Contamination of Sinks and Drains with Gram Negative Bacteria: A Call for Solutions

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Presentation Outline

- What is CPE?
- Biofilm Formation
- Drain Contamination
  - Current guidelines
- Management
- Prevention
  - Prevent contamination of drains
  - Prevent transmission from drains
  - Improve decontamination methods
  - Eliminate water sources
What is CPE?

- *Enterobacteriaceae* - family of bacteria commonly found in the healthy human gastrointestinal tract

- Carpabemamase-producing *Enterobacteriaceae* (CPE) – *Enterobacriaceae* that are resistant to a group of antibiotics called “carabapenems” (often antibiotics of last resort)
How does a patient with CPE present?

- Colonization versus Infection

- 50% mortality rate with invasive infections
CPE Risk Factors

• Transmission and outbreaks of CPE increasingly reported in Canadian hospitals

• Risk factors for acquisition of CPE:
  o Hospitalization in Canada
  o Healthcare receipt outside of Canada and/or travel to the Indian subcontinent
  o Antibiotic receipt
  o Exposure to CPE colonized/infected patients
  o Exposure to environmental sources
Ontario – Yours to Discover

CPE
CPE Prevalence in Ontario

[Map showing CPE prevalence in Ontario with different shades indicating the number of CPE positive isolates.]

CPE surveillance data, Public Health Ontario, 2016 January - 2016 June
Where is CPE coming from?

- Canadian hospital
- Foreign hospital
- Foreign travel
- Unknown

*Data from 3 GTA hospitals*
Biofilm Formation & Drain Contamination
Biofilm Formation

Source: https://www.researchgate.net/figure/221773679_fig4_Figure-1-Antibiofilm-molecules-act-at-several-stages-of-the-biofilm-formation-process
CPE Risk Factors

• Location of biofilm makes manual cleaning difficult

• Protective matrix makes penetration by cleaning agents difficult

• Once a drain is contaminated, difficult to decontaminate without removal of plumbing
Hospitals installed more sinks to st infections. The sinks can make the problem worse

Sinks suspected in Toronto hospital outbreak

Contaminated Sink Drains Linked to ICU Infection

Study Tracks How Superbugs Splash Out of Hospital Sink Drains

Metabolic Medical News from the Healthcare Infection Society (HIS) 2014 International Conference

P. aeruginosa survives in sinks 10 years after hospital outbreak

Nancy A. Merville

December 04

Assistance-resistant superbug bacteria grow up hospital drains and can splash out into sinks and onto counters, researchers reported Friday.

They experiment helps explain just how such germs cause outbreaks of diarrhea in hospitals. And it also demonstrates just how hard it will be to prevent this kind of spread, because the bacteria are especially difficult to kill when they are growing in pipes.

One such outbreak killed 11 patients at the National Institute of Health Clinical Center in 2011-2012 — a huge embarrassment for the federal agency’s flagship hospital.
Current Hospital Plumbing Guidelines
Management
What happens when a CPE positive patient is discharged?

- **Swab Plumbing**
  - Sink
  - Showers

- **Terminal Room Disinfection**
  - Double clean

- **Plumbing Disinfection**
  - AHP Gel
  - Steam

- **Plumbing Management**
  - Close sink and/or
  - Close room
Swab Plumbing

- **Drain** and **overflow hole** (if applicable) cultured post discharge
- Aerators, faucets, shower heads/drains, toilets, etc?
- If negative, consider collecting repeat cultures
CPE Positive Plumbing

Swab drain

- CPE negative drain
  - Swab drain
    - Weekly?
    - Monthly?

- CPE positive drain
  - Disinfect or Replace plumbing
CPE Positive Plumbing

Swab drain

CPE negative drain
- Swab drain
  - Weekly?
  - Monthly?

Disinfection protocol
- Disinfect drain
- Clean overflow
- Steam clean

CPE positive drain
- Disinfect drain
- Clean overflow
- Steam clean
- Replace plumbing
- Swab at cut site
- Replace with CSA approved sink and fixtures
- Consider accessible p-trap and grid

Remove plumbing
- Cleaning and disinfection protocol
- Replacement of plumbing fixtures
- Accessible design considerations
Prevention
Prevent Drain Contamination

1. Proper use of sinks in clinical areas

Do not dump items such as: bodily fluids, IV bags, wash basins

Please use toilet when emptying or rinsing containers for body fluids

Use toilet for disposal of all body fluids, including:
- Bedpan contents
- Urinal contents
- Bath water
- Drain fluid
Prevent Drain Contamination

2. Sink design – prevent placement of objects on rim
Prevent Drain Contamination

3. Automated design

- Vibrating/heating drain
- Ozonated water flow
- Automatic flushing to prevent stagnant water
Prevent Drain Contamination

4. Drain composition

![Graph showing comparison between Standard design, New design, New design, copper coated, and New design, yellow brass.](image)
Prevent transmission to patients from contaminated drains

1. Prevent splashing from drain onto hands/surfaces
   - Off-centre drain
   - Water diversion
Prevent transmission to patients from contaminated drains

2. Maximize distance between water and patients
Sinks should be located so as not to contaminate:

- patients
- supplies
- equipment
- adjacent counters
- splash guards
Improve ease of disinfection

1. Easily accessible drains
   - removable p-trap
   - removable grate/screen
Improve ease of disinfection

2. Cleaners/disinfectants that affect biofilm
   - Steam
   - Foam/gel
   - Friction
Preventative Maintenance
Eliminate water sources in patient care areas
Impact on Patients and Hospitals

• Patient Infections
• Cost of closing beds (e.g., critical care)
• Patient/family perception of closed sinks
• Lab costs
• Workload (maintenance, IPAC, lab, bed allocation)
Conclusions

• Contamination of sinks/drains with CPE is an emerging issue
• The environment is a source of transmission
• Improper disposal of body fluids in sinks likely contributes significantly to sink/drain contamination
• The appropriate best practices approach for managing CPE positive drains and preventative maintenance are unknown
• Drains and sinks for healthcare should be chosen based on a design that minimizes risk to patients
• We should collectively push manufacturers to develop safer equipment
• The necessity of sinks in patient care areas should be weighed against potential harm to the patient
• Future research is needed to establish guidelines
Presentation Guidelines

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