



Revised Abstract

Background: MRSA has been isolated from fire stations and ambulances, but isolates from these previous studies have not been characterized. In the current study, MRSA were isolated and molecularly characterized from environmental surfaces of 2 different Northwest Fire Stations during 2009. **Methods:** Environmental samples collected from SANICULT™ swab and RODAC™ plates. Biochemical verification was done by BBL Crystal™ GP Gram-Positive ID System, coagulase test and/or 16S RNA sequencing. The *mecA* gene was verified by PCR. The Panton-Valentine leukocidin gene, MLST typing and SCC*mec* type were determined by PCR assays and sequencing. Antimicrobial susceptibility testing was performed by disk diffusion according to the CLSI guidelines and PFGE analysis was done. **Results:** Twenty-six (4.8%) of the 540 first samples, and 18 (3.9%) of the 460 second samples from both fire and medic trucks and living quarters of each station, were MRSA positive resulting in 44 isolates. Of these, 8 were SCC*mec* type IV, of which 7 were USA300. Three isolates were type II and the remaining were non-I-V [NT]. Ten different ST types were identified and 20 isolates were grouped into 4 clusters. One cluster of 4 type IV MRSA, isolated from 4 samples within the medic truck, were ST8, and had indistinguishable PFGE patterns and were USA300. Three other clusters with 3 to 9 isolates/cluster with the same ST type included ≥1 isolate from the medic/fire trucks and ≥1 isolate from the living quarters. **Conclusion:** This is the first molecular characterization of MRSA isolated from fire/medic trucks and fire station living quarter surfaces. Both hospital and community acquired MRSA were identified. The same MRSA strain was identified on medic/fire trucks and fire station living quarter surfaces suggesting a spread of MRSA between the vehicles in the garage, and the living spaces in the fire stations. The level of risk to fire personnel and/or patients due to contaminated fire/medic trucks and fire station surfaces pose for MRSA colonization and subsequent MRSA infection is unknown and requires further studies. However, the data suggests that surfaces outside hospitals/nursing homes should be examined for MRSA contamination and could represent reservoirs for MRSA transmission.

Introduction

Staphylococcus aureus is a common cause of serious and life-threatening infections. The prevalence of MRSA has increased rapidly over the last decade due in large part to the emergence of community acquired MRSA [CA-MRSA] infections. In a recent study of 51 ambulances in Maine, 25 (49%) had a least one contaminated with MRSA. In Arizona, 7% of surface samples Tucson Fire Stations and training facility. Were MRSA +. Neither study characterized the MRSA isolates.

Marilyn C. Roberts*, Olusegun O. Soge, David No, and John S. Meschke

Materials & Methods

- Environmental samples were collected from SANICULT™ swab and RODAC™ plates from two Fire stations, in two different Fire Districts in the NW
- Second samples collected 7-9 months later
- Sample sites: Medic truck, Fire truck, Fire engine, Outer fire gear, Garage, Kitchen, Bathrooms, Gym, Other sites
- The isolates were identified by BBL Crystal™ Gram-Positive ID System and/or 16S sequencing, and coagulase test
- Methicillin resistance was determined by presence of the *mecA* gene by PCR assay
- Selected isolates were PFGE typed with *Sma*I
- PCR assay for SCC*mec* typing, multilocus sequence typing (MLST), Panton-Valentine leukocidin gene (PVL), detection tetracycline and macrolide resistance genes

Results

- ❖ 540 samples from 1st sampling with 26 MRSA + [4.8%]
8 of 9 sample locations MRSA+
8 [31%] MRSA type IV, 7 USA 300, 18 not type I-V [NT]
6 MLST types
- ❖ 460 samples from 2nd sampling with 18 MRSA + [3.9%]
9 of 9 sample locations MRSA+
0 MRSA type IV, no USA 300, 3 type II, 15 not type I-V [NT]
8 MLST types

Figure 1. Spread of one MRSA Strain within station

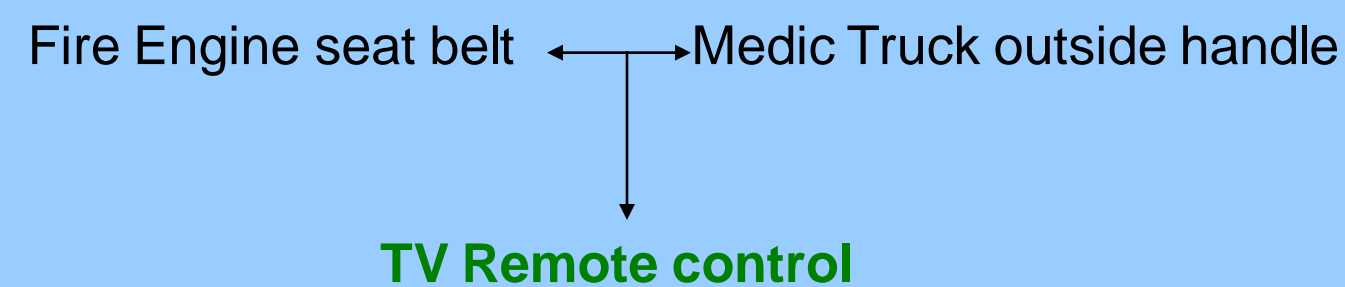


Table 1. MRSA positive surfaces comparing first and second sampling

	1 st sampling n = 26 [4.8%]	2 nd sampling n = 18 [3.9%]	1 st sampling ^a	2nd sampling ^b
Medic truck	14	2	4 IV ST8 USA300 9 NT	2 NT
Fire truck/engine	2	1	2 NT	1 II ST1
Outer fire gear	1	4	1 NT	4 NT
Garage	0	2	0	4 NT
Kitchen	3	4	3 IV ST5/30 USA300 1IV ST34	4 NT
Bathrooms	1	1	1 NT	1 NT
Bedrooms	1	1	1 NT	1 NT
Gym	1	1	1 NT	1 NT
Other	3	2	1 IV ST30 USA300 2 NT	2 NT

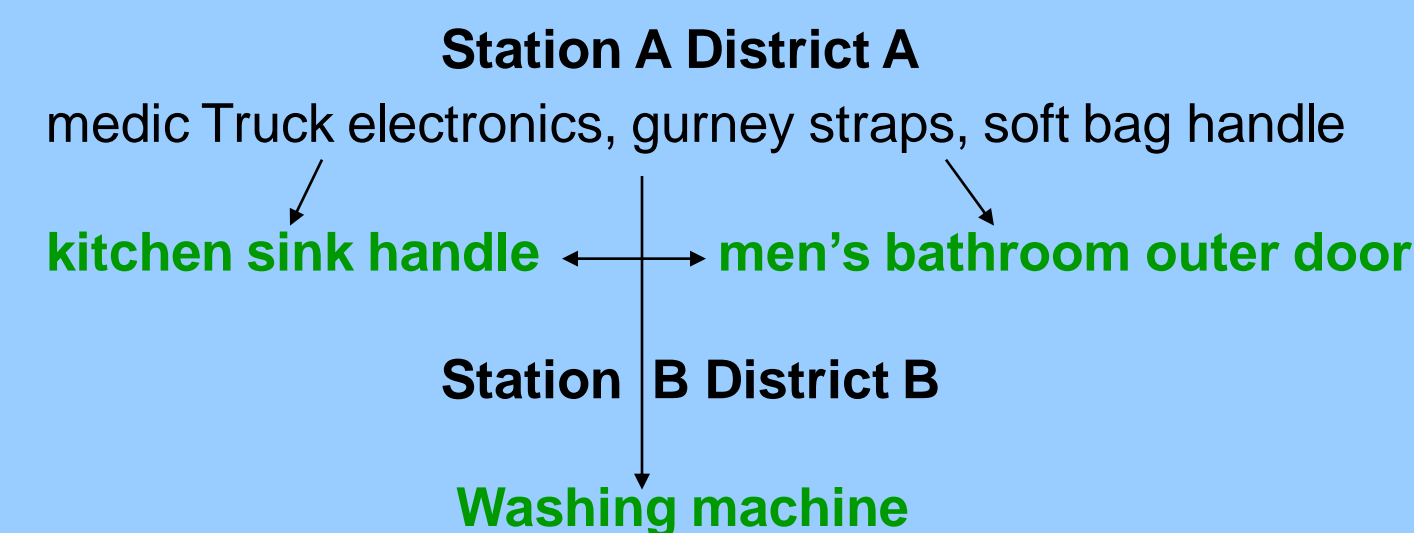
NT= not type I-V; ST=MLST type;
^a ST types included 8, 5, 15, 34, 45, 59; ^b ST types included 1, 5, 8, 15, 45, 72, 9, 105

- ❖ All 26 MRSA from 1st sampling multi-drug resistant
- ❖ 16 of 18 MRSA from 2nd sampling multi-drug resistant

Conclusions

- ❖ USA300 and hospital-like MRSA found
- ❖ MRSA found in Medic/Fire Trucks, Fire engine living quarters (Fig 1); transferred from equipment to living area by personnel?
- ❖ The same MRSA strain found in trucks and living quarters
- ❖ Same MRSA found in both districts (Fig 2); transfer by paramedic trainee?
- ❖ Level of risk to fire personnel and/or patients due to contaminated surfaces is unknown

Figure 2. Spread of one MRSA Strain Between Districts



References:

Brown *et al.* Prehosp Emerg Care. 2010; 14:176-81
Sexton & Reynolds. Am J Infec Con (in press)