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Epidemiology Newsletter

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Community-Associated Methicillin-Resistant *Staphylococcus aureus* Surveillance in Clark County, Nevada: Strategies for Clinical Management

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In June 2004, the Southern Nevada Health District Office of Epidemiology (OOE) newsletter reported on the emergence of Community-Associated Methicillin-Resistant *Staphylococcus aureus* (CA-MRSA), a genetically different strain from health care associated MRSA (HA-MRSA). Continuing disease surveillance activities for MRSA have revealed that CA-MRSA is common in Clark County. Results from various surveillance projects, and a summary of the March 2006 publication from the Department of Health and Human Services (DHHS) and the Centers for Disease Control and Prevention (CDC) regarding the clinical management of MRSA skin and soft tissue infections (SSTIs) in the community[1] will be presented in this report.

MRSA Surveillance Projects

The OOE has been conducting enhanced surveillance for CA-MRSA since March 2004. While several projects have been conducted in this time period, results from the following projects will be reported:

1. analysis of Clark County Detention Centers (CCDCs) skin and soft tissue (SSTI) MRSA surveillance data from 2004 and 2005
2. analysis of voluntary reports received from infection control (IC) nurses from Clark County Hospitals
3. analysis of urban municipal hospital SSTI data, March 2005 through October 2005
4. examination of antibiotic sensitivity data from Quest Diagnostic Laboratories

The CA-MRSA case definition used for surveillance is as follows:

- A culture positive diagnosis of MRSA made in the outpatient setting, or within
- 48 hours after admission to the hospital, and;
- no medical history in the past year of:
  - MRSA infection;
  - hospitalization or surgery;
  - long-term care facility residence;
  - end-stage renal disease and/or dialysis;
  - permanent indwelling catheters or percutaneous medical devices; and/or
  - employment in the health care profession.

Results

1. CCDCs MRSA SSTI Surveillance

Beginning in January 2004 through December 2005, the OOE received 1,014 MRSA positive SSTI results from the Clark County, City of Las Vegas, North Las Vegas, and City of Henderson detention centers. The anatomic site distribution of MRSA SSTI infections from CCDCs are reported in Table 1. Culture and sensitivity (C&S) results obtained through Quest Diagnostic Laboratories, a portion of which are represented in the Quest data section of Table 2, indicate these isolates are susceptibile to trimethoprim-sulfamethoxasole (TMP-SMX), rifampin and linezolid but have increasing resistance to levofloxacin .

Table 1. Anatomic sites for MRSA SSTI infections in Clark County, NV detention centers, 2004/2005.

Anatomic sites	2004 N (%)	2005 N (%)
Lower extremity	126 (27)	142 (26)
Upper extremity	122 (27)	133 (24)
Upper trunk	15 (3)	36 (7)
Lower trunk (including genitals)	51 (11)	110 (20)
Head & neck	50 (11)	52 (9)

** Note – columns do not total 100% due to the potential for multiple lesions per patient (not mutually exclusive categories)

2. Clark County Hospital Study

Five hundred ninety two reports meeting the case definition for CA-MRSA were received from IC nurses in 2004 and 2005. C&S results from these isolates indicate a high susceptibility to trimethoprim-sulfamethoxasole (TMP-SMX), rifampin, linezolid, and tetracycline; a moderate susceptibility to clindamycin; and a low susceptibility (less than 50%) to levofloxacin and erythromycin (Table 2). One hundred of these patients were interviewed to determine the presentation of the initial infection and the occurrence of common risk factors previously identified in CA-MRSA outbreaks across the nation. Data obtained from these interviews revealed that 50% of the cases initially perceived they had been bitten by an insect or spider, 19% had contact with a detention center detainee, and 17% of persons were associated with an employee of a detention center or healthcare facility.

Table 2. MRSA susceptibility percentages of isolates obtained from skin and soft tissue infections from two databases (Quest Diagnostics Laboratories and CA-MRSA surveillance database) Clark County, NV - January 2004 through November 2005.**

Antibiotic	Quest Diagnostics Database			Surveillance Database		
	S (N)	I	R	S (N)	I	R
Levofloxacin	36.7 (2845)	25.6	37.6	43.6 (567)	20.8	35.6
Rifampin	98.3 (2841)	0.3	1.4	98.9 (582)	0.2	0.9
TMP-SMX4	97.4 (2843)	0.0	2.6	99.5 (576)	0.0	0.5
Linezolid	100.0 (2798)	0.0	0.0	99.0 (510)	0.4	0.6
Tetracycline*	--	--	--	94.7 (490)	0.8	4.5
Clindamycin*	--	--	--	66.2 (222)	1.4	32.4
Erythromycin*	--	--	--	7.7 (543)	1.7	90.6

S=susceptible, I=intermediate susceptibility, R=resistant, N=number of organisms tested

*Quest Diagnostics Laboratories does not routinely include these antibiotics within the susceptibility panels for MRSA.

**Quest Diagnostic Laboratories data from January 2004 through August 2005, CA-MRSA surveillance data from May 2004 through November 2005.

3. Urban Municipal Hospital SSTI Study

C&S results of SA isolates for all culture sites of patients seen at an urban municipal hospital in Las Vegas were reviewed from March 1 through October 30, 2005. A lateral case-control study of patients with SA SSTIs (118 MRSA vs 70 Methicillin Sensitive *Staphylococcus aureus (*MSSA)) who were either seen in the Emergency Department or were recently admitted, was also conducted. Results indicate that SSTIs represent the single largest source of SA (40%) infections in this hospital; isolates from SSTIs had a higher frequency of MRSA than MSSA (69.3% vs 30.7%) and SA isolates from SSTIs had a higher frequency of MRSA than other specimen sites (69.3% vs 57.6%). Patients with MRSA SSTIs had demographic and clinical features including younger age, presenting earlier to the hospital after symptom onset, reporting of an insect or spider bite, and a higher frequency of intravenous drug use than patients with MSSA SSTIs.

4.Laboratory Study

Quest Diagnostic Laboratory's bacterial culture results from January 2004 through August 2005 were analyzed in order to identify the most common forms of bacteria associated with SSTIs. Interestingly, approximately 92% of SSTIs (determined by including only specimens in the database most likely obtained from a skin infection) are represented by seven different organisms (Table 3), with *Staphylococcus aureus* (SA) in the majority (74.1%). Of these, approximately 57% were resistant to oxacillin. The susceptibilities of these MRSA isolates (N=2847) were subsequently analyzed with the results recorded in Table 2. These data show that the majority of the MRSA isolates representing non-healthcare associated SSTIs are susceptible to TMP-SMX, rifampin and linezolid but were only 37% to 44% susceptible to levofloxacin (Table 2). Similar results were seen when analyzing the susceptibility panels of the 592 case reports received from local IC practicioners which also revealed a high susceptibility of MRSA to tetracycline (Table 2).

Table 3. Organisms* most commonly isolated from skin and soft tissue infections, Clark County, NV – Jan 2004 through August 2005 (N=6741).**

Organism	Percent (N)
Staphylococcus aureus†	74.1 (4997)
Pseudomonas aeruginosa	8.7 (588)
Escherichia coli	2.6 (174)
Enterobacter cloacae	1.9 (130)
Streptococci Group G	1.9 (130)
Proteus mirabilis	1.6 (111)
Acinetobacter spp.	1.5 (104)

* Data courtesy of Quest Diagnostics Laboratories excludes results obtained from hospitals, surgical and dialysis centers, and long-term care facilities.

** SSTIs were determined by database review for specimen sources most likely to indicate skin infection

† 57% of these *Staphylococcus aureus* isolates are methicillin resistant (MRSA)

Analysis was also conducted of susceptibility data from MRSA isolated from all body sites, which was received from three major laboratories in 2005 and the first quarter of 2006. Table 4 includes those antimicrobials that are greater than 90% effective for treatment of MRSA infections.

Table 4: Oral antibiotics to which Methicillin-Resistant *Staphylococcus aureus* isolated from various body sites (Total N=9003), has greater than 90% Susceptibility* January 2005 through March 31, 2006*

Antibiotic	No. of Isolates Tested	S (%)
Linezolid	8031	100
Nitrofurantoin†	702	99
Rifampin	8980	97
TMP-SMX	8955	95
Tetracycline	1676	93

*Data aggregated from three laboratories in Clark County, NV: Quest Diagnostics, Sunrise Hospital, University Medical Center. University Medical Center data is from January 2005 through February 6, 2006.

†Sensitivity testing for nitrofurantoin is only included when the specimen source is urine

Discussion:

Outpatient data in Clark County shows that of laboratory confirmed SSTIs, 74.1% were culture positive for *Staphylococcus aureus* (SA) and 57% of these were methicillin resistant (MRSA). In the hospital setting, representing both the inpatient and outpatient population, SSTIs have been shown to represent as much as 40% of all SA infections, 69.3% of which are MRSA. Since historically, cefalexin has been routinely prescribed for SSTIs and cefalexin (a beta-lactam antibiotic) is ineffective against MRSA, healthcare providers should consider modifying routine prescribing practices to reflect the current status of antimicrobial resistance within the community. When considering antimicrobial treatment of SSTIs, ideally, a specimen should be obtained for culture and sensitivity. Currently TMP-SMX, TMP-SMX and rifampin combined (recommended by the Bureau of Prisons in conjunction with the CDC), and tetracycline have been identified as the most effective oral antimicrobial choices for empiric treatment when considering the limited spectrum of antimicrobial agents utilized in susceptibility panels available in Clark County. Judicious prescribing practices need to be exercised to avoid development of resistance to these antimicrobials over time. Additionally, if the isolate is resistant to erythromycin, clindamycin should only be used when the D-test, (used to determine if there is inducible resistance to clindamycin) indicates susceptibility. The most recent strategies for clinical management of MRSA SSTIs in the community[1] are outlined in Box 1 (see page 4).

References:

1. Gorowitz, RJ, Jernigan, DB, Powers, JH, Jernigan, JA. "Strategies for Clinical Management of MRSA in the Community: Summary of an Experts' Meeting Convened by the Centers for Disease Control and Prevention. March 2006. http://www.cdc.gov/ncidod/dhqp/pdf/ar/CAMRSA_ExpMtgStrategies.pdf

Box 1: Summary of DHHS/CDC Strategies for Clinical Management of MRSA in the Community with a Focus on Skin and Soft Tissue Infections (SSTIs)[1]

- **Consider MRSA in:**
  - differential diagnosis of SSTIs
  - other syndromes compatible with SA infection
- **Collect appropriate clinical specimens for C&S from patients with abscesses or purulent skin lesions, particularly those with:**
  - Severe local infections
  - Systemic signs of infection
  - History suggesting connection to a cluster or outbreak of epidemiologically linked individuals
- **Appropriate clinical specimens include :**
  - fluid from a purulent lesion or abscess cavity
  - respiratory secretions (e.g., sputum, tracheal aspirations)
  - blood from a moderately or severly ill patient with s/s of systemic infection
  - other specimen from a normally sterile site suspected to be an infection focus
- **Perform incision and drainage (I&D) as primary therapy for furuncles, other abscesses, and septic joints.**
  - If unsure of pus presence, aspirate fluid from lesion w/ 16-19 ga needle and 10 cc syringe
  - Use moist heat for small furuncles not amenable to I&D to promote drainage
- **Consider empiric therapy when purulent skin lesions present with:**
  - Cellulitis
  - Signs and symptoms of systemic illness
  - Co-morbidities or immunosuppression
  - Age extremes
  - Location of abscess in a difficult to drain/clean area
  - Lack of response to I&D alone
- **Consider prescribing the following beta-lactam alternatives if in accordance with local susceptibilities**
  - Clindamycin (D-test if erythromycin resistant)
  - Tetracyclines
    - Doxycycline
    - Minocycline
  - TMP-SMX
  - Rifampin (only in combination with other AMs)
  - Linezolid (only in consultation with an infectious diseases consultant)
- Avoid using antimicrobials that have a potential for rapidly developing resistance such as:
  - Fluoroquinolones
  - Macrolides

Educate patients on how to prevent infecting others