Risk of Environmental Exposure to Methicillin Resistant *Staphylococcus aureus* in Healthcare Programs

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**INTRODUCTION**

The opportunity of disease transmission increases with potential pathogen exposure especially in public facilities, such as restrooms, which are not sterile sites.

Bacteria are known to survive for several weeks on bathroom surfaces and often originate from our skin. Microorganisms found in restrooms therefore represent not only the cleanliness of the facility, but also the user population microbiome.

Because microorganisms exist in our environment good hygiene dictates that we control the impact bacteria has on our health, however some facilities may place individuals at greater risk.

To determine potential environmental microbial exposure and risk for pathogenic transfer, we conducted a systematic evaluation of public access restrooms on the University of Alaska Anchorage (UAA) campus.

**SAMPLE COLLECTION METHOD**

Same day microbial culture samples were collected from public restrooms on the UAA campus. Staphylococcus aureus was isolated in six of the nine buildings within the University of Alaska Anchorage (UAA) campus. Six buildings were selected for study to ensure the diversity of environments within the university, and one of the six was not inhabited by students.

Four discrete sites were targeted for culture: faucet handle, interior door handle, interior stall lock and toilet handle. Flocked swabs were rolled over a 2x2inch area and placed in liquid transport media.

Nine buildings were surveyed:
- Health Sciences Building (NSB), Edward & Kathyn Ramuson Hall (RSH), Natural Sciences Building (NSB), Administrative/Humanities Building (ADMB), ConocoPhillips Integrated Science Building (CPISB), Social Sciences Building (SDB), Engineering and Computational Building (ECCB), Eugene Short Hall (ESH), and Student Union (SU).

**RESULTS**

Sample transport vials were vortex for 5 seconds. Direct plating of sample liquid was quantitatively insolated onto Tryptic Soy Agar (TSA), chromID MRSA/AAD™ Biomerieux and Potato Dextrose Agar (PDA).

500 ul of tryptic soy broth was added to the sample vial as an enrichment culture and plated onto MacConkey/Sheep Blood Agar plates after 48 hours incubation.

Catalase positive, gram positive cocci isolated on all culture media were identified as Staphylococcus aureus by positive coagulase test using rabbit plasma (BD BBL™ Coagulase Plasma, Rabbit with EDTA). Coagulase negative bacteria were further identified as either Coagulase Negative Staphylococcus (CoNS) or Micrococcus species by colony morphology. All Staphylococcus aureus identified colonies were cultured to MRSA/AAD™ plates. All positive chromograin MRSA isolates were verified for methicillin resistance using Alere® PhIPa kit.

Gram negative lactose non-fermenting bacteria were identified using Remel® Rapid NF System and gram negative lactose fermenting bacteria were identified using MicroScan System™.

Gram positive bacilli (GBP) were identified by typical colony morphology and gram stain.

Fungal isolates were identified by lactophenol microscopic evaluation and colony morphology.

In direct bacterial cultures Staphylococcus aureus was the predominante organism isolated with methicillin resistant Staphylococcus aureus having the highest concentration. Other organism isolated included CoNS, Micrococcus, Corynebacterium, Pseudomonas, and Klebsiella species. Fungal cultures isolated Penicilium and Mucor species. Enrichment broth isolated CoNS.

Bacterial growth was found to be evenly distributed between both male and female bathrooms with no statistical difference in gender or culture site. Statistical significance was found in culture positive buildings for Staphylococcus aureus and presence of MRSA.

**DISCUSSION**

Studies of bacterial growth in public spaces identified similar organisms, including Staphylococcus aureus and MRSA. Facilities, such as showers and whirlpools utilized by individuals with high risk of MRSA colonization, showed an increase of MRSA contamination. Household presence of Staphylococcus aureus and MRSA has been related to colonization of its inhabitants.

Staphylococcus aureus was cultured in a number of our UAA bathrooms, but it was not significant for concentrating the building type. However, MRSA colonization was present only in the UAA Health Science Building where the majority of students and faculty are in the medical field, including students in hospital clinical rotations. If this represents the user population, individual colonization of MRSA found in the HSB restroom could be considered either community acquired or hospital acquired. Studies following Staphylococcus aureus and MRSA in medical students found an increase in colonization after clinical rotations.

Our study suggests that individuals in health care education, whether student or faculty, could potentially have high rates of MRSA colonization. Incoming students to the health profession exposed to MRSA either by teaching faculty or clinical rotations places them at a higher risk for colonization.

**CONCLUSIONS**

Healthcare workers are screened for *Mycobacterium tuberculosis* to reduce the potential spread of disease. The same could be considered for MRSA, where the potential for transmission exists. MRSA colonization in the healthcare worker, including students in clinical rotations, has the potential to increase MRSA exposure to patients. Infection control measures, such as handwashing, prevent transfer of MRSA, yet compliance is often inadequate unless there is a measured outcome. Knowledge of MRSA carriage in healthcare students could promote effective standard hygiene protocols, reducing potential of MRSA transfer during clinical rotations.

**REFERENCES**