Podium Session 109
Health Care Industries – I
Tuesday, June 19, 2012, 10:30 AM – 12:30 PM
Papers SR-109-01 – CS-109-06

SR-109-01
Review of the Evidence for Airborne Transmission of Methicillin-Resistant Staphylococcus aureus (MRSA) and its Control
H. Perez, I. Burstyn, Drexel University, Philadelphia, PA; K. Michael, University of Washington, Seattle, WA.

Objective: When designing methods to address the spread of methicillin-resistant S. aureus (MRSA) it is important to take into account all potential methods of transmission. Transmission through physical contact from one person to another is a relatively well studied phenomenon, especially in healthcare environments. There is evidence of aerosolization of MRSA and airborne transmission of MRSA from both humans and the environment.

Methods: A structured search of titles and/or abstracts containing the terms “(methicillin resistant staphylococcus aureus or MRSA) AND (air or airborne)” was performed using the pubmed.gov search engine. The two limits used were English-language abstracts and studies involving humans.

Results: The search located 70 papers. Exclusion criteria included no mention of air sampling for MRSA or consideration of air as a reservoir for MRSA in the methods section (n=42), articles not in English (n=1; abstract in English but article was written in Italian), and review articles (n=3). Twenty four eligible articles were identified for this review. The twenty four articles identified were each categorized into one or more of three groups: 1) 10 studies citing evidence of airborne MRSA, 2) 7 studies citing evidence of airborne transmission of MRSA and, 3) 10 studies discussing considerations and control methods of MRSA.

Conclusions: Evidence of the presence of MRSA in the air, transmission through the air and considerations in effectively reducing the risk of MRSA spread were reported. Additional work is needed to more fully understand the extent to which airborne transmission has a role in the spread of MRSA.

SR-109-02
Indoor Environmental Scientific Research to Evaluate the Use of a Novel Air Sampling Cassette to Detect Mold Spores via PCR Analysis

Objective: Air samples were collected from 31 unique indoor environments over a six month period. The objective of sampling was to determine the feasibility of short duration air collection to capture mold spores for PCR analysis.

Methods: The methods used to collect and analyze samples included a novel PCR cassette inserted into a portable, variable flow, pump. Samples were collected for 10 minutes at a flow rate of 15 liters per minute. Spore trap samples
were collected concurrently with PCR samples, according to the spore trap manufacture’s specification. Outside samples were collected for comparison. Samples were sent to an AIHA accredited laboratory for direct exam analysis. PCR samples were analyzed according to the U.S. EPA’s MSQPCR protocol. Probes and primer sets for 36 species of mold were included in the assay. Variables calculated included spore abundance, species richness, and diversity.

Results: The results identified substantial diversity of species for the chosen 36 probe matrix, although less than spore trap genus diversity. Species richness and abundance varied, but the keystone species, *Stachybotrys chartarum*, was often identified in PCR samples with greater occurrence and concentration as compared to spore traps. Unique *Aspergillus*, *Cladosporium*, and *Penicillium* species were identified with PCR, but were not detectable with spore trap analysis.

Conclusions: In conclusion, PCR air samples collected with the novel cassette, over a short duration, provides a new application for the industrial hygienist, specifically an enhanced capability to identify airborne spore concentrations of critical water intrusion and healthcare relevant species. Current PCR air sampling methods requires low flow pumps and 24 hour sample collection. The feasibility of prolonged collection times is often cumbersome for most professionals to use PCR for routine sampling. Furthermore, PCR air samples provide meaningful species data related to the abundance and occurrence of water intrusion molds, which is lacking in spore trap samples.

CS-109-03 Healthcare Compliance with ASHRAE Standard 188P: Prevention of Legionellosis Associated with Building Water Systems
D. Krageschmidt, Mayo Clinic, Rochester, MN.

Situation/Problem: Healthcare water systems are a risk for generating pathogenic, airborne microorganisms, including *Legionella* species that may infect patients and healthcare workers. Microorganisms grow in biofilms that reside in water pipes that are inadequately controlled for flow, temperature and disinfectant. The World Health Organization has advocated that healthcare facilities utilize a Hazard Analysis and Control Process to manage these risks; and more recently the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has mandated in Standard 188P that many building operators, including healthcare facilities use the Hazard Analysis and Critical Control Points (HACCP) process for potable water management.

Resolution: A large healthcare provider teamed with a water consulting organization to prepare a HACCP plan, as well as implement the plan for their hospitals and clinics. An interdisciplinary team of infectious disease physicians, industrial hygienists, engineers and maintenance personnel combined with the consulting experts to prepare process flow diagrams; perform biological, chemical and physical hazard analyses; determine critical control points; and determine control limits, monitoring and corrective actions.

Results: A plan was prepared and implemented for the prevention of waterborne diseases for patients, employees and visitors and to align water management strategies with best practices and current regulations. Corrective actions were implemented as necessary and an ongoing water systems validation process was designed.

Lessons Learned: A comprehensive water management program will manage the waterborne contamination risks to patients, employees and visitors, as well meet regulatory requirements.

CS-109-04 Nosocomial Mycosis Outbreak Control and Prevention
J. Manfrida, TestAmerica, Phoenix, AZ.

Situation/Problem: An outbreak of a nosocomial mycosis occurs in a hospital or clinic. Nosocomial mycoses, fungal infections acquired in hospitals, cause the deaths of over 10,000 people and incur a cost of approximately 3 billion dollars annually. Thorough understanding of nosocomial mycoses and prevention and remediation strategies is vital to healthcare facilities.

Resolution: Sampling and cleaning plans are implemented to control the outbreak. We will investigate the nature of nosocomial mycoses and their containment. The epidemiology and pathology of common fungal infections will be reviewed, with a focus on how they enter and propagate under outbreak conditions in hospitals. Designing sampling plans will be discussed, focusing on determining the appropriate
sampling methods, locations to be tested and analysis types to be utilized.

**Results:** Viable spore counts in hospital air are lowered to 1 cfu per cubic meter or less.

**Conclusions:** The presentation will conclude with a discussion of the remediation and control of nosocomial infections, including personnel protocols, cleaning regimen and primary engineering controls.

**Lessons Learned:** Successful control of a nosocomial mycosis outbreak requires careful monitoring, close attention to infection control practices and meticulous cleaning. Much of the response to an outbreak can actually be accomplished proactively to lessen the impact of any outbreak that occurs.

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**CS-109-05**

**Addressing Legionella and Waterborne Pathogens in Hospitals with a Water Risk Assessment Plan**

S. Ebersohl, Pall Medical, Ann Arbor, MI.

**Situation/Problem:** 400 bed hospital in New York reports three Legionnaires cases after patients develop symptoms. Legionnaires' disease can have symptoms like many other forms of pneumonia, so it can be hard to diagnose at first. The hospital must restrict water use (no showering) until the situation is resolved.

**Resolution:** Develop a HAACP Plan (Hazard Analysis and Critical Control Point). This includes three key points: A) Documentation of water systems and operation & maintenance as relates to reducing/controlling Legionella. B) Verification that the controls are “within range.” C) Validation that the hazard (Legionella) is in control. After reviewing the plumbing system, a determination is made that a systemic chemical system (Chlorine Dioxide) is used to control Legionella throughout the overall hospital building. Because it will take 2–3 months for the system to take effect, Point of Use (POU) water filters are installed throughout the hospital. For high risk units, POU water filters are installed in the Transplant units for long term use to satisfy the CDC guideline of zero detectable levels of Legionella in Transplant units.

**Results:** After installing Chlorine Dioxide, Legionella culture levels drop off from their high levels. After installation of POU Water Filters, the cultures show zero detectable levels of bacteria (CFU/mL). A process is developed monthly to insure the chemical system is monitored for residuals, per the SDWA. The filters are changed monthly and provided a detailed report by the filter provider.

**Lessons Learned:** Hospital must be proactive, not reactive with water issues. One patient getting sick from Legionnaires Disease can shut the hospital’s water supply off and land the hospital in the newspaper with very bad publicity.

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**CS-109-06**

**Evacuate or Investigate? Pre-planning Saves Disruption and Dollars**

S. Rupkey, Bureau Veritas North America, Downers Grove, IL.

**Situation/Problem:** Cases of Legionnaires disease were associated with a 200 plus bed assisted living and elderly apartment community and the local health department was insisting that all residents and patients immediately evacuate the facility. The evacuation would have cost the institution 100’s of thousands of dollars and significantly disrupted the lives of the elderly population and their caregivers and families.

**Resolution:** The facility temporarily installed point-of-use (POU) filters on all showers and sinks in the residents’ apartments and on ice machines and cooking water in the cafeteria. These filters are reported by the manufacture to trap and prevent 100 percent of the Legionella before it exits the water source. The POU filters were allowed after persuasive discussions with and education of local health department officials regarding the efficacy of POU filters. Peer reviewed papers regarding POU filters and conference calls with Centers for Disease Control and Prevention offices help convenience the local health department officials that the use of POU filters was an acceptable means of preventing patient exposure to Legionella.

**Results:** Residents were allowed to stay in their apartments and continue to use the potable water until a Legionella risk assessment was completed and a long term solution to prevent Legionellosis associated with the building’s water systems was implemented. The long term solution included, but was not limited to, the installation of a systemic water disinfection system and performing verification and validation that the long term solution was effective. By not having to evacuate, the institution saved 100’s of thousands of dollars in temporary relocation...
costs and there was minimal impact to the resident population and their families. **Lessons Learned:** Have an effective waterborne pathogen prevention plan in place prior to this type of event so that you can implement the most practical, evidence based and cost effective solutions.