

## **METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA) OUTBREAK IN THE LOS ANGELES COUNTY JAIL SYSTEM**

### **BACKGROUND**

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a well-characterized nosocomial pathogen that for many years was thought to affect only individuals residing in healthcare facilities [1]. Reports of community-acquired infections began in the 1980's with infections seen among intravenous drug users in Massachusetts and children in Missouri [2,3]. Most community-acquired infections manifest as moderate to severe skin infections and can lead to more serious conditions such as osteomyelitis, endocarditis and even death if not treated appropriately [4]. To date, only one published study has examined the impact of bacterial skin infections in an incarcerated population [5]. The lack of information concerning bacterial skin infections among incarcerated populations has serious implications for the treatment and control of MRSA infections among persons residing in correctional facilities.

The Los Angeles County Department of Health Services (LAC DHS) received a report of an increase in MRSA skin lesions in the Los Angeles County Jail (LACJ) system in June 2002. The lesions included boils, abscesses and "spider bites" in inmates beginning in February 2002. The LACJ is the largest jail system in the United States with an average of 20,000 individuals sleeping in its facilities each night. An outbreak of MRSA in a population of this size had not previously been documented. ACDC began an investigation to determine the extent of the outbreak and to develop prevention and control measures for the LACJ.

### **METHODS**

Using multiple sources of data provided by the LACJ and Quest Diagnostics Laboratory (the clinical microbiology laboratory for the LACJ), inmates with a positive culture for MRSA from a wound site or blood specimen from January 2002 through December 2002 were identified. Inmates with more than one positive MRSA culture between January and December 2002 were counted as an incident case in the first month a positive culture was recorded. Variables chosen for analysis included age, sex, facility of residence at the time of positive culture, time from admission to the LACJ (booking date) to date of positive culture, site of the MRSA positive wound infection and percentage of all wound cultures testing positive for MRSA. Antibiotic resistance patterns among isolates from incident cases were analyzed using antibiotic sensitivity data extracted from laboratory culture reports. All inmates requiring hospitalization are sent to one DHS hospital. Hospital infection control line lists were gathered from 1998 through 2002 in order to analyze inmates MRSA hospitalization trends over time. Hospitalized inmates with pus and wound or blood infections were included in the analysis.

### **RESULTS**

A total of 921 MRSA cases were identified in the LACJ system between January and December 2002 (Figure 1); 792 cases (87.3%) were male, and the median age was 36 years (range 18–73). The median time from booking date to the first MRSA positive wound culture was 44 days—the same median time that an average inmate is housed in the jail system. Eighty-three cases (9%) developed their MRSA infection within 5 days of being in the jail system. A total of 973 separate wound infections with MRSA were identified from the 921 cases as some inmates had multiple wounds that tested positive for MRSA. Wounds on the lower body were more common, accounting for 52.9% of all MRSA infection sites.

A total of 1247 wounds were cultured between January and November 2002. Of the wounds cultured each month, 53%–76% (mean 62%) were positive for MRSA (Figure 2).

Laboratory reports for 556 of the tested MRSA isolates were available for review. All of the tested isolates were susceptible to vancomycin and rifampin and most were susceptible to trimethoprim/sulfamethoxazole (TMP/SMX) (98.4%) and clindamycin (97.3%). Isolates showed partial resistance to fluoroquinolone antibiotics (31.2–86.5%) as well as erythromycin (94.2%) and tetracycline (34.7%). All isolates exhibited resistance to the beta-lactam antibiotics.

From 1998 through 2002, 132 inmates were hospitalized in the jail ward with a confirmed MRSA infection. The number of inmates hospitalized with an MRSA infection increased every year since 1998 (Figure 3). A steep rise in hospitalized cases was noted between 2000 and 2001, increasing from 13 to 45. The trend continued in 2002 with 67 MRSA hospitalizations recorded.

## **DISCUSSION**

ACDC investigated an MRSA outbreak in the LACJ that was presumed to have begun sometime in 2001 after discovering a large spike in the number of MRSA hospitalizations that year. In 2002, a total of 921 cases were identified from multiple sources of data. While the number of cases fluctuated monthly, since January 2002, more than 50 new MRSA cases have been documented in the jail system each month.

Anecdotal reports at the start of the outbreak suggested spider bites as the causative agents for the wounds. However, after a thorough search for spiders in the inmate living quarters uncovered only non-biting spiders, it was concluded that the wounds must not have been caused by spider bites. The lack of spiders combined with the large number of wounds located on the lower body point to lack of hygiene as the primary factor in the development of MRSA infections in this population. New linens and laundry were provided once and twice a week respectively and showers were given at most every other day in some facilities. In addition, the provision of shower and phone privileges during the same time frame or inmates missing shower time due to facility transfers lead to inmates showering on a decreasingly frequent basis while in the jail. Inmates are given a cup of detergent once a month with which to clean their cells, though this cleaning rarely occurred. Living conditions such as these promote improper hygiene, which can lead to an increase in disease in general and MRSA infections specifically.

While the above analysis describes the MRSA situation in the LACJ system during 2002, there are limitations in the data. Only infections that were cultured in the medical clinic or in the hospital jail ward were included in this descriptive analysis. Any inmate with an MRSA infection, but not presenting to the medical clinic for evaluation or not having a culture performed on the lesion could not have been included in the MRSA case total. It is likely then that incident MRSA cases were underestimated during the course of the investigation due to self-selection bias or medical oversight.

Alternatively, an overestimation of incident cases may have occurred by counting prevalent cases as incident cases in 2002. Since complete medical histories were not available for any of the cases included in the study, inmates with a positive culture for MRSA in 2002 were counted as incident cases regardless of prior MRSA infection. This method of case counting could lead to severe misclassification bias, especially if a large portion of the identified cases had MRSA infections diagnosed prior to 2002.

Since cases and descriptive data were collected from multiple different sources, the information gathered for each individual case varies, which limits the conclusions that can be drawn from the data. Basic descriptive characteristics of cases such as race, ethnicity, co-morbidities and course of treatment for MRSA infection could not be evaluated due to the sparse amount of information collected for these factors. However, these characteristics are important in describing the basic parameters that define an outbreak. Without sufficient knowledge of these characteristics it is difficult to present a complete picture of the MRSA outbreak in the LACJ system.

## RECOMMENDATIONS

Based on the findings, a set of recommendations was provided to the LACJ system in August of 2002 outlining specific actions that should be taken to control the spread of MRSA in their facilities. Recommendations included increasing surveillance for MRSA infections, educating for staff and inmates on MRSA infections, increasing opportunities for inmate personal hygiene including the removal of disincentives for maintaining personal hygiene, immediate cell cleaning for inmates with suspect MRSA infections, increasing laundry changes for all inmates and limiting facility transfers for inmates with open wounds. Additionally, a plan was developed for the treatment of soft tissue infections. The plan stressed wound drainage and subsequent wound care as the first line of treatment for a soft tissue infection. If drainage did not cure the infection or if drainage was not possible, appropriate antibiotics should be provided to the inmate. Since the investigation revealed more than 50% of all wounds cultured grew MRSA, an antibiotic regime that would appropriately treat an MRSA infection was recommended. TMP/SMX with rifampin or clindamycin with rifampin were suggested based on the antibiotic sensitivities of the previously tested MRSA isolates.

Using the median time from booking date to culture date and comparing this to the median stay in the LACJ system, the longer a person is in the jail system, the greater their risk is of developing an MRSA wound infection. Nine percent of the cases had developed their infection within five days of entering the jail system, which would indicate that they had acquired the infection outside of the jail system. This has implications for controlling the MRSA outbreak. MRSA is unlikely to be eradicated from the LACJ given the constant reintroduction of the bacterium from outside the LACJ.

Due to the severity of MRSA skin infections and the difficulty in eliminating the spread of this disease in large incarcerated populations, it is important for jail and prison medical staff to be vigilant in monitoring MRSA infections in their institutions. Increases in MRSA infections should be identified as early as possible to not only limit the spread of disease, but also to increase the chance of eliminating the pathogen from the facility.

## REFERENCES

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