Burkholderia cenocepacia complex Outbreak in a Neonatal Intensive Care Unit

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Disclosure

We have no financial interests or relationships to disclose.


Monash
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Burkholderia *cenocepacia* complex (Bcc)

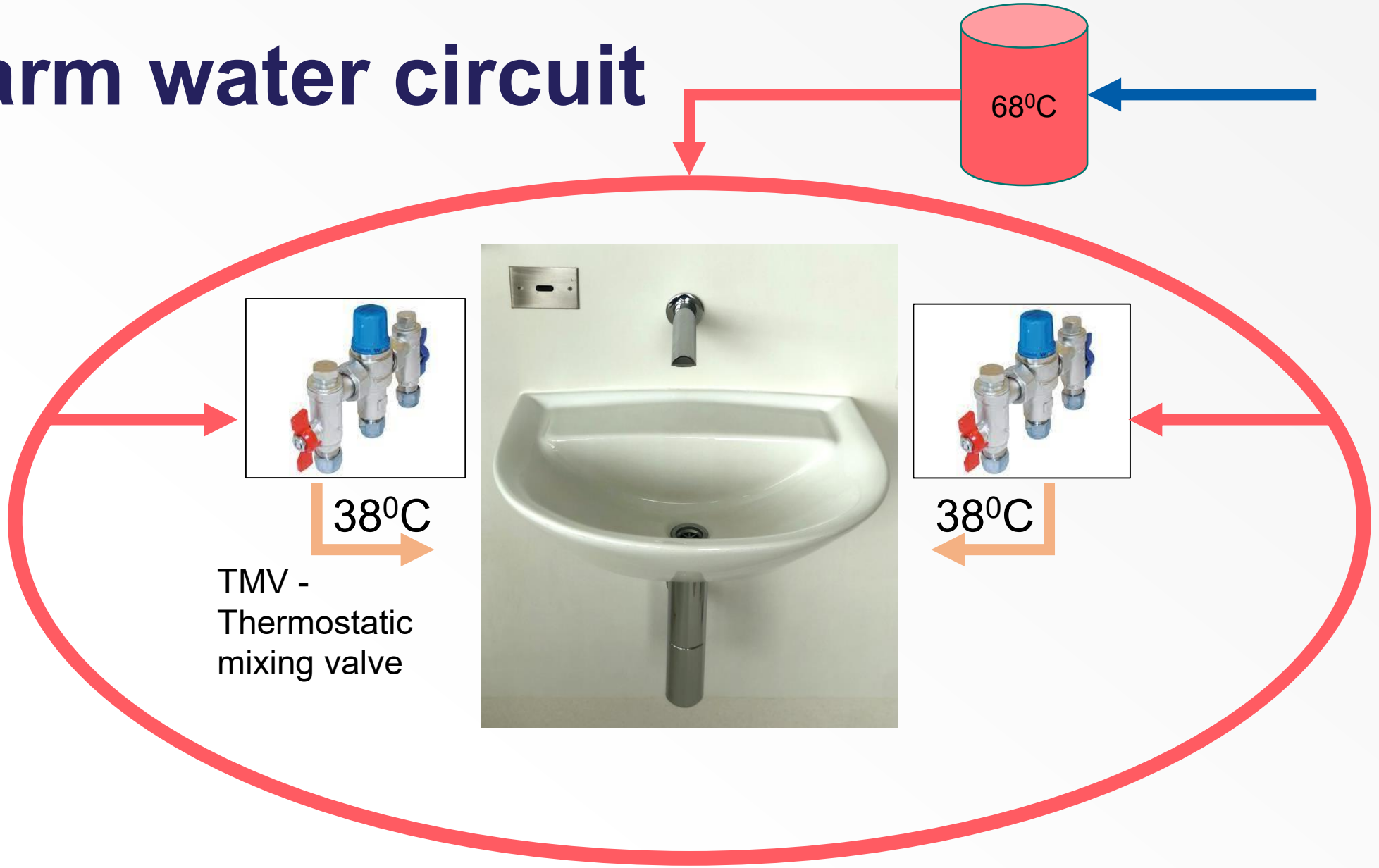
- Opportunistic gram-negative bacteria
- Intrinsic resistance to multiple antimicrobials
- Found in the environment (including water and soil)
- Optimal growth conditions are 30 – 37 degrees Celsius
- Forms biofilms
- Known source of nosocomial outbreaks in healthcare facilities

Water Temperature

Thermal regulatory guidelines NICU water temperature: 35 – 38 °C

	Allowable Temperature (°C)	Max Permissible shut off
Adults	40.5 - 43.5	46
Children	38.0 – 40.5	43
Neonates	35.0 – 38.0*	39
Flushing process	60.0 – 65.0	
Bcc *optimal growth*	30.0 – 37.0	

Warm water circuit



Biofilm formation and plumbing design

Advantages	• Easy to install • Decreased installation costs
Disadvantages	• Susceptible to biofilm formation

Biofilm Formation & Taps

Breast pump cleaning sink

PSA sink

Clinical sink

Background – July 2021

CPE outbreak

- Neonatal & environmental screening
- Bcc incidentally detected in 3 taps & 2 neonatal faecal samples

Actions

- 6 monthly tap microbiological testing, thermal shocking & aerator changes introduced
- 3 monthly drain cleaning introduced

Bcc outbreak identification – May 2022

***Bcc* isolated** in a neonate blood culture

- Neonate located in bay with a previously positive tap

Immediate actions

- Tap isolated & screened – Bcc isolated
- Tap removed – cleaned and soaked in Chloradet
- Tap reinstalled – tap and water rescreened – negative result

All 54 NICU taps screened

2 additional positive taps identified

- Breast pump cleaning sink
- Clinical sink

Tap water and baby care

Baby care

- Bathing
- Nappy care

Actions

- Sterile water for baby care
- Warming cabinets purchased for sterile water
- Education on practise changes for all staff
- Education on correct clinical sink use

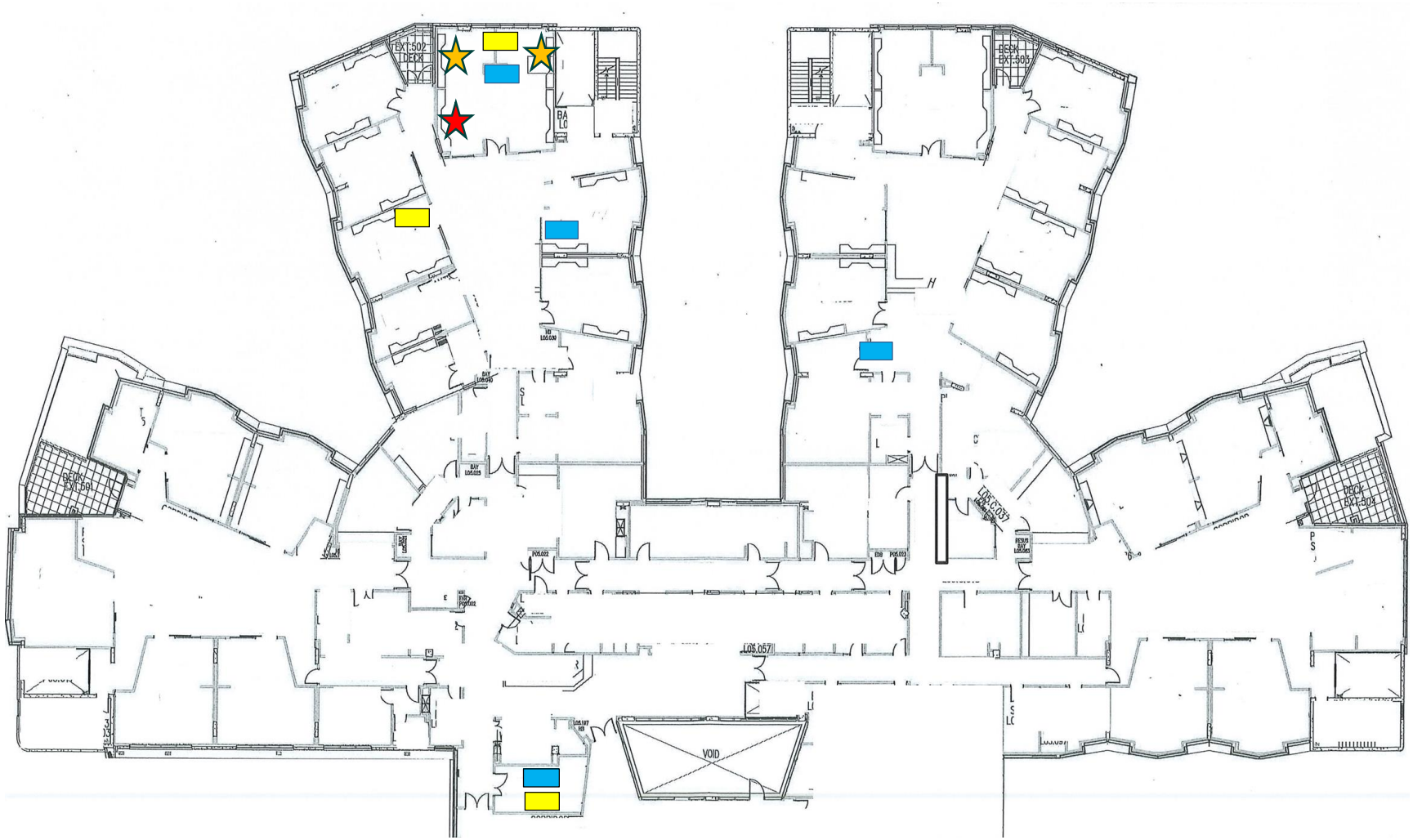
Thermal shocking & aerators

Thermostatic mixing valve (TMV)

Aerators

Bcc isolate location-May 2022 outbreak

- July 2021 Tap positive
- May 2022 Tap positive
- Clinical isolate
- Screening isolate



Whole genome sequencing confirmed all isolates were related.

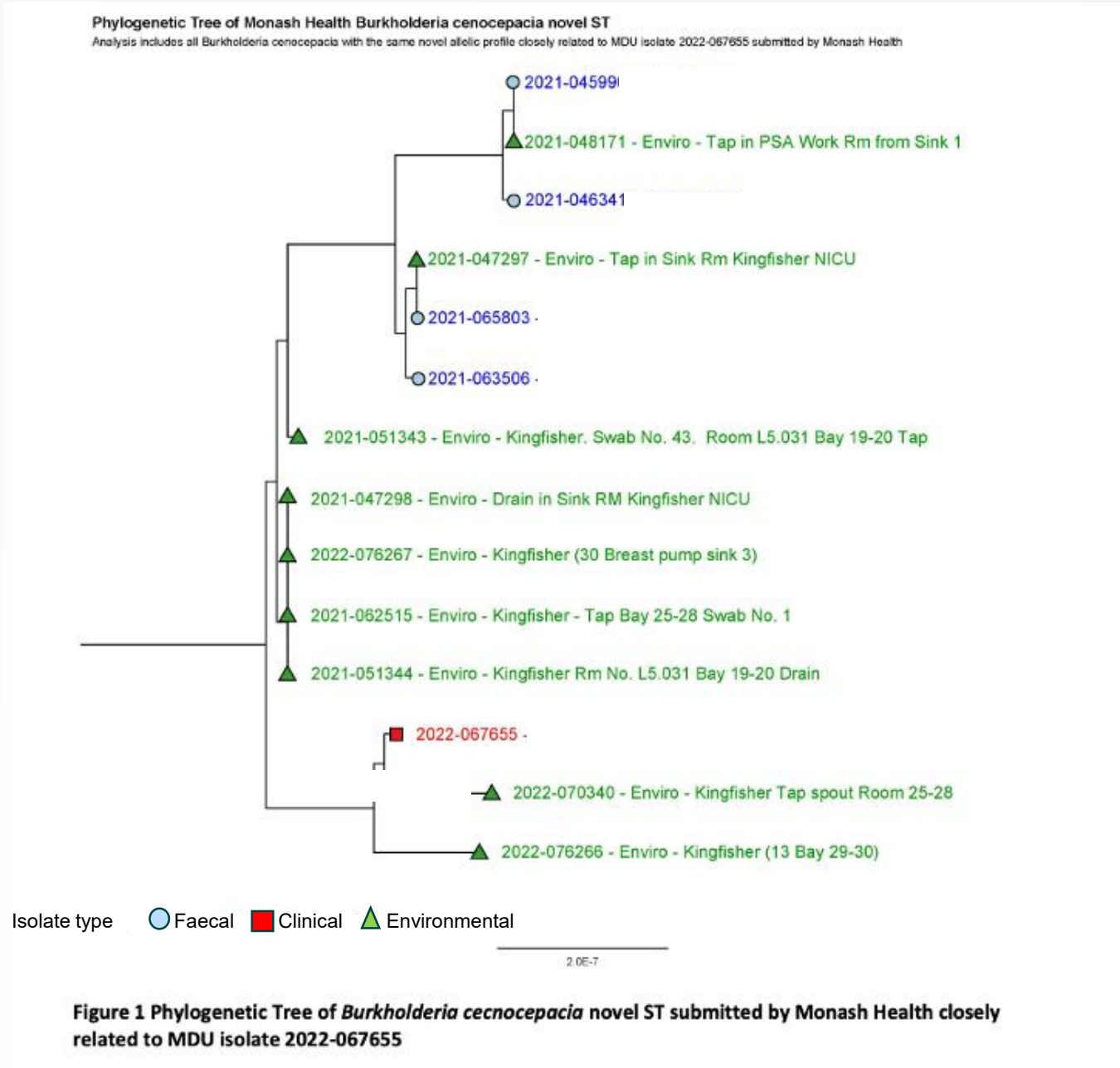
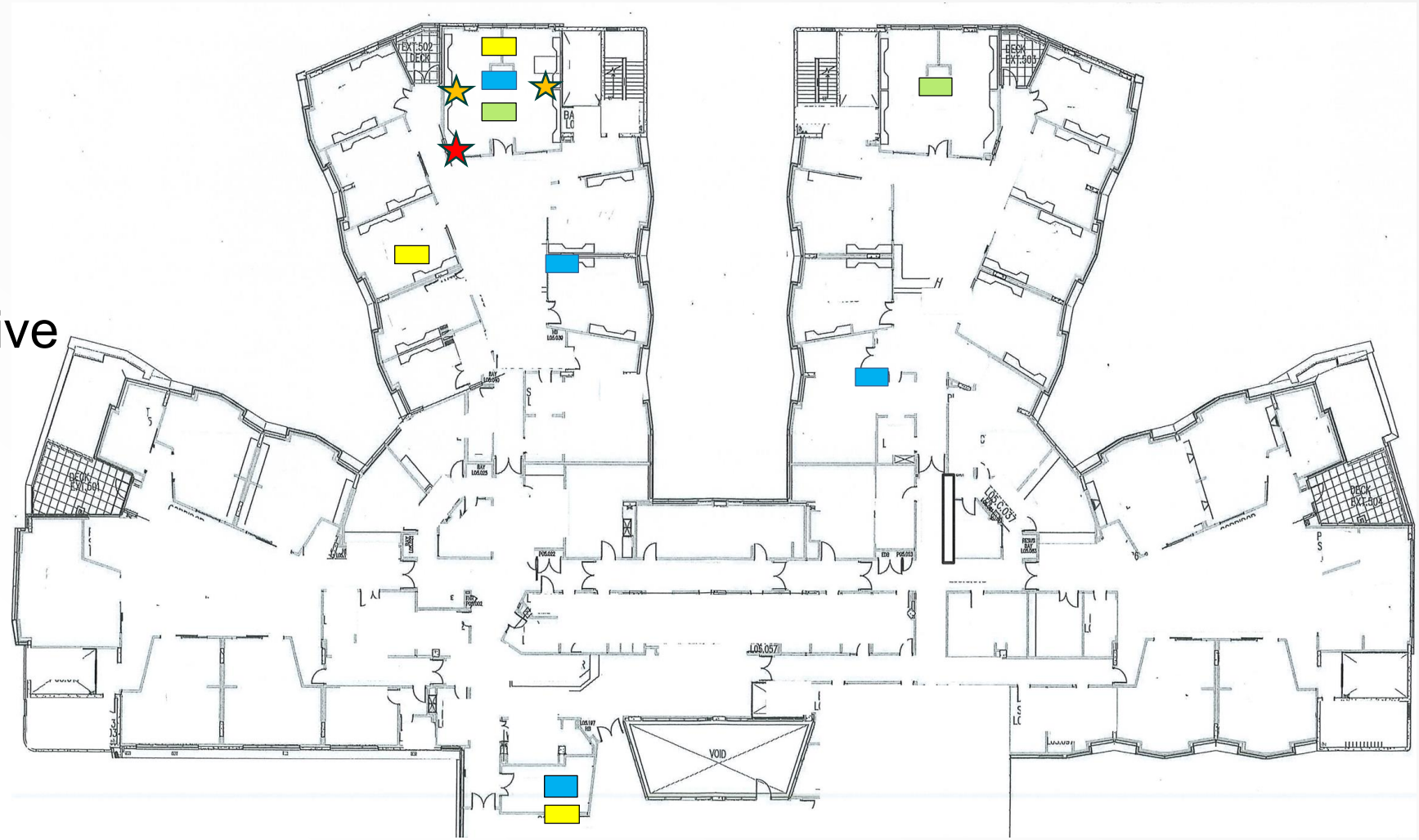


Figure 1 Phylogenetic Tree of *Burkholderia cecnocepacia* novel ST submitted by Monash Health closely related to MDU isolate 2022-067655

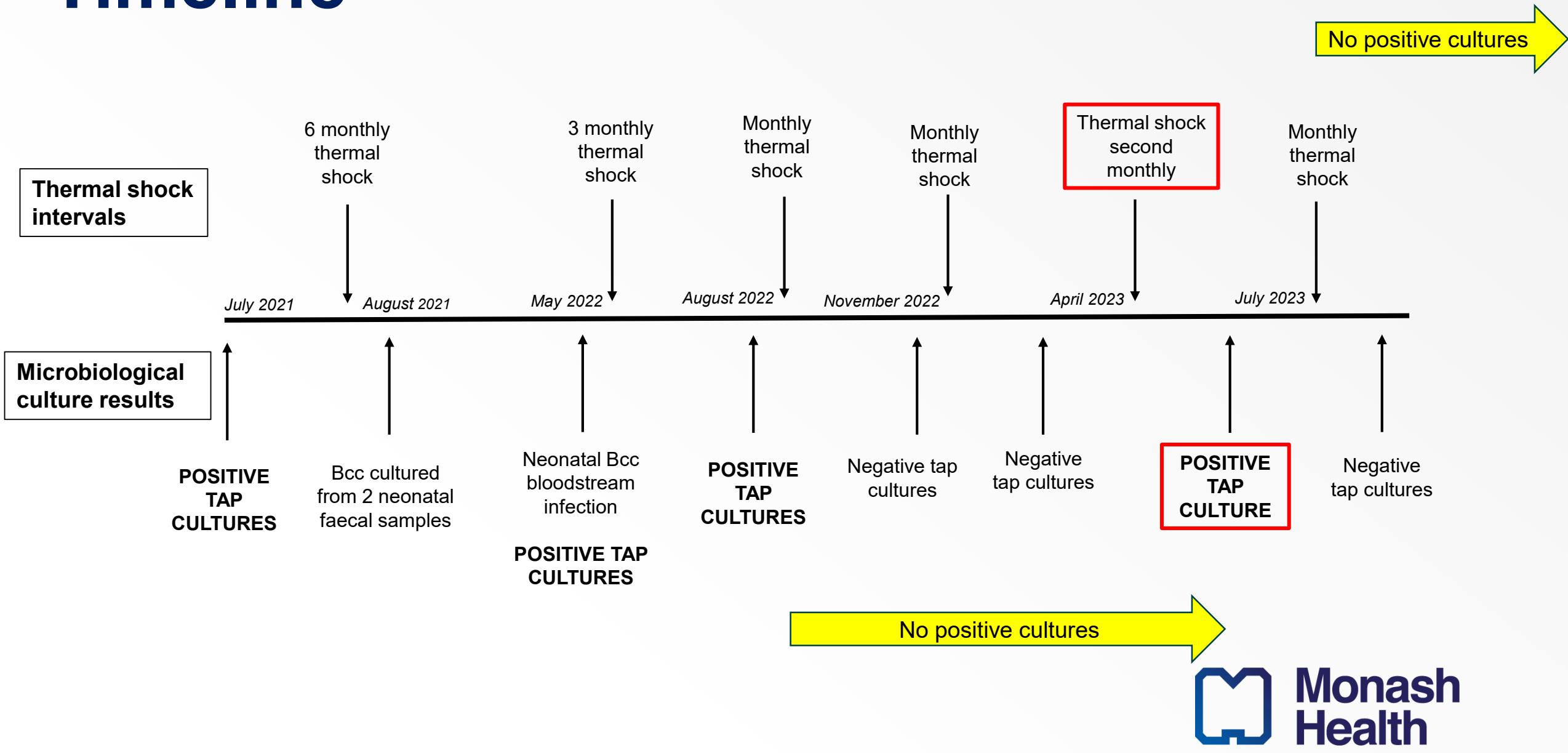
Image courtesy of Microbiological Diagnostic Unit Public Health Laboratory

Bcc isolate locations-August 2022

- July 2021 Tap positive
- May 2022 Tap positive
- August 2022 Tap positive
- Clinical isolate
- Screening isolate



Timeline



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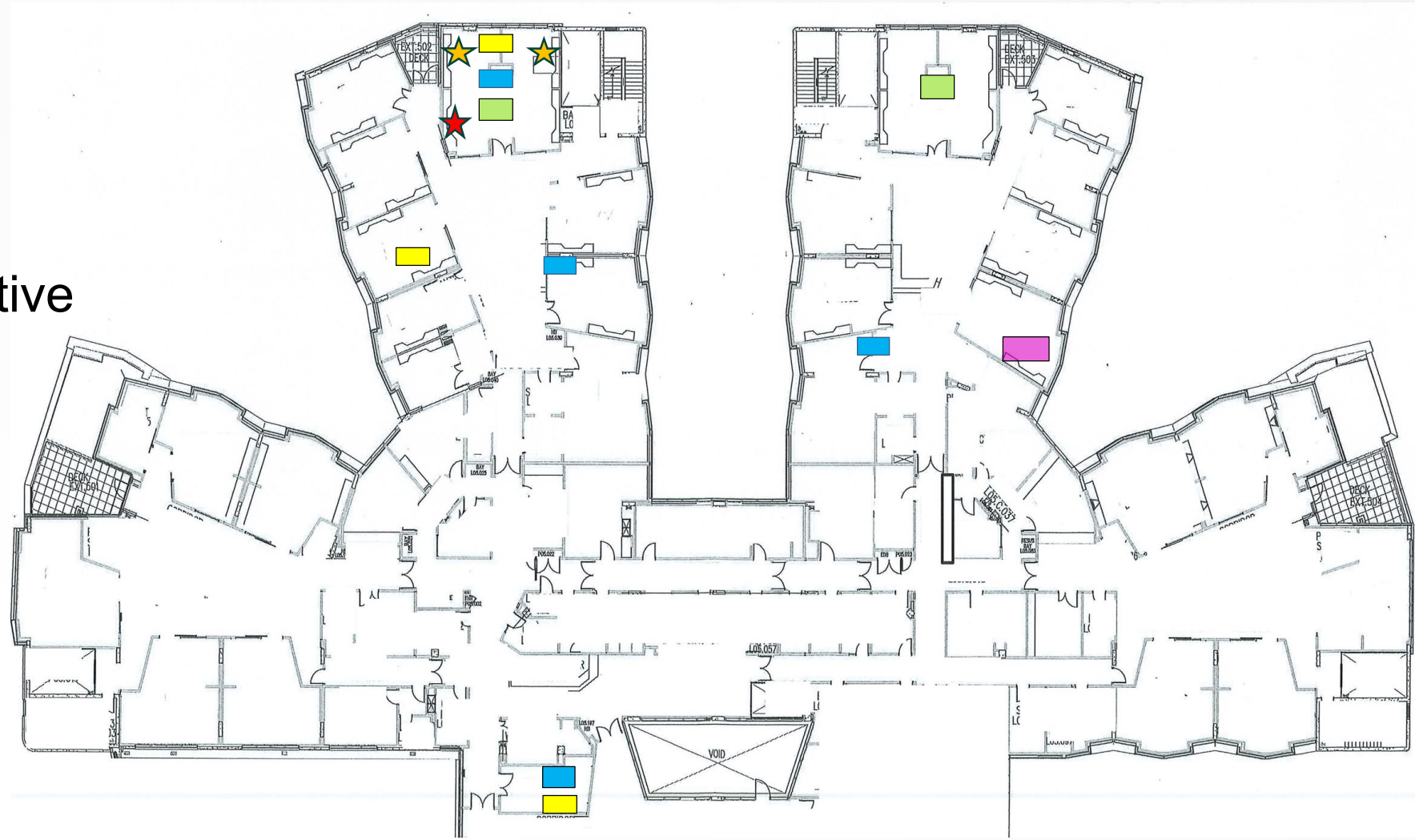
Bcc isolate locations July 2023

- July 2021 Tap positive
- May 2022 Tap positive
- August 2022 Tap positive
- July 2023 Tap positive
- Clinical isolate
- Screening isolate



Long term solutions considered

Filters

Permanent filters – required 70mm depth – insufficient for hand washing

Alternative temporary filters trialled

- Failed within 24hrs
- Water pressure issues
- Leakage around tap and filter

Tap replacement

Advantages	• Successful in other NICU outbreaks
Disadvantages	• Risk of pipe breakage during installation

Replacement of plastic pipes with copper pipes from TMV to tap outlet

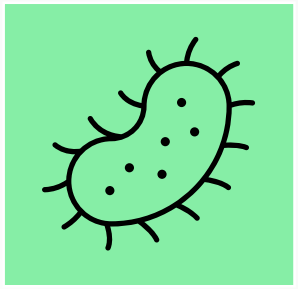
Advantages	• At least 5 years bio static protection (natural biostatic)
Disadvantages	• Invasive works • Financial cost

Addition of chlorine to water supply

Proposed approaches	• Slug dosing • Drip dosing
Disadvantages	• Biofilm may not be removed • **Slug dosing-**Risk to neonates and healthcare worker's skin • **Drip dosing-**Floating bacteria may not be removed

Current situation

Thermal shocking monthly



Screen three monthly 54 taps

Water for baby care

Review June 2025 or if positive results

Conclusion

Appropriate plumbing and tap design in NICUs is essential to prevent:

- tap and pipe colonisation
- water contamination
- neonate colonisation
- potential neonate infections

QUESTIONS?

Acknowledgements

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