





Community Acquired Methicillin-Resistant Staphylococcus aureus

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Case Presentation

- A 27-year-old commercial diver presents to an occupational medicine clinic in near New Orleans, LA with the complaint of boils on her leg and buttocks that she first noticed 2 days prior to her visit.
- She described the lesions as painful, red and associated with some drainage.
- She denied associated symptoms of fever, chills, malaise, arthralgia, myalgia.
- She denied a prior history of similar lesions, reported no history of skin trauma, travel, surgery in the last year. She used a wet suit of a colleague once in the last week when she left her suit at home.


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Case Presentation

- She thought that a spider may have bitten her while she was on a camping trip the previous weekend.
- She had no significant past medical history other than seasonal allergic rhinitis and her only medications were allergra and montelukast.
- She denied allergies to medications.
- She stated that she had three cats at home. She lived alone, was a non-smoker, and consumes alcohol occasionally.
- She had been working as a diver for the last 3 years after separating from the U.S. Navy.

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Case Presentation

- On physical examination, she had a temperature of 99.7°F, HR 100, RR 14, BP 110/73.
- There were two 3 to 4 cm boils on the proximal aspect of her left hamstring region. There was a third 3 cm boil on her left buttocks.
- The boils were associated increased warmth, induration, erythema and fluctuance.
- A central pustule was noted on each lesion. Her buttock abscess was cultured for herpes simplex virus and she was started on dicloxacillin.

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Case Presentation




<http://www.temple.edu/medicine/images/mrsa.jpg>

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Case Presentation

<p>Differential Diagnosis:</p> <ul style="list-style-type: none"> • S. aureus abscesses • Streptococcal abscess • <i>Loxosceles reclusa</i> bite • Toxoplasmosis • Disseminated gonococemia • Cutaneous Anthrax • Toxic epidermal necrolysis • Stevens-Johnson syndrome • Pyoderma gangrenosum • Erythema multiforme/nodosum • Lymphomatoid papulosis • Squamous cell carcinoma 	<ul style="list-style-type: none"> • Poison ivy/oak dermatitis • Chemical burn • Decubitus ulcer • Localized drug reaction • Diabetic ulcer • Factitious/psychogenic dermatitis • Pilonidal sinus • Thromboembolic skin necrosis (warfarin skin necrosis) • Focal vasculitis • Polyarteritis nodosa • Lyme disease (erythema chronicum migrans) • Rocky Mountain spotted fever • Purpura fulminans • Syphilitic chancre • Cutaneous anthrax
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Case Presentation

- She returned three days later without improvement of her symptoms.
- The lesions were incised, drained, and packed with sterile gauze.
- A culture was obtained for identification of the causative organism and antibiotic susceptibility. Her wound culture revealed methicillin-resistant *Staphylococcus aureus* (MRSA).
- She was placed on trimethoprim-sulfamethoxazole (TMP-SMX) and had a nasal culture done which did not show MRSA. Her skin infection resolved after treatment.

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“Relax – MRSA will get you before the Asian Flu”

<http://www.whale.to/b/images/mrsa.jpg>

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The Top Ten Infectious Disease Stories of 2007 ...

- 10) ACIP recommends MCV4 vaccine for adolescents.
- 9) Chikungunya fever outbreak reported in Italy.
- 8) Two contrasting views of influenza vaccine effectiveness.
- 7) Increased number of foodborne illness outbreak reported.
- 6) Human to human transmission of Avian Influenza detected.
- 5) Vaccines:
 - HPV and Shingles Vaccine
 - Merck discontinues HIV vaccine (V520)
- 4) HIV /AIDS:
 - Male circumcisions prevented HIV transmission by approximately 50%
- 3) Rates of XDR-TB and MDR-TB increasing worldwide.
- 2) Universal HIV screening is found to be cost-effective at any HIV prevalence level.
- 1) Nationwide study reveals MRSA much more widespread than previously believed.

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The Challenge of Methicillin-Resistant *Staphylococcus aureus* (MRSA) ...ABCs study

- In 2005, MRSA caused more than 94,000 life-threatening infections and nearly 19,000 deaths in the United States.
- Most were associated with health-care settings (85%)
- 2/3 of these became evident in the community among people who were hospitalized or underwent a medical procedure or resided in a long-term care facility within the previous year.
- 15% occurred in people without documented health-care risk factors. This is the group of patients that we will focus on today; those with Community-Acquired Methicillin-resistant *Staphylococcus aureus* (CA-MRSA)
- Ref: Klevins RM. JAMA ,Oct 17 ,2007-Vol 298,p1763

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Virulence Factors of *S. aureus* ...

- Significant Virulence Factors in the Pathogenesis of Invasive *S. aureus* Infections:
 - Antibiotic Resistance
 - Ability to Bind to Fibrinogen
 - Fibronectin A and B
 - Clumping Factor A
 - Ability to Bind to /aggregate Platelets
 - Alpha toxin Production
 - Ability to Produce Endotheliosis
 - 5% of *S.aureus* live for 30' within normal wbc's
 - Protein A
 - Panton-Valentine leukocidin
 - Other toxins
 - Ability to colonize the nasopharynx and other body surfaces

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Timeline of *S. aureus* Infections ...

2006 Greater Than 50% of Staphylococcal Skin Infection Seen in Emergency Room's Caused by CA-MRSA; HA-MRSA Rates Increase in Hospitals in the Netherlands

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Epidemiology of Staphylococci ...

- Staphylococci are Gram-positive bacteria that commonly colonize the skin in anterior nostrils of healthy people. At any given time, 20%-30% of all individuals are colonized with *S. aureus*.
- *S. aureus* has been responsible for a variety of infections that range from skin and soft tissue to pneumonias and sepsis/bacteremia.
- Because of the rise of immunosuppressed patients and the use of intravascular devices, *S. aureus* has become the premier bacterial pathogen of the 21st century.

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What is the meaning of "Community" in the term Community - Acquired Methicillin-Resistant *S. aureus*

- Does it refer to?:
 - A Municipality
 - A Geographic Region
 - The Environment of Dwellings and/or Health Care Facilities or ...

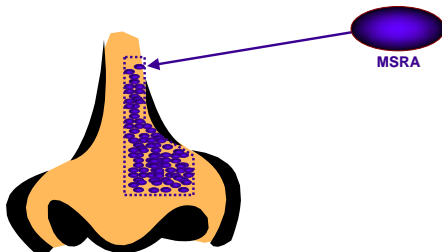
Our Own Skin and Noses

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Keep Your Nose Clean!

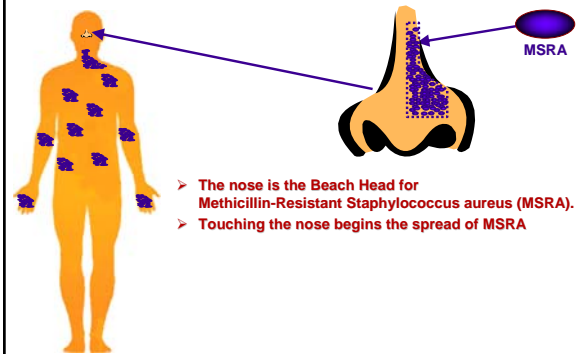
The nose is the Beach Head for Methicillin-Resistant *Staphylococcus aureus* (MSRA).



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Keep Your Nose Clean! (continued)



- The nose is the Beach Head for Methicillin-Resistant *Staphylococcus aureus* (MSRA).
- Touching the nose begins the spread of MSRA

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The 5Cs of CA-MRSA...

- Crowded living conditions
- Frequent skin to skin Contact
- Compromised skin
- Sharing Contaminated personal items
- Lack of Cleanliness

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Methodological concerns of the epidemiology of CA MRSA

- Difficulty in culturing MRSA from body sites
- Differentiating colonization from infection
- Degree of compliance with medications and other treatment strategies
- Shortcomings of crude mortality data and dealing with confounding variables

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Distinctions Between HA-MRSA and CA-MRSA ...

HA-MRSA:

- 1) High risk factors include older age (60 yo), hospitalizations or surgery or residency in long-term care facilities or in other health care delivery locations such as dialysis units, intravascular devices, prolonged antibiotic use.
- 2) These strains produce several types of infections (bacteremia, pneumonia soft tissue infections).
- 3) Transmission is person-to-person.
- 4) Its rate of growth is slow.
- 5) Antibiotic resistance is via SCC-MEC I-III. Virulence factors are unknown.
- 6) HA-MRSA is resistant to multiple antibiotics.

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Distinctions Between HA-MRSA and CA-MRSA (continued) ...

CA-MRSA:

- 1) Risk factors have not been established. Victims appear to be healthy younger (23yo) with a common association of recurrent close quarters and skin and soft tissue changes. CA-MRSA is associated with dermatological conditions, diabetes, smoking for sharing of close quarters.
- 2) Most of the time CA-MRSA causes soft tissue/skin infections. Clues to its existence is the presence of an abscess.
- 3) Transmission is person to person.
- 4) Growth rate is fast.
- 5) Antibiotic resistance is via SCC-MEC IV. Virulence factor appears to be the Panton-Valentine leukocidin. There are two major clones (USA 300 and USA 400).
- 6) Strains are resistant to the beta lactams but sensitive to trimethoprim/sulfamethoxazole, tetracyclines and clindamycin.

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When to Empirically Treat for CA-MRSA ...

- Three leading sets of risk factors for CA-MRSA:
 - I. Demographic
 - Younger age
 - II. Clinical
 - Lower rate of comorbidities
 - Non-skin related infections
 - III. Exposure
 - Snorted/smoked illicit drugs
 - Incarcerated in the prior 12 months
 - Visits bars, and raves or clubs
- However, clinical and epidemiologic of risk factors in patients hospitalized for community acquired S. aureus cannot reliably distinguish between MRSA and MSSA.
- When the prevalence of methicillin resistance, among community acquired S. aureus, is 60% lack of these leading risk factors reduces the posttest probability to 52%.
- Therefore, seriously ill patients need to be empirically treated for MRSA until cultures results are available.

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Treatment of CA-MRSA ...

- In a non systemically ill patient, drainage of an abscess is usually adequate and does not requiring administration of antibiotics.
- Effective orally administered antibiotics include:
 - Erythromycin and other macrolides - up to 70% resistance.
 - Clindamycin - > 70% resistance rate documented and ever present risk of promoting C. difficile.
 - Trimethoprim/sulfamethoxazole- approximately 20% resistance rate and is not effective against S. pyogenes.
 - Minocycline -approximately 20% resistance rate.
 - Doxycycline -approximately 30% resistance rate.
- Effective parenterally administered antibiotics include:
 - Vancomycin - up to 25 % failure rate in seriously ill patients.
 - Linezolid.
 - Daptomycin.
 - Doripenem.

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Prevention of CA-MRSA Outside of Healthcare Facilities...

Transmission of CA-MRSA is almost always due to direct physical contact and not through the air. It may also be transmitted to indirect contact by touching objects contaminated by the skin of the infected person.

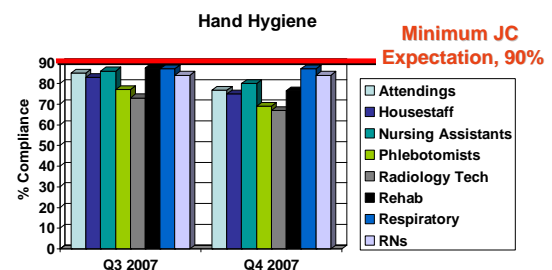
Prevention strategies include:

- 1) Do not share personal items (towels, soap).
- 2) Monitor, treat and dress all open skin abrasions and cut.
- 3) Hand hygiene is imperative.
- 4) Chlorhexidine bathes for extensive skin and soft tissue infection and for recurrent outbreaks is recommended.
- 5) Consider contact precautions in all patients with pertinent skin and soft tissue infections in areas where prevalence of MRSA is high.

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All Disciplines in Need of Prompt Improvement ...



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Recurrent Infections ...

- Remember that humans are the natural reservoir for *S. aureus*.
- The anterior nostrils and skin are the usual sites of MRSA colonization.
- Best approach for treating recurrent infections is eradicating MRSA from the anterior nostrils with 2% mupirocin ointment and applied to the nares twice daily for 5 to 10 days as well as applying the ointment under the fingernails.
- Consider treating household contacts and close contacts if recurrence persists. It is likely that one or more contacts are asymptomatic carriers of MRSA (up to 70% of affected families).

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The Role of Mupirocin in MRSA Decolonization ...

- Decolonization of MRSA by mupirocin has become increasingly employed in reducing MRSA colonization, preventing infection and controlling outbreaks.
- Decolonization is different from eradication.
- Fewer than 50% of patients remained free of MRSA nasal carriage at year.
- Resistance to mupirocin (up to 18%), although not common, has been reported
- The CDC does not recommend routine use of mupirocin for decolonization.
- Its use should be limited to outbreaks or other high prevalence situations.
- Health-care workers, colonized with MRSA, but who have not been linked to transmission of MRSA do not require treatment with mupirocin.
- Selected populations may benefit from MRSA decolonization: with a five-day course with mupirocin:
 - Surgical patients colonized with MRSA
 - Continuous ambulatory peritoneal dialysis patients
 - Select patients with recurrent MRSA skin infections

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Recommendations for Acute Care Hospital Management of ...

Both CA-MRSA HA-MRSA (based on The MAINEHEALTH Infection Control Consortium Guidelines for the Management of MRSA and VRE)

- 1) Standard precautions will be the basic practice for all patients before or after diagnosis of colonization or infection with MRSA.
- 2) Patients with a known history of MRSA should not be screened for MRSA.
- 3) Culture high-risk populations (to be defined by each facility). Groups that may be considered "high-risk" include patient from long-term care/physical rehabilitation units; dialysis patients; patients with history of extended stays in acute care facilities and patients with chronic conditions.
- 4) Obtain cultures within 48 hours of admission of the nares, groin and open wounds.
- 5) Repeat active surveillance cultures once a week.
- 6) Place patients who are culture positive or who have a history of a positive culture on contact precautions upon every admission or at the identification of a positive culture. Contact precautions are gloves, gowns and masks (if transmission by droplets is suspected).

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Recommendations for Acute Care Management of ... (continued)

Both CA-MRSA HA-MRSA (based on The MAINEHEALTH Infection Control Consortium Guidelines for the Management of MRSA and VRE)

- 7) No recommendations for routinely decolonizing patients.
- 8) Patients should be placed in a private room or cohorted.
- 9) Instruct family and visitors on proper hand washing and refraining from visiting other patients.
- 10) Discontinuation of precautions for patients with MRSA across the health care continuum should occur very infrequently.

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