Environmental Surface Sampling for MRSA in Washington State Fire Stations

FINAL REPORT

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A Collaborative Effort

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Special Acknowledgement

We wish to express a special thank you to the fire stations who participated in this project. We extend a special appreciation to the Washington Fire Chiefs for their support throughout the year-long project.

EXECUTIVE SUMMARY

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a bacterium that is resistant to common antibiotics. MRSA can cause minor or severe skin infections, surgical wound infections, bloodstream infections, and pneumonia. It can live for weeks or months on surfaces that are not kept clean. MRSA is spread by direct skin-to-skin contact with an active infection or by contact with contaminated shared items and surfaces. Fire service professionals may have a higher likelihood of exposure to MRSA when they come in contact with patients during emergency medical situations. However, for this population, the risk of developing a MRSA-related disease is not known.

The risk of MRSA infections has become an increasingly important concern for firefighters; recent studies have found MRSA on surfaces in fire stations. This service project was coordinated by the University of Washington Field Research and Consultation Group, working in collaboration with Dr. Marilyn C. Roberts, Professor in the Department of Environmental and Occupational Health Sciences (DEOHS). The goal of the project was to collect environmental surface samples from 30 different fire stations across Washington state to better understand the presence and distribution of MRSA and to help reduce exposure risk factors in fire stations.

Thirty-three fire stations with career-based staff participated in this study. Sampling kits containing all supplies needed to conduct environmental surface sampling were mailed to each station. Fire station personnel collected 653 samples. Eight percent of the field samples (52/653) were positive for MRSA, and 19 of 33 stations (58%) had at least one positive MRSA sample. The percentage of MRSA positive samples per station ranged from 5%–35%. Forty-two percent of the stations had two or more positive MRSA samples. Nine stations (27%) had three to seven samples with MRSA. Sixty-two percent of the positive MRSA samples were collected from the living quarters. MRSA was also found on turnout gear, items in aid cars (work benches, seat belts, and medical bag handles), and fire engines/ladders (steering wheels, door handles, mobile data computers, and arm rests). MRSA was not found in samples from 14 stations.

The average fire station call volume was 151 per week, ranging from 5 to 1800. Seventy-six percent of the stations transported patients for medical services.

Stations were classified into two groups according to the presence or absence of MRSA. In general, policies, practices, and cleaning and disinfecting items did not significantly differ between the two groups. Many factors appear to contribute to the presence of MRSA on a surface. This project was designed to give general guidance and strategies to fire stations for reducing the spread of MRSA and other infectious diseases.

Each fire station was provided the results of its sampling, educational materials on how to maintain a clean zone in the fire station, and a fact sheet on tools for improving an infection control program. Special attention to infection control policies, work practices, and cleaning techniques are necessary to reduce the risk potential of MRSA transmission.

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INTRODUCTION

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a bacterium that is resistant to common antibiotics. MRSA can cause minor or severe skin infections, surgical wound infections, bloodstream infections, and pneumonia. It can be spread by direct skin-to-skin contact with an active infection or by contact with contaminated shared items and surfaces (US Center for Disease Control and Prevention, 2012). Fire service professionals may have a higher likelihood of exposure to MRSA due to their contact with patients during emergency medical situations. However, for this population, the risk of developing a MRSA-related disease is not known.

During the past 10 years, MRSA has become a major nosocomial pathogen for patients in hospitals and nursing homes (Hardy et al., 2006; Clevens et al., 2007; Boyce, 2007; Chambers and DeLeo, 2009; Kallen et al., 2010). Moreover, community-acquired MRSA (CA-MRSA) infections are on the rise, and the transmission of MRSA from the community and beyond acute care hospital environments is receiving more attention in the public health literature (Seybold et al, 2006; Miller and Diep, 2008; Cooke and Brown, 2010). It is well documented that transmission occurs primarily from person to person by direct skin contact, and there is growing evidence that contact with contaminated environmental surfaces is a significant transmission factor (Hartmann, 2003; Bhalla, 2004; Kassem et al, 2007; Scott et al, 2009; Otter et al., 2009; Otter et al., 2011).

Recent studies monitoring the workplace and living quarters of firefighters and emergency health care responders found MRSA on surfaces and objects (e.g., objects in medic/fire trucks and couches in living areas); however, little information is available regarding the prevalence of MRSA-related disease among these workers (Sexton and Reynolds, 2010; Brown et al., 2010; Roline et al., 2010; Roberts, 2011). In two studies involving firefighters/emergency responders, four to seven percent of the environmental surfaces evaluated tested positive for MRSA (Sexton and Reynolds, 2010; Roberts, 2011). Brown et al. sampled approximately 16 sites within 51 ambulances, and 49% of the ambulances had at least one area testing positive for MRSA. Ambulances found to have the highest number of contaminated sites included those from fire departments.

Photos, left to right: Comstock/photos.com, Sarah Fish

Roberts found MRSA in 44 (4.2%) of the 1,060 samples examined in a recent study of two Washington state fire stations (Roberts 2011). Samples were taken from the inside and outside surfaces of fire apparatus (medic/aid trucks, fire engines, and fire trucks) as well as specific equipment and equipment bags in the fire apparatus, fire-station garage floors, water coolers, computer keyboards, kitchen appliances, phones, TV remote controls, cloth chairs, desks, bathroom and gym surfaces, washing machines, and fire-protection clothing. Many of the same strains of MRSA were isolated in both the apparatus sections and the living quarters.

Sampling and analytical methods for detecting MRSA on surfaces vary across studies (Obee et al., 2007; Sexton et al., 2008; Brook et al, 2009; Sherlock et al., 2009; Hedin et al., 2010; Popovska et al., 2011; Roberts, 2011), and currently there are no standard or consensus methods for environmental hazard surveillance (Dolan et al., 2011). For a qualitative assessment for MRSA, swab surface sampling methods and direct contact-based media (e.g., RODAC plates) are the convention. Intervention studies that address environmental cleaning and infection control practices have proven successful in reducing the environmental burden of MRSA and other pathogens (Dancer, 2008; Carling, 2008; Goodman, 2008; Callahan, 2010; Carling, 2010; Manian, 2011; Otter, 2011). Environmental monitoring for MRSA in non-healthcare settings is an important endeavor to better characterize the sources of MRSA load on surfaces and to help develop effective prevention programs for at-risk occupational populations.

The objectives of this project were to:

1) Design a hazard surveillance program that identifies the MRSA burden in fire stations in Washington state,
2) Conduct environmental surface monitoring for MRSA at high-probability locations in the firehouse stations and on apparatus,
3) Document cleaning protocols used currently in firehouses and on apparatus, and
4) Provide general guidance and strategies to fire stations for reducing the spread of MRSA and other infectious diseases.

METHODS

OUTREACH

This project's goal was to recruit at least 30 career-based fire stations across Washington state to participate in a field surveillance project. Thirty-three fire stations agreed to participate in the project. The University of Washington Field Research and Consultation Group (UW FRCG) and Dr. Marilyn C. Roberts developed a protocol for sending MRSA environmental surface sampling kits to participating fire stations (Appendix 1). Educational materials were developed to provide guidance on reducing MRSA transmissions in fire stations.

Outreach activities to increase awareness of the project included attending firefighter association conferences, regional meetings, and workshops. In October and November 2011, UW FRCG staff attended several meetings with the Washington Fire Chiefs (WFC) to discuss the project. The WFC agreed to partner with the UW and placed an article about the MRSA project in several newsletters (*www.wsafc.org*). They also updated their website by adding a MRSA Resource Library, with the assistance from UW FRCG. A recruitment flyer was developed for the websites and meetings (Appendix 2). In addition, Dr. Roberts worked with the International Association of Fire Fighters (IAFF) in Washington state to notify members about the program. The local news media, *King 5 News*, ran a story about the project in November 2011. In February 2012, UW FRCG staff attended the Washington State Fire Training and Safety Officers annual conference to reach out to more fire stations.

With guidance from the United States Centers for Disease Control and Prevention (CDC), WFC, King County Emergency Medical Services Division, and firefighters from pilot fire stations, educational materials on preventing MRSA infections in fire stations were developed (Appendix 3). One fact sheet, "Prevent MRSA: Maintain a 'Clean Zone' in the Fire Station," was reviewed by the CDC and King County Emergency Medical Services Division. Another fact sheet describing the benefits of microfiber technology in an infection control program was also developed (Rose and Westinghouse, 2010).

It should be noted that many municipalities are passing ordinances that encourage or even require fire stations to use "green" products, referred to as environmentally preferable purchasing (EPP) cleaning products. The fire stations participating in the pilot phase of this project had an interest in the elements of an EPP program. Because EPP programs are increasing in popularity, general information and resources about these programs were included in the educational materials for the fire stations. US Executive Order 13101 defines environmental preferable as "products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose." An EPP cleaning program includes standardized operations, effective cleaning chemicals, uniform dispensing systems, comprehensive staff training, and the adoption of new equipment and technologies.

DEVELOPMENT OF SAMPLING PROTOCOL—PILOT PHASE

The environmental sampling protocol was piloted with four fire stations during September and October 2011, and modifications were made to procedures and instructional material to clarify sampling instructions, improve shipping procedures, and clarify the survey questionnaire and educational materials. The WFC also developed a template letter for fire chiefs to use for requesting MRSA sampling kits.

SAMPLING PROTOCOLS

The final sampling protocols required collection of 20 samples (19 pre-selected and one self-selected) by fire station personnel (Appendix 4). Each sampling vial contained one SANICULT swab in 1 milliliter (mL) of buffer (Starplex Scientific). One swab was used to sample several surfaces; an average of 58 to 60 surfaces were sampled in each fire station. The recommended locations for sampling were identified as those that were presumed to be the highest risk for firefighter exposure because of the possibility of bare skin contact. The criteria for sampling included: 1) locations with high risk of bare skin contact or hand-face contact, such as bathrooms, beds, and gym equipment; 2) surfaces where MRSA had been reported in the literature (e.g., patient action areas, gurneys, couches, steering wheels, computer keyboards, stethoscope), and 3) locations amenable to cleaning and disinfecting.

Kits containing all supplies needed to conduct sampling were mailed via US postal service (priority mail) to each station. Little information is available in the literature regarding the viability of MRSA under various temperature conditions and duration between sample collection and analysis; therefore, temperature indicators were added to each sampling kit (WarmMark Indicators [37°C/99°F] and ColdMark Indicators [0°C/32°F]) that change colors if the temperature exceeds the range of 32°F to 99°F. Indicators did not change color during shipping to and from the fire stations except in one case, indicating that temperature extremes were rarely experienced during transport.

One station sent samples just before a holiday, and samples were not processed for eight days. MRSA was found in this station. We do not know the impact of this delay on the growth rate or viability of MRSA organisms. One station in eastern Washington notified the UW FRCG that the ColdMark Indicator had changed color when the kit was received. This suggests that the sample vials were in an environment that was at least 0°C (32°F) during shipment. It is not known for how long the samples were at this temperature or if the samples were also in a cold environment upon return to the UW FRCG. Samples from this station did not have any surfaces positive for MRSA. Subsequent laboratory experiments suggest that there will be sufficient growth of MRSA, if it is present, even if samples are exposed to temperatures of 0°C (32°F) for up to six hours.

SURVEYS AND FORMS

A survey instrument was designed by UW FRCG research industrial hygienists to collect information on procedures in stations (Appendix 5). Questions were based on typical occupational health survey instruments and a thorough review of the relevant literature, particularly variables that indicated a positive relationship between occupational risk factors and MRSA contamination on surfaces (Nied Jr., 2008). The survey instrument was then reviewed by practicing firefighters and, after minor modifications, was piloted at four fire stations to determine response reliability. Additional questions were recommended by firefighters who participated in the pilot phase of this project (e.g., does your station transport patients for medical services?). Questions in the final survey instrument included fire station status (e.g., call volume), kinds of furniture in living quarters, cleaning and disinfecting protocols in use at the station, types of cleaning products and disinfectants, general information on MRSA outbreaks among staff, training, and use of infection control precautionary measures. Other forms developed for this project included a sampling sheet, chain of custody form, and laboratory results report form.

ANALYTICAL METHOD

The analytical method used by the Roberts Laboratory is designed to improve identification of MRSA in environmental samples (Roberts et al., 2011a, 2011b; Safdar et al., 2003). The method includes the following:

After receipt at the laboratory, two mL of sterile Bacto® m *Staphylococcus* broth (1.5 X; Difco Laboratories, Sparks, Maryland), supplemented with a final concentration of 75 µg/mL of polymyxin B and 0.01% potassium tellurite (Sigma-Aldrich, St. Louis, Missouri) was added to each tube under sterile conditions. The supplements were made fresh and added to the sterilized media. A blind positive laboratory control, a sample that was formulated in another laboratory at the UW, was included in selected runs for quality assurance while internal positive controls were used to verify the media each week.

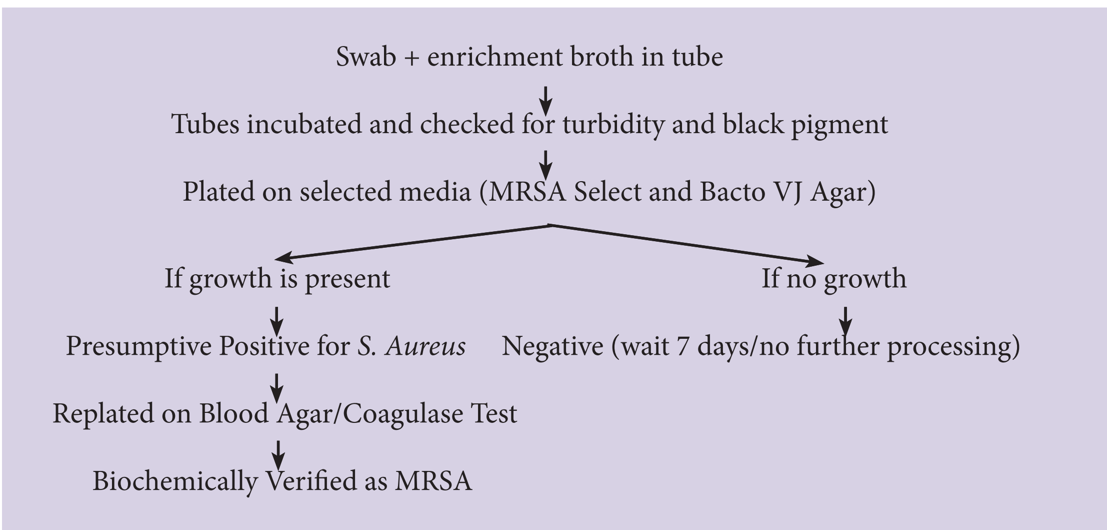
Tubes were incubated in 5% CO_2 at 36.5°C and checked daily for turbidity and black pigment. Most positive samples became turbid with black precipitate at 48–96 hours. Both turbidity and black precipitate must be present to indicate the potential presence of *S. aureus*/MRSA. Tubes that were not turbid and black were held seven days before being labeled as negative. All results were logged into the laboratory data spreadsheet.

Each positive tube was vortexed at high speed for 10 seconds and then 20 µl of broth was removed with a sterile tip and spotted onto a MRSASelect™ plate (Bio-Rad, Hercules, California) and Bacto® VJ Agar (Difco Laboratories, Sparks, Maryland) incubated 18–24 hours at 36.5°C. Samples that are presumptive were re-streaked for isolation on blood-agar-containing plates (5% sheep blood with Brucella Agar [Difco Laboratories]) and incubated in 5% CO_2 at 36.5°C overnight to verify β-hemolysin. Growth from the blood agar plate was used to do the Remel Staphaurex® rapid latex test (Thermo Fisher Scientific, Lenexa, Kansas) to determine coagulase activity. The isolates that grew on MRSASelect™ plate and gave the correct colored colony were reported as positive. β-hemolysin coagulase positive colonies from Bacto® VJ Agar were verified as MRSA by growth on MRSASelect™ plate and also reported as positive. The field isolates were further tested and labeled as MRSA positive. All results were logged into the laboratory data spreadsheet. Field MRSA isolates were suspended in autoclaved skim milk and stored at -75°C.

Ten percent of total samples collected were quality control samples. Two field blanks were submitted with each set of field samples. Field blanks were prepared by UW FRCG staff. A vial containing one SANICULT swab in 1 mL of buffer was labeled like a field sample. On the day of shipping out the kits, the cap of the field blank was opened and closed briefly, and then parafilm was placed around the lid. The field blank was placed in a small plastic bag labeled "Blank—Do Not Touch" and placed in the sampling kit. Sixty-two field blanks were submitted. Four stations submitted only one field blank (e.g., one station sampled incorrectly and used the blank to start over). All field blanks were negative.

The analytical limit of detection for the swab sampling method is approximately 100 colony-forming units (cfu)/mL. Experiments conducted in the Roberts Laboratory (seeding hard surfaces with 104–106 cfu/mL, allowing surfaces to dry, and subsequently recovering the bacteria from the surfaces with a swab) found a recovery efficiency of approximately 10% (one swab per sample).

Controls were prepared in the UW Meschke Laboratory from two positive control strains provided by the Roberts Laboratory and were submitted randomly to the Roberts Laboratory with samples on three different dates during the study. Positive controls were prepared by growing an overnight culture of the provided MRSA control strain, making serial 10-fold dilutions of the overnight growth, and then spiking swabs directly with approximately 100–1000 cfu. At the time of spiking, the dilutions were plated on Bacto® *Staphylococcus* 110 agar (BD) to determine the titer and subsequently calculate the exact amount that was spiked on the control swabs. The two positive controls that were prepared with the first provided control strain were not detected by the Roberts Laboratory. Although the specific reason for this lack of detection is unknown, it is likely due to the control strain not performing well with the Remel Staphaurex rapid latex test. Upon changing to a new control strain, the positive controls which were above the limit of detection of 100 cfu/mL were detected by the Roberts Laboratory. Additionally, negative controls spiked with sterile phosphate buffered saline (PBS) were correctly identified as negative by the Roberts Laboratory.



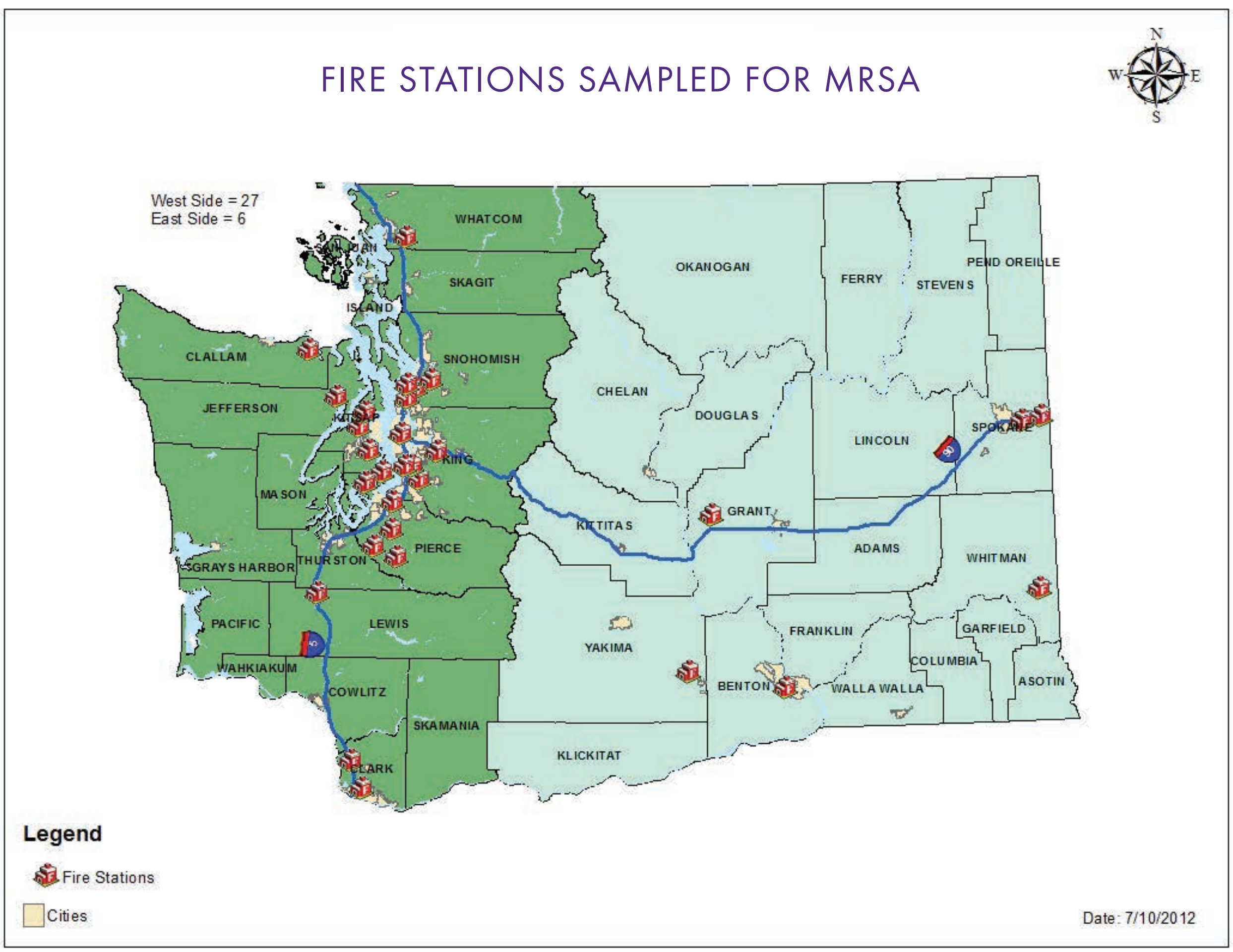
DATA ANALYSIS

All data were maintained in Microsoft Access database. Survey responses (n=56) by each station were summarized. Descriptive statistics of policies and practices were completed for each station. Stations were classified into two groups according to the presence or absence of MRSA. The Fisher's Test was used to test for significant differences in policies and practices in stations with or without MRSA. Because we do not have sufficient information regarding the likelihood of MRSA on a surface, we asked many questions in the fire station survey; therefore, the results of the Fisher's Test for each factor should be considered as hypothesis-generating for future studies and research.

RESULTS

From November 2011 to May 2012, UW FRCG sent environmental sampling kits and surveys to 33 stations. Participating stations were located in eastern (6) and western (27) Washington (see map). Seven hundred twenty-one samples were collected: 653 field samples, 62 field blanks, and 6 positive controls. The percentage of MRSA positives per station ranged from 5%–35%. Eight percent of the field samples (52/653) were positive for MRSA, and 19 of 33 stations (58%) had at least one positive MRSA sample. Forty-two percent of the stations had two or more positive MRSA samples. Nine stations (27%) had three to seven samples positive with MRSA. MRSA was not found in 14 stations. Twelve stations (36%) reported that a fire service professional reported MRSA symptoms that were treated by a health care provider. They included six of the 19 stations with MRSA positive results and six of the 14 stations without MRSA.

MRSA may be present on surfaces in untested stations. Our findings agree with the literature, which suggests that 8%–10% of surfaces are found to have MRSA organisms. However, there are very few studies reported.



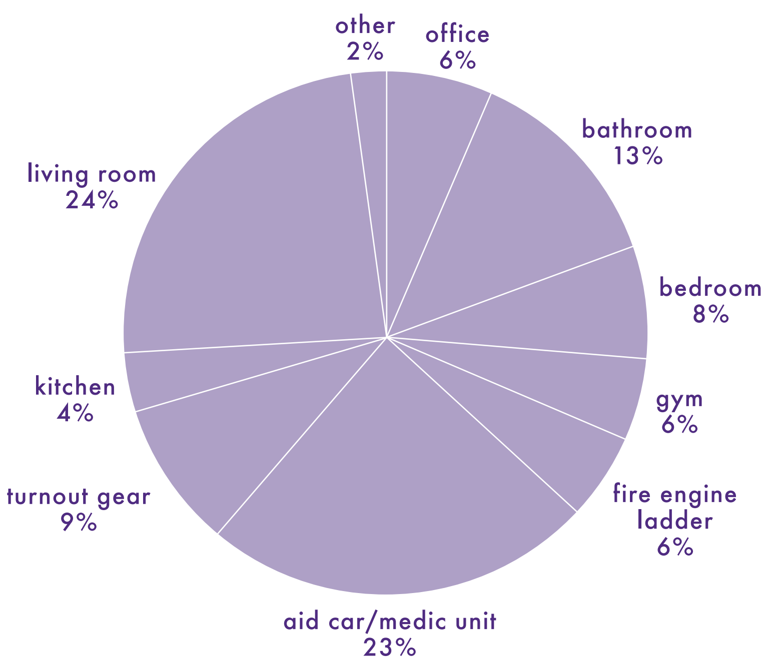
LOCATIONS OF MRSA-POSITIVE SURFACES

Nineteen sample sites were pre-selected by UW staff, and fire stations were asked to select an extra site to sample. Fire stations chose to sample door handles to living quarters, public use medical equipment, jackets, computers/tablets, stair railing, office chairs, and copiers. An equal number of samples and surfaces were monitored in the living quarters (10 samples with 30 surfaces) as in the apparatus bay (9 samples with 25 surfaces). MRSA was found most frequently (62%) in the living quarters (Figure 1). MRSA was also found on turnout gear, items in aid car (work benches, seat belts, and medical bag handles) and fire engine/ladder (steering wheel, door handles, mobile data computer, and arm rests). MRSA was found most frequently on living room furniture and TV remotes, as well as items in the aid car including work bench, seat belts, and medical bags (Table 1). All "free" choice items were negative except for one collected from doors to dorms. Eleven fire stations collected two samples from the same location in the aid car/medic unit (e.g., three different sections of the work surface/bench next to the patient care area). Nine were negative for MRSA. In two stations, the results were inconsistent; one section of the work surface/bench was positive and the other was negative, suggesting sampling location is important.

SURVEY RESPONSES

The survey was returned by all stations, and most stations answered all questions. The average fire station call volume was 151 per week, ranging from 5 to 1800. Seventy-six percent of stations transport patients for medical services. Thirty-six percent of the stations reported MRSA symptoms among fire professionals that were treated by a health care provider. Almost all stations provide infectious disease training to fire service professionals, and 79% reported that they conduct training on MRSA specifically. Forty-nine percent reported that the dispatcher asks if patient has a cough, fever, or any known disease. Only 61% of

Figure 1. Sample locations with MRSA.



Location	Items	# of Positive MRSA
Bathroom	Three different sections of the bathroom counter	4
	Outside door knob of men's and women's bathroom, and two sink handles and two toilet handles in men's bathroom	3
Gym	Three most commonly used pieces of equipment where user hands are most often located	3
Bedroom	Two beds used by multiple personnel	3
	Dormitory outside doors ("free" choice)	1
Living Room	Two pieces of furniture	5
	Two TV remote controls and land line telephone handle	5
	One arm rest on three different chairs	3
Kitchen	Sink handles, fridge door handles, coffee pot	1
	Three different sections of kitchen table	1
Office	Three different desks in office and computer keyboards/ space bars	3
Fire Engine/Ladder	Steering wheel, outside door handle, mobile data computer keyboard/mouse, and passenger arm rest	3
Aid Car	Three different sections of work bench	3
	Seat belts on the driver's side and passenger's side	3
	Medical bag handles from two bags	3
	Gurney straps, ceiling grab bar, metal buckle	1
	Diaphragm of stethoscope, inside of blood cuff	2
Turnout Gear	Inside area of right and left arm cuff	3
	Inside the rim of two helmets	2

Table 1. Items with MRSA-positive surfaces in fire stations from 52 samples.

all fire stations reported cleaning turnout gear after a fire, whereas most reported cleaning turnout gear after exposure to a blood-borne or airborne pathogen. Table 2 provides responses to policies related to hand washing, sink facilities in apparatus bay, signage, and training.

Approximately half of the stations reported that fire professionals received some training on cleaning surfaces for infection control and post-call decontamination cleaning procedures. Most stations reported that they bring their work boots and work clothing into the living quarters, but not their turnout gear or tools. Ninety-seven percent of fire stations reported that multiple fire service professionals use the same bed, and 39% have policies for cleaning the bed and bedding materials in between users. More than half of the stations have policies for routine cleaning and disinfecting of medical equipment, aid car items, fire engine/ladder, turnout gear, and duty uniforms (Figure 2). However, cleaning and disinfecting policies for

Question	Percentage (%) Yes
Does the fire station have a policy to inform fire service professionals when they should wash their hands?	58
Does the fire station use signage to inform fire service professionals when they should wash their hands?	33
Is there a policy that first responders wear gloves, goggles, and masks in high-risk environments or on medical calls (e.g., prisons, nursing homes, patients with a fever)?	76
Are there sinks for hand washing in the apparatus bay?	76
Are there disinfectant hand-gel dispensers at the access points between the apparatus bay and the fire station?	55
Are there signs to remind firefighters that the apparatus bay is "dirty" and the station is "clean" with respect to infectious disease from patients?	6
Have fire service professionals received any training on cleaning surfaces for infection control and post-call decontamination cleaning procedures?	61
Have any fire service professionals in your station reported MRSA symptoms that were treated by a health care provider?	36

Table 2. Responses to questions related to prevention of contamination (n=33).

high-touch surfaces in living quarters (door knobs, remote controls, etc), gym equipment, and computers are lacking in many stations. Less than 50% of the stations reported the use of microfiber mops, microfiber cloths, vacuum cleaners with HEPA filtration, and walk off mats. The type of disinfectants used across stations varied with some stations using more than one kind: 61% alcohol-based, 39% sodium hypochlorite, 27% quaternary amines, 6% hydrogen peroxide, and 3% silver based. Many stations (76%) reported the presence of sinks for hand washing in the apparatus bay (Table 2); however, few stations have signs reminding fire professionals that the bay is "dirty" and the station house is "clean".

Stations were classified into two groups according to the presence or absence of MRSA. The responses to survey questions between these two groups were compared to explore if an association exists between potential MRSA risk factors and the presence of MRSA on surfaces. In general, survey responses about policies, practices, and cleaning and disinfecting items did not differ greatly between the two groups (Figure 3). Of 56 questions pertaining to potential risk factors affecting MRSA in fire stations, only three were statistically significant. Stations were less likely to find MRSA on surfaces if tools were kept out of the living quarters of the fire station ($p=0.027$). Two other factors (the use of walk off mats ($p=0.02$) and presence of sinks in apparatus bay [$p=0.047$]) were also significantly associated with the presence of MRSA on surfaces. Both of these results are counter-intuitive and need further investigation to determine whether they are meaningful or a statistical anomaly due to the large number of comparisons. Many factors contribute to the presence of MRSA on a surface, and other sources and conditions warrant further investigation. In addition, observations of the actual practices used in the fire station should be considered in future study designs.

Figure 2. The percentage of fire stations with policies for cleaning and disinfecting listed items (n=33).

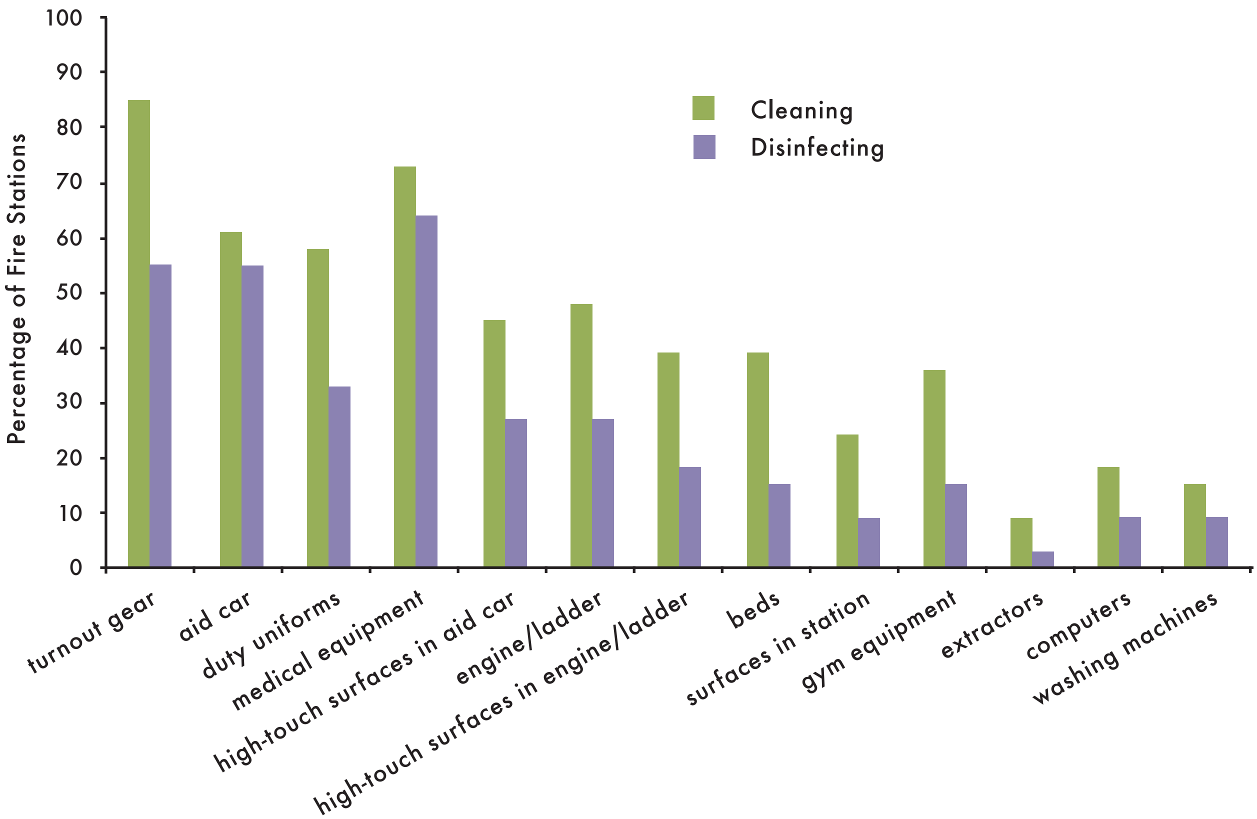
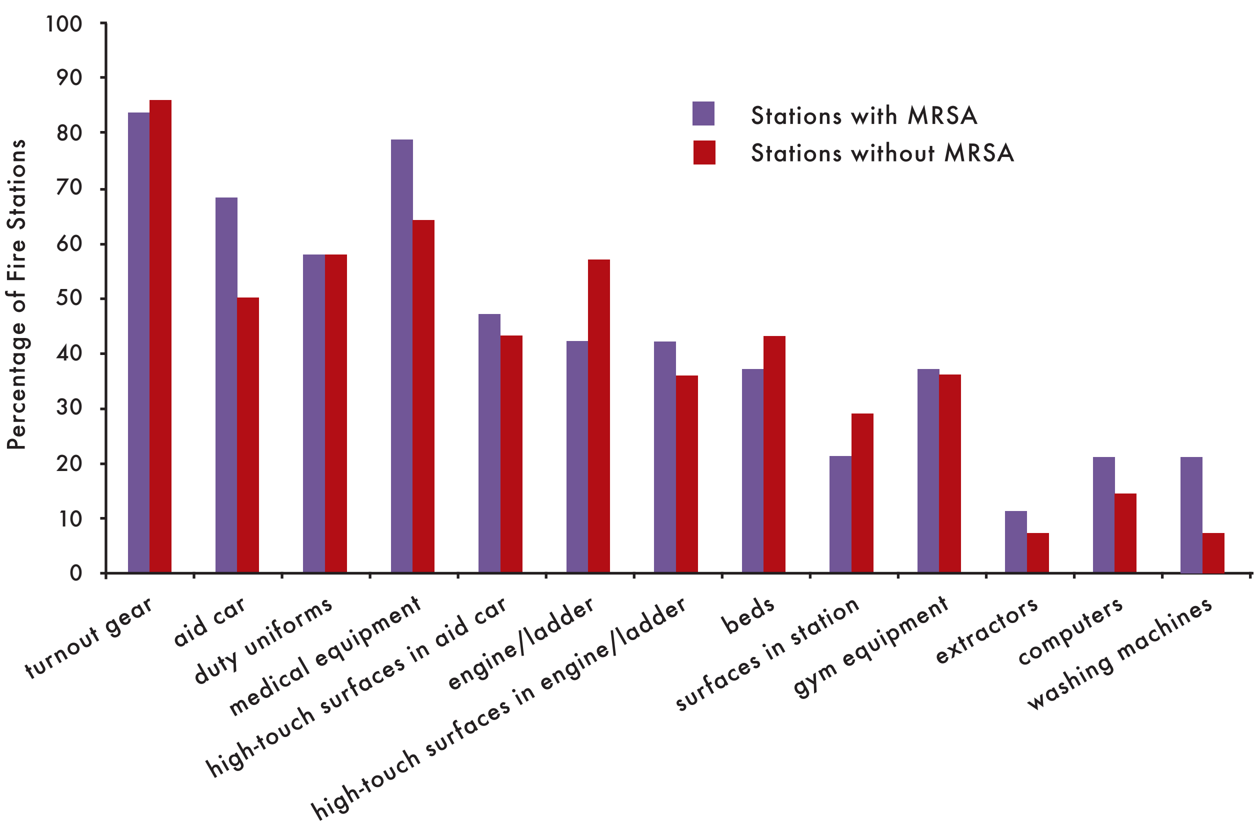


Figure 3. The percentage of fire stations with cleaning polices, with and without MRSA (n=33).



DISCUSSION

This hazard surveillance project identified MRSA burden in fire stations. Eight percent of the samples were MRSA-contaminated with levels of at least 100 cfu/sample, and more than half the stations had at least one MRSA contaminated surface. Although there are only a few occupational studies characterizing MRSA burden in fire stations, our findings of 8% are consistent with studies in the literature. Our results indicate that MRSA was found on different kinds of surfaces in both the fire station living quarters and the apparatus bay. Notably, MRSA was most frequently detected on commonly touched items and surfaces in the living quarters (62% of the positive samples). For example, MRSA was found on bathroom counters, living room furniture, and TV remotes, as well as items in bedrooms, offices, and kitchens. Particular attention should be given to maintaining the living quarters as a "clean zone." Fire stations are required to have standard operating protocols to protect firefighters in the workplace that cover infection control, training, personal protective equipment, cleaning protective gear, and post-exposure actions. However, cleaning protocols in the living quarters are less standardized and can vary. Several strategies are available to reduce the risk potential of MRSA contamination in fire stations.

The following prudent work practices should be encouraged:

Wash hands. Hand washing is the most important practice to prevent transmission of disease. Hands should be washed before entering the living quarters.

Clean and disinfect targeted surfaces and areas. Frequent and correct cleaning of high-risk and high-touch surfaces with proper equipment (e.g., microfiber) removes microbes on surfaces.

Ensure living quarters are maintained at relative positive air pressure as compared with the apparatus bay (air should flow from living quarters to the apparatus bay).

Place multi-level scraper walk-off mats with rubber backing at entrances of the fire station and the living quarters (mats should span the entryway and be 15 to 20 feet long). Vacuum walk-off mats daily.

Clean dirt and debris off work boots. Leave all boots outside of entrances to the living quarters.

Avoid taking home hazardous substances. Launder work clothes at the fire station or by a professional cleaning service to reduce the risk of carrying pathogens home.

Replace cloth surfaces with hard surfaces, wherever possible. For example, replace carpeting with hard flooring; replace upholstered furniture fabric with material that can be cleaned easily; replace old wooden or damaged kitchen counters and tables with stainless steel.

Wash sheets, blankets, and bed covers in hot water with a detergent at the fire station or by a professional cleaning service before each new user. Do not share sheets, blankets, or bed covers.

Provide cleanable covers for electronics (such as TV remote, keyboards, and radios). Many items such as computer keyboards or handheld electronic devices may be difficult to clean or disinfect or they could be damaged if they become wet. Check to see if the manufacturer has instructions for cleaning. Alcohol is recommended for some electronics (*www.cdc.gov/MRSA/environment/index.html*), but it is best to refer to manufacturer's instructions before applying.

MRSA was not identified on as many items in the apparatus bay as compared to the living quarters, suggesting that the current cleaning and disinfection practices may be adequate for the apparatus bays. Twenty-three percent of all positive MRSA samples were found on typical work-related items in the medic/aid car. Sixty percent of fire stations reported that they have policies for cleaning and disinfecting medic/aid cars; however, only 45% reported cleaning high-touch surfaces in the medic/aid car. Our finding that MRSA was found in fire stations where personnel brought tools inside the living quarters warrants further investigation. Fire stations should review their Exposure Control Plans and modify elements to improve infection control in accordance with federal and state health and safety laws (such as WAC 296-305-06505). The use of greater precautions to prevent transmission of MRSA from apparatus bay into other areas of the fire station is a key strategy. According to the CDC, hand washing is the most important practice to prevent transmission of disease. Our results show that more than half of the stations have equipment (sinks and or hand gels) for personnel to wash their hands in the apparatus bay before entering the living quarters. However, only 6% of stations reported the use of signage to remind personnel to wash their hands. Fire stations should consider adding hand washing signage throughout the station to raise awareness among personnel. Other key practices include the following:

After caring for patients, clean and disinfect equipment and the inside of the rig according to standard operating protocols and manufacturer's instructions. This includes steering wheel, door handles, radio handset, headsets, mobile data terminals, gurney, and other high-touch surfaces. Wear disposable gloves while performing these tasks and dispose of the gloves properly after use.

Inspect gear regularly for dirt, damage, and expiration dates. Clean turnout gear according to manufacturer's instructions and fire station policies.

Store turnout gear in the apparatus bay, not in the living quarters.

Do not take emergency medical equipment into the living quarters of the fire station.

LIMITATIONS

In this hazard surveillance project, there was a potential for selection bias because participation was voluntary and self-selected. However, there is no evidence to suggest that the participants were unrepresentative of the fire stations in the state. There is no standardized sampling method for the identification of MRSA in the environment, and the swab culture method we used was conducted by untrained fire station personnel. Further studies are needed to determine the representativeness of the surface sampling techniques for estimating exposure. Although some of the sites sampled were found to be negative for MRSA, it is prudent to continue to use effective cleaning protocols and best practices for disinfection in the fire station. It is possible, as was shown with the positive control results, that MRSA may be present, but the analytical method used in this project could not detect below 100 cfu/sample. Another limitation of the project is that guidance for the prevention of MRSA was developed and distributed in January 2012. The stations with positive MRSA samples were found more frequently prior to January 2012. It is not known whether the fire stations participating after January reviewed the educational materials and changed their cleaning practices before ordering a sampling kit. Other risk factors should be included in future surveys, such as the type of tools are brought into the living quarters and the policies in place for cleaning and disinfecting these tools.

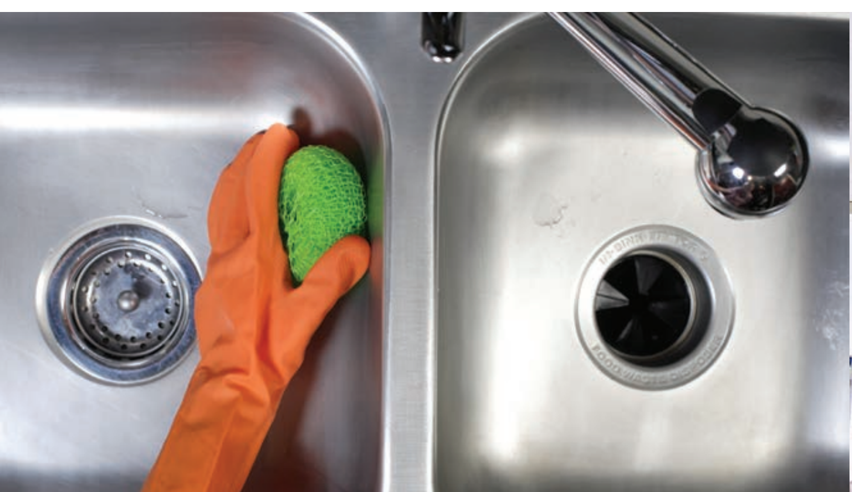
CONCLUSIONS

This study characterized MRSA burden in fire stations using conventional environmental sampling methods (e.g., swab cultures). Special attention to infection control policies, work practices, and cleaning techniques are necessary to reduce the risk potential of MRSA transmission in fire stations. Resources are available at the following websites: *http://www.cdc.gov/mrsa*, *http://www.wsafc.org*, and *http://www.depts.washington.edu/frcg*. The National Fire Protection Association Standards and local health departments also provide guidance on reducing occupational health risks associated with infectious diseases.

In summary,

1. We successfully designed and implemented a hazard surveillance program for MRSA burden in fire stations.
2. Firefighters were able to collect surface samples using written directions.
3. Eight percent of the samples were positive for MRSA, which is consistent with the literature. Fire stations should focus time and attention on best cleaning and disinfection practices, particularly in the shared areas of the living quarters, rather than on environmental testing.
4. Thirty-six percent of the stations reported diagnosed MRSA. In the event of clinically confirmed MRSA cases, fire station personnel should increase cleaning efforts and talk with health care providers.
5. Cleaning protocols were variable from station to station, particularly in living quarters.

Photos, left to right: Mike G/photos.com, Sarah Fish



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APPENDIX 1

Environmental Sampling for MRSA in Fire Stations

Standard Operating Protocol

The objectives of this project are to:

1) Design a hazard surveillance program that identifies the MRSA burden in fire stations in Washington state,
2) Conduct environmental surface monitoring for MRSA at high-probability locations in the firehouse stations and on apparatus,
3) Document cleaning protocols used currently in firehouses and on apparatus, and
4) Provide general guidance and strategies to fire stations for reducing the spread of MRSA and other infectious diseases.

1. Fire Station Outreach

1.1 Outreach period: September 30, 2011 – June 2012.

1.2 Target Goal for service: 30 fire districts that represent fire professionals from paid services.

1.3 There are 240 career-based fire stations in eastern (n=45) and western (n=195) Washington. Selection will be on a first-come, first-serve basis. One-third will be selected from eastern Washington and two-thirds from western Washington.

County	Eastern or Western Washington	Number of Career Fire Stations
Whatcom	Western	6
Snohomish	Western	10
King	Western	113
Pierce	Western	28
Thurston	Western	3
Grays Harbor	Western	4
Kitsap	Western	19
Lewis	Western	9
Clark	Western	2
Skamania	Western	1
Chelan	Eastern	2
Yakima	Eastern	6
Benton	Eastern	7
Grant	Eastern	1
Franklin	Eastern	3
Walla Walla	Eastern	2
Spokane	Eastern	24

1.4 Nancy Simcox will contact and present information about the service project to the different organizations that represent firemen/women via phone, meetings, organization newsletters, e-mails and conventions:

1.4.1 Washington Fire Chiefs (WFC) is an incorporated nonprofit association. Its mission is to be a source of information and education to its members and to take a lead role in influencing issues affecting the fire service. A presentation will be made to the board to gain their support for the project in September 2011. WFC will partner with UW FRCG on the project. WFC has a fire station directory and will provide a list of the career-based fire stations to UW FRCG. An article about the project will be placed in the WFC newsletter. Information and resources about MRSA will be on WFC website. Nancy Simcox will present the project to career-based fire professionals at a joint management/labor meeting in November 2011.

1.4.2 Washington State Council of Fire Fighters (WSCFF) represents 130 unions and the 6900 members of the International Association of Fire Fighters in the state. Dallas Baker, Seattle IAFF contact, will send an email to all the members of the targeted career-based stations. The newsletter article will be included.

1.4.3 Information about the project will be made available on websites of the following groups: WFC, UW FRCG and UW Dr. Roberts Laboratory.

1.5 Fire stations will contact the UW FRCG via phone for information on how to receive the service. UW FRCG will log the name of the fire district, department or station in an access database. The fire station will be asked to send a letter from the fire chief or other authorized representative [wellness coordinator or medical officer may help facilitate our access] of the station requesting the service. UW FRCG will send the fire station the project packet with sampling instructions, return mailer, and supplies.

2. Sample Preparation

UW FRCG will order SANICULT swabs from manufacturer according to Dr. Roberts Laboratory specifications. Vials that contain 1 mL of buffer (Starplex Scientific) will be sealed by the manufacturer and sent to the UW FRCG. Contact at Starplex is Susan Flynn (416-674-7474). UW FRCG will label samples for shipping and prepare the packets with instructions and other supplies.

2.1 SANICULT swab plastic vials will be pre-labeled with a unique ID using a Tuff Tag label. Vials will be placed in a small plastic bag.

2.2 Each vial is labeled with a unique number that matches the ID number and sampling location on the sample collection sheet. The sample collection form will be on yellow colored paper.

2.3 An instruction sheet with photos will be developed to identify sampling methods and locations.

2.4 A Fire Station Survey will be developed. This will include questions about fire station status (e.g., call volume), cleaning protocols in use at the station/equipment with specific attention to post-call decontamination, general information on MRSA outbreaks among staff, bed assignments, and use of infection control precautionary measures. The survey will be on blue colored paper.

2.5 Temperature sensors will be placed inside the plastic container. Type: VWR WarmMark Indicators (37°C/99°F); $51 for 50 indicators (WS37/8-V) and ColdMark Indicators (0°C/32°F); $149 for 50 indicators (CMO-V). (*www.vwrsp.com*)

2.6 Samples will be sent from fire station within 24 hours of collection. It is preferred that the stations mail the samples on Monday to Wednesday. This will prevent samples from arriving on the weekends. They are expected to be returned to the UW FRCG via US Postal Service within 24–72 hours of collection depending on the shipping location.

2.6.1 UW FRCG will include mailing instructions in the sampling packet. Priority Mail US Postal Service Mailing Box (12 1/16 in. x 2 11/16 in. x 13 7/16 in.) will be used for shipping samples to fire stations from UW FRCG. The cost for mailing is $5.20 if package is less than one pound ($5.60 is less than two pounds). Fire stations will place samples inside a large Ziploc plastic bag. The plastic bag will be placed inside a large Kroger 76 fluid ounce plastic rectangle disposable container (cost $1.75) with a Sure Seal lid. The lid will be taped (3M Pre-Cut Tape Strips) and placed inside the cardboard box that supplies arrived in. An address label and postage will be placed on the cardboard box, and the box will be mailed to UW FRCG. The package will need to be mailed from post office if it weighs more than 13 ounces due to postal security regulations. Total transportation costs: $10.40.

3. Field Sampling Locations

A total of 58–60 surfaces will be sampled. Twenty sampling locations with multiple surfaces will be identified. If we assume a 5% MRSA positive detection rate, then we expect at least 1 positive MRSA swab per fire station from 20 swabs. Recommended sampling locations were identified; these locations had the highest risk of occupational exposure to firefighters because of the possibility of bare skin contact. Items related to patient care, which have been identified in the literature to have high levels of MRSA, are less emphasized in this sampling strategy because firefighters wear gloves when using many of these items.

Criteria for sampling locations include:

- Locations with high risk of bare skin contact or hand-face contact for firefighters, such as bathrooms, beds, and gym equipment;
- Locations of MRSA contamination identified in the literature (e.g., patient action areas, gurneys, couches, steering wheels, computer keyboards, stethoscope)
- Locations amenable to cleaning and disinfecting.

Sampling Locations

One swab will be used for two or more items below.

Swab an area the size of a hand palm.

3.1 **1# Medic Truck:** The seat belts on the driver's side and the passenger's side.

3.2 **2# Medic Truck:** The handles (top and inside of handle) of two medical bags that were recently used inside a person's home on a call.

3.3 **3# Medic Truck:** Gurney straps, ceiling grab bar, and metal buckle.

3.4 **4# Medic Truck:** The diaphragm of the stethoscope, swab the inside of the blood pressure cuff, and pulse oximeter.

3.5 **5# Medic Truck:** The steering wheel, outside door handle to driver's side, and the mobile data computer keyboard/mouse, and passenger's arm rest.

3.6 **6# Medic Truck:** Three different sections of the work surface/bench to the right of the patient care area.

3.7 **7# Fire Engine/Ladder:** The steering wheel, outside door handle to driver's side, and the mobile data computer keyboard/mouse, and passenger's arm rest.

3.8 **8# Turnout Gear:** The inside rim of two helmets. Choose two helmets that were recently used on a call.

3.9 **9# Turnout Gear:** The inside area of the left and right arm cuff of turnout gear that has been frequently used.

3.10 **10# Bedroom:** Select two beds used by multiple personnel. Swab the mattress pad at the head of each bed with sheets removed.

3.11 **11# Living Area:** Select two pieces of furniture (couch or chair). Swab the seating areas on the furniture.

3.12 **12# Living Area:** Two TV remote controls and the landline telephone handle.

3.13 **13# Living Area:** Select three different chairs. One armrest of each chair.

3.14 **14# Office:** Three different desks in the office and their computer keyboard keys, including space bar. Avoid swabbing computer screens.

3.15 **15# Kitchen Preparation Area:** The kitchen sink handles, refrigerator door handles, coffee pot dispenser, and dishwasher handle.

3.16 **16# Kitchen:** Three different sections of the kitchen table.

3.17 **17# Bathrooms:** Outside door knob/plate on men's bathroom, outside door knob/plate on women's bathroom sink handles, two sink handles, and two toilet handles.

3.18 **18# Bathrooms:** Three different sections of the bathroom counter in men's bathroom.

3.19 **19# Gym area:** Select three of the most commonly used pieces of gym equipment (e.g., stair master, treadmill, free weights). Swab each piece at the location where user hands are most often placed.

3.20 **20#** Select an item in the firehouse or apparatus that you would like to sample, but was not included on our prescribed list.

4. Fire Station Sampling Instructions

The sampling packet will contain all the supplies needed to collect and send environmental samples from the fire station to the UW FRCG. Environmental samples will be collected with SANICULT swabs which have 1 mL of buffer (Starplex Scientific, Etobicoke, Ontario, Canada) and a sterile swab attached to the lid of the tube. We expect to collect up to 1,100 samples. If we get samples from 30 stations, this number will include 600 field samples and 66 quality control samples (2 field blanks/stations and 3–6 positive controls during project period).

Fire Station Sampling Instructions

4.1 Check the sampling supplies. The packet should include:

22 SANICULT swabs in their transport vials, an instruction sheet with photos, a Sample Collection Form, temperature sensors on box, 1 pair of gloves, parafilm, Fire Station Survey, plastic box, strips of tape, postage, and postage return labels. 20 swabs will be used to collect samples. 2 swabs will be opened in UW FRCG laboratory, closed tightly, wrapped with parafilm, put in a plastic bag and placed in plastic box. Plastic bag will be labeled "Do Not Touch." These blanks will be returned with the used field samples.

4.2 Verify that all seals are intact. SANICULT vials have a one year expiration date. Call Nancy Simcox at the UW FRCG (206-543-9711) for replacements if expiration date has passed or if seals are broken.

4.3 Complete Fire Station Survey and place in box with the samples.

4.4 Review the sample instruction sheet to identify the 19 prescribed sampling locations. An extra swab and vial is available in each kit for the fire station to collect a sample from a location of their choosing. Call Nancy Simcox at the UW FRCG if you have any questions about how or where to sample.

4.5 Refer to instruction sample sheet with photos for guidance on how to conduct sampling at the prescribed location. Review swabbing protocol.

4.6 Keep swabs at room temperature. Do not freeze or overheat swabs or their transport vials before or after sampling. Please note if temperature indicators changed color upon arrival of the kit (check mark on Sample Collection Sheet if yes).

4.7 Identify the first location to sample.

4.8 Put on a pair of gloves. Wear the same pair of gloves during sampling. Do not touch or place the swab on any surfaces other than the specific sampling site. Do not touch your face with your hands when collecting samples. Do not touch swab with gloved or bare hands. If there is a break in the glove or you feel that they are contaminated in some way, please change the gloves. Gloves are provided but you may use your own from the fire station if you prefer.

4.9 Select swab tube that matches the location on the Sample Collection Form.

4.10 Twist open the top of transport vial, breaking the seal, and remove the pre-moistened swab.

4.11 Carefully press swab against the interior wall of the tube to remove excess liquid.

4.12 Hold swab handle at 30-degree angle to surface being swabbed. Rub the swab slowly over the surface while twisting the swab back and forth. Swab an area the size of a hand palm (approximately 3 inches by 3 inches).

4.13 Swab the surface again in a perpendicular direction from the first swab wipe, rubbing the swab slowly over the surface at a 30-degree angle, rotating the swab while wiping.

4.14 Place the used swab back into its sampling vial. Carefully press swab against the interior wall of the tube to remove excess liquid. Repeat steps 4.13 and 4.14 for sampling next item.

Please note that one swab will be used to wipe several items at a location. Place swab back into its sampling tube in between swabbing items at one location.

4.15 After swabbing all items, place swab back into vial. Screw lid closed tightly.

4.16 Place parafilm around the top of the tube by rotating it around the white cap to seal the top to the body of the tube.

4.17 Place the used vial into a small Ziploc plastic bag, and then place the bagged tube in the big Ziploc bag.

4.18 Complete the Sample Completion Form. Check if you sampled a soft porous or hard surface. Add any other comments you need on the sheet.

4.19 Repeat steps 4.7-4.18 for each sample.

4.20 The packet will contain three extra vials.

4.20.1 Use one vial to take a sample from a location in the fire station or from the apparatus of your choosing. Record the sampling location on the sample collection form.

4.20.2 For the other two vials, leave them in the plastic bag and transport with samples collected from the fire station.

4.20.3 Do not send any vials with swabs or materials taken from bodily surfaces. Collect samples only from surfaces of objects.

4.21 Place plastic box, Fire Station Survey, and Sample Collection Form in the cardboard box that supplies arrived in. Send enclosed box on Monday to Wednesday. Send enclosed mailer to the following address within 24 hours of collection:

Field Research and Consultation Group
Attention: Nancy Simcox
4225 Roosevelt Way NE, Suite 100
Seattle, WA 98105

5. Field Quality Control

5.1 Ten percent of total samples collected will be quality control samples.

5.2 Two field blanks will be submitted with each set of field samples.

5.3 Three to six positive control samples will be submitted randomly with field samples.

5.3.1 Positive controls will be prepared by Dr. Meschke.

5.3.2 A positive control is a swab that has been placed into a tube of broth that contains 102 mL of a known MRSA control strain.

5.4 After laboratory analyses are complete for each batch of samples, Dr. Roberts will be notified which samples are the positive controls. This is so that she can continue with the last step of the analysis with only field samples.

6. **Sample Arrival at the UW FRCG and transmission to Roberts Laboratory**

6.1 Record the date and time that samples arrive at the UW FRCG into the MRSA database. UW FRCG will complete FRCG Chain of Custody Form.

6.2 Record the postmarked date from the mailing box on Chain of Custody Form.

6.3 Record the status of the temperature sensor indicators on the FRCG Chain of Custody Form. The indicators will be placed on the bottom of the inside of the plastic box.

6.4 Record the name of the person receiving the samples. Verify seals are intact on all samples and note condition of samples on Chain of Custody Form.

6.5 Ensure that half the swab tip is immersed in buffer solution for each sample. If all swabs are immersed correctly, record "swabs are okay" (SOK) on FRCG Chain of Custody Form. If not, record which sample is not immersed in buffer solution.

6.6 Record station ID, sample ID numbers, location ID, and Item ID into the UW FRCG database.

6.7 UW FRCG will transport the samples to the Roberts Laboratory at F-Wing [F066] on the same day as arrival date as early as possible with Chain of Custody form. UW FRCG will send Dr. Roberts an electronic version of the Chain of Custody Form so that the sample ID numbers can be copied into her station report.

6.8 UW FRCG will provide Roberts laboratory the sample ID numbers that are positive controls once the laboratory analyses for each batch are complete within the same day as tentative report is provided so that the field positive samples can be further verified and then frozen for the future. This is important because Roberts Laboratory needs to perform another assay once positive detects of MRSA are found. This extra assay does not need to be performed on the positive control samples.

7. **Dr. Roberts Laboratory Analysis**

7.1 Confirm sample IDs with list on Chain of Custody form. The Roberts laboratory, upon receipt of the samples, will sign Chain of Custody form and will retain a copy of the form.

7.2 Two mL of sterile Bacto® m *Staphylococcus* broth (1.5 X; Difco Laboratories, Sparks, Maryland) supplemented with a final concentration of 75 μg/mL of polymyxin B and 0.01% potassium tellurite (Sigma-Aldrich, St. Louis, Missouri) will be added to each tube under sterile conditions. The supplements are made fresh and added to the sterilized media. A positive control which is a swab which has been placed into a tube of broth that contains 102 mL of a known MRSA control strain will be included in each set run each week for quality assurance.

7.3 Tubes are incubated in 5% CO_2 at 36.5 °C and are checked daily for turbidity and black pigment. Most positive samples will have turbidity and black precipitate at 48–96 hours. Both turbidity and black precipitate must be present to indicate the potential of *S. aureus*/MRSA. Tubes that are not turbid and black will be held seven days before being labeled as negative. All results will be logged into the laboratory data spreadsheet. Dr. Roberts' laboratory will obtain the identification numbers for the positive control samples from the UW FRCG. These samples will not be processed further.

7.4 Each positive tube will be vortexed at high speed for 10 seconds and then 20 µL of broth will be removed with a sterile tip and spotted onto a MRSASelect™ plate (Bio-Rad, Hercules, CA) and Bacto® VJ Agar (Difco Laboratories, Sparks, Maryland) incubated 18–24 hours at 36.5°C. Samples that are presumptive will be re-streaked for isolation on blood agar-containing plates (5% sheep blood with Brucella Agar [Difco Laboratories]) and incubated in 5% CO_2 at 36.5°C overnight to verify β-hemolysin. Growth from the blood agar plate will be used to do the Remel Staphaurex® rapid latex test (Thermo Fisher Scientific, Lenexa, Kansas) to determine coagulase activity. The isolates that grow on MRSASelect™ plate and gave the correct colored colony, and β-hemolysin will be reported. β-hemolysin coagulase positive colonies from Bacto® VJ Agar will be verified as MRSA by growth on MRSASelect™ plate will also be reported. The field isolates will be tested and labeled as MRSA positive. All results will be logged into the laboratory data spreadsheet as they become available.

7.5 Field MRSA isolates will be suspended in autoclaved skim milk and stored at -75 °C.

7.6 A laboratory report will be completed with the results of all swabs and controls and forwarded electronically to the UW FRCG.

7.7 The Roberts Laboratory will provide interpretation of the findings.

8. **Fire Station Report**

8.1 The number of positive MRSA samples will be totaled for each station.

8.2 Fire stations will receive information on how to reduce risk factors for MRSA transmission with their individual laboratory report.

8.3 The UW FRCG will prepare and send a report of findings to the participating fire station.

8.3.1 The report will contain a summary of the project, methods, results (individual % positive MRSA detects), areas of high concern based on sampling results, best practices cleaning protocols, and recommendations for reducing occupational risk factors.

8.4 Communication about the overall results of the service project to the firefighter community will be developed by Dr. Roberts and the UW FRCG by June 2012.

9. **"At-Risk" Follow-up Plan For Fire Stations**

9.1 Follow-up plans for fire stations with a high level of positive MRSA samples will be determined by project team members once a preliminary review of the data from approximately 15 stations is completed. All stations will receive fact sheets on how to reduce MRSA risk factors of transmission in the fire station with their results.

9.2 Fire stations will be encouraged to consider characterizing worker carriage rate through a fee-for-service arrangement with the Roberts Laboratory.

APPENDIX 2
Recruitment Survey

Environmental Sampling for Methicillin-Resistant *Staphylococcus Aureus* (MRSA) in Fire Stations

MRSA is a bacterium that is resistant to common antibiotics. MRSA is spread by direct skin-to skin contact with an active infection or by contact with contaminated shared items and surfaces. The risk of disease to fire service professionals is not known.

The goals of the project are to:

* collect environmental surface samples in fire stations and vehicles
* better understand the presence and distribution of MRSA and
* help reduce exposure risk factors in fire stations.

What does a fire station have to do to participate?

* Send a letter to the University of Washington requesting to participate
* Complete a short survey
* Collect 20 swab samples from different locations in the apparatus bay and fire station
* Mail the samples back to UW FRCG in a pre-paid box

CONTACT UNIVERSITY OF WASHINGTON

FIELD RESEARCH AND CONSULTATION GROUP (FRCG)

4225 Roosevelt Way NE, Suite 100

Seattle, Washington 98105-6099

FOR MORE INFORMATION 206-543-9711

APPENDIX 3
Educational Materials

Prevent MRSA

http://depts.washington.edu/frcg/content/MRSA/MRSA%20 booklet%202-1.pdf

Microfiber Fact Sheet

http://depts.washington.edu/frcg/content/MRSA/microfiber%20fact%20 sheet%2011-21-11.pdf

PREVENT MRSA

MAINTAIN A "CLEAN ZONE" IN THE FIRE STATION

Field Research and Consultation Group
Department of Environmental and Occupational Health Sciences
University of Washington

Photos: front cover: Sarah Fish; above, left to right: Sarah Fish, ©2012 www.photos.com

Recent studies have found MRSA on surfaces in fire stations. The risk of MRSA infections is an increasingly important concern for firefighters. The University of Washington MRSA in Fire Stations project provides general guidance and strategies to reduce the spread of MRSA and other infectious diseases.

Prevent MRSA: Basic Workplace Strategies

1. Develop and implement an Exposure Control Plan according to federal and state health and safety laws (such as, WAC 296-305-06505). The National Fire Protection Association Standards also provide guidance to reduce occupational health risks associated with infectious diseases.
2. Require use of standard infection control precautions on all calls (such as, the use of personal protective equipment [PPE], hand hygiene, and safety devices). Be prepared to increase the level of PPE, especially in high-risk MRSA environments, such as nursing homes, jails, or shelters.
3. Hand washing is the most important practice to prevent transmission of disease. Place signs throughout the fire station to remind personnel to wash their hands. Provide a sink for hand washing or provide automatic hand sanitizers (requiring no physical contact of user hands to operate) at all entrances to the living and office areas. Provide touchless hand towel dispensers in fire station and bay.

What is MRSA?

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a bacterium that can cause minor or even severe skin infections, bloodstream infections, and pneumonia. As the name implies, MRSA is resistant to first-line antibiotics. It is spread by direct skin-to-skin contact with an active infection or by contact with contaminated items and surfaces. MRSA can live for weeks or months on surfaces that are not kept clean. Firefighters may have a higher likelihood of exposure to MRSA when they come in contact with patients during emergency medical situations. The risk of disease to firefighters as a result of exposure to MRSA is not known.

Remember...The Biggest Risk Factor for MRSA Infection Is Broken Skin.

- Keep skin wounds and lesions covered with clean, dry bandages.
- Seek medical attention if skin rashes or infections do not improve. Treatment of MRSA will vary by the specific type of organism and the location of the infection.
- Do not share personal items (e.g., soap, towels, washcloths, razors, clothing, or uniforms).

How to Keep Living Quarters a "Clean Zone"

Fire stations are required to have standard operating protocols to protect firefighters in the workplace that cover infection control, training, personal protective equipment, cleaning protective gear and equipment, and post-exposure actions. However, cleaning protocols in the living quarters are less standardized and can vary by department. Develop, maintain, and follow a set of written standard operating procedures for cleaning the living quarters of the fire station. Particular attention should be given to maintaining the living quarters as a "clean zone."

Where is MRSA?

MRSA is found on surfaces, that are in frequent contact with hands and skin, such as:

- bathroom counters and sink handles
- door handles
- gym equipment
- in the living room: TV remotes, armchair rests
- kitchen table and appliances
- desks and computer keyboards
- beds
- in emergency response vehicles: steering wheel, door handles, seat belts, mobile data terminals
- turnout gear
- medical bag handles

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PREVENT MRSA 3

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A key strategy for preventing MRSA transmission is to "Clean First, Then Disinfect."

"Clean First, Then Disinfect"

Step 1: Clean surfaces to remove dirt and visible contaminants according to standard procedures.

Step 2: Apply disinfectant to a clean surface. Allow disinfectant to remain wet on the surface for the specified contact time as indicated in the product's label instructions.

- Select disinfectants that carry the Environmental Protection Agency (EPA) registration and are effective against MRSA. *www.epa.gov/oppad001/chemregindex.htm* (List H). Consider disinfects that carry the EPA Design for the Environment seal on the label.

Step 3: Disinfect in targeted areas. Identify surfaces contaminated with blood or other bodily substances and surfaces often touched by a variety of hands (such as doorknobs, light switches, counters, phones, toilets, gym equipment, sinks, computer keyboards and mouse).

Which Is Better?

According to the Centers for Disease Control and Prevention, there is no evidence that spraying or fogging entire rooms or surfaces with disinfectants will more effectively prevent MRSA infections than the targeted approach of cleaning frequently touched surfaces and any surfaces that have been exposed to contaminated items (*www.cdc.gov/MRSA/environment/index.html*).

Design for the Environment
U.S. EPA

How to Maintain a "Clean Zone" in Living Quarters

Wash hands. Hand washing is the most important practice to prevent transmission of disease. Wash hands before entering the living quarters.

Clean and disinfect targeted surfaces and areas.

Ensure living quarters are maintained at relative positive air pressure as compared with the apparatus bay (air should flow from living quarters to the apparatus bay).

Place multi-level scraper walk-off mats with rubber backing at entrances of the fire station and the living quarters (mats should span the entryway and be 15 to 20 feet long). Vacuum walk-off mats daily.

Clean dirt and debris off work boots. Leave all boots outside of entrances to the living quarters.

Avoid taking home hazardous substances. Launder work clothes at the fire station or by a professional cleaning service to reduce the risk of carrying MRSA home.

Replace cloth surfaces with hard surfaces, wherever possible. For example, replace carpeting in favor of hard flooring; replace upholstered furniture fabric with material that can be cleaned easily; replace old wooden or damaged kitchen counters and tables with stainless steel.

Wash sheets, blankets, and bed covers in hot water with a detergent at the fire station or by a professional cleaning service before each new user. Do not share sheets, blankets, or bed covers.

Provide cleanable covers for electronics (such as TV remote, keyboards, and radios). Many items such as computer keyboards or handheld electronic devices may be difficult to clean or disinfect or they could be damaged if they become wet. Check to see if the manufacturer has instructions for cleaning. Alcohol is recommended for some electronics (*www.cdc.gov/MRSA/environment/index.html*), but it is best to refer to manufacturer's instructions before applying.

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Is Training Available for Firefighters?

Your local health department is the best source of information and training on infectious diseases.

The Global Health Institute offers a special MRSA training for firefighters. Information on this training is available from the Western Fire Chiefs Association (*www.wfca.com*).

Prevent Transmission of MRSA from Apparatus Bay into Other Areas of the Fire Station

After caring for patients, clean and disinfect equipment and the inside of your rig according to standard operating protocols and manufacturer's instructions. This includes steering wheel, door handles, radio handset, headsets, mobile data terminals, gurney, and other high-touch surfaces. Wear disposable gloves while performing these tasks and dispose of the gloves properly after use.

Inspect gear regularly for dirt, damage, and expiration dates. Clean turnout gear according to manufacturer's instructions and fire station policies.

Store turnout gear in the apparatus bay, not in the living quarters.

Do not take emergency medical equipment into the living quarters of the fire station.

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What is a Comprehensive Environmentally Preferable Purchasing (EPP) Cleaning Program?

Many municipalities are passing ordinances that encourage or even require fire stations to use "green" products, referred to as environmentally preferable cleaning products. US Executive Order 13101 defines environmental preferable as "products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose." An EPP cleaning program includes standardized operations, effective cleaning chemicals, uniform dispensing systems, comprehensive staff training, and the adoption of new equipment and technologies. Key elements of an EPP Cleaning Program include:

1. Develop and maintain a set of written standard operating procedures for cleaning the living quarters of the fire station. This should include schedules for routine cleaning operations and activities performed periodically.
2. Choose certified cleaning products and chemical-dispensing stations that comply with a set of effective, environmental, and human health criteria (e.g., Green Seal and Ecologo).
3. Practice most advanced cleaning methods (such as, Green Seal GS-42 Standard for Cleaning Services). For example, perform restroom cleaning from high to low, toward the doorway, and with dry cleaning tasks performed prior to wet cleaning tasks.
4. Frequently clean general surfaces with a certified all-purpose cleaner and microfiber cloths and mops. Use a clean surface of the cloth to prevent cross contamination.
5. Disinfect targeted surfaces especially in high-risk areas such as the gym or exercise equipment.
6. Clean floors daily with a microfiber mopping system and a third-party certified floor care cleaning product.
7. Use a vacuum cleaner with a high efficiency particulate air (HEPA) filter on carpeting.

For more information about MRSA,
contact these resources:

CDC:	*www.cdc.gov/MRSA*
WA Fire Chiefs:	*www.wsafc.org*
UW Field Group:	*www.depts.washington.edu/frcg/MRSA*

Environmental Sampling for MRSA in Fire Stations Project
http://depts.washington.edu/frcg/MRSA.html

Emergency Management Response Information Sharing
and Analysis Center Infogram 23-11:
www.usfa.fema.gov

Green Seal: *www.greenseal.org*
http://www.greenseal.org/FindGreenSealProductsAndServices.aspx

MICROFIBER

Microfiber cloths and mops are essential tools in an infection-control program.[1] The goal of an infection-control program is to prevent the spread of infectious disease by reducing contact with pathogenic microbes.

What is Microfiber?

Microfiber is a polyester and nylon (polyamide) fiber that is used to make fabric. The fiber is split many times smaller than a human hair. This makes it a superior tool for cleaning and germ removal because it is able to penetrate cracks and crevasses that cotton cloths or paper towels are not able to reach. The increased surface area of the fibers and their star shape also allow them to absorb up to 7 to 8 times their weight in liquid. The fibers generate a static electric charge when moved across a surface that attracts dust and contains it, rather than spreading it around or releasing it into the air when dry dusting.

The term microfiber technically applies to fiber that is 1.0 denier or smaller. The smaller the denier measurement, the finer and more effective the microfiber. Superior microfiber measures 0.13 denier. Manufacturers have created products with different weaves and weave densities for specific types of tasks. Ask the vendor about the grades of microfiber that are available and which grade is best for specific cleaning tasks.

Benefits of Microfiber

1. ***Effective at capturing microbes:*** Several studies have determined that microfiber is better than cotton at capturing bacteria. The University of California, Davis Medical Center compared the amount of bacteria picked up by a cotton-loop mop and by a microfiber mop. The cotton-loop mop reduced bacteria on the floors by 30%, whereas the microfiber mop reduced bacteria by 99%.[2]
2. ***Prevents cross-contamination:*** Microfiber cloths and mops are available in different colors so that a color-coding system can be implemented for specific uses. For instance, in bathrooms, pink cloths can be used for toilets and yellow cloths for sinks. Green cloths can be used for office cleaning.
3. ***Reduces chemical and water use more effectively:*** A University of Massachusetts Lowell study[3] determined that because the microfiber mopping system uses less water and chemicals, it reduced the amount of water and chemicals handled, and it eliminated the need to wring the heavy cotton mops, resulting in less potential for worker injury.

—continued on reverse side

Environmental Sampling for MRSA in Fire Stations Project
http://depts.washington.edu/frcg/MRSA.html

Field Research and Consultation Group
Department of Environmental and Occupational Health Sciences
University of Washington

Infection Control Using Microfiber Cleaning Tools and Proper Disinfection Procedures

At your fire station, include microfiber materials into your comprehensive cleaning and infection control program. Frequently clean surfaces with microfiber and an all-purpose cleaner to remove dirt and visible contaminants. Use wet microfiber mops to clean floors in offices, kitchens, bathrooms, and tiled areas. Dusting cloths require no polish or other chemical while removing up to 99% of dust, dirt, and other materials. Dust wands reach places that are difficult to access and remove the dirt and dust that have accumulated.

Implement a targeted disinfection program in your fire station. Frequent and correct cleaning of high-risk and high-touch surfaces with the microfiber removes microbes on surfaces and eliminates conditions (food and water) that some microbes need to survive. Several key strategies to implement:

1. Identify, clean, and disinfect high-touch non-porous surfaces (e.g., doorknobs and TV remote control) and high-touch areas (e.g., gym) in the fire house that are touched by a variety of hands.
2. Use an EPA-registered product effective against the germ you are concerned about, such as MRSA.
3. Follow the manufacturer's product use and management instructions, including the correct product dilutions and the amount of time a product should stay wet on the surface.
4. Wash microfiber only with other microfiber materials because it can pull the lint out of cotton or other materials during the washing and drying process. Use only laundry detergent, NOT bleach.

References

[1] L. Rose and C. Westinghouse. Cleaning for Healthier Schools-Infection Control Handbook. 2010. Toxics Use Reduction Institute, University of Massachusetts Lowell. Chapter 6.C. Using Microfiber Cloths and Mops for Infection Control. Available at: *www.informedgreensolutions.org*.

[2] Environmental Protection Agency, Using Microfiber Mops in Hospitals, Environmental Best Practices for Health Care Facilities. 2002. Region 9 Pollution Prevention Program. Available at: *http://www.epa.gov/region9/waste/p2/projects/hospital/mops.pdf*.

[3] J. Desa, A. Bello, K. Galligan, et al., Case Study: Are Microfiber Mops Beneficial for Hospitals? Sustainable Hospitals Project, A Project of the Lowell Center for Sustainable Production, University of Massachusetts Lowell. 2003. Available at: *http://www.sustainablehospitals.org/PDF/MicrofiberMopCS.pdf.*

[4] Microfiber.com, Fabric of the Future, What is microfiber? Available at: *http://www.microfiber.com/microfiber.html*.

[5] W. Rutala, M. Gergen and D. Weber, Microbiologic Evaluation of Microfiber Mops for Surface Disinfection. 2007. Association for Professionals in Infection Control and Epidemiology 35(9):569–573.

http://depts.washington.edu/frcg/MRSA.html

November 2011

APPENDIX 4

Environmental Sampling for MRSA in Fire Stations

Instruction Sheet

Start Sampling

1. Complete the fire station survey.
2. Review swabbing protocol.
3. Review sample collection form and organize tube numbers by sampling location.
4. Put on a pair of gloves. Do not touch your face with your hands when collecting samples. Do not touch the tip of the swab with gloved or bare hands. Do not touch or place the swab on any surface other than the specific sampling site. Change gloves if any of these conditions occur or if the glove breaks.
5. Identify the first location to sample. Select swab tube that matches the location on the sample collection form.
6. Follow swabbing protocol on page 1. Please note that one swab will be used to wipe several items in a location. **Place swab back into its sampling tube in between items at one location.**
7. After sampling is complete, place parafilm around the top of each tube by rotating it around the white cap of the tube.
8. Place each used tubes into a small ziploc plastic bag, and then place it in the big Ziploc bag.
9. Complete sample collection form. Remember to record the location and items for YOUR CHOICE on the form.
10. **Send samples via U.S. mail within 24 hours of collection.** Follow the Mailing Instructions on back of this sheet.

Ingredients of fluid in tube:

- ***Sterile peptone water*** *- provides minimal nutritional value to recover injured microorganisms.*
- ***Lecithin*** *- inactivates the germicidal effect of quaternary ammonium compounds (commonly found in cleaning agents/disinfectants).*
- ***Polysorbate 80*** *- neutralizes the effect of phenolic disinfectants.*

ENVIRONMENTAL AND OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY *of* WASHINGTON
School of Public Health

Mailing Instructions

1. Place plastic box inside the cardboard box that supplies arrived in.
2. Place pre-paid postage stamp, tape and self-addressed label on the box.
3. Mail samples within 24 hours of collection.
4. Mail on Monday, Tuesday or Wednesday.
5. Send via U.S. Mail to:

Field Research and Consultation Group
Attention: Nancy Simcox
4225 Roosevelt Way NE, Suite 100
Seattle, WA 98105

Environmental Sampling for MRSA in Fire Stations

Instruction Sheet

Methicillin-Resistant *Staphylococcus Aureus* (MRSA) is a bacteria that is resistant to common antibiotics. The goals of the project are to collect environmental surface samples in fire stations and vehicles, better understand the presence and distribution of MRSA, and help reduce exposure risk factors in fire stations.

Please do sampling on
MONDAY, TUESDAY or WEDNESDAY

Check that your kit includes:

- 22 swabs in their transport tubes
- This instruction sheet
- A sample collection sheet
- One pair of gloves
- Parafilm ("saran wrap for tubes")
- Sample location labels
- Fire Station Survey
- Plastic mailing box and strips of tape
- Postage return lable
- Postage

True.
You may use ONE swab for multiple items!

Review Swabbing Protocol

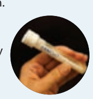
Step 1: Twist open top of tube. Remove sterile pre-moistened swab from tube. Squeeze off excess liquid on the swab by carefully pressing it against the interior wall of the tube.

Step 2: Swab an area the size of a hand palm. Hold swab handle at a 30° angle to surface being swabbed. Rub the swab slowly and thoroughly over the surface.

Step 3: Swab the surfce again in a perpendicular direction from the first swab wipe, rubbing the swab slowly over the survace at a 30° angle, rotating the swab while wiping.

Step 4: Place the used swab back into its sampling tube. Carefully press swab against the interior wall of the tube to remove excess liquid. Repeat steps 1-4 for next item.

Step 5: Once all items are swabbed, screw cap on tightly, place parafilm around the top of the tube by rotating it around the white cap of the tube to seal the top to the body.

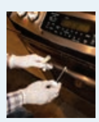


Step 6: Place a label that describes the sampling location on the sample log sheet next to the tube ID number.

1

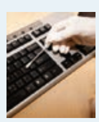
Sampling Locations √

Use one tube (with swab) for each of the 20 sampling sets listed below. Twist open the tube, then swab ALL of the items listed in each sampling location. Swab an area the size of a hand palm.



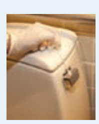
Kitchen:
1. ☐ Kitchen sink handles, refrigerator door handles, coffee pot dispenser, and dishwasher handle
2. ☐ Three different sections of the table.

Living Area:
3. ☐ Choose two pieces of furniture (couch or chair); the seating area on each piece of furniture.

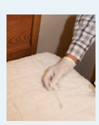


4. ☐ The TV remote control, the land line telephone handle.
5. ☐ One arm rest on 3 different chairs.

Office:
6. ☐ Three different desks in the office and their computer keyboard keys including space bar. Avoid swabbing computer screens.



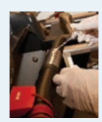
Bathroom:
7. ☐ Outside door knob/plate on men's bathroom door, doorknob/plate on women's bathroom door, 2 sink handles, and 2 toilet handles.
8. ☐ Three different sections of the bathroom counter in men's bathroom.



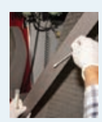
Bedroom:
9. ☐ Two beds used by multiple personnel (the mattress pad at the head of the bed with sheets removed).

Gym:
10. ☐ Select 3 of the most commonly used pieces of gym equipment (e.g., stair master, treadmill, free weights). Swab each piece at the location where user hands are most often placed.

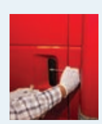
2



Aid Car/Medic Truck/EMS unit:
11. ☐ Driver's side and passenger side seat belts.
12. ☐ Medical bag handles from 2 bags (top and inside of handle) that were recently used inside a person's home on a call.
13. ☐ Gurney straps, ceiling grab bar, and metal buckle.

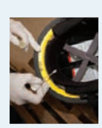


14. ☐ The diaphragm of the stethoscope, the inside of the blood pressure cuff, and pulse oximeter.
15. ☐ Three different sections of the work surface/bench to the right of the patient care area.
16. ☐ Steering wheel, door handle to driver side, and mobile data computer keyboard/mouse.



Fire Engine/Ladder:
17. ☐ Steering wheel, outside door handle to driver side, mobile data computer keyboard/mouse and passenger arm rest.

Bunk Gear:
18. ☐ The inside rim of two helmets that were recently used on a call.
19. ☐ The inside area of the right and left arm cuff of bunk gear that has been frequently used.



Your Choice:
20. ☐ Select an item in the firehouse or apparatus that you would like to sample, but was not included on our prescribed list.

3

APPENDIX 5
Environmental Sampling for MRSA in Fire Stations
Survey

Environmental Sampling for MRSA in Washington Fire Stations

Fire Station Survey

Thank you for taking the time to complete this survey. This project is designed to provide you with information to help you understand possible environmental sources of MRSA as well as how to reduce the risk factors that are associated with transmission of Methicillin-Resistant *Staphylcoccus aureus* in your workplace. This questionnaire is designed to help us learn more about your station's infection control policies and procedures.

Please provide a name and phone number for the person completing this survey in the box below so we may contact them if we have any questions.

Name of Fire Station____ Date:_________________

Name of Fire Department____

Contact Person/Job Title____Phone:________________

1. What is the call volume for your station?___________________calls/week
2. Does the fire station have a policy to inform fire service professionals when they should wash their hands? _____no ______yes
3. Does the fire station use signage to inform fire service professionals when they should wash their hands? _____no ______yes
4. When a call comes in, does the dispatcher ask if patient has a cough, fever, or any known disease?_____no ______yes
5. Do fire service professionals receive the information from the dispatcher regarding the risk for transmission of infectious disease or possibility that a patient might have an infectious disease?_____no ______yes
6. Is there a policy that first responders wear gloves, goggles and masks in high-risk environments or medical calls (e.g. prisons, nursing homes, patient with a fever)? _____no ______yes

7. Does your station transport patients for medical services? _____no ______yes
8. Are there sinks for hand washing in the apparatus bay?_____no ______yes
9. Are there disinfectant hand-gel dispensers at the access points between the apparatus bay and the fire station?_____no ______yes

10. Are there signs to remind firefighters that the apparatus bay is 'dirty' and the station is 'clean' with respect to infectious disease from patients?_____no ______yes

11. Do fire professionals bring the following into the fire station in commonly shared areas such as the living areas, dorms, bathroom, living room and kitchen?
    turnout gear _____no ______yes tools _____no ______yes
    work boots _____no ______yes clothing _____no ______yes

12. Does the fire station have fabric covered furniture (couches and chairs) that are not vinyl or leather?_____no ______yes

13. Do fire station living areas have carpeting on the floors? _____no ______yes

14. Do multiple fire service professionals use the same bed?_____no ______yes
15. Do you have a policy for routine cleaning and disinfecting the following:

Item	Cleaning	Disinfecting
a. Medical equipment?	_____no ____yes	_____no ____yes
b. Aid Car/EMS Units/Medic?	_____no ____yes	_____no ____yes
c. High-touch surfaces in aid car/EMS/Medic (door handles, headsets and steering wheels)?	_____no ____yes	_____no ____yes
d. Fire Engine/Ladder?	_____no ____yes	_____no ____yes
e. High-touch surfaces in Fire Engine/Ladder (door handles, headsets and steering wheels)?	_____no ____yes	_____no ____yes
f. Turnout gear?	_____no ____yes	_____no ____yes
g. Regular duty uniforms?	_____no ____yes	_____no ____yes
h. Fire station?	_____no ____yes	_____no ____yes
i. Beds?	_____no ____yes	_____no ____yes
j. High-touch surfaces in fire station (door knobs, remote controls, couches)?	_____no ____yes	_____no ____yes
k. Gym equipment and work-out room?	_____no ____yes	_____no ____yes
l. Computers?	_____no ____yes	_____no ____yes
m. Washing Machines?	_____no ____yes	_____no ____yes
n. Extractors?	_____no ____yes	_____no ____yes

If yes, please provide a copy of your procedures.

16. After a disinfectant is applied, is the surface allowed to AIR DRY?_____no ______yes
17. What disinfectant product(s) are used?

    _____ Alcohol based (isopropyl) ______Hydrogen peroxide based

    ______Sodium hypochlorite (bleach) ______Silver based (e.g. Staph-Attack)

    ______Quaternary amines ("quats" including benzoalkonium chloride)

    ______Active Ion ______Other (name:________________)

18. Does the station use a micro mist type of system (e.g. Zimek) for cleaning and disinfecting?_____no ______yes If yes, how often?______________________

19. Does the station use the following?

    _____no ______yes Third-party certified cleaning products (e.g. Green Seal or Ecologo)

    _____no ______yes Automatic dispensing stations for cleaning products

    _____no ______yes Microfiber cloths and mops

    _____no ______yes Vacuum cleaners with a high efficiency particulate filter

    _____no ______yes Walk off mats at entrances (span the entryway and are 15-20 feet long)

20. Does the station have a policy for decontamination of apparatus, gear, etc. <u>after each call</u> that fire service professionals regularly follow?_____no ______yes

21. What is the policy for washing turnout gear (check all that apply)?

    After each fire? _____no ______yes

    After exposure to blood borne or airborne pathogen? _____no ______yes

    After an inspection of the gear found it was necessary? _____no ______yes

    Other:____

22. Have fire service professionals received any training:

    on MRSA ?_____no ______yes on other infectious diseases?_____no ______yes

    on cleaning?_____no ______yes

23. Have fire service professionals received any training on cleaning surfaces for infection Control and post-call decontamination cleaning procedures? _____no ______yes

24. Have any fire service professionals in your station reported MRSA symptoms that were treated by a health care provider?_____no ______yes

    Other Comments:____

    ____

    ____

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE!

For more information about MRSA, contact these resources:

US Centers for Disease Control and Prevention
www.cdc.gov/MRSA

Washington Fire Chiefs
www.wsafc.org

University of Washington Field Research and Consultation Group
www.depts.washington.edu/frcg/MRSA

Environmental Sampling for MRSA in Fire Stations Project
http://depts.washington.edu/frcg/MRSA.html

Emergency Management Response Information Sharing and Analysis Center Infogram 23-11
www.usfa.fema.gov

Green Seal
www.greenseal.org
http://www.greenseal.org/FindGreenSealProductsAndServices.aspx