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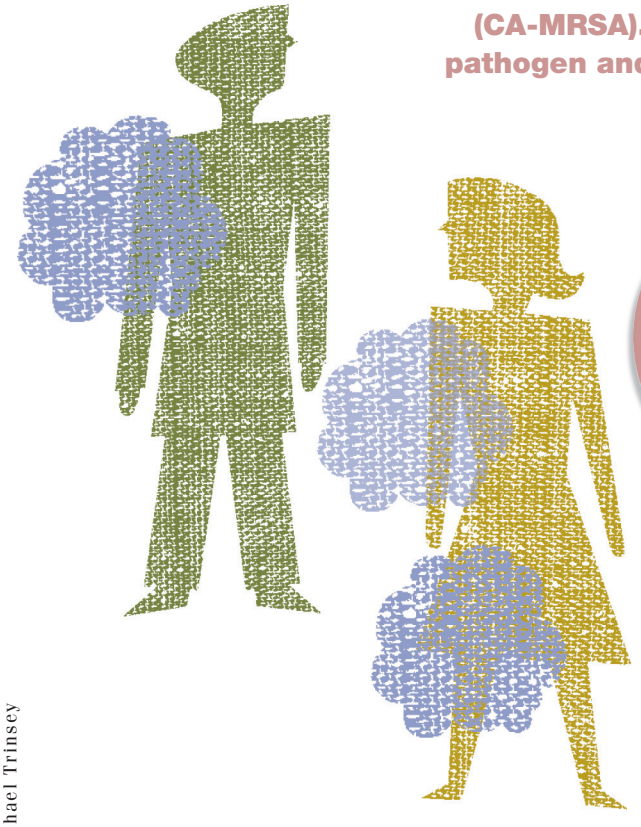
Detecting and preventing CA-MRSA

In the past 10 years, more and more patients under age 30 are affected by community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA). Get the facts about this emerging pathogen and help prevent its spread with proper patient education.



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The author has disclosed that she has no significant relationship with or financial interest in any commercial companies that pertain to this educational activity.

DOUG IS A 17-year-old high school junior who's on the varsity wrestling team. During an afterschool practice, he scraped his right knee. He went home after practice; showered; cleaned his knee with warm water, soap, and peroxide; and left it open to the air to heal. Two weeks later, the abrasion wasn't healing and was becoming more reddened with purulent drainage. The redness was accompanied by pain and inflammation of the knee, with decreased range of motion. He comes to your facility, seeking treatment for the skin lesion.

Upon assessment, you note a 3-cm lesion that's tender to the touch with a 2-cm border of erythema. He's afebrile with stable vital signs. An incision and drainage of the lesion is done and a sample of the drainage is sent for culture and sensitivity. The health-care provider orders cephalexin, 500 mg, four times

per day for 7 days. Because the wound is now open and draining, you instruct Doug to clean and completely cover the wound twice a day and when the bandage is soaked. You also tell him to wash his hands with soap and water before and after handling the bandage. You advise him to refrain from participating in wrestling practice or competition and gym class until the wound is healed and no longer draining.

Three days later, Doug returns to your facility for a follow-up appointment. You note that the wound isn't healing. He has a low-grade fever, but otherwise stable vital signs. The area is still tender to the touch, with a 3-cm border of erythema, a red streak up his thigh, and his right groin lymph node is swollen. The microbiology results indicate CA-MRSA—*S. aureus* bacteria that isn't susceptible to extended-penicillin antibiotic formulas, such as methicillin, oxacillin, and nafcillin, acquired by a person who hasn't been recently hospitalized within the past year or who hasn't had a medical procedure, such as dialysis, surgery, or catheter placement.

The healthcare provider switches Doug from cephalexin to clindamycin. After the prescribed course, the wound stops draining and heals, and the lymph node is no longer palpable. Doug is now able to complete the wrestling season and participate in gym class.

The above scenario is becoming more common as CA-MRSA has become the most frequent cause of skin and soft tissue infections, such as pimples or boils, presenting in the ED across the United States. These skin lesions are often misdiagnosed as spider bites because they're similar in appearance and patients often don't seek treatment until the infection worsens.

What do you need to know about this emerging pathogen? In this article, I'll give you the facts about CA-MRSA, from risk factors and treatment to prevention techniques.

History lesson

In 1929, Alexander Fleming discovered penicillin, which was first used on humans in 1940. In 1941, the first case of penicillin-resistant *S. aureus* was discovered. In 1960, methicillin was developed to treat penicillin-resistant *S. aureus*, and MRSA was discovered in 1961. In 1981, CA-MRSA was first reported in Detroit among I.V. drug users. Between 1997 and 1999, four pediatric deaths in North Dakota and Minnesota were associated with CA-MRSA.

For decades, MRSA was considered to be a nosocomial pathogen with a certain set of risk factors, such as advancing age, prolonged hospitalization, admission to the ICU, indwelling central lines and catheters, hemodialysis, invasive procedures, comorbidities, and institutionalization. CA-MRSA was thought to have spread from healthcare-associated MRSA (HA-MRSA); however, CA-MRSA has several distinct characteristics that clearly distinguish it from healthcare-associated strains. Let's take a closer look.

The resistance movement

CA-MRSA bacteria have a pulsed-field gel electrophoresis pattern and produce specific toxins, which includes Panton-Valentine leukocidin. This gene encodes cytotoxins to form pores in the cellular membranes to cause tissue necrosis and destroy leukocytes. CA-MRSA hasn't shown resistance to multiple antimicrobial classes like HA-MRSA; so far, CA-MRSA isolates have shown resistance to the beta-lactams (penicillin and cephalosporins) and the macrolides/azalides (erythromycin and azithromycin). To date, CA-MRSA has been sensitive to trimethoprim-sulfamethoxazole, gentamicin, tetracycline, and clindamycin.

Risk factors

The median age of patients with CA-MRSA is 30, compared with the median age of 70 for HA-MRSA. At-risk populations identified for CA-MRSA are very different from HA-MRSA populations. They include:

- children, especially those in day-care centers
- large groups of people living in close quarters, such as soldiers and prisoners
- competitive high school, college, and professional athletes, such as those who engage in wrestling, football, fencing, and rugby
- I.V. drug users
- homeless people
- men who have sex with men.

Outbreaks of CA-MRSA have also occurred in certain ethnic groups. According to the CDC, Pacific Islanders, American Indians, Native Alaskans, and Native Canadians have shown higher rates of CA-MRSA. It's theorized that lack of infection control has been associated with CA-MRSA outbreaks among these communities.

Treatment options

In 2003, a study found that 75% of CA-MRSA infections presented as soft tissue or skin infections compared with 37% of HA-MRSA infections. In patients without comorbidities who don't present with a fever and have a boil or abscess less than 5 cm in diameter (see *Picturing CA-MRSA infection*), the boil or abscess is often treated by incision and drainage with or without

a topical antibiotic. If the infection is progressive or severe, the patient has comorbidities, cellulitis is present, or if the boil or abscess is greater than 5 cm in diameter or the infection doesn't respond to incision and drainage alone, antibiotics are usually prescribed.

A culture of the wound, wound drainage or pus, or infection site is obtained and sent to a microbiology lab for culture and sensitivity. If *S. aureus* is suspected to be the cause of a urinary tract infection, pneumonia, or bloodstream infection, fluid from the appropriate site, using aseptic technique, should also be obtained and sent for culture and sensitivity. If the cultures test positive for *S. aureus*, the sensitivity test will be used to determine which antibiotic or combination of antibiotics is the best form of treatment.

When treating a patient presenting with an infected wound who's a member of a sports team, lives in close quarters, or has other characteristics of at-risk populations for CA-MRSA, it's important to obtain cultures early and routinely. In several states, CA-MRSA is a reportable disease. To find out if your state considers CA-MRSA a reportable disease, contact your state's health department.

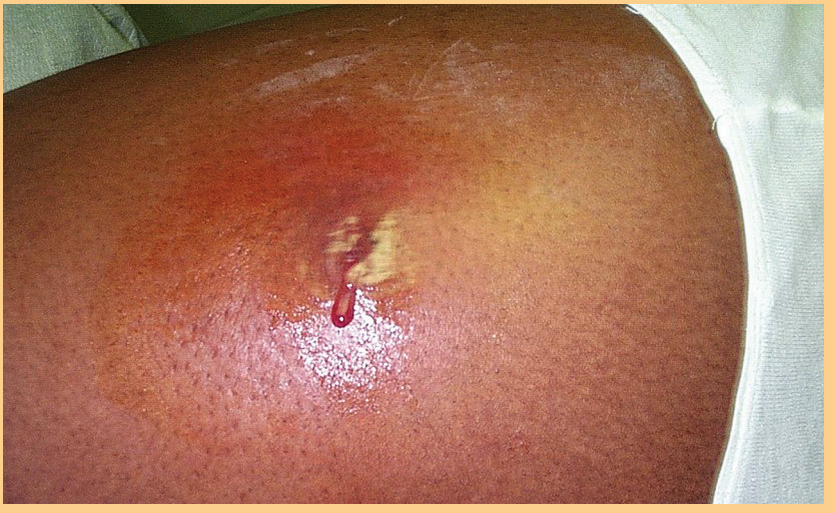
Prevention is contagious

CA-MRSA is contagious and easily spread by direct contact. Therefore, it's important to educate your patient as well as his family members on how to prevent the spread of CA-MRSA within the household. The measures used to prevent the spread of CA-MRSA are basic. Teach your patient to wash his hands thoroughly with antibacterial soap and water or use an alcohol-based hand sanitizer before and after cleaning the wound and changing the bandage or any time he comes in contact with the bandage or the wound. Instruct him to clean skin cuts, abrasions, and scrapes and use bandages to cover them until healed. Stress the importance of avoiding skin-to-skin contact with other people's wounds or bandages. Encourage him to avoid sharing personal items, such as razors, clothing, uniforms, athletic equipment, washcloths, towels, or any other items that may have come in contact with broken skin, wound drainage, or the wound or bandage. Bed linens, washcloths, towels, and any clothing that has come in contact with the wound or bandage should be washed with water and laundry detergent. Drying clothes and linens in a dryer is more effective in killing bacteria than air-drying.

Because your patient, Doug, is a member of an athletic team, you'll also need to educate the team administrators or coaches on how to prevent the spread of CA-MRSA among other team members. Sports team administrators will need to educate the members of the team and their families. They need to ensure that facilities for proper hygiene for team members are available and that shared sports equipment is properly cleaned and disinfected on a routine basis. If a team member can't properly cover a wound, team administrators or coaches should consider not allowing the team member to participate in practice or competition until the wound can be adequately covered or has completely healed. The surface of equipment in a gym or health club should be wiped down with a clean towel before and after use. The CDC also recommends a barrier, such as clothing or a towel, to be used between the skin and the equipment to reduce contact with skin or body fluids.

CA-MRSA is easily transmitted in settings where groups of individuals live in tight quarters, such as barracks, dormitories, prisons, and day-care centers. According to the CDC, these facilities have the five Cs that allow for the transmission of CA-MRSA: **c**rowding, frequent skin-to-skin **c**ontact, **c**ompromised skin, **c**ontaminated items, and lack of **c**leanliness. Therefore, it's necessary to educate those who live and work in these environments on how to prevent the spread of

Picturing CA-MRSA infection



CA-MRSA. For individuals who live in close quarters, such as soldiers and prisoners, skin assessments should be completed and documented upon intake, on a routine basis, and when a resident or group of residents are treated for CA-MRSA. Improving hygiene and infection control practice will also create long-term success in controlling outbreaks. Ensuring appropriate laundering of uniforms, clothing, towels, and linens; limiting the sharing of personal items; and increasing the availability of soap or alcohol-based hand gels will decrease the transmission of CA-MRSA in these populations.

Looking ahead

CA-MRSA has its own unique set of characteristics that will allow it to continue to exist and spread. Patients presenting with CA-MRSA have become more prevalent, yet few studies have been done to determine its origin and how it spreads and the most effective treatment and prevention strategies. More data on CA-MRSA need to be collected and evaluated in order to fully understand how to control and prevent it from spreading in the community. **LPN**

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On the Web

CDC: **http://www.cdc.gov/ncidod/dhqp/ar_MRSA_ca_public.html**
National MRSA Education Initiative: **http://www.cdc.gov/mrsa/mrsa_initiative/skin_infection/index.html**
U.S. Department of Health and Human Services: **http://www.hhs.gov/faq/diseases/diseases/disease-0013.html**

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