AAOS Now

How USC football tackled MRSA

By Carolyn Rogers

USC study details strategies used to contain MRSA outbreak

Thanks to a well-orchestrated offensive strike by athletic trainers, physicians, and disease specialists at the University of Southern California (USC), a once-rampant bacterial infection among USC football players now appears to be largely contained.

Methicillin-resistant *Staphylococcus aureus* (MRSA) was once primarily a hospital-acquired organism. Recently, though, outbreaks of community-acquired MRSA (CA-MRSA) have occurred among otherwise healthy athletes and the public at large.

This highly contagious infection is particularly menacing because it is resistant to an entire class of antibiotics, making it more difficult to treat. Because MRSA also has a predilection for skin and soft tissue and is more virulent than methicillin-sensitive *S aureus*, it can cause rapidly progressive cellulitis and necrotizing abscesses.

Athletes at risk

Athletes who participate in contact sports are particularly susceptible to complicated skin and soft-tissue infections (cSSTIs) caused by skin trauma, such as turf burns, abrasions, shaving, and chafing. Football and wrestling are the most commonly affected sports nationally, due to the greater amount of skin-on-skin contact and the large number of athletes congregating in common locker rooms.

"Outbreaks of CA-MRSA in sports teams are very serious, and recognition is crucial to avoid further complications," says **Paul D. Holtom, MD,** associate professor of infections, disease and orthopaedics at the USC Keck School of Medicine. "Without proper referral and care, more serious infections may cause pneumonia, bloodstream infections, or surgical wound infections."

Dr. Holtom—along with Russ Romano, USC head athletic trainer; and Doanh Lu, MD, fellow in the division of infectious diseases at Keck School of Medicine—conducted a three-year retrospective study documenting potential MRSA cases among USC football players.

Their report, "Outbreak of community-acquired methicillin-resistant *Staphylococcus aureus* skin infections among a collegiate football team," was published in the April-June 2006 *Journal of Athletic Training*. (To read the report, visit: http://www.pubmedcentral.gov)

As part of the study, the researchers reviewed the medical records of past USC football seasons a cSSTIs or SSTIs requiring surgical dbridement and/or hospitalization caused by MRSA over the pr

MRSA vs. USC football

USC football's first encounter with MRSA occurred during the 2002 season, when two players were hospitalized with severe cSSTIs resulting from MRSA.

One player first developed a painful pimple on his elbow, flu-like symptoms, and low-grade fever. The infection quickly developed into necrotizing fasciitis, and the athlete underwent multiple surgical procedures, including skin grafts, before ultimately recovering.

The second player was hospitalized with a painful abscess on his lower leg. He received intravenous and oral antibiotic therapy, and the abcess was incised for drainage. He also recovered.

Once the two cases had been identified, the Los Angeles County Department of Health Services initiated an investigation into the MRSA outbreak at USC.

"As a result of the investigation, a number of measures were instituted, including the use of a 3 p hexachlorophene (pHisoHex) in showers and bathrooms, covering all open wounds, increased em trainer hygiene and universal precautions, not allowing athletes in whirlpools when they had oper discontinuing multiuse lotions with pumps or other preparations for massage," Dr. Holtom says.

In addition, players were instructed on the importance of showering; advised to refrain from sharing towels, equipment, and personal items; and directed to report any suspicious skin lesions to the medical staff immediately.

No further cSSTIs occurred that season.

Infections spike in 2003

Unfortunately, the cSSTI rate surged during the 2003 USC football season. Seventeen of the 107 players on the team presented with MRSA-like infections—all requiring surgical incision and drainage. Eleven players were later confirmed as being infected with MRSA, and six of the 11 were hospitalized. Another six players had probable cases, with abscesses requiring incision and drainage, but no cultures were performed.

After the fifth player reported an infection, the staff athletic trainers, team physicians, and a consultant infectious disease physician met to discuss infection control strategies, Dr. Holtom reports.

Topics discussed during the meeting included how to recognize common signs and symptoms of MRSA-associated cSSTIs; bacterial transmission; appropriate treatment options; a review of infection control techniques in the athletic training room, locker room, weight room, and laundry facility; personal hygiene; and educating administrators, coaches, and athletes.

They subsequently established the following protocol for the treatment of cSSTIs:

- All abscesses receive incision and drainage.
- All open wounds are covered with dressings to prevent transmission.
- Bacterial cultures are taken whenever possible.

The following antibiotic therapy was administered:

- 100 mg of doxycycline twice a day and 600 mg of rifampin daily for 7 days
- Mupirocin ointment

"In addition, patients with severe cellulitis or abscesses too large to drain in the outpatient setting respond to antibiotic therapy—were hospitalized for intravenous antibiotic therapy and surgical dr Dr. Holtom says.

Infection control strategies implemented

Numerous infection-control strategies were also reviewed and implemented. (See below "Preventing MRSA at USC: Infection control measures" for a detailed listing.)

In the fourth week of the 2003 season, nasal cultures were performed on the entire team to identify MRSA carriers. Results showed that seven players were MRSA carriers, and they were treated with topical nasal mupirocin ointment and oral rifampin.

Of the 17 total infections identified in 2003, 13 occurred between the second and fifth week of the season. Toward the end of the 2003 season, staff athletic trainers, athletic equipment staff, and students working with the football program had nasal cultures. None tested positive for MRSA.

Dramatic drop-off in 2004

The effectiveness of the infection control measures implemented by USC can be seen in the marked decrease in cSSTIs during the 2004 season. Only one player was found to have an infection caused by MRSA that year.

"Once in place, our interventions resulted in a significant decrease in MRSA cSSTIs," reports Dr. Holtom. "We feel that all the components of the infection control measures were important in contributing to our success."

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Would you recognize CA-MRSA?

The high morbidities on the USC football team and during other outbreaks of CA-MRSA illustrate the importance of recognizing this disease early. Physicians should watch for the following indications:

- In early stages, skin infections resulting from CA-MRSA may resemble pimples, pustules, or boils—which may rapidly progress to form abscesses, cellulitis, deep-seated furuncles, or necrotizing fasciitis.
- Athletes described the pain as similar to a "spider bite."
- Pain experienced during the physical examination may be out of proportion to the injury.
- The infection site may be hot and/or red.
- A low-grade fever may accompany the infection.
- Abscesses may be associated with previously existing turf burns or abrasions.

Preventing MRSA at USC: Infection control measures

Infection control measures and prevention are vital to containing outbreaks of community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA). The Centers for Disease Control and Prevention (CDC) has published recommendations for preventing the spread of CA-MRSA (available at http://www.cdc.gov), and the USC football team modeled many of its interventions on those recommendations.

The USC measures included:

- Educating staff, coaches, administrators, and athletes about the CDC guidelines
- Increasing surveillance of "spider bites," pimples, and boils that could be early signs of MRSA

infection

- Identifying CA-MRSA carriers with nasal cultures (especially at beginning of season)
- Encouraging frequent hand hygiene by all medical staff and athletic trainers
- Introducing 3 percent hexachlorophene or 4 percent chlorhexidine in shower soap dispensers intermittently during the season
- Making alcohol-based hand sanitizers available on the practice field and at games
- Spraying treatment tables, taping tables, and weight-training and rehabilitation equipment with disinfectant frequently throughout the day
- Using disposable towels on the field during practices and games to prevent the spread of bacteria, and immediately discarding used towels
- Using unit-dose massage lotions and gels rather than large containers with pumps
- Barring athletes with open wounds from using the whirlpools
- Ensuring that the water used for laundry and showers is at least 140F (60C)
- Incising and draining pimples and boils presenting as painful spider bites and performing wound cultures
- Warning players about possible consequences of these infections and showing them pictures of wounds that had gone untreated.

Players were also given the following instructions:

- Shower with hot water after practices and workouts.
- Use the pump provided in the dispensers instead of bar soap, which can breed MRSA.
- Place soiled laundry and towels in the hampers labeled “soiled.”
- Refrain from sharing towels, clothes, and equipment.
- Show all pimples, boils, spider bites, lacerations, and abrasions to medical staff immediately.
- Have all open or draining wounds covered by staff athletic trainers.

Signs were also posted in the locker room and outside the athletic training room to remind players to follow these measures.

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