

INFECTIONS IN SPORTS MEDICINE

METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS

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WHAT IS MRSA AND WHY ARE ATHLETES AT RISK?

Methicillin-Resistant *Staphylococcus aureus* (MRSA) is a highly drug-resistant bacterium that can cause skin and soft tissue infections in athletes and other healthy individuals. Since the late 1960s, MRSA has contributed to epidemic infections throughout many countries and is the most common cause of hospital-associated infection. While MRSA originated as a hospital-associated infection, as of the late 1980s a community-associated strain of MRSA emerged, creating new epidemiologic and clinical challenges for identifying, treating and containing the infection. Over the last decade the incidence of infections from community-acquired MRSA (CA-MRSA) has significantly increased and CA-MRSA is now considered the most common identifiable cause of purulent skin and soft tissue infections in the United States. Traditional risk factors for this bacterium include hospitalisation, comorbidities such as diabetes mellitus, older age, immune suppression and the use of broad spectrum antibiotics. However, community-onset cases often have no identifiable risk factors and younger patients are equally at risk.

Crowding does, however, appear to increase the risk. Multiple outbreaks have been described in Europe and North America in athletes, particularly those who engage in contact sports such as football. In 2005, a United States National Football League (NFL) survey reported that 13 out of 30 teams that responded to the survey had had at least one player with MRSA infection. MRSA has been reported not only in the United States and Europe but worldwide and outbreaks have been described in healthcare workers, military recruits and prisons.

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CA-MRSA, which includes strains USA 300 and USA 400, is characterised by specific genetic determinants, including possession of the *MecIV* or *MecV* staphylococcal chromosome

cassette and Panton-Valentine-leukocidin exotoxin which is associated with abscess formation and necrosis. Unlike what is typically expected of the hospital acquired variant, CA-MRSA often displays susceptibility to multiple antibiotics including clindamycin, the sulfa antibiotics and tetracyclines, while displaying variable susceptibility to fluoroquinolones. CA-MRSA may cause recurrent infection in up to 1/3 of cases and is frequently found to be carried in the nares or other extranasal sites including the axilla, throat and groin. Carriage may predispose individuals to a greater risk of subsequent infection, and has been associated with an increased risk of postoperative infection, particularly in orthopaedic procedures. Thus, screening for the bacterium using conventional culture or newer molecular rapid diagnostic tests may be an important preventive measure in these patients.

HOW IS MRSA TRANSMITTED?

Although direct person to person contact is the most common mode of transmission, the bacterium may be transmitted through the sharing of personal care items including towels, clothing and sports equipment.



Credit: CDC/ Bruno Coignard, M.D.; Jeff Hageman, M.H.S.

Top: A cutaneous abscess on the knee which had been caused by methicillin-resistant *Staphylococcus aureus* bacteria.

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WHAT ARE THE HALLMARK FEATURES OF A MRSA INFECTION?

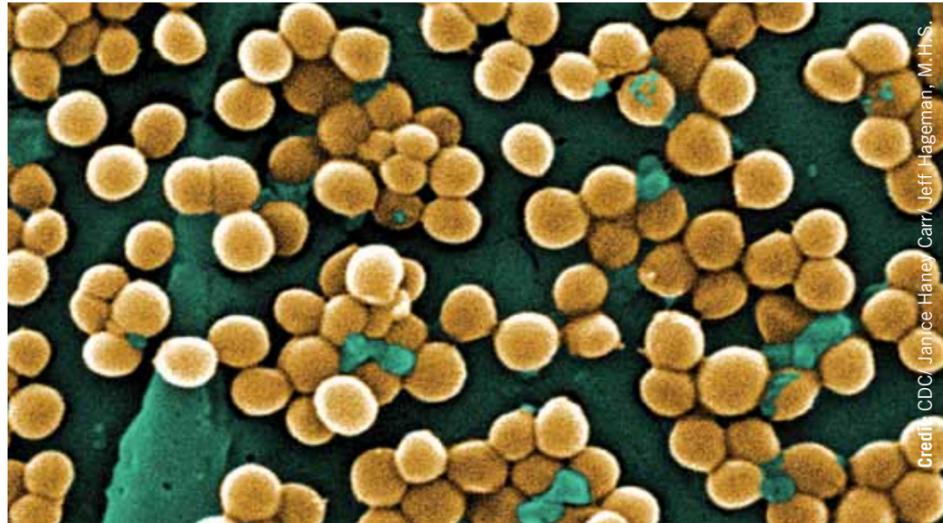
Typically, patients with MRSA will present with a cutaneous abscess or furuncle. A painful, red and swollen lesion will be noted by the patient, which may be surrounded by hard inflammation or occasionally will drain pus spontaneously. In some cases, fever and malaise may be experienced. Up to 20% of patients may present with multiple skin lesions. Infection may arise spontaneously or may complicate an abrasion or laceration. A skin and soft tissue infection that is associated with

pus, lumps or bumps is more likely to be caused by MRSA than a simple cellulitis, characterised by tenderness and redness.

HOW IS THE DIAGNOSIS MADE?

While half or more of purulent skin infections are not caused by MRSA, participants who experience more than one infection and those involved in contact

sports may be at greater risk of MRSA. Occasionally the infection is transmitted among close personal contacts in the household, and transmission has been associated with pets and other animals. Diagnosis can be confirmed by culture of purulent material obtained during incision and drainage. While these results typically take 24 to 48 hours to return,



Left: A scanned electron micrograph depicted numerous clumps of methicillin-resistant *Staphylococcus aureus* bacteria.

rapid molecular diagnostic tests, such as the GeneXpert® MRSA/SA SSTI (Cepheid, CA, USA) assay may be useful where earlier diagnosis is desired.

WHAT IS THE TREATMENT?

Incision and drainage is the primary treatment for a cutaneous abscess. Oral antibiotics alone are likely to be ineffective and the wound must be allowed to drain in order to heal through secondary intention. Packing of the wound is recommended by some authorities in order to prevent premature wound closure and re-accumulation of pus although this may cause a moderate increase in discomfort.

Typically, for a simple uncomplicated cutaneous abscess antibiotic therapy is not necessary. However the Infectious Disease Society of America recommends treatment of patients who are at risk of complications, including:

- extremes of age (infants, the elderly),
- comorbidities such as diabetes or immune suppression,
- systemic symptoms including fever,
- abscesses in areas that are difficult to drain (e.g. the genitals),
- those who demonstrate worsening signs of infection.

When empiric antibiotic therapy is started, a microbial culture should be obtained for antimicrobial susceptibility testing in order to tailor antibiotic treatment. Local antibiograms should be used to guide empiric antibiotic treatment. CA-MRSA is typically susceptible to trimethoprim-sulfamethoxazole or

clindamycin, although inducible resistance may prevent effective treatment in vivo for clindamycin. The 'd-test' can be performed by clinical microbiology laboratories to test for inducible resistance, which can occur in both MRSA and MSSA (Methicillin sensitive *S. aureus*) strains. For highly drug resistant MRSA infections such as those acquired in the hospital, treatment may necessitate broad spectrum agents such as linezolid or parenteral medications (e.g. ceftaroline, vancomycin).

While the majority of healthy adults recover with outpatient treatment, patients should return to care after 48 hours for re-evaluation to determine that their wound is healing (decreasing redness, drainage, pain and swelling, as well as absence of fever). The wound should be covered until it is no longer open and drained in order to decrease the risk of transmission to others. Patients who have worsening symptoms, significant systemic symptoms, extensive infection or comorbidities should be considered for hospitalisation.

WHAT IF THE INFECTION RECURS?

While therapy for recurrent infection is controversial due to variable effectiveness, if an athlete develops more than two MRSA-related infections, some infectious disease consultants will recommend decolonisation therapy. Decolonisation success rates vary, and patients may become recolonised, particularly if close contacts do not also undergo treatment.

Because an athlete may be a carrier for MRSA without exhibiting signs of infection,

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if an outbreak occurs in a sports team, it is prudent to screen other players. However, routine decolonisation is not recommended as patients are frequently recolonised after treatment ends. Routine culturing of staff is not recommended.

WHAT ABOUT SURGERY?

Screening of athletes prior to orthopaedic procedures is recommended, especially for joint procedures, to decrease the risk of postoperative infection. Preoperative colonisation with MRSA increases the risk of surgical site infection. Up to 5% of orthopaedic patients exhibit colonisation upon admission. Prevention of these infections is particularly important given the difficulties of treating prosthetic associated infections. MRSA infection has also been described following anterior cruciate ligament (ACL) surgery. A recent study by Jameson et al published in *Knee* evaluating complications after ACL surgery in England found that 0.75% of these patients suffered a subsequent wound infection. Various protocols have been used for decolonisation, including daily washes with chlorhexidine, daily use of 2%

mupirocin to both nares and for cases that relapse, oral antibiotic therapy. Treatments are generally recommended for 5 days. Decolonisation should be undertaken only after expert consultation.

TESTING FOR COLONISATION

A sterile swab moistened in saline or a culture transport swab with transport media should be used and the swab sent as soon as possible to the clinical microbiology laboratory. Both anterior nares should be cultured and the same swab may be used. Culturing of extracolonisation sites may be important in detecting MRSA colonisation, however testing of multiple sites is expensive and experience with the incremental advantage of expanding routine testing to extranasal sites is limited. Rapid molecular diagnostic tests such as the GeneXpert® SA Nasal Complete (Cepheid, CA, USA) nasal complete can be used for rapid detection of nares colonisation, with results available in approximately one hour where these platforms are available.

WHAT ARE SOME STEPS THAT CAN BE TAKEN FOR PREVENTION?

Because MRSA can be transmitted through close contact and the sharing of personal care items, athletes should be encouraged to maintain the highest standards of cleanliness. Frequent hand-washing should be encouraged. Clothes should be laundered after each use in sports, and sports equipment and other shared items should be cleaned with disinfectant in between players and on a daily basis. Any athlete with a wound should seek medical

attention as soon as possible, and any open wounds should be covered to minimise the risk of transmission of infection to other athletes.

WHAT IS THE FUTURE OF MRSA?

Outbreaks of boils have been reported in the United States, Europe and worldwide and CA-MRSA has become endemic in many locations. Growing antimicrobial resistance related to overuse as well as inappropriate use of antibiotics is of mounting concern. Patients who acquire MRSA infection are more likely to have recently been treated with antibiotics, particularly beta lactams. Human factors such as crowding, globalisation and travel have prompted great concern by clinicians, public health authorities, and policymakers regarding the growing public health challenge of antimicrobial resistance. Strategies to combat antimicrobial resistance at the community, medical and policy level include:

- Patient and community education,
- Targeted spectrum antibiotics,
- Antibiotic avoidance where possible,
- Shorter antibiotic courses,
- Optimal hygiene practices,
- The use of cultures and local resistance trends to guide antibiotic therapy,
- Improved surveillance,
- The use of rapid point of care testing to improve the use of targeted spectrum antibiotics,
- Incentives for the development of new antimicrobials,
- Decreasing the use of antibiotics in animal feed.

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Further Reading

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