

Claire Wright, AICA, 2010

A 2 YEAR STUDY EVALUATING POINT-OF-USE FILTRATION AS A BARRIER CONTROL AGAINST WATER-BORNE GRAM NEGATIVE PATHOGENS IN A UK HOSPITAL WATER SYSTEM

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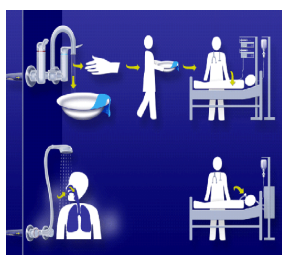
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Water: Not Just a Source of *Legionella*.....

- *Mycobacteria* spp.
 - *Pseudomonas* spp.
 - ❖ *aeruginosa*
 - ❖ *putida*
 - ❖ *stutzeri*
 - *Stenotrophomonas maltophilia*
 - *Burkholderia cepacia*
 - *Sphingomonas paucimobilis*
- ❖ Skin Infections
 - ❖ Wound Infections
 - ❖ Respiratory Infections
 - ❖ Catheter-Related-Infections
 - ❖ Bacteraemia

Water as a Transmission Vector



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- Transmission via hands of staff/visitors & other patients
- Bathing of patients (wound sites)
- Aerosol transmission (showers)
- Ventilator assisted patients (particularly *P. aeruginosa* & *S. maltophilia*)

University of Bradford/Bradford Royal Infirmary Study - Aims

- To investigate longitudinal prevalence of opportunistic Gram negative pathogens in the hospital water distribution system
 - ❖ *Pseudomonas* spp. (*aeruginosa*)
 - ❖ *Stenotrophomonas maltophilia*
 - ❖ *Acinetobacter baumannii*
- The effect of POU filtration on the incidence of any endemic Gram-negatives in water

Aims cont.

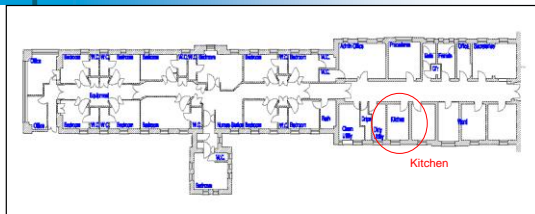
- To monitor patients for colonisation with the target species during their stay
 - ❖ Haematology malignancy patients
 - ❖ Neutropenic for 10 days
 - ❖ Give written consent
- Molecular analysis/characterisation of isolates
 - ❖ PCR confirmation of species
 - ❖ Antibiotic susceptibility/resistance
 - ❖ Relatedness of water isolates to patient isolates ???

Bradford Royal Infirmary – Ward 7 Haematology Unit

- Built 1936
- Teaching Hospital
- ~800 beds
- Population >520,000
- Ward 7 opened September 2000
- Diagnosis & management of haematological disorders
- 14 inpatient beds
- Day centre - outpatients



Ward 7 – Haematology Unit

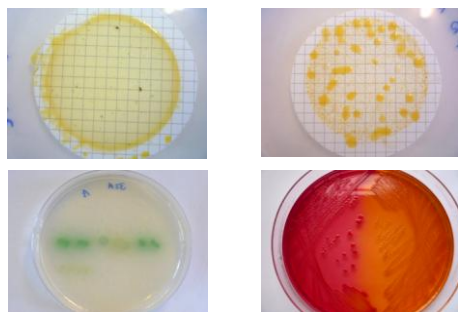


- 12 Bedrooms (10 single bed, 2 double bed), en-suite
- 38 outlets
- Single kitchen for provision of all drinking water and ward cleaning water
- Sampling protocol: swabs, 100ml sample (x2), patient samples

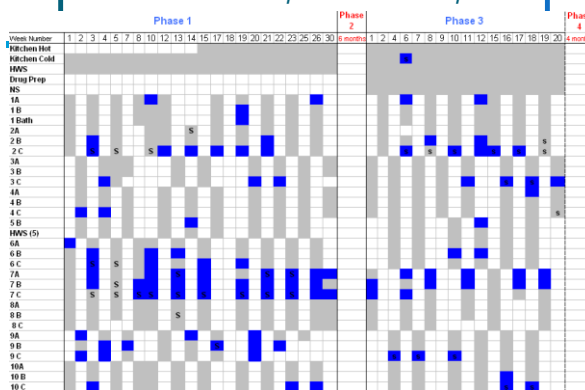
Chronology

- **Early 2008:** Extensive plumbing work to outlets to allow correct fittings for filter devices
- **June 2008- April 2010:** Alternating between unfiltered and Point-Of-Use Filtration (Pall Aquasafe™)
 - ❖ **Phases 1 & 3:** unfiltered
 - ❖ **Phases 2 & 4:** filtered (Pall Aquasafe™)

Microbial Load & Primary Identification



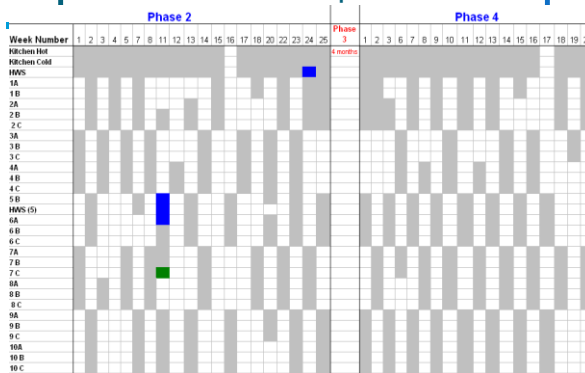
Patterns – *Stenotrophomonas maltophilia*



Patterns – *Pseudomonas* Spp.



Patterns – filtered phases



Unfiltered Samples – Phases 1 & 3

- Total 1396 samples
 - ❖ 98.8% +ve bacterial growth
 - >90% too numerous to count
 - ❖ 22% samples yielded *Pseudomonas* spp. or *Stenotrophomonas maltophilia*
- 720 swabs collected from outlets
 - ❖ But only 10.4% outlet swabs yielded these organisms
- Many resistant to anti-pseudomonad antibiotics

Filtered Samples – Phases 2 & 4

- 1242 water samples
 - ❖ **Decrease** from 99% to only 22% of water samples +ve for bacterial growth
 - ❖ Only 5 instances of target organisms collected:
 - 1 *Pseudomonas* spp.
 - 4 *S. maltophilia*
- Average colony growth per culture +ve sample only 4.3 CFU/100ml
- No swabs yielded target organisms

Patient Samples

- Low recruitment
 - ❖ Only 20 patients in total (mostly at end!!!!!!)
- Throat, skin and stool
 - ❖ Strong reluctance by patients to give stool samples
- Patient colonisation:
 - ❖ *Pseudomonas aeruginosa*
 - ❖ *Stenotrophomonas maltophilia*
 - ❖ *Chryseomonas luteola*

Blood Cultures

- January 2008 to March 2010, the total blood cultures =1354
 - total 197 +ve.
- Most common organisms:
 - Coagulase Negative *Staphylococci*
 - *E. coli*
- *P. aeruginosa*: 5 different patients,
 - 4 (1 prior to & 3 during phase 1)
 - 1 during phase 4 (filtered)

Conclusions

- Water could be an overlooked source for nosocomial pathogens
- High microbial load in water samples
- Opportunistic pathogens endemic within the water supplies
- Particular species often seen in connection with certain outlets
- Water isolates could serve as an environmental reservoir for antibiotic resistance

Conclusions

- Swabbing of outlets not a reflection of true numbers – limited as a surveillance tool
- POU filtration acted as an effective barrier against the study organisms
- Blood cultures show that Ward did not have a high level of blood infections with these bacterial species
 - Further analysis to be done to confirm relatedness between water & patient isolates

Disclosures

(for the life of the current research/presentation)

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