

## Community-Associated MRSA

### 119. The Impact of USA 300 Community-Acquired Methicillin-Resistant *Staphylococcus aureus* (CA-MRSA) on Healthcare-Acquired MRSA Infections (HA-MRSA-I)

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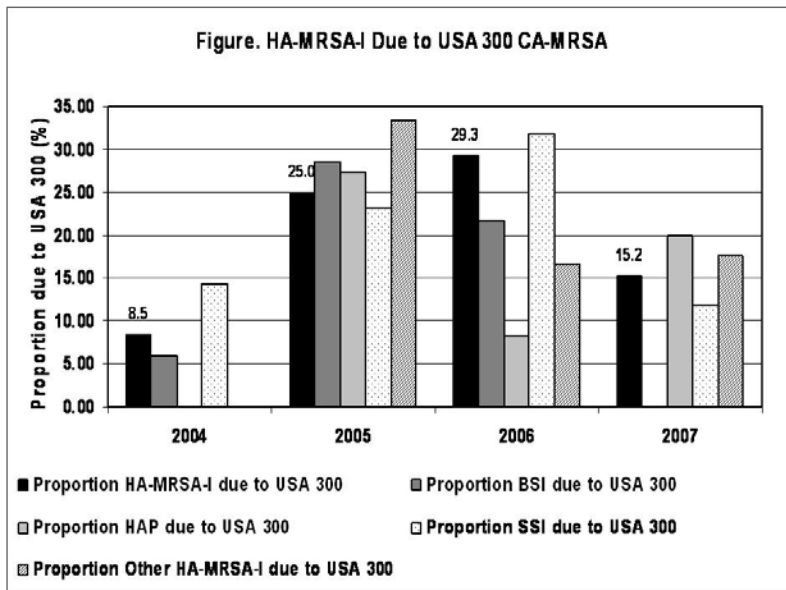
Background: The incidence of HA-MRSA-I has continued to increase in US hospitals. These infections have been associated with significant morbidity and mortality. There have been recent reports of an increasing number of HA-MRSA-I caused by the USA 300 CA-MRSA strain.

Objective: We sought to determine the impact of USA 300 CA-MRSA on HA-MRSA-I at our academic medical center.

Methods: A retrospective cohort study of pts with HA-MRSA-I between 1/04 and 6/07 was conducted to determine the proportion caused by USA 300 CA-MRSA, and to identify pt characteristics associated with HA-MRSA-I due to USA 300 CA-MRSA. HA-MRSA-I (bloodstream infections (BSI), pneumonias (HAP), surgical site infections (SSI), or others) were defined according to CDC criteria. Characteristics (age, sex, race, type of infection, days to infection, co-morbidities) were extracted from patient records. Pulsed field gel electrophoresis (PFGE) was used to identify MRSA strains as USA 300 CA-MRSA. Multivariate logistic regression (MLR) was used to identify characteristics associated with having a HA-MRSA-I due to USA 300 CA-MRSA (SAS 9.1, Cary, NC). Statistical significance was determined at the  $p < 0.05$  level.

Results: 272 HA-MRSA-I occurred over the study period (75 BSI, 39 HAP, 125 SSI, and 33 others). PFGE was available for 235 (86.4%) isolates and 50 (21.3%) of these were indistinguishable from USA 300 CA-MRSA (10 (15.6%) of 64 BSI, 5 (14.3%) of 35 HAP, 29 (27.6%) of 105 SSI, and 6 (19.4%) of 31 others). The proportion of SSI due to USA 300 CA-MRSA was significantly higher compared to all other types of HA-MRSA-I (27.6% vs. 16.2%,  $p = 0.048$ ). Compared to 2004, the proportion of HA-MRSA-I due to USA 300 CA-MRSA significantly increased in 2005 (OR 3.58 95%CI 1.01-13.98,  $p = 0.05$ ), and 2006 (OR 4.45 95%CI 1.33-16.41,  $p = 0.01$ ), however, compared to 2005-2006, in 2007, the proportion of HA-MRSA-I due to USA 300 CA-MRSA decreased (OR 0.61 95%CI 0.23-1.55,  $p = 0.34$ ) (Figure). MLR identified younger age (OR 0.95, 95%CI 0.94-0.97,  $p < 0.0001$ ), black race (OR 2.16, 95%CI 1.02-4.56,  $p = 0.043$ ), and SSI (OR 4.25, 95%CI 1.89-9.54,  $p = 0.0005$ ) to be significantly associated with HA-MRSA-I due to USA 300 CA-MRSA.

Conclusions: USA 300 CA-MRSA was responsible for a measurable proportion (21.3%) of HA-MRSA-I at our hospital, particularly among SSI. The proportion of HA-MRSA-I due to USA 300 CA-MRSA significantly increased from 2004 through 2006; however, in 2007 we observed a decrease in this proportion. Further analysis over time is needed to determine if the epidemiology of the impact of USA 300 CA-MRSA on HA-MRSA-I is changing. Younger pts, black race, and those with SSI were significantly more likely to have USA 300 CA-MRSA as the cause of their HA-MRSA-I.



## 120. Recovery of Methicillin-resistant *Staphylococcus aureus* From School-associated Fomites

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**Background:** There have recently been a number of reports of methicillin-resistant *Staphylococcus aureus* (MRSA) infections in schools. Because it has been demonstrated that MRSA may survive for prolonged periods on surfaces, there has been uncertainty regarding the extent to which environmental decontamination of schools may be indicated.

**Objective:** To examine recovery of MRSA on swabs and on fingertips after inoculation onto environmental surfaces and fomites present in schools.

**Methods:** Three strains of MRSA were studied, including one community-associated isolate (pulsed-field gel electrophoresis type USA 300). An inoculum of 10<sup>4</sup> colony-forming units (CFU) in 10 microliters was inoculated onto surfaces, including a laminated tabletop, school notebooks, plastic binder, computer mouse pad, and moist nutrient-free agar. Cultures were performed to assess recovery of MRSA on moistened cotton-tipped swabs or on fingertips at baseline (i.e., before the inoculum dried) and at 10 minutes, 1 hour, 3 hours, and then daily for 6 days.

**Results:** Approximately 10<sup>3</sup> CFU were recovered by swabs prior to drying of the inoculum for each strain, and MRSA was consistently acquired on fingertips. On all dry surfaces, the number of CFU recovered by swabs decreased 10-fold by 3 hours (~10<sup>2</sup> CFU) and 100-fold by 2 days. By 3-6 days, recovery of MRSA from dry surfaces using swabs decreased 1000-fold (i.e., only 0-4 CFU were recovered), and no MRSA were recovered on fingertips. On moist nutrient-free agar, no significant decrease in MRSA recovery occurred during the study period (P = 0.9).

Conclusions: Although MRSA survived for at least several days on dry surfaces, there was a marked reduction in the number of colonies recovered on swabs or fingertips by 3 days after inoculation. The reduction in MRSA recovery was attributable to desiccation because inoculation onto a moist surface resulted in prolonged recovery of large numbers of MRSA. These results provide support for the recommendation that schools with MRSA cases should focus environmental disinfection on areas that are moist and/or frequently come into contact with poorly covered infections.

### **121. Molecular Characteristics of Methicillin Resistant *Staphylococcus aureus* in Human Immunodeficiency Virus Infected and Uninfected Patients with Skin and Soft Tissue Infections**

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Background: Methicillin resistant *Staphylococcus aureus* (MRSA) is identified in 59% of skin and soft tissue infection (SSTI) seen in emergency departments in the United States. Although studies have looked at geographical differences in MRSA isolates, few have studied the molecular epidemiology of MRSA isolates causing SSTI in Human Immunodeficiency Virus Infected (HIV+) and in HIV-uninfected (HIV-) patients.

Objective: To characterize and compare the molecular epidemiology of CA-MRSA SSTI in HIV+ and HIV- patients.

Methods: From 1/1/2005 to 12/31/2005, MRSA culture positive isolates from patients presenting to University of California, San Diego (UCSD) Emergency Department or the Owen clinic with a skin or soft tissue infection were included in the study. HIV+ were required to have a documented HIV infection and at least one clinic visit at the Owen clinic, 2 months before the positive culture. Pulsed-field gel electrophoresis (PFGE), *mecA* gene testing and Panton-Valentine Leukocidin (PVL) assay were performed on 115 viable isolates. Patient demographics and risk factors for CA-MRSA infection were collected by retrospective chart review. Univariate and logistic regression analyses were performed to identify independent variables significantly associated with CA-MRSA.

Results: 34 HIV+ and 81 HIV- isolates had complete molecular characterization. 100% of HIV+ and 68% of HIV- were male. HIV+ were 3 times more likely to report using methamphetamine ( $p=0.02$ ) and 5 times less likely to receive incision and drainage than HIV- ( $p=0.003$ ). In HIV+, median CD4 counts were 365 cells/mm<sup>3</sup> and HIV RNA was 11,400 copies/ml. Only 32% of isolates were sensitive to ciprofloxacin. All isolates belonged to USA300 strain, 99% were PVL positive and 80% were *mecA* type IV. PFGE with criteria of  $\leq 5$  vs.  $\leq 2$  band difference identified 1 vs. 23 patterns without clustering among HIV+ or HIV-.

Conclusions: CA-MRSA strains causing SSTI infections are very similar in HIV+ and HIV- patients, even though demographics and risk factors are different. This suggests that the similar strategies aimed at preventing CA-MRSA SSTI should be used regardless of HIV status.

## **122. Frequency of Carriage and Routes of Acquisition of *Staphylococcus aureus* among Healthy Infants**

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**Background:** It is known that healthy infants may acquire colonization by *Staphylococcus aureus*, including community-associated methicillin-resistant *S. aureus* (CA-MRSA). However, the modes of transmission are not well defined and the importance of the intestinal tract as site of colonization is controversial.

**Objective:** To assess the frequency of nares, skin, and stool carriage of *S. aureus* by healthy infants. To test the hypothesis that colonized mothers or other family members are the source of the majority of *S. aureus* isolates, including CA-MRSA isolates, which colonize infants in non-outbreak settings. To evaluate the potential for MRSA to colonize the intestinal tract.

**Methods:** Between August, 2005 and April 2007, surveillance cultures of anterior nares, peri-umbilical skin, stool, and bassinets of healthy infants, as well as nares of mothers and other selected family members were obtained at 1-2 days and 2 weeks of age at the Madigan Army Medical Center. Isolates were tested for methicillin susceptibility and molecular subtyping was performed. The ability of MRSA isolates to grow anaerobically in fresh stool samples of infants was assessed.

**Results:** Of 37 mothers and 38 infants cultured during admission, 4 mothers and 1 infant had positive nares cultures for methicillin-susceptible *S. aureus* (MSSA), but no infants had positive cultures of skin, stool, or environment. Of 23 infants cultured at 2 weeks of life, 8 (35%) acquired nasal carriage; 6 of the 8 (75%) had positive stool cultures and 5 of 8 (63%) had positive cultures of peri-umbilical skin. Of the 8 infants acquiring *S. aureus*, only 1 (13%) had a mother or other family member with nasal carriage of the same clone. Two of the 8 (25%) colonized infants carried MRSA, including 1 community-associated MRSA strain; however, cultures of family members were either negative or were positive for MSSA. MRSA strains grew rapidly to high concentrations when inoculated into stool of healthy infants.

**Conclusions:** Healthy infants frequently acquired *S. aureus* colonization, including MRSA strains, and carriage on skin and in stool was common. Our findings suggest that sources other than colonized family members may account for a significant proportion of cases.

## **123. Identification of USA 300 Community-Associated Methicillin Resistant *Staphylococcus aureus* by Pulsed Field Gel Electrophoresis of Blood and Nasal Isolates in a Tertiary Hospital**

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Background: Community-associated methicillin resistant *Staphylococcus aureus* (CA-MRSA) strains with the USA 300 pulsed field gel electrophoresis (PFGE) pattern have increasingly been reported as a cause of hospital admissions and healthcare associated (HCA) infections. CA-MRSA colonized/infected patients are potential reservoirs for HCA transmission. Incidence of CA-MRSA strains in hospitals appears to be rising but this data was not available at UPMC Presbyterian, a 766-bed tertiary care facility.

Objective: An observational study was performed to identify USA 300 CA-MRSA in a sample of blood and nasal isolates collected from April-July 2007. The utility of PFGE for categorizing MRSA isolates was examined. HCA risk factors were assessed in patients with USA 300 CA-MRSA.

Methods: Forty-four MRSA nasal isolates identified by growth on BBL CHROMagar and 19 MRSA blood isolates were studied. To increase the likelihood of capturing CA-MRSA, 7 blood isolates susceptible to clindamycin by Kirby Bauer, including 2 that were ciprofloxacin susceptible, were included. Molecular subtyping of isolates by PFGE with Sma I was performed, and comparison was done with CDC reference strains USA 100-1200, which include common CA (300/400) and HCA (100/500/800) MRSA strains. Band patterns were compared and dendrograms were generated based on the Dice coefficient and unweighted pair group method with arithmetic mean (UPGMA), using BioNumerics v5.10. An isolate was defined as a USA type based on a similarity coefficient of at least 80%. Patient data on HCA risk factors was obtained from the electronic record.

Results: Out of 19 blood isolates, 3 were USA 300, 7 were USA 100, and 4 were USA 800. Two of the USA 300 blood isolates were susceptible to both clindamycin and ciprofloxacin. All 3 USA 300 blood isolates were from admission cultures; however, the source patients had HCA risk factors. One was on hemodialysis, another had a peripherally inserted central catheter and was transferred from rehabilitation, and the third was on chemotherapy for acute leukemia. Of the 44 MRSA nasal isolates, 3 were USA 300, 15 were USA 100, and 2 were USA 800. One of the 3 patients with a USA 300 nasal isolate had HCA risk factors, including multiple abdominal surgeries and recent hospitalization. Majority of nasal isolates and roughly one fourth of blood isolates could not be subtyped, although some were 70% similar to USA 300, 100 or 800.

Conclusions: USA 300 CA-MRSA were identified from blood and nasal isolates at UPMC Presbyterian. Only 14/19 (74%) of blood isolates and 20/44 (45%) of nasal isolates had band patterns identified as USA 300, 100 or 800, which limits the utility of PFGE as a tool for categorizing many of the circulating MRSA strains in the hospital. Four of the 6 patients with USA 300 CA-MRSA had HCA risk factors, and may have acquired the strain during healthcare contact.

#### **124. Is MRSA Hiding in the Gym?**

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Background: The increasing incidence of community associated methicillin-resistant *Staphylococcus aureus* (MRSA) infections has fostered a great deal of concern within

the public health community and the general public at large. One area of concern lies in identifying locations that may harbor high risk for acquisition of the organism. A common assumption is that exercise gyms may be sites where transmission is occurring, though no data exist to support or refute this hypothesis. Therefore, we sought to identify MRSA in a large gym.

**Methods:** The study was performed at the university fitness center located on the Medical College of Virginia Campus, which is used primarily by healthcare workers and health professions students. On average, 218 members use the gym daily. Ninety-nine environmental surface cultures were obtained. These included treadmills (8), stair-masters (7), elliptical machines (9), recumbent bikes (7), upright bikes (8), locker room benches (6), other locker room surfaces (10), free weights (7), workout benches (9), weight machines (22), hand grips (1), interchangeable hand grips (1) belts (1), mats (1), medicine balls (1), and stability balls (1). The cultures were processed using standard techniques. Susceptibilities were performed using the Kirby-Bauer method. Molecular typing was performed via pulsed-field gel electrophoresis following digestion of DNA with restriction endonuclease SmaI.

**Results:** Ten out of 99 samples yielded *Staphylococcus aureus*, all of which were methicillin-susceptible. Positive samples were collected on elliptical machines (2), recumbent bikes (2), workout benches (2), swimsuit water extractor (1), towel dispenser (1), leg press (1), and chest press (1). Molecular typing revealed that 2 strains were possibly related (4-6 bands different), however, these samples did not come from adjacent equipment. All other strains were unrelated.

**Conclusions:** In this point prevalence microbiologic survey of a large gym frequented by healthcare workers and health professions students, no MRSA was detected. Several strains of methicillin-susceptible *Staphylococcus aureus* were isolated, 2 of which were possibly genetically related. As the incidence of community associated MRSA continues to rise, further studies are needed to properly elucidate the epidemiology of MRSA in the gym setting.

### **125. Oxacillin-Susceptible, mecA-Positive *S. aureus* Nasal Carriage in Adults**

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**Background:** Accurate detection of MRSA nasal carriage may reduce transmission through appropriate isolation and decolonization strategies. Due to variation in the degree of *mecA* gene expression in heterogeneous populations of MRSA, several studies have reported the occurrence of oxacillin-susceptible, *mecA*-positive *S. aureus*.

**Objective:** In a population comprised predominantly of healthy university students and ambulatory clinic patients, we determined the prevalence of oxacillin-susceptible *mecA*-positive *S. aureus* nasal carriage and assessed the phenotypic resistance of these isolates after exposure to cefotaxime.

Methods: 568 participants, predominantly from a university student health center, underwent nasal swab screening for *S. aureus*. Oxacillin-susceptible *S. aureus* isolates were identified by the CLSI disk-diffusion method with cefoxitin 30µg and oxacillin 1µg disks. The presence of the *mecA* gene was tested by PCR. All *mecA*-positive oxacillin-susceptible isolates were inoculated onto MHA containing cefotaxime 6µg/ml for the induction of phenotypic resistance. Organisms that failed to grow were classified as "dormant MRSA". Strains that grew and developed resistance to oxacillin or cefotaxime were classified as "inducible dormant MRSA" and subsequently underwent SCCmec typing and PFGE analysis.

Results: 490 students and 78 non-students underwent nasal swab screening for *S. aureus*. A total of 152 oxacillin-susceptible *S. aureus* isolates were evaluated in the study. The *mecA* gene was detected in 99/152 isolates (65%). Of these, 77 were dormant MRSA and 22 were inducible dormant MRSA. The prevalence of inducible dormant MRSA in this population was 3.9% (22/568). There was no significant difference in the diameter of the zone of inhibition for oxacillin and cefotaxime disks among oxacillin-susceptible *mecA*-negative *S. aureus*, dormant MRSA, or inducible dormant MRSA prior to induction. Among inducible dormant MRSA isolates, 12 were SCCmec-II MRSA, 6 were SCCmec-IV MRSA, 3 were SCCmec-I MRSA, and 1 was SCCmec-V MRSA. The USA-300 clone accounted for only 18% of inducible dormant MRSA isolates.

Conclusions: The prevalence of oxacillin-susceptible *mecA*-positive *S. aureus* nasal carriage in this study population was 17% (99/568). Using the disk diffusion method for methicillin resistance screening may not detect MRSA in a heterogeneous population of *S. aureus*. Unlike CA-MRSA, only 32% of the inducible dormant MRSA isolates contained SCCmec type IV or V. Although some oxacillin-susceptible, *mecA*-positive *S. aureus* isolates may become overt MRSA after cefotaxime exposure in vitro, the clinical impact is unknown. Further studies are needed to determine the clinical significance of these findings.

### **126. Nasal Carriage of Community-Associated Methicillin-Resistant *Staphylococcus aureus* among University Students and an Ambulatory Patient Population**

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Background: CA-MRSA infections have become increasingly prevalent. Nasal carriage of CA-MRSA serves as a reservoir for endogenous infections and transmission. Prior studies demonstrated geographic variation in carrier rates.

Objective: To determine the prevalence and microbiological characterization of CA-MRSA nasal carriage among university students and an adult outpatient population without known risk factors for the acquisition of healthcare associated (HA)-MRSA.

Methods: Nares cultures were performed in ambulatory patients at the university student health service, HIV clinic, dermatology clinic, and emergency department of

an 800-bed tertiary care medical center from January to December 2007. A questionnaire was administered to participants. Antibiograms were performed by disk diffusion methods according to CLSI guidelines. MRSA phenotype was confirmed by the presence of the *mecA* gene. MRSA isolates were further evaluated for the presence of the PVL gene, by SCCmec typing, and by PFGE analysis.

Results: A total of 568 volunteers were enrolled. Participants were predominantly university students (86%). Mean age was 25 years; 61% were female; 58% Caucasian; 27% African American, and 7 % were HIV seropositive. *S. aureus* was isolated from 167 participants (29%); MRSA nasal carriage was present in 15 participants (2.6%). The prevalence of MRSA nasal carriage among the student and non-student populations was respectively 2.65% (13/490) and 2.56% (2/78). There was no significant difference in the prevalence of MRSA colonization according to sex, race, HIV serostatus, or student status. Among the MRSA isolates, 100% were susceptible to gentamicin, 87% to rifampin and sulfamethoxazole/trimethoprim (SMX-TMP), 73% to tetracycline, 67% to clindamycin, 60% to ciprofloxacin, 36% to kanamycin, and 0% to erythromycin. Nine subjects were colonized with SCCmec-IV MRSA, and 4 with SCCmec-II MRSA. The remaining 2 subjects were colonized with SCCmec-V MRSA or SCCmec-I MRSA. Among the SCCmec-IV MRSA isolates, 6 isolates (40%) were genetically identical to the USA-300 clone and 4 contained the PVL gene.

Conclusions: Despite concerns that the prevalence of CA-MRSA carriage is increasing, the frequency of CA-MRSA colonization in our predominantly student sample is similar to the previously reported rate among the general U.S. population. Most colonizing isolates of CA-MRSA are susceptible to gentamicin, TMP-SMX, rifampin, and tetracycline. Although the MRSA USA-300 genotype was the predominant clone isolated in this study, it accounted for only 40% of the CA-MRSA isolates. These results suggest a greater degree of genetic diversity in CA-MRSA strains in a population comprised predominantly of healthy university students.

### **128. A Real Time PCR Screening Program for MRSA in a Community Hospital: The First Year's Results**

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Background: Methicillin Resistant *Staphylococcal aureus* (MRSA) infections are becoming progressively more frequent throughout the United States. The organism is now endemic in some communities and has recently been a frequent subject in the lay press. Clinical cultures only detect a small portion of the organisms harbored by inpatients. Early identification of individuals harboring the organism is critical for the implementation of timely control strategies.

Objectives: We sought to determine the rate of MRSA carriage in a population of high risk patients entering our hospital and to determine if the organism was sporadically harbored.

Methods: Between 1 January 2007 and 31 December 2007 we employed polymerase chain reaction (PCR) analysis to screen for MRSA in a select group of patients entering our community hospital. Patient transfers from other hospitals and long

term care facilities, those entering our intensive care unit (ICU) and individuals with a previous history of MRSA constituted the screened population. A cotton-tipped applicator employed to swab the anterior nares of candidate patients was placed in provided carrier media and forwarded to the laboratory for PCR processing. Screened patients, irrespective of the reason for the screening, were admitted to standard precautions. Patients were only placed in contact isolation if the current screening evaluation resulted in a positive PCR screen for MRSA. PCR testing was batched daily and the results were available on a next day basis. If necessary MRSA PCR screen could be performed STAT with results available within two hours. Results: Overall in calendar year 2007 we screened 1,568 patients and found 144 (9.2%) positive. Of the 902 patients that were screened upon entering our ICU 55 (6.1%) were positive. There were 170 (10.8%) of the 1,568 patients that we screened had the indication of a previously known MRSA infection. Of these 96 (56.5%) had negative screens indicating that they were not harboring the organism at that time.

Conclusion: We successfully initiated and carried out a PCR based MRSA screening program in our 160 bed community hospital in Northwest Montana. Our MRSA screening program assisted us in identifying 144 patients, many of whom may have gone unrecognized, that were potential sources for the nosocomial transmission of MRSA. Our screening program may impact our MRSA rate by not only identifying carriers but also increasing awareness about MRSA and in-hospital transmission amongst the staff. Another important outcome of our program was that we confirmed that many individuals harbor the organism sporadically and do not require to be placed in contact isolation upon admission solely based on a past history of a MRSA infection.

### **129. Lack of MRSA Colonization at Birth among Newborn Infants**

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Background: Community-associated Methicillin Resistant *Staphylococcus aureus* (CA-MRSA) infections are increasing in frequency. Incidence of MRSA colonization at birth among newborn infants is not well characterized.

Objective: To determine the incidence of nasal MRSA colonization among newborn infants < 48 hrs of age.

Methods: All infants admitted to neonatal intensive care unit (NICU) of Ronald McDonald Children's Hospital, Loyola University Medical Center, IL, during 2006 and 2007 were screened for MRSA colonization upon admission and bi-weekly by obtaining anterior nasal swab cultures. In addition, all infants admitted to newborn nursery from 12/1/07-12/31/07 were screened for MRSA colonization at birth. The nasal cultures were inoculated on CHROMagar plate (BD BBLTM CHROMagarTM MRSA) and MRSA was confirmed by susceptibility testing of suspicious colonies.

Results: There were 999 admissions to NICU during 2006 and 2007; 854 admissions of children < 48 hours of age and 59 admissions of children > 48 hours of age and there were 86 term newborns during December, 2007. A total of 2110 MRSA screening cultures were obtained, eight of which (0.38%) tested positive for MRSA. None of the 86 full-term newborns tested positive for MRSA. Eight NICU infants were

detected to have nosocomial MRSA colonization/infection at or after six days of age (range 6 days-52 days). Seven of these infants tested MRSA negative at birth, and one infant whose MRSA screen was positive at nine days of age was not tested at birth. This infant's strain is clindamycin resistant, consistent with health care-associated MRSA. In addition, there were no cases of MRSA bacteremia or invasive disease among newborn infants admitted to our nursery and NICU during 2006 and 2007.

Conclusions: Our data indicate that MRSA colonization of infants at birth is extremely uncommon despite increasing incidence of CA-MRSA infections in our geographic area. Lack of colonization/invasive disease due to MRSA infection at birth also suggests the use of empiric vancomycin treatment for early onset neonatal sepsis may not be warranted.

### **130. Sequential Community-Associated Methicillin Resistant *Staphylococcus aureus* (CA-MRSA) Outbreaks in a Neonatal Intensive Care Unit**

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Background: CA-MRSA strains are an increasing cause of nosocomial infections though outbreaks occurring in the neonatal intensive care unit (NICU) setting are infrequent.

Objective: To analyze two CA-MRSA outbreaks in the NICU of an urban, academic medical center.

Methods: Outbreak investigation with genotyping, city-wide colonization prevalence survey, and multiple interventions in a 32-bed, level III NICU.

Results: Two premature infants with respiratory distress syndrome developed septic shock and died within a 48-hour period. Blood cultures revealed the USA-300 clone of CA-MRSA. Four other babies were found to be colonized with the USA-300 clone, 1 of whom developed a skin infection. All of the colonized babies were placed on contact precautions, treated with mupirocin and cohorted. Nares cultures of 176 healthcare workers (HCW) revealed 11 positive for MRSA (1 USA-300). All colonized HCW were treated with mupirocin and all were subsequently culture negative. A point prevalence survey of MRSA colonization for all babies in the 7 NICUs in the Richmond region revealed 3 of 86 to be colonized (all with a non-USA 300 strain at another hospital). All of the babies in our NICU were screened for colonization weekly over the subsequent 4 months, with no new colonized babies identified. Interestingly, weekly surveillance cultures revealed the development of a second, temporally distinct outbreak 4 months later, with the predominant MRSA isolate being the PVL negative USA-1000 strain. Of the 15 babies affected during this outbreak, 5 were infected (1 bloodstream infection, 2 wound infections, 1 with a right face abscess and 1 with infected pericardial fluid). 14 of these babies were found to be colonized (including 4 of the infected babies). All of the colonized and infected babies survived. Interestingly, 1 of these babies had had a right ankle skin infection during the first outbreak and developed a gastric-tube site infection with two strains of MRSA during this second outbreak. Screening of 350 HCWs revealed 6 positive for MRSA with none colonized with the outbreak strains. Other infection

control measures implemented included extensive education to parents on hand hygiene with required demonstration of competency and around-the-clock hand-hygiene monitoring with rapid achievement of 99% compliance. Weekly feedback of hand hygiene rates was provided, and unit access was restricted to essential personnel only. Over the 9 month period encompassing these outbreaks, the infection rate was 2.2/1,000 patient days.

Conclusions: Two CA-MRSA outbreaks separated by 4 months occurred in a NICU due to two different clones. Given the increasingly high prevalence of MRSA in the community and the high susceptibility of premature neonates to infection, NICUs will remain vulnerable to introduction of these strains, necessitating the need for optimal infection control practices.

### **131. Establishing a Surveillance System to Identify the Role of Colonization with Resistant Bacteria in Patients Undergoing Elective Surgery**

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Background: A surveillance system is needed to clarify whether colonization with resistant bacteria has an effect on postoperative nosocomial infection rates for patients undergoing elective surgery. While beta-lactam resistant gram-negative organisms and methicillin-resistant *Staphylococcus aureus* (MRSA) are both important, MRSA is of special interest because MRSA infections are increasingly being reported in otherwise healthy individuals without associated risk factors for infection. Community-acquired MRSA is now the major cause of community-associated skin infections; and community-acquired MRSA strains often carry the Panton-Valentine leukocidin genes that produce cytotoxins associated with tissue necrosis and leukocyte destruction.

Objective: The study goal was to establish a surveillance system and screening procedure for patients undergoing elective surgery, identify patients colonized with community MRSA and other resistant organisms, and assess the effect of colonization on postoperative infection rate.

Methods: Patients from breast and general surgical clinics were enrolled after giving informed consent and before their respective elective surgical procedures. Swab cultures were taken from nose, axilla and groin. All patients received routine preoperative antibiotic prophylaxis. No changes in antibiotic prophylaxis were done based on culture results. Participating patients were evaluated in hospital and at 7 and 30 days after surgery for signs of infection (high temperature, pain or redness at the surgical site).

Results: 63 patients were screened for MRSA. *Staphylococcus aureus* strains were detected in 24 patients (38%). 6 of the 24 patients (10%) had MRSA strains. 11 of 63 patients (17%) were identified with gram-negative flora without known clinical significance. No patients (0%) developed signs of postoperative wound infection.

Conclusion: While 10% of consenting patients receiving elective surgery were colonized with MRSA and 17% with gram-negative flora, the postoperative infection rate was 0%, even without organism-specific pre-surgical antibiotic prophylaxis.

### **132. The Epidemiology of Community-Acquired Methicillin-Resistant *Staphylococcus aureus* (CA-MRSA) USA 300 in a Children's Hospital**

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Background: CA-MRSA has been classified as an emerging infectious agent and many of these isolates have been identified as the USA 300 strain.

Objective: We sought to determine the proportion of MRSA due to CA-MRSA USA 300 in our academic children's hospital and to describe factors associated with being colonized or infected with the USA 300 strain.

Methods: A retrospective cohort study of children with MRSA colonization or infection between 10/2006 and 9/2007 was conducted. Characteristics including, sex, race, presence and type of infection (bloodstream, skin and soft tissue (SSTI), respiratory, and other), days to colonization or infection, receipt of ICU care, and length of stay were recorded. Pulsed field gel electrophoresis (PFGE) was used to identify MRSA strains as a USA 300 CA-MRSA. Logistic regression was used to identify characteristics associated with having MRSA colonization or infection due to USA 300 CA-MRSA (EpiInfo 3.22, 2004, CDC, Atlanta, GA). Of note, all children admitted with SSTI were empirically placed into contact precautions.

Results: 73 children with MRSA were identified over the study period (12 were colonized and 61 were infected). 60 (82.2%) of these isolates were available for PFGE. 39 (65%) were identified as the CA-MRSA USA 300 strain and 37 (94.9%) of these children had MRSA infection. Presence of infection (OR 22.8 95%CI 2.6-199.9,  $p=0.005$ ) was significantly associated with having MRSA due to the USA 300 strain. Factors associated with a significantly lower likelihood of USA 300 included receipt of ICU care (OR 0.019 95%CI 0.002-0.17,  $p=0.0004$ ), longer length of stay (OR 0.94 95%CI 0.89-0.99,  $p=0.02$ ), and having a healthcare-acquired isolate (OR 0.092 95%CI 0.02-0.39,  $p=0.001$ ). Among 50 children with MRSA infection whose isolate was available for PFGE, 37 (74%) were due to USA 300 CA-MRSA. 2 (5.4%) of these 37 USA 300 MRSA infections were healthcare-acquired infections occurring in the NICU and the oncology ward. Having an MRSA SSTI (OR 12.8 95%CI 2.6-64.1,  $p=0.002$ ) was significantly associated with the USA 300 strain. Longer length of stay (OR 0.92 95%CI 0.84-0.99,  $p=0.04$ ) was associated with a significantly lower likelihood of having an MRSA infection due to the USA 300 strain.

Conclusions: USA 300 CA-MRSA was responsible for the majority of MRSA isolated from children in our hospital. Children with MRSA infection, particularly those with SSTI were significantly more likely to have USA 300 CA-MRSA. Longer hospital stay and receipt of ICU care were associated with a significantly lower likelihood of having a USA 300 CA-MRSA. Despite the fact that the USA 300 strain caused the majority of MRSA colonization or infection, it was rare among healthcare-acquired MRSA, suggesting that empiric contact precautions for those with SSTI was effective in preventing transmission of USA 300 CA-MRSA within the children's hospital.