

# A Longitudinal Study on the Impact of Two Sink Interventions on Environmental Bioburden and Patient Infections within Two Intensive Care Units at an Academic Hospital

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## BACKGROUND

- Patient room sinks have been frequently identified as potential sources of healthcare-associated infections (HAIs) in outbreak investigations
- Sinks in intensive care units (ICUs) have been found to be persistently colonized with pathogenic bacteria that may lead to outbreaks across multiple studies (1-4)
- No standard recommendations to reduce pathogenic bioburden in patient sinks are included in evidence-based guidelines
  - Methods can be time-consuming and costly
  - May not eliminate pathogens long-term
- Study goal: first longitudinal trial to assess the impact of 2 practical patient sink interventions in an academic hospital

## METHODS

### Interventions

- 4-phase randomized crossover trial in a medical ICU (MICU) and burn ICU (BICU) at UNC-MC
- Phases:
  - Drain covers (MICU & BICU)
  - Point-of-use sink (MICU & BICU) and hose filters (BICU)
  - Both drain covers and filters
  - No intervention
- Phase length: 8 weeks with at least 2-week washout between phases

### Sampling

- Biweekly environmental samples: tap water, p-trap standing water, air, swabs of sink basin and adjacent surface
- Sampled 5 patient room sinks in MICU
- Sampled 4 patient room sinks and hydrotherapy room in BICU
- CFU/mL of non-tuberculous mycobacteria (NTM), carbapenem-resistant *Enterobacteriales* (CRE), multidrug-resistant *Enterobacteriales* (MDRE), and *Stenotrophomas maltophilia* (SMAL) identified using MALDI-TOF speciation
- Patient HAIs in MICU and BICU pulled from HAI surveillance system

## REFERENCES

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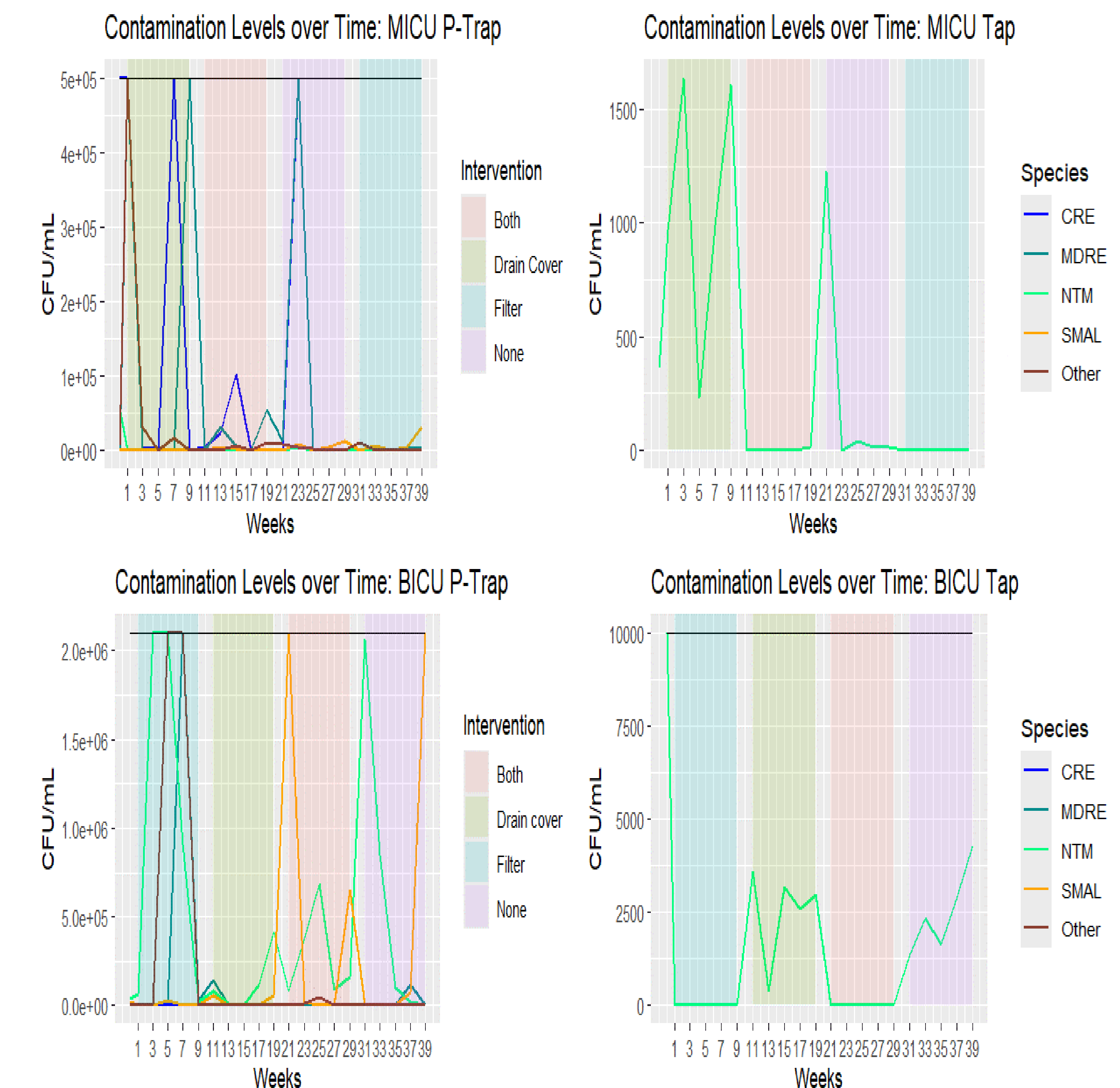
## RESULTS

- P-trap samples were highly variable with high bioburden and no clear time trends at the room or unit level (Figure)
- Environmental samples at the room level were primarily positive before same-species clinical isolates were found
- Tap water samples across both units were positive for NTM alone (N=70/189 samples total)
- No study-room-associated NTM infections were identified
- Without filters, 68.7% (N=68/99) of tap water samples were positive, compared to 2.2% (N=2/90) with filters (p<0.05)
- Positive air and surface samples rarely occurred but were most common in the drain cover phase (N=12/135)

Table, Total Positive Samples (N, %) by Intervention and Hospital Unit

	MICU				BICU			
	Tap Water	Sink Surface	Adjacent Surface	Air	Tap Water	Sink Surface	Adjacent Surface	Air
Filters	0, 0.0%	0, 0.0%	0, 0.0%	2, 8.0%	0, 0.0%	0, 0.0%	0, 0.0%	1, 5.0%
Drain Cover	17, 68.0%	2, 8.0%	0, 0.0%	3, 12.0%	19, 95.0%	4, 20.0%	1, 5.0%	2, 10.5%
Both	0, 0.0%	1, 4.0%	1, 4.0%	0, 0.0%	1, 5.0%	0, 0.0%	0, 0.0%	0, 0.0%
Neither	10, 33.3%	3, 12.0%	0, 0.0%	0, 0.0%	24, 100.0%	3, 15.0%	3, 15.0%	1, 5.0%

Figure, Contamination Levels Over Time



## DISCUSSION

- Sinks, particularly p-traps, present a consistent source of pathogenic bioburden with fluctuating populations
- P-traps rarely contributed to surface/air contamination within rooms
- Neither filters nor drain covers impacted total p-trap colonization as measured by CFU/mL
- Point-of-use filters consistently and effectively removed NTM from patient sink tap water
- Drain covers were not found to be a useful intervention for reducing the spread of bioburden from sinks to sink basins, adjacent surfaces, and the air
- Future research on decontaminating pathogenic bacteria from patient room sink p-traps is needed

## CONCLUSIONS

- Point-of-use filters were highly effective at removing bacterial contamination from tap water, while drain covers were not associated with reduced detection of water pathogens
- P-traps had highly variable bioburden levels and species present within rooms and within units over time, with no clear trends emerging
- Surface and air contamination was very limited despite high bioburden in water sources