



CONTAGIOUS COMMENTS

Department of Epidemiology

Community Acquired MRSA in Children

Ann-Christine Nyquist, MD, MS

Elaine Dowell, SM (ASCP) and John James, PhD

In many areas of the United States and throughout the world, Methicillin-resistant *Staphylococcus aureus* (MRSA) is an established community pathogen. Humans are a natural reservoir for *S. aureus*, and the anterior nares and skin are usual sites of colonization, which may persist for years. Until recently, nearly all attention focused on nosocomial MRSA strains, and most clinicians regarded community-acquired *S. aureus* strains as penicillin resistant and methicillin sensitive.

In 1997, the issue of community-acquired MRSA became much more visible and disturbing when 4 children in Minnesota and North Dakota died of infections caused by this organism. Infections with CA-MRSA are now widespread with reports of outbreaks in correctional facilities, participants in contact sports such as wrestling and football and in military personnel. Recurrent skin infections are common (even more frequent in children with eczema). Infection in more than one family member is common. Clinical presentations of wounds that look like an "insect bite or spider bite," folliculitis, pustular lesions, boils and abscesses may be CA-MRSA. Although most of these cases involve skin and soft tissue infections; approximately 5% are associated with invasive diseases including bacteremia, necrotizing pneumonia, septic arthritis, and bursitis. This requires that laboratories rapidly identify MRSA. TCH uses the PBP2a agglutination test to detect the protein product of the *mec* gene. This saves a day of turn-around-time over the standard protocol.

Molecular epidemiology studies of MRSA strains suggest that CA-MRSA strains are different than strains of HA-MRSA. The major differences are that CA-MRSA have low MIC levels of methicillin resistance, methicillin hetero-resistance, lack of multiple antibiotic resistance, staphylococcal cassette chromosome (SCC) *mec* type IV, and the presence of genes encoding for the production of the Panton-Valentine Leucocidin (a toxin that enhances the organisms ability to cause skin infections), as well as the staphylococcal enterotoxins B and C super-antigens. Worldwide, it appears that CA-MRSA arose in a wider variety of methicillin sensitive *S. aureus* strains that did HA-MRSA, and that some CA-MRSA strains have additional virulence factors. An abbreviated view of the molecular epidemiology of MRSA in the USA is shown in Table 1.

USA Pulse-Field Type	Multilocus Sequence Type	SCC <i>mec</i> Type	Panton-Valentine Leucocidin	Community Associated (CA) or Hospital Associated (HA)
100	5	II	-	HA
200	36	IV	-	HA
300	8	II	+	CA
400	1	IV	+	CA+HA
500	8	IV	-	HA
600	45	IV	-	HA
700	72	IV	-	HA
800	5	II	-	HA
1,000	59	IV	+	CA
1,100	30	IV	+	CA

Clones of CA-MRSA are distinct from MRSA causing nosocomial infections. CA-MRSA may be less likely than CA-MSSA to cause invasive infections. CA-MRSA strains are more likely than nosocomial MRSA isolates to be susceptible to TMP/SMX, gentamicin and clindamycin although special laboratory methods must be used to assure clindamycin susceptibility. Table 2 shows the 2003 antibiogram for overall *S. aureus* isolates from the TCH Microbiology Laboratory; the most noticeable change has been a dramatic increase in CA-MRSA strains.

Gram Positive Organisms (% susceptible)		ANTIMICROBIALS						
ORGANISMS	NUMBER OF ISOLATES	Penicillin (IV / PO)	Oxa-/Naf-/Dicloxacillin (IV / PO)	Cefazolin / cephalexin (IV / PO)	Trimethoprim / sulfa (IV/PO)	Erythromycin (IV / PO)	Clindamycin (IV / PO)	Vancomycin (IV)
Staph aureus								
<i>Staph aureus</i> (MSSA) [†]	181	12	100	100	100	85	88	100
<i>Staph aureus</i> (MRSA) [†]	103	0	0	0	100	19	47	100

[†] May include > 1 isolate / patient.

Table 3 is a summary for the first half of 2004 for MRSA and MSSA separated by outpatient and inpatient isolates reflecting the widespread nature of CA-MRSA in the community. Currently 25% of the isolates identified as *S. aureus* are MRSA. Although the numbers are small, a subgroup from Aurora Urgent Care reflects 42% of *S. aureus* isolates as MRSA.

Table 3. MRSA and MSSA Summary First Half of 2004

	MRSA Total	MSSA Total	Total <i>S. aureus</i>	MRSA Rate
Outpatient (TCH ED, Aurora UC, Broomfield UC, CHC)	21	63	84	25%*
TCH Inpatient	38	304	342	11.1%

* Aurora Urgent care had 19 *S. aureus* isolates identified in the first half of 2004; 42% of these were MRSA.

How should you deal with this increase in CA-MRSA? Given that pyoderma or cellulitis can be caused by a number of different organisms (MRSA, MSSA, Gp A Strep) that require different treatments, a culture before treatment becomes more important. Incision or drainage of abscesses may be helpful in addition to a bacterial culture of the wound. Minor skin infections or abscesses caused by CA-MRSA in healthy children usually resolve with beta-lactam antibiotics ± surgical drainage, but good follow-up is critical. If the focus is moderate to severe, it is critical to obtain a culture (i.e., needle aspirate). A gram stain may help to narrow antimicrobial coverage, but if not available, the oral combination of trimethoprim / sulfamethoxazole or clindamycin for CA-MRSA in addition to cephalexin (Keflex) for Group A beta strep coverage may be indicated. Antimicrobial recommendations for hospitalized patients where MRSA is a consideration should include Vancomycin and Clindamycin until bacteria identification and susceptibilities are known.

In health care facilities, inanimate surfaces are occasional sources of nosocomial spread, although the contaminated hands or gloves of health care workers usually serve as intermediate

transmission vectors. Thus, strict infection control policies such as we have at TCH that include isolation and barrier precautions are critical components of prevention. Hand hygiene and wound coverage also are important to prevent transmission.

Community physicians should focus on good handwashing between patients and proper cleaning of the examination rooms. There are currently no restrictions in the community (i.e., daycare, school) for patients with MRSA. In 2003, the Colorado Department of Public Health and Environment (CDPHE) convened an MRSA in School / Childcare Settings Working Group. The group developed recommendations that can be used to determine the appropriateness of children with MRSA attending these settings. Many factors are taken into consideration as each situation is often unique. These recommendations can be found on the CDPHE Web site (http://www.cdphe.state.co.us/dc/epidemiology/CO_MRSA_schools5_03.pdf).

CA-MRSA continues to be an ever increasing problem in the pediatric setting. Because MRSA can be a serious nosocomial pathogen, isolation precautions in the inpatient and TCH hospital associated (KidStreet, Medical Day Treatment) are very stringent and often disqualify known MRSA patients from participation in these programs. Community outpatient settings are very different for potential risks and require excellent hand hygiene by health care providers. The Colorado Department of Public Health and Environment has published a policy recommendation to help schools when a child has MRSA.



**CONTAGIOUS COMMENTS
Department of Epidemiology**

NON-PROFIT ORGANIZATION
U.S. POSTAGE
P A I D
DENVER, CO
PERMIT NO. 1050



The Children's Hospital Association
1056 East 19th Avenue, Denver, Colorado 80218



Affiliated with
University of Colorado Health Sciences Center

EDITOR:

Diane Carter, Staff Assistant III
The Children's Hospital, Department of Epidemiology, B-276
1056 E. 19th Avenue, Denver, CO 80218
Phone: 303-861-6072; FAX: 303-837-2631

Carter.Diane@tchden.org
www.thechildrenshospital.org
We Recycle!

©