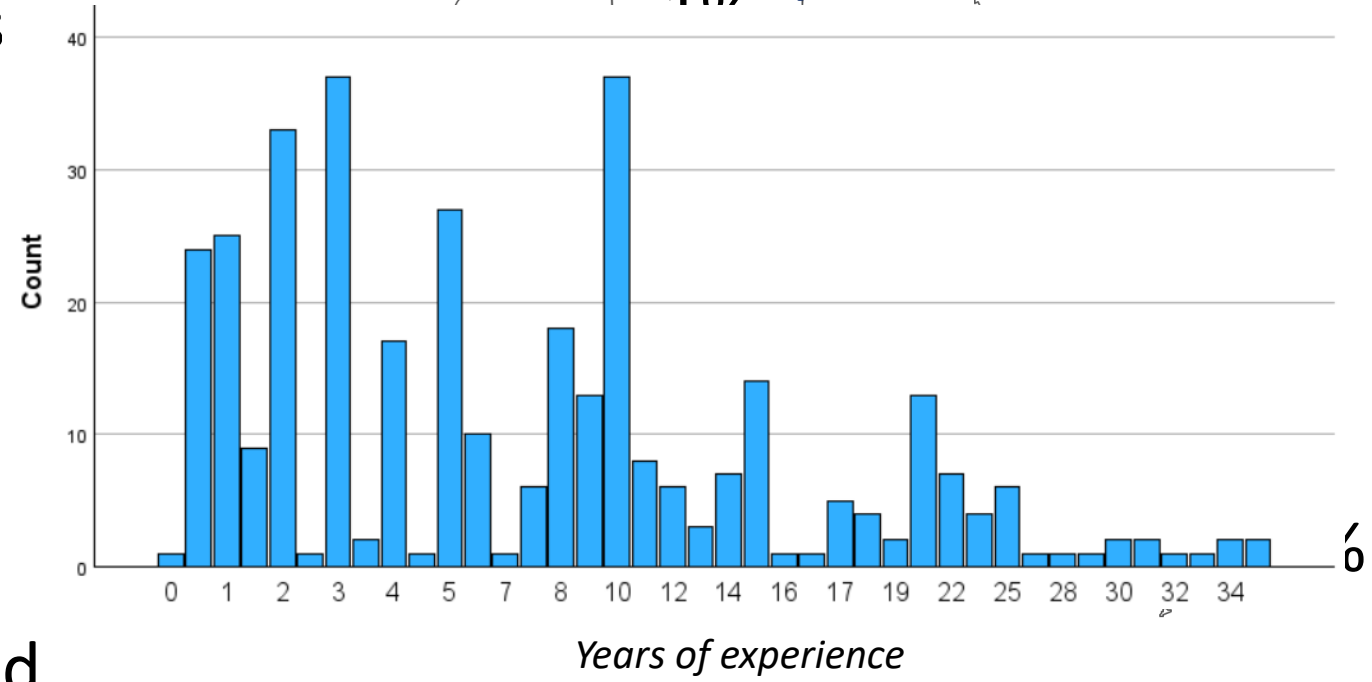
Infection Prevention and Control Workforce

Overview

- 356 ICPs across Australia and New Zealand

- 58% worked in hospitals, 11% RACFs
- 34% leading an IPC team
- 75% public sector

Distribution of years worked



- 47% not credentialled, 23% advanced
- Years working in IPC = 6 (median), 8 mean

Infection Prevention and Control Workforce

Results: WoSS / Work Stress Screener

- 5 questions
- Possible score of 0 to 15
- High score = indication that there is malignant or harmful stress

- Mean score 4.3
  - 14% score of 0
  - 8% score >10
- Significantly higher levels of stress
  - Those <6 years IPC experience
- Significantly lower levels of stress
  - Masters or higher level degree

Infection Prevention and Control Workforce

Results: Resilience, Brief resilience score

- 6 questions

- 1.00–2.99 for low resilience
- 3.00–4.30 for normal resilience
- 4.31–5.00 for high resilience

- Mean score 3.3
  - 26% low resilience
  - 8% high resilience
- Significantly higher levels of resilience
  - ≥ 6 years IPC experience
  - Masters or higher level degree
- Significantly lower levels of resilience
  - Who are credentialed
  - < 45 years old

Infection Prevention and Control Workforce

Results: Personality traits (n=243)

- **Neuroticism**
  - Tendency for negative feelings
- **Extraversion**
  - Pronounced engagement with external world
- **Openness To Experience**
  - Imaginative, creative people from down-to-earth, conventional people
- **Agreeableness**
  - Cooperation and social harmony
- **Conscientiousness**
  - Control, regulate, and direct our impulses

- **Neuroticism**
  - Mean 70 (SD 15) - LOW
- **Extraversion**
  - Mean 79 (SD 11) - HIGH
- **Openness To Experience**
  - Mean 79 (SD 9) - HIGH
- **Agreeableness**
  - Mean 87 (SD 15) - HIGH
- **Conscientiousness**
  - Mean 87 (SD 15) - HIGH

Personality traits differed between age groups and those credentialed/not credentialed, little with IPC education

Infection Prevention and Control Workforce

Results: Workforce (n=343)

- **Will you leave the profession in the next three years?**
    - 20% Yes
        - 24% in the less 6 years experience category
        - 22% in <45 years old (16% ≥45 years)

- **Retire in next 10 years**
    - 31% Yes

IPC Workforce Take-homes

- Important to think about personalities in your own team
  - Mix?
  - Tailor your leadership style
  - Conscientiousness, biggest influencer in job performance - higher knowledge and conscientious to learn (Essentials of Organizational Behavior: 14th Edition)
  - Neuroticism propensity for burnout
- Reflect on your own personality – play to your strengths and understand others
- Need to look after those less experienced
- Study is not cause and effect

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PhD students

Pathogen survival

HAPPEN study

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Accelerometer hand hygiene usage study

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The CLEANING AND ENHANCED DISINFECTION study

Brett Mitchell, Kate Browne, Georgia Matterson, Phil Russo, Nicole White, Andrew Stewardson, Allen Cheng, Maham Amin, Kirsty Graham, Jennie King, Martin Kiernan, Peta Tehan, David Brain, Maria Northcote.

CLEEN study
Cleaning of shared medical equipment

3 hours of **additional dedicated** cleaning of shared medical equipment per ward, per weekday

www.cleenstudy.com

CLEEN study

Study design

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Cluster 1 Wards 1&2	Control	Intervention	Intervention	Intervention	Intervention	Intervention
Cluster 2 Wards 3&4	Control	Control	Intervention	Intervention	Intervention	Intervention
Cluster 3 Wards 5&6	Control	Control	Control	Intervention	Intervention	Intervention
Cluster 4 Wards 7&8	Control	Control	Control	Control	Intervention	Intervention
Cluster 5 Wards 9&10	Control	Control	Control	Control	Control	Intervention

www.cleenstudy.com

CLEEN study: Different parts and outcomes

- **Effectiveness of additional cleaning on all HAIs**
  - Sub-analyses on All HAIs minus COVID-19; Pneumonia, surgical site, blood-stream and urinary traction infection combined
- **Improvements in the thoroughness of cleaning**
  - Florescent gel and UV
- **Cost effectiveness**
- **Time and motion**
  - How long does it take to clean individual pieces of shared medical equipment?
- **Cleaner interviews**
  - Cleaners' experience of receiving feedback
- **Scenario modeling**

CLEEN study: Different parts and outcomes

Effectiveness (RCT)

- Preliminary results presented at ECCMID later this month
- Journal publication submitted end month
- Presentation of results at IPS conference (Manchester, UK)

- Cost-effectiveness
  - Working on analysis currently
  - ? Presentation of results at ACIPC, in addition to effectiveness

- Cleaner interviews
  - Present some findings now
  - ? Presentation of results at ACIPC, in addition to above

- Time and motion study
  - Journal paper under review
  - Present some findings now
  - ? Presentation of results at ACIPC, in addition to above

- Scenario modeling
  - Paper to come
  - ? Presentation of results at ACIPC, in addition to above

CLEEN Study: Time and motion study

How much time is needed to effectively clean shared medical equipment?

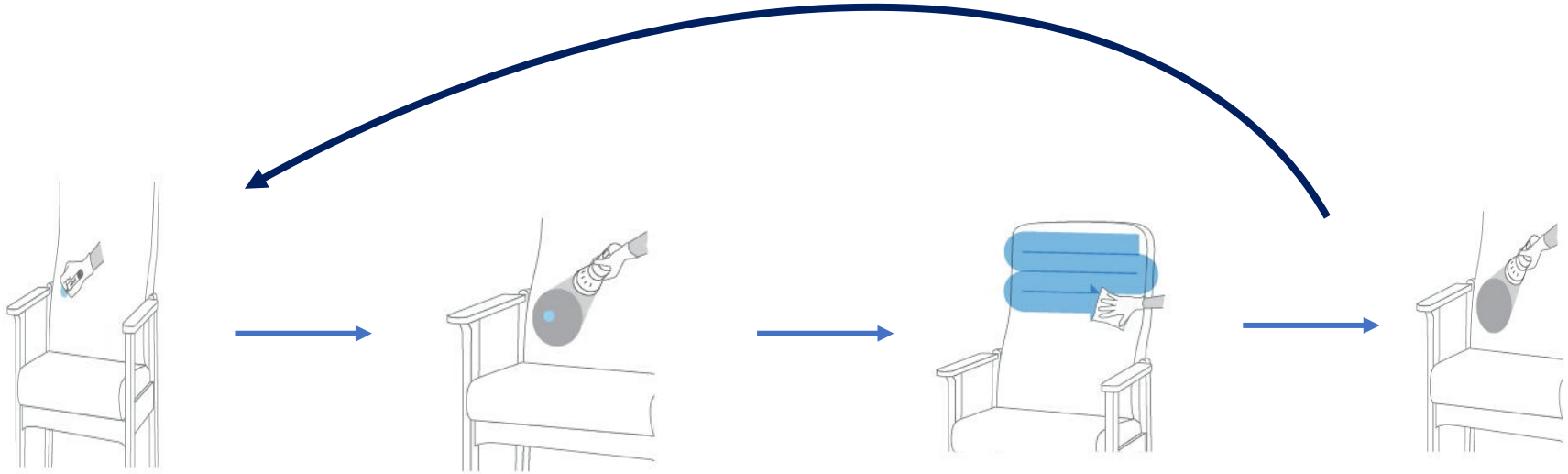
CLEEN study: Time and Motion - Why?

- How can we effectively plan cleaning programs and staff these accordingly?
- Allocating cleaning responsibility means time, especially for clinical staff
- Cost-effectiveness evaluations
- Plan future cleaning models

CLEEN study: Time and motion study

Methods

- Observational study, time and motion
- Participants received training on how to clean shared medical equipment
- UV dot placed, item cleaned, recorded how long.



www.cleenstudy.com

CLEEN study: Time and motion study

Results

Type of equipment	Mean time: effectively* clean (min:sec)	Min time (min:sec)	Max time (min:sec)
Blood glucose testing kit	0:50	0:27	1:10
Intravenous stand	1:20	0:40	2:01
Infusion pump	1:21	0:31	2:06
Blood pressure monitor	1:49	1:00	2:13
Patslide	2:17	1:38	3:00
Metal trolley	2:19	1:38	4:20
Wheelchair	2:29	1:21	3:38
Resuscitation trolley	2:29	2:01	3:50
Computer on wheels	2:43	1:46	4:00
Commode	2:58	2:18	4:20
Bladder scanner	3:16	2:09	5:01
Medication trolley	3:53	3:15	4:28

CLEEN study: Different parts

Effectiveness (RCT)

- Preliminary results presented at ECCMID later this month
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- Cost-effectiveness
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  - Paper to come
  - ? Presentation of results at ACIPC, in addition to above

CLEEN study: Cleaners experience study

Method and results

Methods

- Describe their personal experiences of cleaning shared medical equipment and how they prefer to receive feedback about their work
- Semi-structured focus group

Results

- Regarding feedback the cleaners preferred method was verbal or through email (small groups or individually)
- Did not like the public displays of feedback.
- Furthermore, it was noted that cleaners valued demonstrations of cleaning processes as an additional feedback method

CLEEN study take homes:

Time and motion & Cleaner's perspectives

- It takes time to clean shared medical equipment, need to factor this into planning
- Consider the cleaner's perspectives on receiving feedback
- Main results on effectiveness and cost-effectiveness to come

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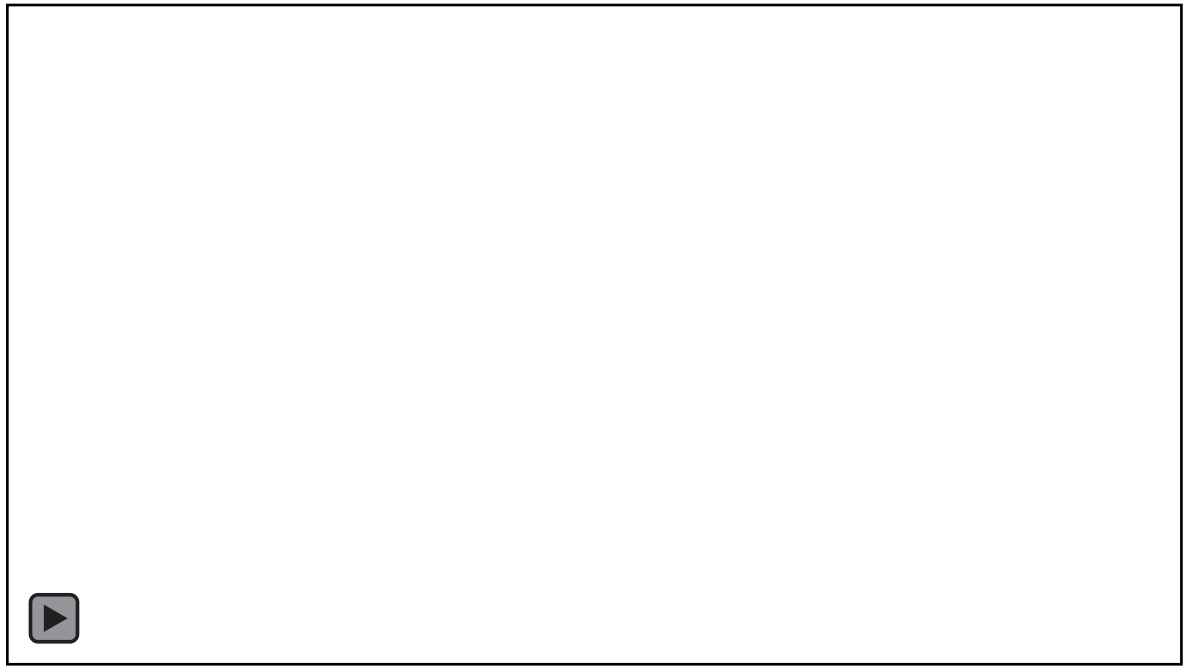
Hospital Acquired Pneumonia PrEveNtion (The HAPPEN study)

- Multi-centre RCT
- Effect of improving the quality and quantity of oral care on the incidence of HAP
- Cost-effectiveness
- Patient experience of HAP
- Attributable LOS in hospital



www.happenstudy.com

HAPPEN study: The team

Chief Investigators

- Professor Brett Mitchell
- Dr Nicole White
- Professor Allen Cheng
- Professor Helen Rawson
- Professor Phil Russo
- Professor Rhonda Wilson
- Professor Jenny Sim
- A/Professor Andrew Stewardson
- Dr Sonja Dawson
- Dr Julee McDonagh
- Dr Auxilla Madhuvu

Associate Investigators

- Liz Orr
- Jayne O'Connor
- A/Prof Caroline Marshall
- A/Prof Doug Johnson
- Professor Patricia Stone
- Professor Nick Graves
- Professor Maria Northcote
- Professor Janet Wallace

- Dr Peta Tehan
- Dr Kate Browne
- Georgia Matterson

Partners

Australian College of Nursing

Sigma Global Nursing Excellence

Clinical Excellence Commission

ACIPC Australasian College for Infection Prevention and Control

Cabrini

NSW Government Health Mid North Coast Local Health District

NSW Government Health Central Coast Local Health District

Consumers

www.happenstudy.com

HAPPEN study overview

Completed

Starts ~ June 2024

2025-2026

www.happenstudy.com

HAPPEN: Oral care and HAP survey

Methods

- A national survey of Australian Nurses in 2023 (RN or EN).
- Paper currently under review
- Describe current practices, barriers and facilitators, knowledge and educational preferences of registered nurses performing oral health care in the Australian hospital setting, with a focus on the prevention of HAP
- 179 participants

HAPPEN: Oral care and HAP survey

Results (preliminary)

Oral care priorities, training and practice

- 82% agreed that oral care is important, 66% feel oral cavity hard to clean

Perceptions of pneumonia (HAP) risk and prevention strategies

- Of all HAIs, participants ranked pneumonia as third in terms of frequency

Topic	Not important (%)	Slightly important (%)	Moderately important (%)	Very important (%)
Hand hygiene	3 (2)	23 (15)	40 (26)	**90 (58)**
Patient Mobilisation	3 (2)	19 (12)	49 (31)	**85 (55)**
Environmental Cleanliness	8 (5)	24 (15)	43 (28)	**81 (52)**
Correct use of PPE	9 (6)	28 (18)	40 (26)	**79 (51)**
Dysphagia management	3 (2)	20 (13)	56 (36)	**77 (49)**
Oral Care	7 (5)	31 (20)	47 (30)	**71 (45)**

HAPPEN: Oral care and HAP survey

Results (preliminary)

Barriers

- Uncooperative patient (n=91, 43%), inadequate staffing (n=84, 40%) and a lack of oral toilet requisite (n=63, 30%)
- Better supplies (66%)
- Insufficient time (20%)

Education and support

- In-services most popular (30%), then website
- Patient reminders (77%)
- High-quality toothbrushes
- Games and apps least favoured

Publication under review

HAPPEN: Oral care and HAP focus groups

Methods & results (preliminary)

- Three focus groups with nurses across the country
- Paper currently under development

Themes

- **The nurses role**
- **Challenges**
  - Time, lack of resources, education
- **Empowering patients**
  - Education
- **Prompts**
  - Patient prompts and innovation

> *And it's only later that I started to realise that there was a link between oral hygiene and respiratory health, and it's a fairly strong link. Um, and it — and it's interesting that when I mention it to nurses who were quite experienced, they — they're quite surprised by this.*

> *Equipment isn't readily available for patients to do it themselves, which leads me into the expectation is on the patients and therefore the patients aren't getting either prompted or don't know why they're doing it*

Publication in development

www.happenstudy.com

HAPPEN study: Our intervention

- **Dedicated research nurse**
  - Education patients and staff on the ward, working with them [Education, in-service, engaging patients]
  - Assist in providing oral care [Time resource]

- **Products**
  - Good quality toothbrush [Product, Patient prompt]
  - Three-sided toothbrush and toothpaste [Product]

- **Education**
  - Website, training material, short videos and more [Education, engagement]
  - Separate patient and clinician focussed

HAPPEN study overview

Completed

Starts ~ June 2024

2025-2026

www.happenstudy.com

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CATION study

- Investigate the role of chlorhexidine for cleaning meatal area for reducing UTIs in patients that self-catheterise in the community
- Double blind, placebo, cross-over RCT
- Saline Vs 0.1% chlorhexidine
- Recruitment underway
- Results late 2025

Chlorhexidine for meatal cleaning in reducing catheter-associated urinary tract infections: a multicentre stepped-wedge randomised controlled trial

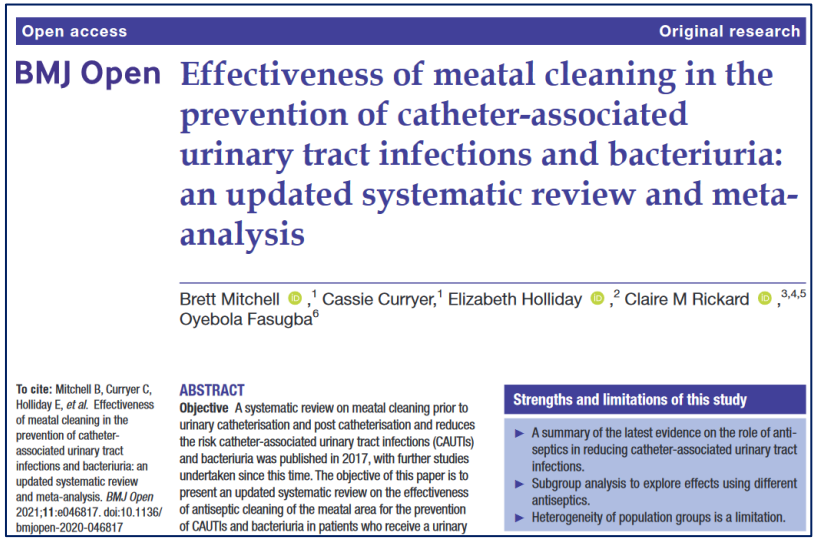
Oyebola Fasugba, Allen C Cheng, Victoria Gregory, Nicholas Graves, Jane Koerner, Peter Collignon, Anne Gardner, Brett G Mitchell

Summary

Background Evidence for the benefits of antiseptic meatal cleaning in reducing catheter-associated urinary tract infection (UTI) is inconclusive. We assessed the efficacy of 0·1% chlorhexidine solution compared with normal saline for meatal cleaning before urinary catheter insertion in reducing the incidence of catheter-associated asymptomatic

Lancet Infect Dis 2019; 19: 611–19

Published Online April 12, 2019



Open access Original research

BMJ Open

Effectiveness of meatal cleaning in the prevention of catheter-associated urinary tract infections and bacteriuria: an updated systematic review and meta-analysis

Brett Mitchell [1], Cassie Curryer,[1] Elizabeth Holliday [2], Claire M Rickard [3,4,5] Oyebola Fasugba[6]

To cite: Mitchell B, Curryer C, Holliday E, *et al*. Effectiveness of meatal cleaning in the prevention of catheter-associated urinary tract infections and bacteriuria: an updated systematic review and meta-analysis. *BMJ Open* 2021;**11**:e046817. doi:10.1136/bmjopen-2020-046817

ABSTRACT

Objective A systematic review on meatal cleaning prior to urinary catheterisation and post catheterisation and reduces the risk catheter-associated urinary tract infections (CAUTIs) and bacteriuria was published in 2017, with further studies undertaken since this time. The objective of this paper is to present an updated systematic review on the effectiveness of antiseptic cleaning of the meatal area for the prevention of CAUTIs and bacteriuria in patients who receive a urinary

Strengths and limitations of this study

- A summary of the latest evidence on the role of antiseptics in reducing catheter-associated urinary tract infections.
- Subgroup analysis to explore effects using different antiseptics.
- Heterogeneity of population groups is a limitation.

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HIPPS study

- Led by A/Professor Andrew Stewardson
- Establish the prevalence of healthcare-associated infections (HAIs) among adult patients in acute care hospitals in the Philippines
- 23 Level 1, 2 and 3 hospitals in the Philippines
- WHO and DoH Philippines funded
- Data collection coming mid-year

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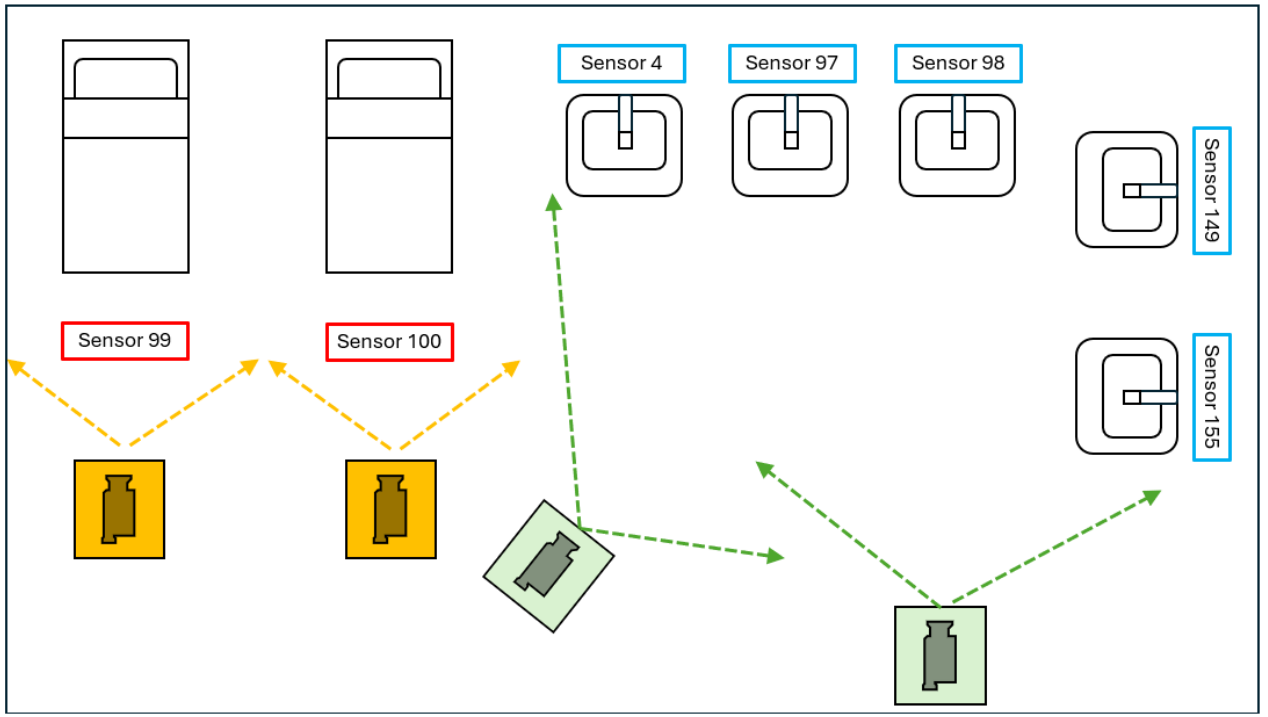
Accelerometer hand hygiene usage study

Hand hygiene sensor technology

- Real-time data collection of hand hygiene usage
- Accelerometer placed in each ABHR and soap-dispenser
- Real-time data could be used to identify historical trends and help facilitate targeted early interventions
- Identify empty ABHR and soap dispensers
- Tested this in a simulation ward with 5000+ observations and nursing activities



Publication in development

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Selection of PhD student work

Air purifier study

- Bismi Thottiyil Sultanmuhammed Abdul
- Effect of in-room air purification on the incidence of ARI
- Multi-centre, double-blind cross-over RCT

Drivers of multi-resistant organism (MRO) acquisition and transmission

- Dr Sarah Browning
- Antibiotic thresholds, gloves and gowns and clinical handwashing basins

Aseptic technique

- Hannah Kent
- Improving education and understanding of aseptic technique

HAP epidemiology & impact

- Michelle Chalker
- Incidence, mortality and attributable LOS associated with HAP

Pressure injury prevention

- Hayley Ryan
- Impact of a barrier wipes on pressure injury in aged care residents
- Multi-centre, single-blinded, parallel RCT

HAI Textbook

- The first Australian text to address the challenges posed by infectious diseases and healthcare-associated infections
- 76 authors
- 25 peer reviewers

Scan to order and receive an exclusive 25% discount!*

* 25% discount offer exclusively for ACIPC members. ACIPC members will receive the 25% discount code via email.

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CLEEN (cleaning) study: **cleanstudy.com**

HAPPEN (pneumonia) study: **happenstudy.com**

CATION (UTI) study: **utipreventioncom.wordpress.com/**

Infection Control Matters podcast**: infectioncontrolmatters.com**

HAI text:

Prof Brett Mitchell (AM)

brett.Mitchell@avondale.edu.au

STAY A STEP AHEAD

of winter infections

gama healthcare | ACIPC Australasian College for Infection Prevention and Control

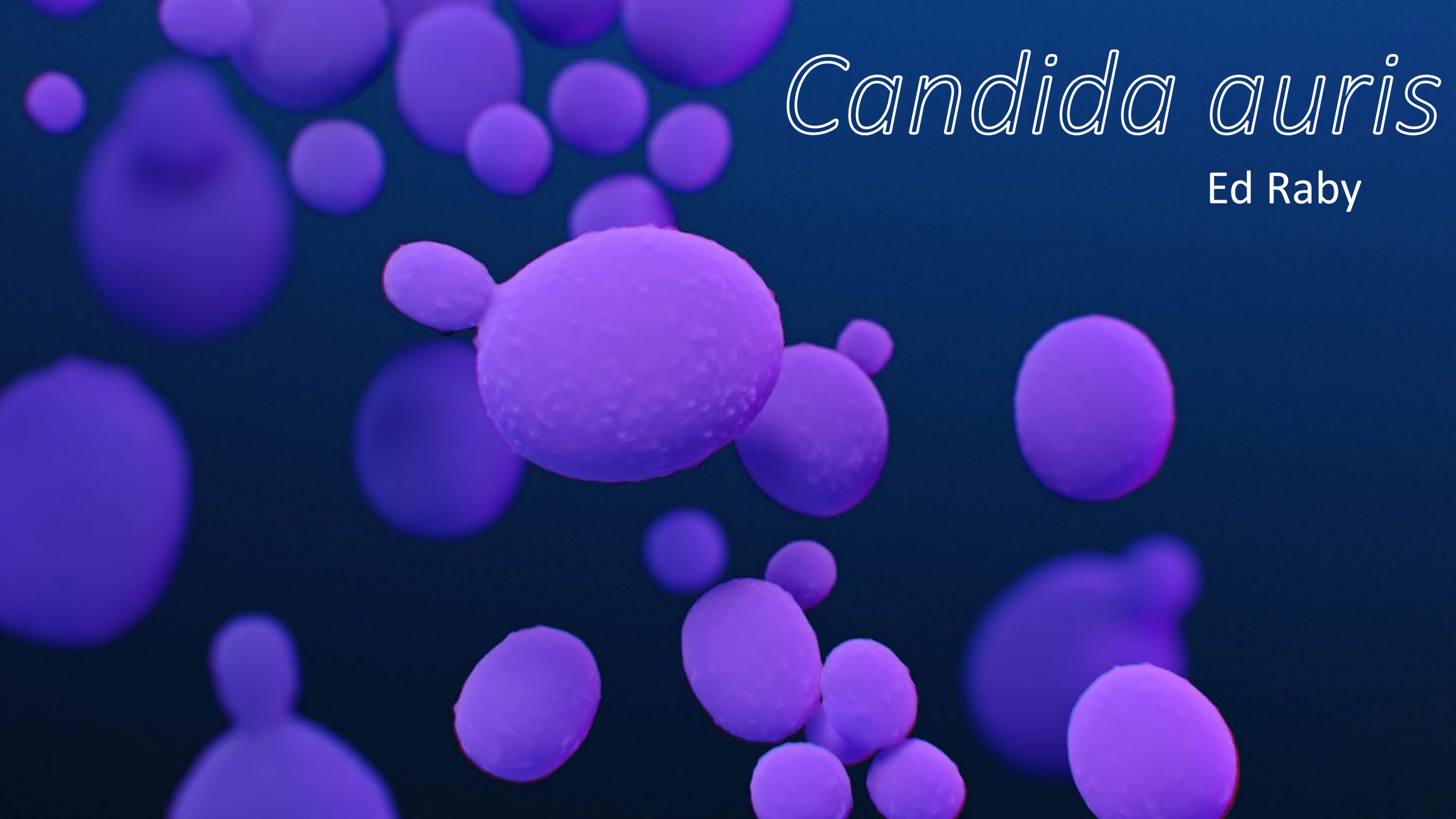
Scan the QR code to register now for the Winter IPC educational webinar, **"Stay a Step Ahead".**

23rd April 2024, 7-8pm AEST

Lunch

Dr Edward Raby

Emerging pathogen: *Candida auris*



Candida auris

Ed Raby

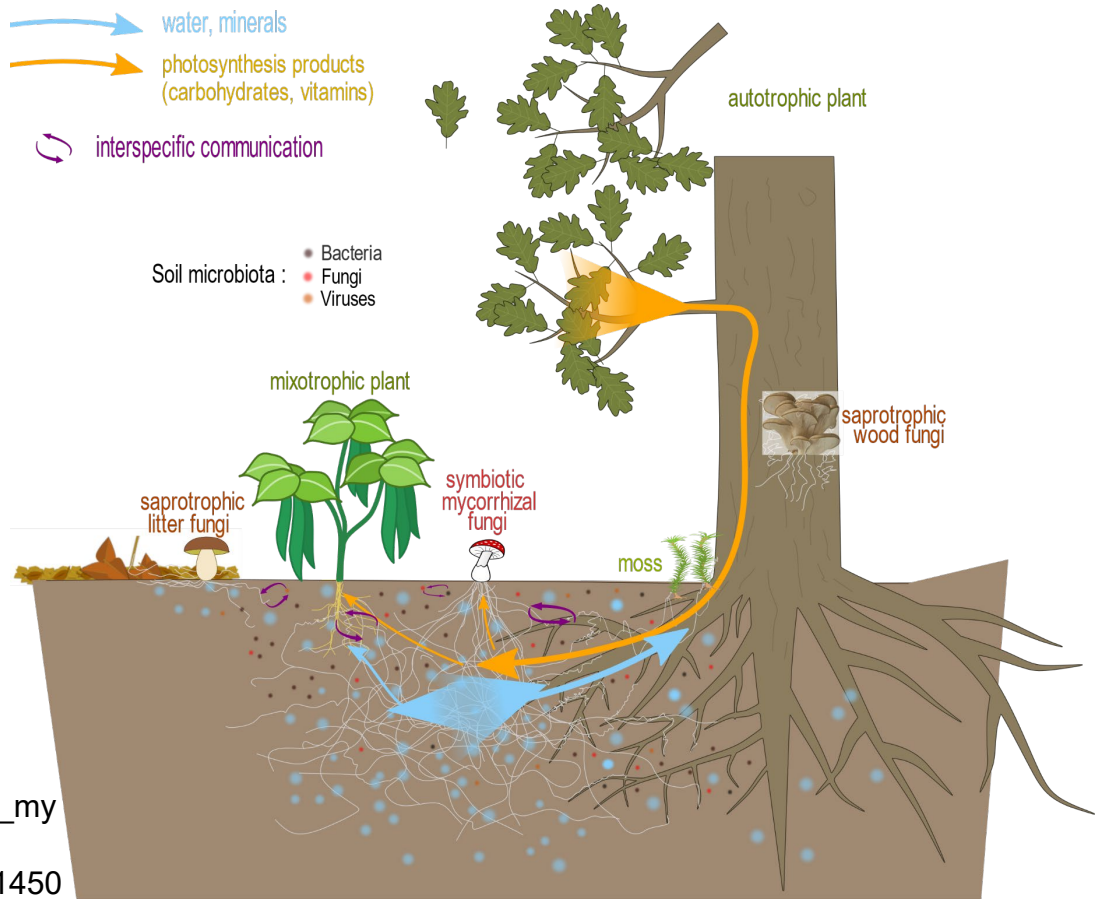
Fungi as friends

- Many fungi in food and beverage production

- Normal human mycobiome
  - Oral cavity – GI tract
  - Upper respiratory tract (sinuses)

Fungi as disease agents

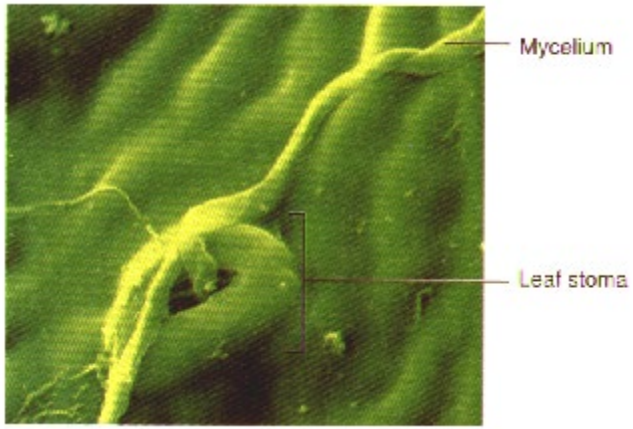
- More than 100 000 species of fungi are known
  - About 90% are harmless (and essential) saprobes
  - About 10 000 cause disease in plants



By Charlotte Roy, Salsero35, Nefronus - Adapted from https://commons.wikimedia.org/wiki/File:R%C3%A9seau_mycorhizien.svg, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=92921450

Apple Scab

Hyphae infecting via stomata

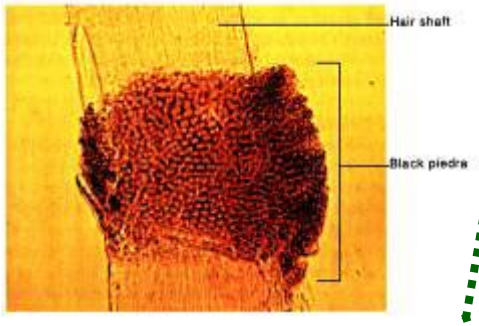


Ergot of rye, wheat, barley

Wheat Stem Rust

Fungi as disease agents

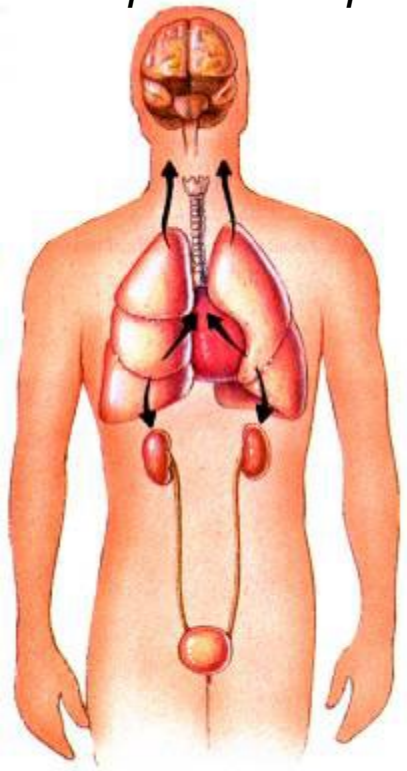
- More than 100 000 species of fungi are known
  - About 90% are harmless (and essential) saprobes
  - About 10 000 cause disease in plants
  - About 300 (0.3%) have been linked to animal disease
  - 30 species cause the majority of human disease
    - Hypersensitivity
    - mycosis/mycoses (fungal infections)
    - mycotoxicosis (fungal poisons)



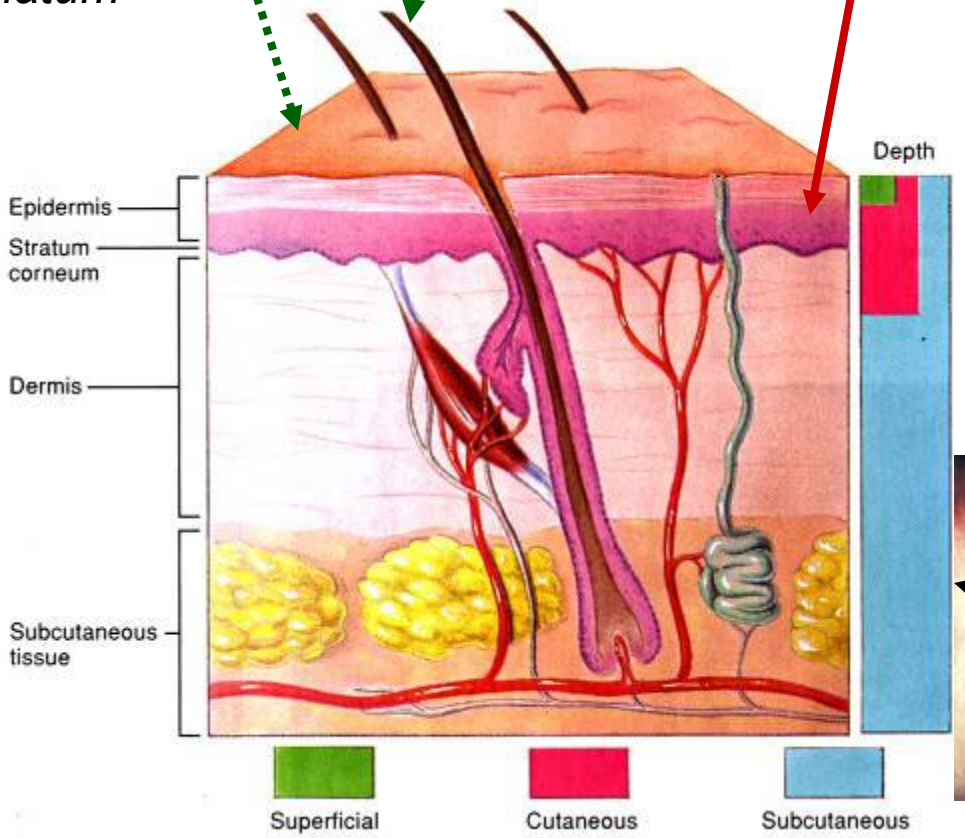
Superficial
e.g. Black piedra
Piedraia hortae

Cutaneous
e.g. Tinea pedis (athlete's foot)
***Trichophyton* spp.**

Systemic
e.g. Histoplasmosis
Histoplasma capsulatum



Systemic



Subcutaneous
e.g. Sporotrichosis
Sporothrix schenckii

Fungi as disease agents

- More than 100 000 species of fungi are known
  - About 90% are harmless (and essential) saprobes
  - About 10 000 cause disease in plants
  - About 300 (0.3%) have been linked to animal disease
  - 30 species cause the majority of human disease
    - Hypersensitivity
    - mycosis/mycoses (fungal infections)
    - mycotoxicosis (fungal poisons)

“Unfortunately no fungal infection is reportable in Australia so it is very hard to get an accurate measure. All up I would say about 1000 cases a year for invasive, life threatening fungal infections vs 1,000,000 superficial or cutaneous infections.” (about 5% of the population)

Dr David Ellis

https://mycology.adelaide.edu.au

App Google Scholar IBM Watson for Drug Home - SMHS / EMH

The University of Adelaide

Search All University Sites

Mycology Online

THE UNIVERSITY of ADELAIDE

Mycology Home

Welcome to Mycology Online

This website contains information on the identification and management of human and animal fungal infections. The site provides a range of educational materials including a mould identification self assessment module, descriptions of fungal pathogens and diseases, antifungal susceptibility data and links to societies and to other mycology sites.

Mycology MasterClass

ISHAM

ISHAM
INTERNATIONAL SOCIETY FOR HUMAN AND ANIMAL MYCOLOGY

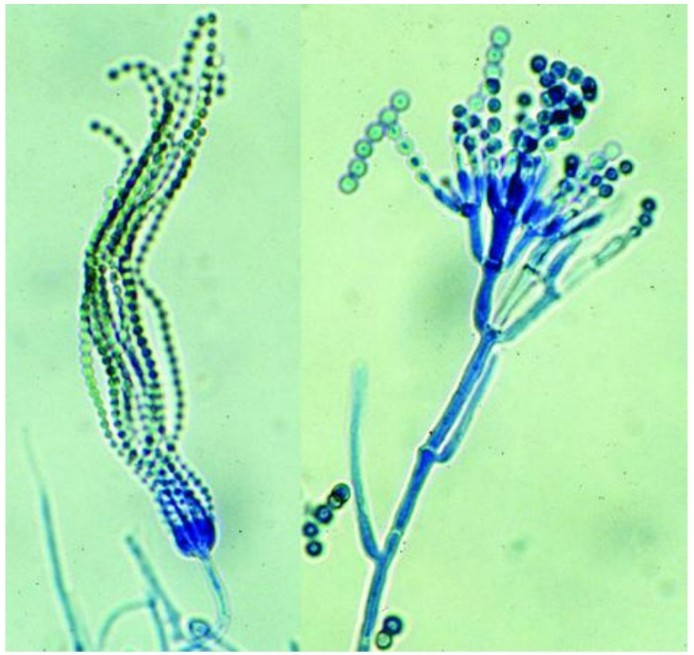
Quicklinks

- Journal of Medical Mycology
- Medical Mycology Case Reports
- 20th ISHAM Congress 2018
- Atlas of Clinical Fungi

Fungal Descriptions

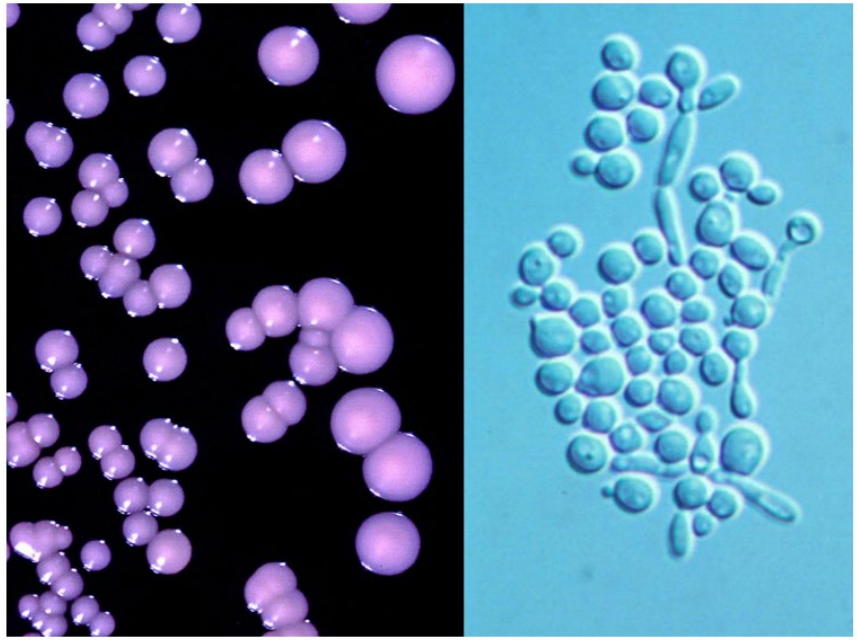
Descriptions of Medical Fungi

Human fungal infections in Australia



(Left) Simple conidiophore of *P. cheresanum* showing long chains of single-celled phialoconidia and (right) conidiophores of *P. verrucosum* var. *cyclopium* showing two-stage branching.

Culture of *Penicillium* spp.



Candida albicans showing typical cream-coloured, smooth surfaced, waxy colonies and narrov based budding spherical to ovoid blastoconidia.

Incidence of opportunistic fungal pathogenesis is rising

- Aging population
- More surviving but debilitated and immunocompromised patients (cancer, AIDS, TB, alcoholism, organ disease, immunosuppressive drugs)
- 5% of nosocomial infections (up to 40% mortality)

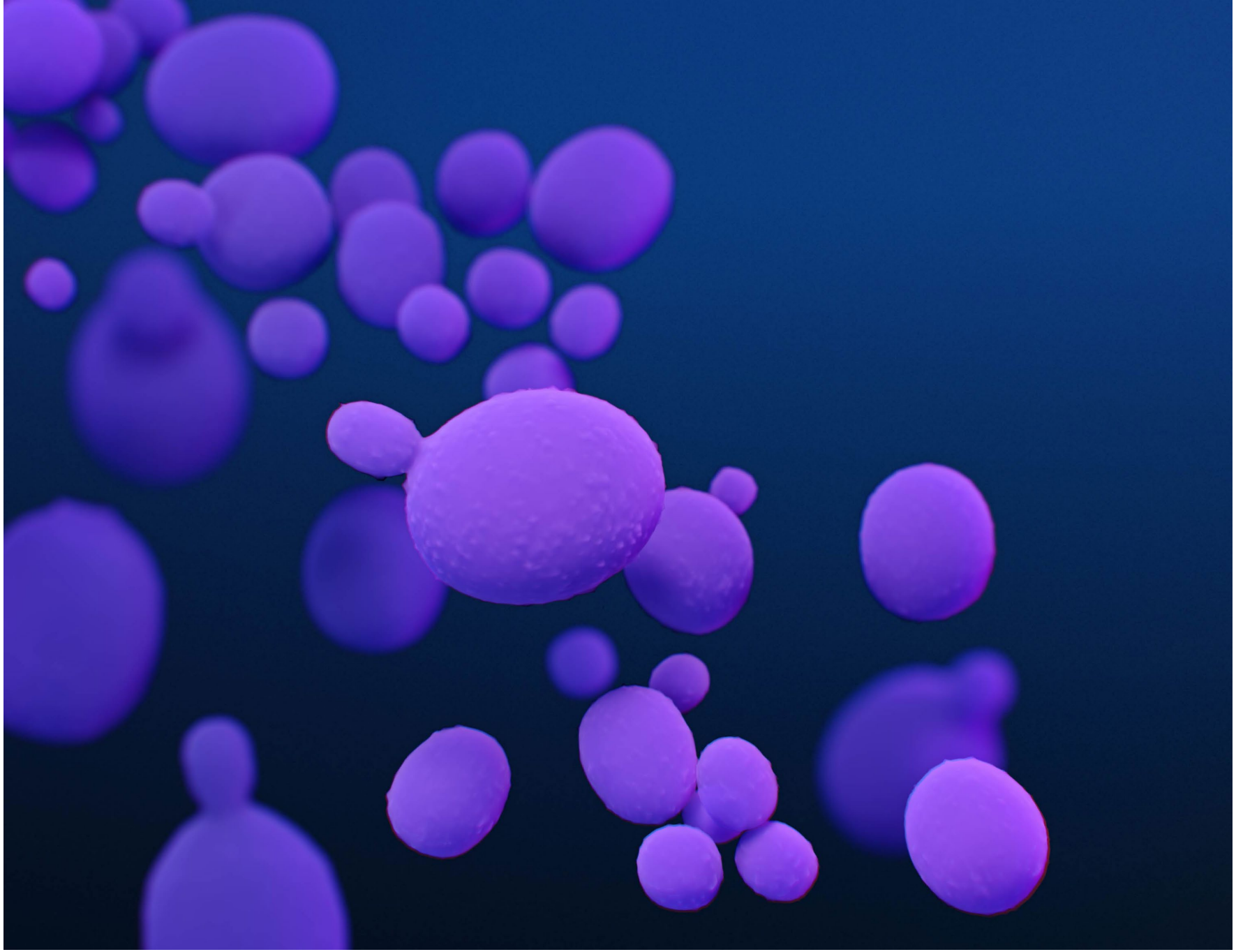
Current nomenclature	Previous nomenclature (if applicable)
Candida albicans	N/A
Candida auris	N/A
Candida dubliniensis	N/A
Candida tropicalis	N/A
Clavispora lusitaniae	Candida lusitaniae
Meyerozyma guilliermondii	Candida guilliermondii
Pichia kudriavzevii	Candida krusei
Candida glabrata complex	
Nakaseomyces bracarensis	Candida bracarensis
Nakaseomyces glabrata	Candida glabrata
Nakaseomyces nivariensis	Candida nivariensis
Candida parapsilosis complex	
Candida parapsilosis	N/A
Lodderomyces elongisporus	N/A
Candida metapsilosis	N/A
Candida orthopsilosis	N/A

Predisposing factors and interventions associated with invasive Candida infection

Patients who have many risk factors are at a significantly increased risk

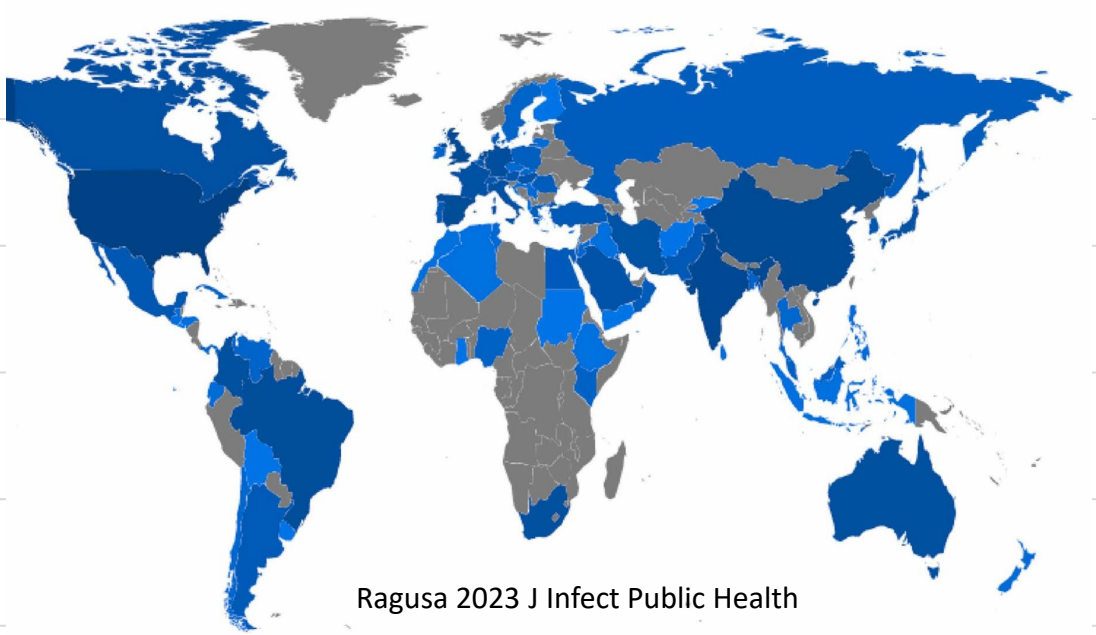
(Keighley, 2021) (Playford, 2016) (Thomas-Ruddel, 2022)

- Comorbidities
  - chronic liver disease
  - solid organ transplant
  - people who inject drugs
- Current risk factors and interventions
  - central venous access device in situ
  - moderate to severe neutropenia (< 1.0 x10^9 cells/L)
  - receiving total parenteral nutrition
- Risk factors or interventions within the last 30 days
  - gastrointestinal or hepatobiliary surgery
  - urological instrumentation (including IDC)
  - carbapenem use for more than 72 hours
  - high-dose corticosteroid use in the last 7 days
  - receipt of blood transfusion
  - culture of Candida from throat or urine
    - increased risk if both are positive



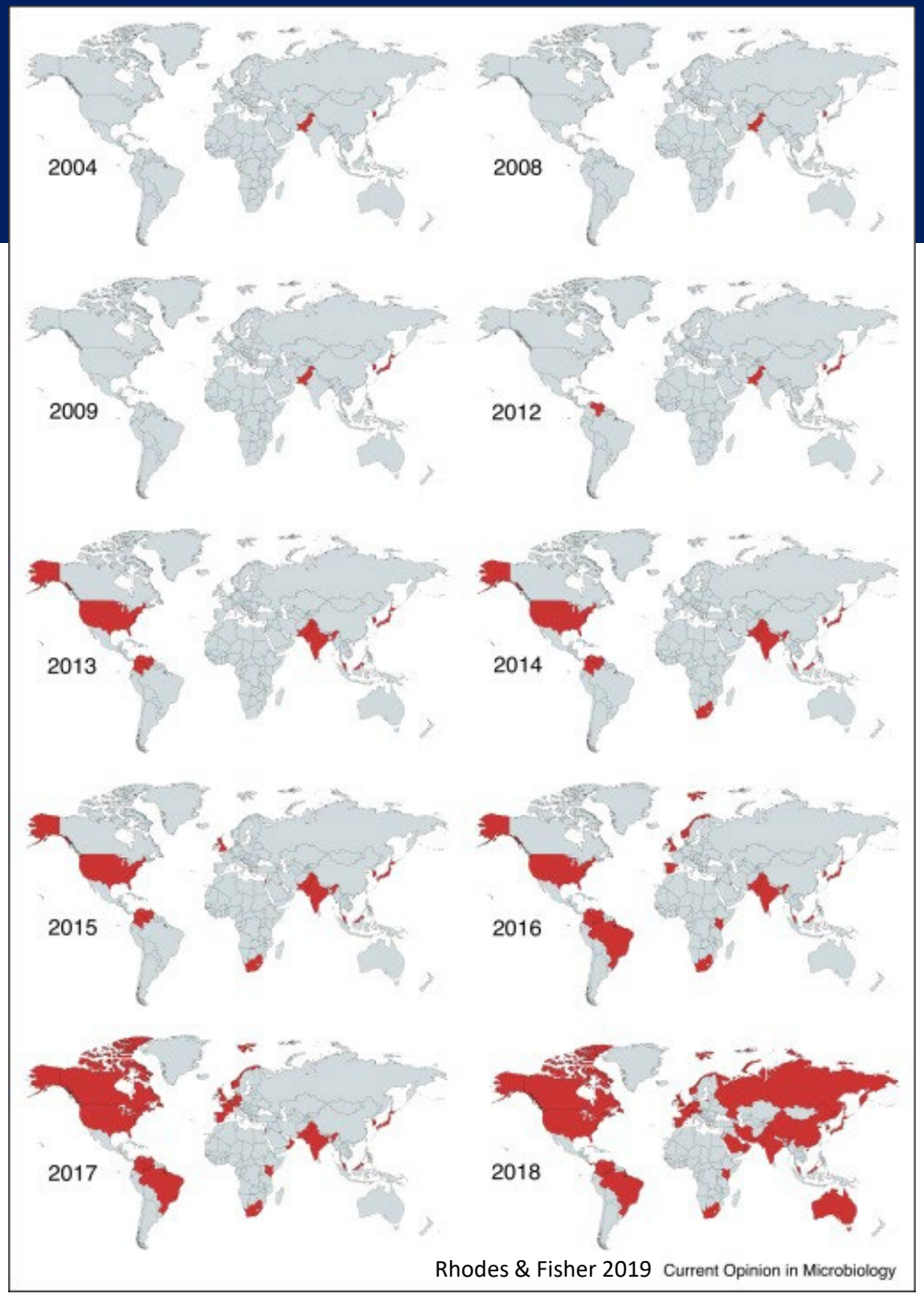
CDC/ Antibiotic Resistance Coordination and Strategy Unit (Stephanie Rossow) 2019

PubMed search



Ragusa 2023 J Infect Public Health

- Identified in 2009 in Japan
- Serious disease reported in 2011-2012
  - Asia
  - Africa
  - South America
- Earliest retrospective isolate 1996 South Korea
- Common genetic ancestor 1980s



Origin theories

Azole theory

Minor skin commensal

Selected for by antifungal use

- Clinical
- Agriculture

Climate theory

Environmental source

- Salt marshes

Thermotolerant

Halotolerant

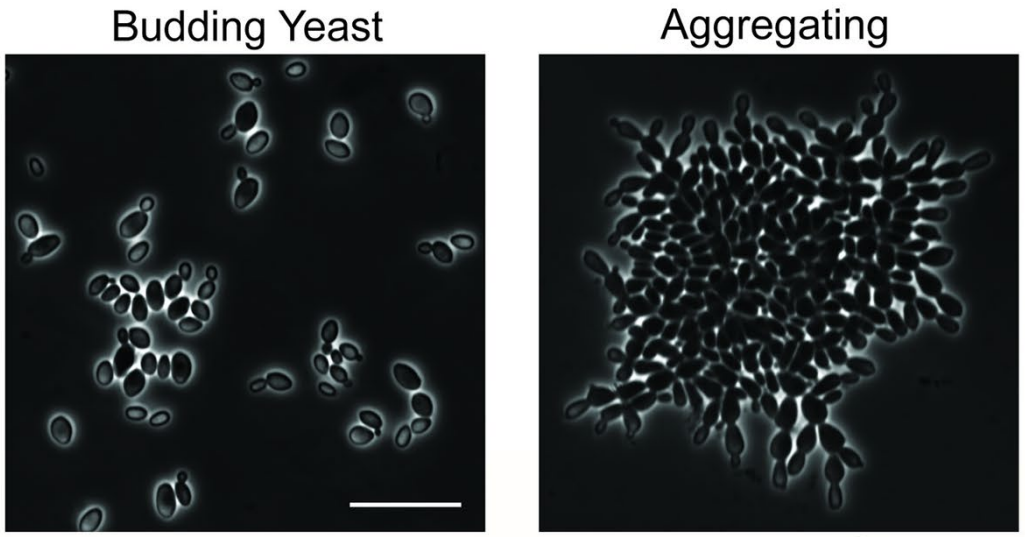
Adapting with global warming

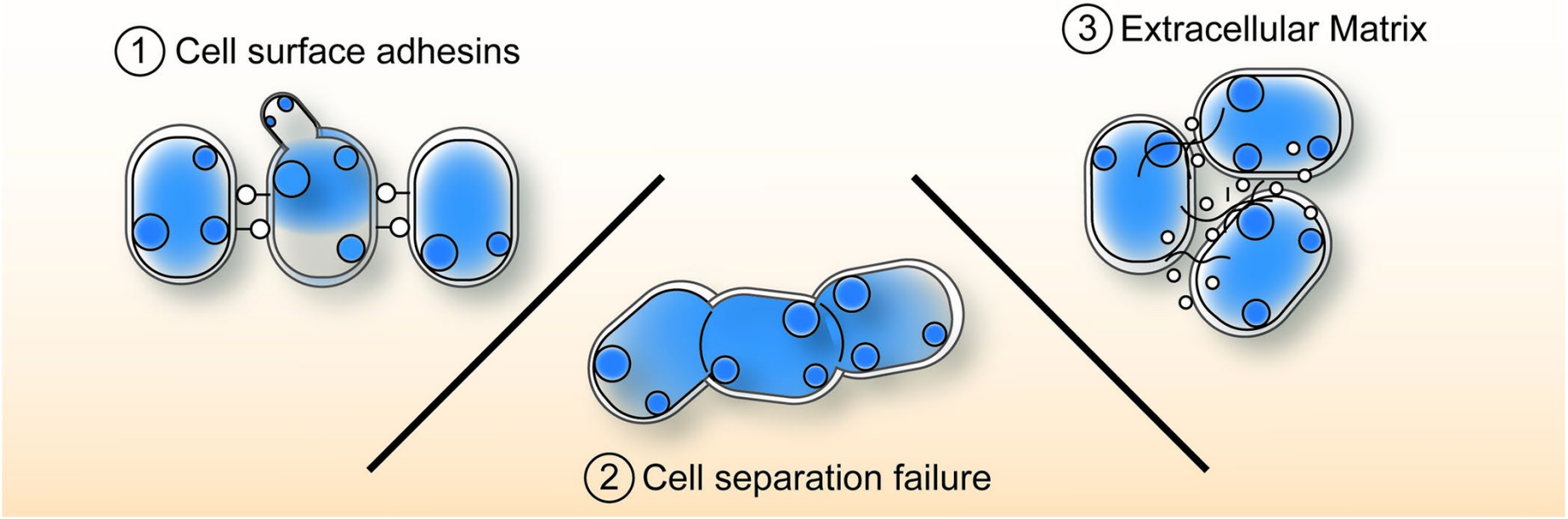
- Pathogenic to mammalian hosts

Three distinct molecular mechanisms of *C. auris* aggregation

doi: 10.1371/journal.ppat.1012011.g003

- Dry surface biofilm
  - Skin rather than mucosa
  - Environmental surfaces
  - Resistance

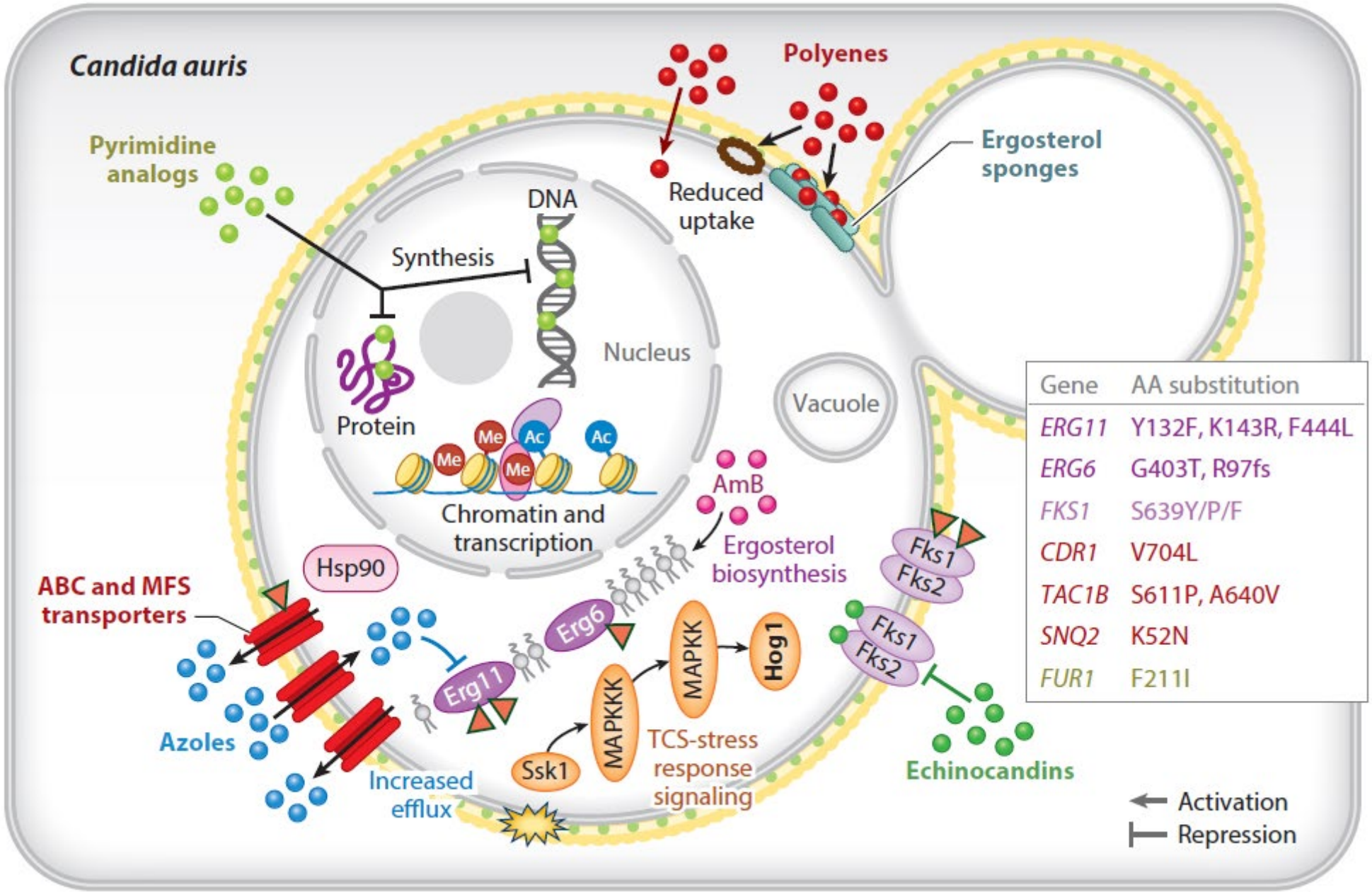




Clinical manifestations

- Intensive care and critically ill
  - NICU
  - NY SNF PPS 12%
- After colonisation
  - 25% invasive infection
- Invasive infection
  - 40% mortality

- Invasive infection
  - Candidaemia
  - Urinary tract infection
  - Wound infection
  - Osteomyelitis
  - Meningitis
  - Myocarditis
  - Otitis


Candida auris
Polyenes
Pyrimidine analogs
Reduced uptake
Ergosterol sponges
DNA
Synthesis
Nucleus
Protein
Me
Ac
Me
Me
Ac
Chromatin and transcription
Vacuole
AmB
Ergosterol biosynthesis
Hsp90
ABC and MFS transporters
Erg6
Erg11
MAPKKK
MAPKK
Hog1
Ssk1
TCS-stress response signaling
Azoles
Increased efflux
Fks1
Fks2
Fks1
Fks2
Echinocandins
Activation
Repression
Gene
AA substitution
ERG11
Y132F, K143R, F444L
ERG6
G403T, R97fs
FKS1
S639Y/P/F
CDR1
V704L
TAC1B
S611P, A640V
SNQ2
K52N
FUR1
F211I

Disinfectant resistance

- Quaternary ammonia compounds
- Sodium hypochlorite at less than 1000ppm
- Chlorhexidine

Surfaces

hospital floors

bed rails

Bedsheets

Trolleys

mobile phones

chairs,

bed trays

air conditioning units

sink surfaces

Equipment

temperature probes

blood pressure cuffs

Glucometers

intravenous poles

oxygen mask,

Carts

dialysis equipment

ultrasound machines

computer monitors

keypads

National Surveillance

State	2019	2020	2021	2022	2023	Total
NSW	2	2		1	1	6
VIC	3	3	1	1	1	9
QLD				2	1	3
SA				3	4	7
WA	1			1	9	11
NT				1		1
ACT						0
TAS						0
Total	6	5	1	9	16	37

Data from National Alert System for Critical Antimicrobial Resistances (CARAlert) as at Oct 31, 2023.
Excludes pre-2019 cases (approx. 6)

Prevention better than cure

Screening

- Overseas hospitalisation
  - Highest risk: direct transfers, ICU, ventilation, prolonged stay, anti-fungal use
- Overseas dialysis
- Contacts

Swab

- Single swab: Both axillae, both sides of groin
- Double-headed swab increases yield. No transport medium.
- Consider: wounds, devices

Isolation in single room with ensuite, contact precautions

- Interim at 48 hours – hospitalised overseas
- Final at 10 days – direct transfers

Preparation

Improved laboratory screening methods

- PCR vs culture

Optimised cleaning and terminal disinfection

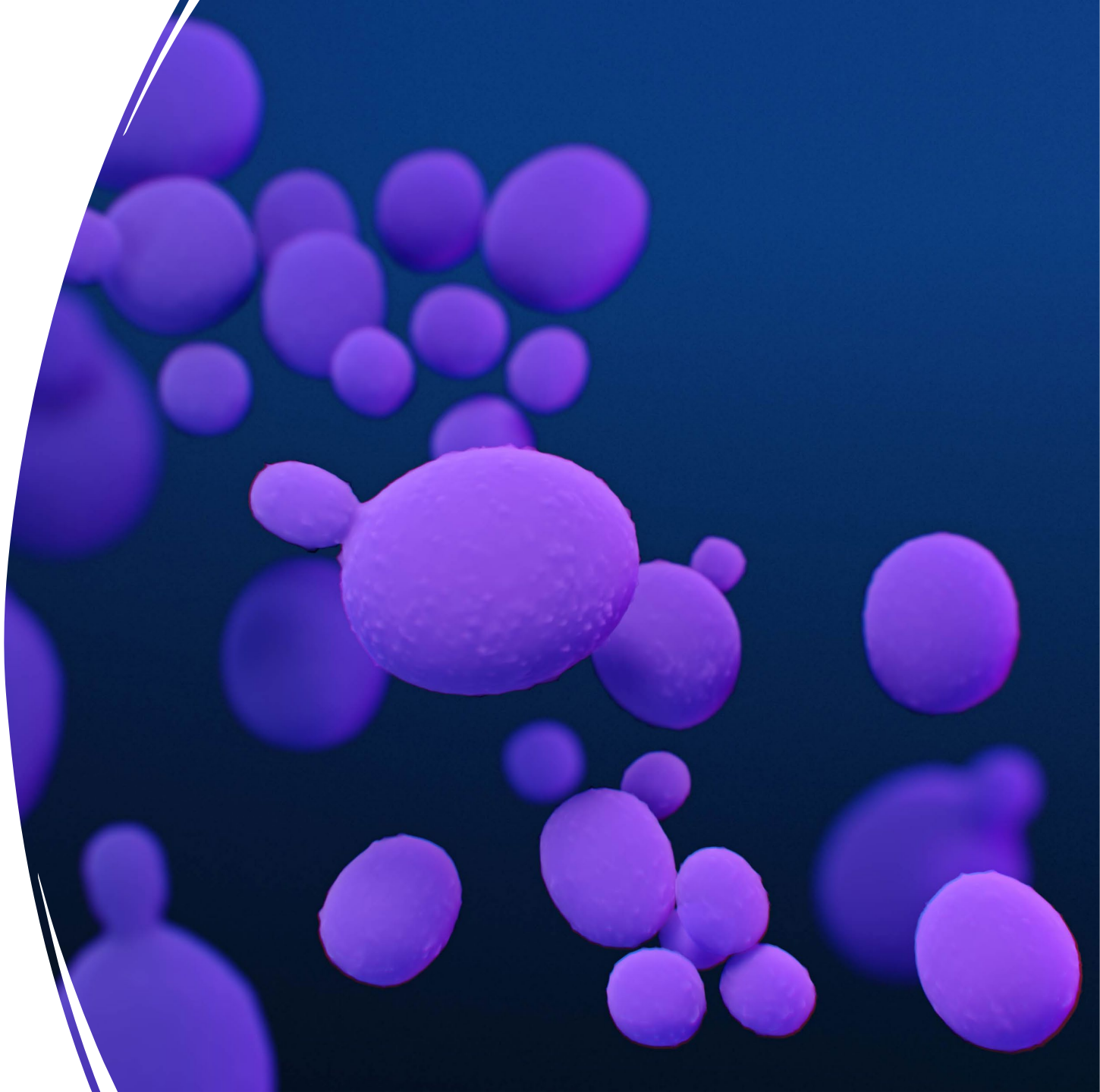
- Sodium hypochlorite
- UV-C
- Paracetic acid

Appropriate use of contact precautions

- PPE
- Hand hygiene

Candida auris

- Global emergence
  - Not yet endemic in Australia
- Aggregates
  - Surface adaptation
  - Resistance
- High morbidity and mortality
- WA is under threat
  - Preparation



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Panel Discussion

STAY A STEP AHEAD

of winter infections

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Thank you for attending the **IPC Tour 2024!**

Scan the QR code to download winter campaign resources.