

# MRSA

## RESOURCE LINE

A QUARTERLY SUMMARY OF PEER-REVIEWED PUBLISHED LITERATURE

### Kitchens, bathrooms highly contaminated with MRSA and other pathogens

Scott *et al.* *A critical evaluation of methicillin-resistant Staphylococcus aureus and other bacteria of medical interest on commonly touched household surfaces in relation to household demographics.* *Am J Infect Control* 2009;37(6):447-53.

A sampling of homes in the Boston area revealed high levels of contamination with medically important pathogens, including methicillin-resistant *Staphylococcus aureus* (MRSA), in hand and skin contact surfaces such as kitchen and bathroom sinks.

Dr. Elizabeth Scott, Simmons College Center for Hygiene and Health in Home and Community, Boston, Massachusetts, and colleagues identified 35 homes in the metropolitan Boston area that met their inclusion criteria of having a child in diapers and a dog or cat in the home. “Environmental sampling was performed on 32 surfaces in each home using sterile swabs,” they noted.

The highest median aerobic counts were associated with the kitchen drain, faucet handles and sponge, bathroom floor around the toilet and bathtub, most constituting “wet sites,” researchers observed. Lowest median counts were recorded from the toilet seat and toilet bowl. Regarding specific pathogens, methicillin-

susceptible *S. aureus* (MSSA) was found in 34 out of the 35 homes and MRSA in nine of them.

Gram-negative bacteria belonging to either the *Enterobacteriaceae* or *Pseudomonadaceae* families were isolated from all 32 sites in one or more homes. “For the most part, wet sites were more frequently contaminated than dry sites, while the kitchen sites were always more frequently contaminated than the bathroom and other areas,” the authors reported.

They noted that 37% of the homes sampled had at least one person working in healthcare; of the nine homes that were positive for MRSA, two belonged to healthcare workers. Ultimately, however, results did not indicate that having a healthcare worker in the home was a significant predictor of MRSA contamination.

There was also some indication that homes in which a child was in daycare or households owning a cat were more likely to be contaminated but the difference was not statistically significant.

“To our knowledge, this is the first report of a study to isolate MRSA in ‘healthy homes,’ i.e. homes without a history of infection or antibiotic use,” investigators stated, “and it again confirms the importance of regular and effective cleaning and disinfection at targeted surfaces in the home.”

### MRSA infections among hospitalized children in the US on the rise

Gerber *et al.* *Trends in the incidence of methicillin-resistant Staphylococcus aureus infection in children’s hospitals in the United States.* *Clin Infect Dis* 2009;49(1):65-71.

According to the most comprehensive description to date of the epidemiology and burden of MRSA infection, the number of hospitalized children in the US with MRSA infection has increased significantly since 2002. The increase was largely driven by, but not

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**AIDS Patient Care STDS:** [www.liebertpub.com/APC](http://www.liebertpub.com/APC)

limited to, an increase in skin and soft-tissue infections (SSTIs).

Dr. Jeffrey Gerber, The Children's Hospital of Philadelphia, Department of Pediatrics, University of Pennsylvania School of Medicine, and colleagues carried out a retrospective, observational study using the Pediatric Health Information System to characterize *S. aureus* infections in children under the age of 18 who were hospitalized in one of 40 participating hospitals between January 2002 and December 2007. "During this six-year period, we identified 57,794 children with *S. aureus* infection, 29,309 [51%] of whom had MRSA infection," the authors reported.

The mean age of children who developed an *S. aureus* infection was 3.1 years and less than one-third of them had other complex or chronic medical conditions. Investigators found that over time, rates of MRSA infection increased from 6.7 cases per 1000 hospital admissions in 2002 to 21.1 cases per 1000 admissions in 2007.

In contrast, "The incidence of MSSA infection remained stable," they added. Children who developed an MRSA infection were more likely (47%) to have an SSTI than children with an MSSA infection, but were less likely (26%) to have a complex or chronic condition than children with an MSSA infection (34%). The median length of hospital stay for patients with an MRSA infection was five days and six days for those with an MSSA infection.

The authors pointed out that their analysis did not distinguish between community-associated (CA) and hospital-acquired MRSA infection. Nevertheless, "The observed increase in MRSA infections was likely driven by the recent dramatic emergence of CA-MRSA strains that occurred during the study period," they stated, "and the predominance of SSTIs among the cases of MRSA infection in our study is consistent with this hypothesis, because pediatric SSTIs predominantly originate in the community." Reassuringly, the mortality rate from all *S. aureus* infections was a low 2%.

## Increasing proportion of CA-MRSA isolates: Single-centre experience

*McMullen et al. The changing susceptibilities of methicillin-resistant Staphylococcus aureus at a midwestern hospital: the emergence of "community-associated" MRSA. Am J Infect Control 2009;37(6):454-7.*

**T**he number of MRSA isolates identified at a single centre over the past 10 years has consistently increased, with CA strains accounting for an increasing proportion of positive MRSA cultures.

Dr. Kathleen McMullen, Barnes Jewish Hospital, St. Louis, Missouri, and colleagues described their experience with MRSA cultures at the 1250-bed academic medical centre from 1996 to 2005. "All cultures positive for MRSA between 1996 and 2005 were abstracted from Barnes-Jewish Hospital's microbiology database and we used the first culture per patient per visit that was positive for MRSA," they reported. During the 10-year study interval, a total of 10,530 cultures were positive for MRSA. The median age of patients with MRSA decreased from 60 in 1996 to 49 in 2005.

During the same study interval, the annual prevalence of CA-MRSA increased significantly from 8.9% in 1996 to 39.6% in 2005. As for the CA-MRSA subset, the percentage of positive cultures obtained within 48 hours of admission increased from 53.5% in 1996 to 92.1% in 2005. MRSA isolates that remained susceptible to both clindamycin and trimethoprim/sulfamethoxazole suggested community association. Using time to culture as a surrogate for type of MRSA, "these data would indicate that the proportion of MRSA that was CA grew from 50% in 1996 to 80% in 2005," the authors observed.

The proportion of non-Caucasian patients with CA-MRSA also increased from 30.2% in 1996 to 60.4% in 2005, while the proportion of patients categorized as low socioeconomic status increased from 25.6% to 35.6% in 1996 and 2005, respectively. "An increasing number of MRSA with a CA phenotype occurred during the 10-year study," researchers concluded.

## High false positive rate with PCR assay negates use alone for MRSA screening in NICU

*Sarda et al. Active surveillance for methicillin-resistant Staphylococcus aureus in the neonatal intensive care unit. Infect Control Hosp Epidemiol 2009;30(9):854-60.*

**S**creening infants in the neonatal intensive care unit (NICU) with real-time, polymerase chain reaction (PCR) assays to detect MRSA colonization should not be used alone because the assay has a high false positive rate, according to Chicago-based investigators.

Dr. Vanessa Sarda, University of Illinois Medical Center, Chicago, and multicentre colleagues compared PCR with bacterial culture methods for MRSA screening in their NICU between March and November 2007. "Patients in the NICU were screened for MRSA on

admission and weekly thereafter until discharge,” they commented, “and healthcare workers were also screened as part of an outbreak investigation.”

During the period of active surveillance, 435 infants were admitted to the NICU and 1873 nasal swab specimens were collected. Of these, 21 infants (4.8%) of the overall sample size tested positive for MRSA by PCR testing but only 11 of the 21 infants (52.4%) had concomitant positive bacterial culture results. As the authors observed, “Only patients with positive culture results developed frank MRSA infection and this occurred at a fairly low frequency,” which was in two out of 11 patients.

The PCR assay had a sensitivity of 100% in the study and a specificity of 97.6%. The positive predictive value was 52.4% while the negative predictive value was 100%, investigators explained. “This demonstrates that in a low-prevalence setting, even a highly specific screening test can be misleading because a high proportion of positive results will be falsely positive.” False-positive PCR test results can lead to not only wrongful identification of outbreaks but also a disruption in patient care and a significant waste of hospital resources.

“We conclude that in the NICU, the PCR assay is overly sensitive with a low reproducibility rate for patients that have a concomitant negative culture result,” the authors stated, “and we therefore propose that PCR screening be used in conjunction with bacterial cultures for MRSA surveillance in the NICU.”

## HIV patients highly susceptible to CA-MRSA skin and soft tissue infections

*Crum-Cianflone et al. Recurrent community-associated methicillin-resistant Staphylococcus aureus infections among HIV-infected persons: incidence and risk factors. AIDS Patient Care STDS 2009;23(7):499-502.*

According to Dr. Nancy Crum-Cianflone, Uniformed Services University of the Health Sciences, Bethesda, Maryland, and colleagues, patients infected with HIV are highly susceptible to CA-MRSA SSTIs and are more likely than non-HIV patients to experience recurrent infections.

Researchers carried out a retrospective study to identify all wound culture-proven MRSA infections in all HIV-infected patients seen at the Naval Medical Center San Diego, California, between January 2000 and June 2007. Their mean CD4 cell count was 445 cells/mm<sup>3</sup>, 48% had HIV-1 RNA levels <1000 copies/mL and 71% of the

group were receiving HAART when they acquired the infection.

Thirty-one of 458 patients (6.8%) had wound culture-proven CA-MRSA infections, the authors reported. The incidence rate of CA-MRSA was 12.3 infections per 1000 person-years. Importantly, 14 out of the group overall (41%) developed a recurrent SSTI, seven of which (21%) had a confirmed recurrent CA-MRSA infection. “The median time between recurrent infections was four months,” the authors noted, “and all recurrences occurred in a unique location from the initial infection.” In all cases, the first infection had completely resolved before patients developed a recurrent infection; because recurrence was noted at a novel site, the authors felt that reinfection was the source of the recurrent infection.

Investigators also found that in their univariate model, patients who developed a recurrent SSTI had lower CD4 cell counts at 334 cells/mm<sup>3</sup> compared with those who did not develop a recurrent infection at 502 cells/mm<sup>3</sup>, higher HIV-1 RNA levels at 4.3 copies/mL vs. 1.8 copies/mL and were less likely to undergo incision and drainage procedure at the time of the initial MRSA infection. In the final multivariate model, HIV-1 RNA levels of <1000 copies/mL was associated with a lower rate of recurrence.

The authors concluded that better control of HIV might help reduce the risk of HIV-infected patients developing a CA-MRSA, although prospective studies on preventive strategies are needed.

## High salvage success rates with linezolid-based regimen in persistent MRSA bacteremia

*Jang et al. Salvage treatment for persistent methicillin-resistant Staphylococcus aureus bacteremia: efficacy of linezolid with or without carbapenem. Clin Infect Dis 2009;49(3):395-401.*

Early microbiological responses and salvage success rates have been shown to be significantly higher with a linezolid-based regimen than with comparator regimens in patients with persistent MRSA bacteremia.

Dr. Hee-Chang Jang, Seoul National University College of Medicine, Republic of Korea, and colleagues evaluated the efficacy of linezolid with or without carbapenem in salvage treatment of persistent MRSA bacteremia. A total of 35 patients with persistent MRSA bacteremia (>7 days) who were treated at the Seoul National University Hospital were studied. During the

study, carried out between January 2006 and March 2008, investigators identified 377 cases of *S. aureus* bacteremia.

“Of the 377 cases of *S. aureus* bacteremia, 41 [11%] were persistent despite administration of appropriate antibiotic,” investigators noted, with more cases (17%) of MRSA bacteremia being persistent than MSSA (4%). Duration of persistent bacteremia was also longer for MRSA bacteremia at a median of 12 days than for cases of MSSA bacteremia at a median of seven days.

Researchers observed that linezolid-based therapy had a salvage success rate of 88%. In contrast, “Adding aminoglycosides or rifampicin to vancomycin was not successful in any case,” they stated. Among six patients who failed treatment despite the addition of aminoglycosides or rifampicin, five were successfully treated with a linezolid-based regimen. Importantly, *S. aureus*-related mortality rates were significantly lower for patients who were treated with a linezolid salvage regimen (13%) than for patients who continuously received a vancomycin-based regimen (53%).

“We found that linezolid-based salvage therapy was effective in eradicating *S. aureus* from the blood within 72 hours for patients with persistent MRSA bacteremia,” investigators noted. While the efficacy of the regimen

was good, the occurrence of thrombocytopenia limited prolonged use for more than four weeks, likely due to the high proportion of serious underlying diseases resulting from persistent bacteremia. Nevertheless, after achieving a negative blood culture with linezolid, the subsequent use of vancomycin for four to six weeks was found to be successful. □

## UPCOMING EVENTS

### **Infection Prevention 09: Annual Conference and Exhibition of the Infection Prevention Society**

September 21-23, 2009 / Harrogate, UK  
[www.infectionpreventionconference.org](http://www.infectionpreventionconference.org)

### **3rd International High Containment Operations and Maintenance Workshop**

September 21-25, 2009 / Winnipeg, Manitoba  
[www.biosafety.ca/om/](http://www.biosafety.ca/om/)

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