

MRSA

What We Need to Know

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What is MRSA?

- Methicillin-resistant *Staphylococcus aureus*
 - This hardy bacterium has developed resistance to every antibiotic in its path, beginning with PCN nearly 70 years ago
 - PCN was discovered in 1940 and was effective against a broad spectrum of bacteria for years until *S. aureus* developed the ability to produce *beta-lactamase*, an enzyme that destroys PCN
 - Pharmacologists then created a class of semi-synthetic PCNs that could withstand *beta-lactamase*

Beta-Lactam PCNs

- Methicillin is the prototype
- For years, *S. aureus* was eradicated with Methicillin, Nafcillin and Cloxacillin
- Soon the resourceful bacterium was able to resist Beta-Lactam PCNs
- The first strain of MRSA was identified in 1961
- First major appearance in US was in 1981 among IV drug abusers (Wilkopedia, 2009)

Rates of MRSA by Country

○ Lowest Rates

- Scandinavia
- Netherlands
- Germany

○ Highest Rates

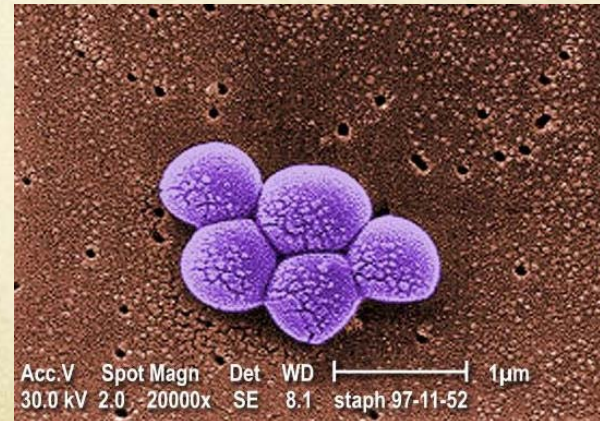
- Italy
- Spain
- Turkey

Middle Rates

- France
- UK

Incidence

- Worldwide
 - 2 BILLION carry some form of *staph aureus*
 - 53 MILLION carry MRSA
- In the US
 - 95 MILLION carry *staph aureus* in their noses
 - 2.5 MILLION are MRSA



MRSA is resistant to:

- Cephalosporins
- Erythromycin
- Clindamycin
- Gentamycin
- Bactrim
- Cipro

Vancomycin

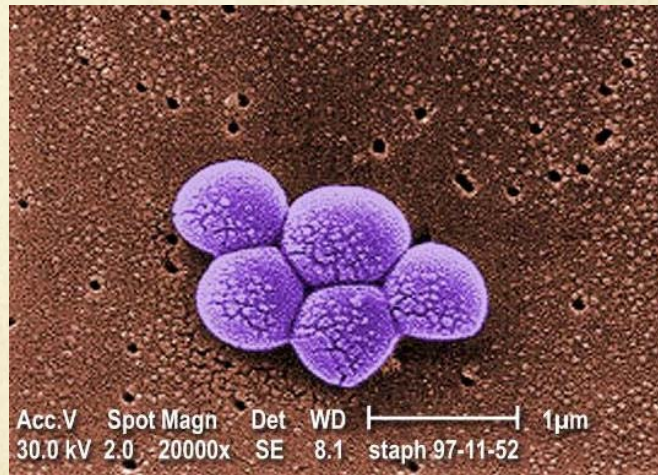
- Glycopeptide antibiotic was relied upon until recently to eradicate MRSA
 - Significant glycopeptide antibiotics include vancomycin, teicoplanin, telavancin, bleomycin, ramoplanin, and decaplanin.
- As expected, strains of Vancomycin-resistant *S. aureus* (VRSA) has been isolated and are becoming a treatment challenge

NOW It is Sub-Categorized

- CA-MRSA Community Acquired MRSA
- HA-MRSA Health Care Associated MRSA

MRSA

- Primarily a nosocomial microbe
- Of staph infections, 40-50% are MRSA
- HCW are the major mechanism for patient to patient transmission



In Long Term Homes

- MRSA is isolated from urinary catheters
- Gastrostomy tubes



In ICUs-Critically Ill Patients

- MRSA causes
 - Bacteremia- mortality rates of 50%
 - Pneumonia-mortality rates of 30%
- Skin, soft tissues, and surgical sites are all classic sites for MRSA

Isolates of MRSA

- Have been found on environmental surfaces
 - Particularly computer keyboards
 - Sink faucets
 - (Dermatol Nurs 15(6):535-5)



- One study- 1 in 5 stethoscopes were contaminated with *staph-1* with MRSA
- Wiping with alcohol between patients decreased colonization to 0 (Nurse Practitioner, Vol 31, No 9)



Health Care Environment

- MRSA can survive on fabrics
 - Privacy curtains
 - Garments worn by HCW
 - Some hospitals are forbidding staff to wear uniforms home



Cost Implications of MRSA

- CDC estimates 1.7 million nosocomial infx a year in US
 - 60% of infections are MRSA
 - 99,000 associated deaths (more deaths than from AIDS)
 - Incidence is 4.5 nosocomial infx per 100 admissions
- Costs incurred are about 3X greater
- Hospital stay is 3X greater (14 vs 5 days)
- 5X greater hospital death (11% vs 2%)

Prevalence Exacerbated By:

- Rising levels of nasal carriage

Intranasal Colonization

- Rising levels of nasal carriage
- 30% of people have *staph* in nose and have no symptoms (CDC data)
- Application of mupirocin ointment (Bactroban) 2X daily for 7 days



Prevention and Prophylaxis

- Simple handwashing
- Isolation
- Widespread screening



Hand Hygiene

- The cornerstone to prevention



Hand Hygiene

- Alcohol-based rubs if effective against MRSA
- Compliance is usually <50%
 - Why?
 - Forget
 - High work load
 - Understaffing
 - Accessibility



3 Methods of Hand Hygiene

- Handwash with Hibiscrub for 1 minute
 - Who has time?



- Handrub using ethanol (Sterillium) for 30 secs
- More compliance

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- Waterless, alcohol-based antiseptic gel handrub for 30 secs
- Most hand gels contain 53-70% alcohol which is not an effective concentration against nosocomial pathogens



MRSA

- Is acquiring resistance to disinfectants and antiseptics



Artificial Nails

- Increase the chances of transmitting bacteria
- Colony counts on and under artificial nails are greater than natural nails



Lotion-To Use or Not to Use?

- Could weaken glove integrity
- Could weaken efficacy of antiseptic agents
- Only use during non-patient contact times, breaks, and after work



Transmission of MRSA in ICU

- Patients in ICU that are colonized or infected in multi-bed wards had NO effect on transmission if standard precautions taken



Pre-Op Holding and MRSA

- Document contact precautions
- Do patient at end of day
- Transport directly to OR
- If in HR, separated patient by 1 slot

Masks?

- Wearing while caring for MRSA patients may decrease the risk for acquisition in anterior nares



Colonization

- Colonization does not inevitably lead to infection
- However, colonization of patients or hospital personnel with MRSA is common and increases the risk of transmission among patients, especially in hospitals (UpToDate.com, 2005)
- Transient colonization may occur- the risk for the infection being passed on is lower than from an established carrier
 - HCW may be carriers during a shift only to become MRSA free during off duty periods (AnnRCollSurgEng, 2005:87)

HCW

- 58% of HCW are said to be colonized
- Healthy individuals may carry MRSA for a few weeks to many years



MRSA Colonized Patients

- The risk for transmission is 12 fold higher if not isolated
- Colonized patients are an important reservoir of spread that is better controlled with isolation than standard precautions
- Identification of asymptomatic MRSA carriers using a screening program is important for controlling nosocomial infections

Colonized Patients in Hospitals

- More than $\frac{1}{2}$ of colonized patients would remain undetected without screening on admission
- Screening includes cultures of nasal, axilla, and rectal swabs
- Results can be back in 2 hours

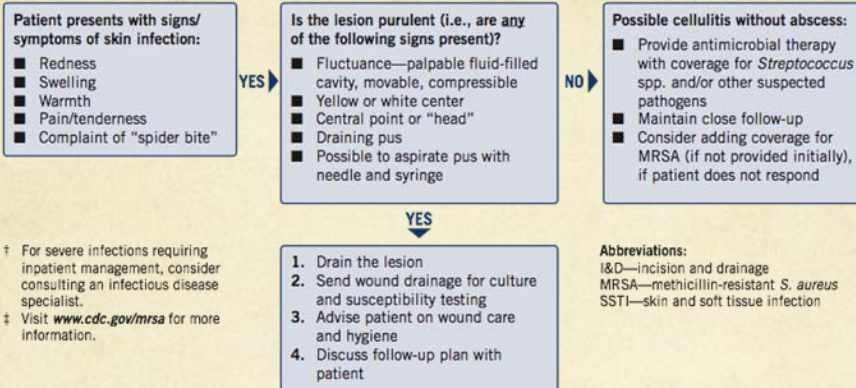


- It is essential to establish that a patient is infected (rather than colonized) prior to therapy since elimination of colonization is unlikely with systemic antimicrobials

Treatment of MRSA in Adults

- Vancomycin (1gram q 12 hours) remains drug of choice
- Costs about \$100/day
- Must be given IV
- Rifampin po in addition has some promise
- If can't take Vancomycin, Clindamycin is possible

Outpatient† management of skin and soft tissue infections in the era of community-associated MRSA‡



† For severe infections requiring inpatient management, consider consulting an infectious disease specialist.

‡ Visit www.cdc.gov/mrsa for more information.

If systemic symptoms, severe local symptoms, immunosuppression, or failure to respond to I&D, consider antimicrobial therapy with coverage for MRSA in addition to I&D. (See below for options)

Options for empiric outpatient antimicrobial treatment of SSTIs when MRSA is a consideration*

Drug name	Considerations	Precautions**
Clindamycin	<ul style="list-style-type: none"> ■ FDA-approved to treat serious infections due to <i>S. aureus</i> ■ D-zone test should be performed to identify inducible clindamycin resistance in erythromycin-resistant isolates 	<ul style="list-style-type: none"> ■ <i>Clostridium difficile</i>-associated disease, while uncommon, may occur more frequently in association with clindamycin compared to other agents.
Tetracyclines ■ Doxycycline ■ Minocycline	<ul style="list-style-type: none"> ■ Doxycycline is FDA-approved to treat <i>S. aureus</i> skin infections. 	<ul style="list-style-type: none"> ■ Not recommended during pregnancy. ■ Not recommended for children under the age of 8. ■ Activity against group A streptococcus, a common cause of cellulitis, unknown.
Trimethoprim-Sulfamethoxazole	<ul style="list-style-type: none"> ■ Not FDA-approved to treat any staphylococcal infection 	<ul style="list-style-type: none"> ■ May not provide coverage for group A streptococcus, a common cause of cellulitis ■ Not recommended for women in the third trimester of pregnancy. ■ Not recommended for infants less than 2 months.
Rifampin	<ul style="list-style-type: none"> ■ Use only in combination with other agents. 	<ul style="list-style-type: none"> ■ Drug-drug interactions are common.
Linezolid	<ul style="list-style-type: none"> ■ Consultation with an infectious disease specialist is suggested. ■ FDA-approved to treat complicated skin infections, including those caused by MRSA. 	<ul style="list-style-type: none"> ■ Has been associated with myelosuppression, neuropathy and lactic acidosis during prolonged therapy.

■ MRSA is resistant to all currently available beta-lactam agents (penicillins and cephalosporins)
■ Fluoroquinolones (e.g., ciprofloxacin, levofloxacin) and macrolides (erythromycin, clarithromycin, azithromycin) are not optimal for treatment of MRSA SSTIs because resistance is common or may develop rapidly.

* Data from controlled clinical trials are needed to establish the comparative efficacy of these agents in treating MRSA SSTIs. Patients with signs and symptoms of severe illness should be treated as inpatients.

** Consult product labeling for a complete list of potential adverse effects associated with each agent.

Role of decolonization

Regimens intended to eliminate MRSA colonization should not be used in patients with active infections. Decolonization regimens may have a role in preventing recurrent infections, but more data are needed to establish their efficacy and to identify optimal regimens for use in community settings. After treating active infections and reinforcing hygiene and appropriate wound care, consider consultation with an infectious disease specialist regarding use of decolonization when there are recurrent infections in an individual patient or members of a household.

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Treatments

- Maggot therapy to clear out necrotic tissue of MRSA has been successful



Treatments

- Lemongrass essential oil completely inhibited MRSA colony growth



CA-MRSA

- The first reported cases appeared in mid 1990's in Australia, New Zealand, US, UK, France, Finland, Canada, Samoa
- Notable because the involved people had not been exposed in a health care setting
- 1997- 4 fatal cases with children in MN, ND
 - Became clear that CA-MRSA was a different strain than HA-MRSA

CA-MRSA

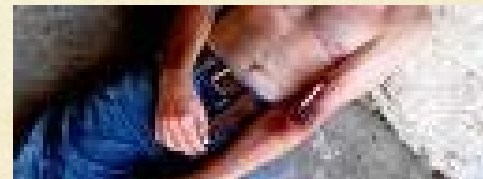
- Presentation
 - Small red bumps (resemble pimples)
 - Look like spider bites
 - Boils
 - May be accompanied by fever and occasionally rashes
- 75% of CA-MRSA are localized to skin and soft tissue

MRSA



CA-MRSA

- Athletes
- Prisoners
- Men who have sex with men
- Drug users
- Native Americans

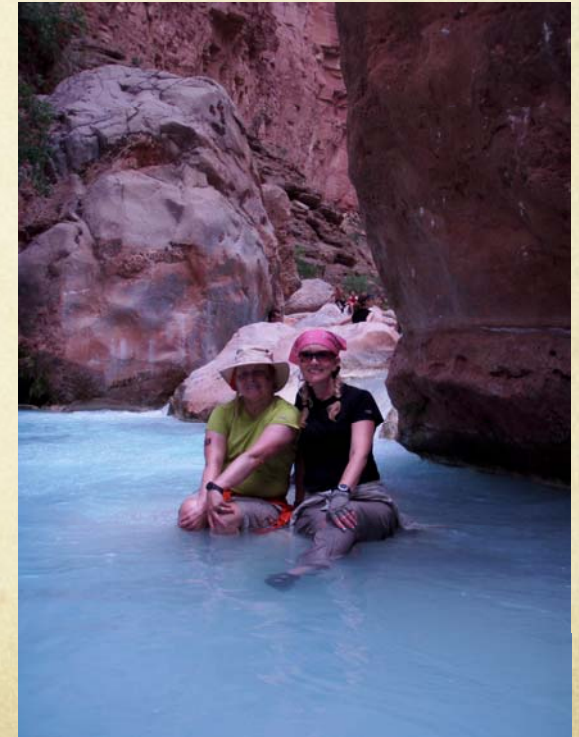


CA-MRSA

- 2003- 5 of 58 RAMS players developed MRSA
- MRSA was recovered from whirlpools and taping gel
- MRSA also occurred in competing teams after a game suggesting transmission of MRSA occurred during play
- WHY?
 - Towels frequently shared
 - No showers prior to communal whirlpools
 - Weight equipment not cleaned
 - Higher than average antibiotic use



River Rot



To Clean Using Household Chlorine Bleach

- ¼ cup of bleach in 1 gallon of water (CDC recommendations)

Treatment of CA-MRSA

- After incision and drainage to decolonize
 - Shower at home using Hibiclens or PhisoHex
 - Bactroban in nares
 - Antibiotics- Sulfa and Tetracyclines are most cost effective choices

Thoughts

- Some experts believe that antibiotics given to animals is contributing to the development of resistance in humans and that the pervasive use of antibacterial soaps is another problem

If you have MRSA, do you always have it?

- MRSA is not active in one's body forever, or even necessarily ever, although it may be present at times. It is usually not tested for unless there's reason to suspect there may be an infection or if there has been exposure to someone who is infected or colonized. Most of us have some form of staph on board at some time or other, but it usually passes eventually, only to return some other time. We may never know unless we develop an active infection, but that can be from a totally new and different crop.