

Common Features of Waterborne Pathogens in Hospitals: Why Are They So Challenging?
Prof. Joseph O. Falkinham, III
A Webber Training Teleclass




Common Features of Waterborne Pathogens in Hospitals: Why Are They So Challenging?

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Hosted by Paul Webber
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Waterborne Pathogens in Hospitals

- *Mycobacterium avium complex (MAC)*
- *Mycobacterium abscessus complex*
- *Pseudomonas aeruginosa*
- *Stenotrophomonas maltophilia*
- *Acinetobacter baumannii*
- *Sphingomonas paucimobilis*
- *Legionella pneumophila*

2



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Hospital Acquired Infections

- Life-threatening pneumonia
- Dermal infections post surgery
- Life-threatening bacteremia post cardiac surgery (*M. chimaera* in heater-coolers)


3




Risk Factors Hospital Infection

- **Patients:** Immunosuppression, cancer, cystic fibrosis, neonates
- **Hospital Environment:** Surgery, intensive care, cardiac surgery, shower exposure, ice exposure, prolonged residence in hospitals

4




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Shared Characteristics of Waterborne Pathogens

- Disinfectant-Resistance
- Adherence and Biofilm Formation
- Grow at Low Organic Carbon
- Desiccation-Tolerant
- Grow at Low Oxygen (stagnation)
- Concentrated in Aerosols
- Grow in Amoebae

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Consequences of Impermeable Membrane

- Hydrophobic cells = Adherence
- Reduced uptake of nutrients
- Resistance to disinfectants
- Resistance to antibiotics
- Reduced rate of growth

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Consequences of Adherence

- Biofilm-formation
- Protective Extracellular Matrix
- Residence and Persistence
- Resistance to Disinfection
- Re-appearance Following Disinfection

7




Waterborne Pathogen Sources

- Fountains, Drinking Water, Ice
- Showers, Therapy Baths, Drains
- Medical Equipment:
 Bronchoscopes, Heater-Coolers
- Disinfectant Solutions

8



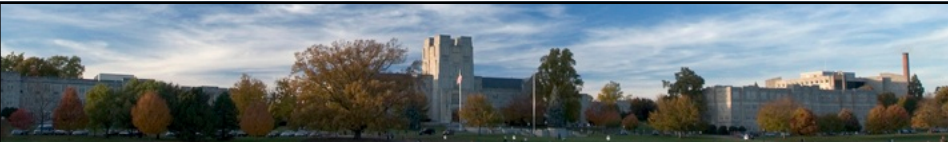

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Routes of Transmission

- Swallowing water or ice
- Aerosols: Showers, Therapy Baths, Humidifiers, Drains, Medical Equipment
- Sterilizing Solutions
- Inoculation from Bronchoscopes
- Construction Activities


9




Monitoring Challenges

- Numbers Don't Correlate with *E. coli*, HPC, nor Other Measures
- Enumeration Requires Special Media and Long Incubation
- Enumeration by PCR
- No Infectious Dose Identified
- Where and When to Monitor

10




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Emergency Remediation

- **Actions:**
 - Circulate Very Hot Water: 70° C
 - Circulate High Chlorine: 5 ppm
- **Problem:**
 - How to Remove Biofilm?
- **Never Get Rid of OPPPs**

11



Regular Remediation

- Drain Water Heater Monthly
- Raise Water Heater to 70° C
- Reduce Stagnant Portions: **Flush**
- Remove All Dead Ends
- Point-of-Use Filters and Shower Heads
- Remove Aerosol-Generators

12




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Green Buildings Enrich NTM Numbers

- Lower Water Heater Temperatures
- Longer Water Residence Time
- Reduced Flow, Misting Shower Heads
- Biofilm Build-Up

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October 20, 2021	<i>(FREE Teleclass)</i> CLEAN HOSPITALS DAY 2021: WHY ENVIRONMENTAL HYGIENE IS MORE IMPORTANT THAN EVER Speaker: Prof. Didier Pittet , University of Geneva Hospitals
October 28, 2021	<i>(FREE Teleclass)</i> HAND HYGIENE RELOADED Speaker: Prof. Hugo Sax , HumanLabZ, Zurich
November 4, 2021	DISCOVERING AND TRANSFORMING THE INNER ICP EDUCATOR: EXPLORING CORE ELEMENTS OF AN INNOVATIVE PROFESSIONAL'S EXPERIENCE Speaker: Dr. Gwyneth Meyers , Alberta Health Services
November 19, 2021	<i>(FREE Teleclass)</i> THE SANITATION ECONOMY & PUBLIC HEALTH Speaker: Alexandra Knezovich , Toilet Board Coalition, Switzerland
December 2, 2021	EMERGING FUNGAL INFECTIONS AND INFECTION PREVENTION AND CONTROL Speaker: Prof. Andreas Voss , Radboud University, The Netherlands
December 16, 2021	<i>(FREE Teleclass)</i> COVID-19 AS DRESS REHERSAL: THE RISE OF DISEASE X Speaker: Prof. Stephen S. Morse , Mailman School of Public Health, Columbia

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