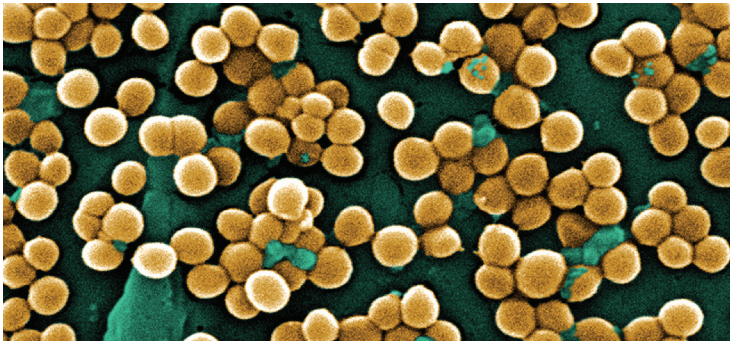


# MRSA METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS



*Staphylococcus aureus* is Greek for "golden grape seed."  
(Credit: Janice Haney Carr, CDC)

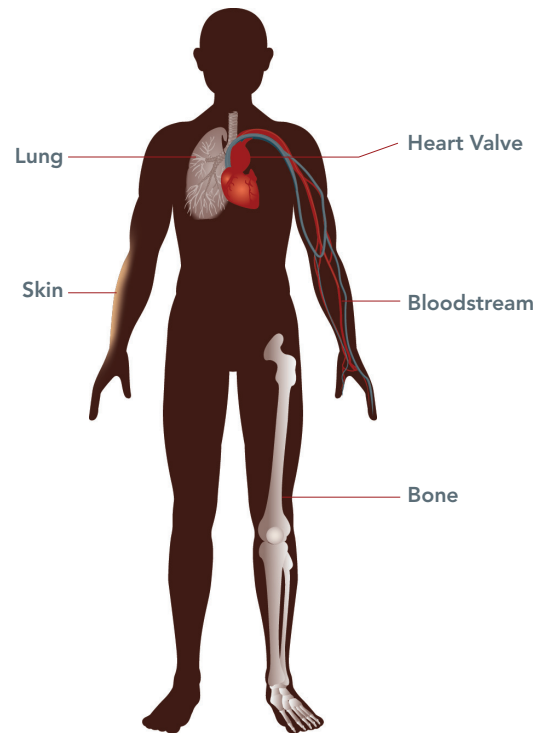
## A Deadly Pathogen with Fewer and Fewer Treatment Options

*Staphylococcus aureus*, or staph, is a common bacterium that exists in our environment and our bodies. Most of the time it does no harm. Sometimes, however, it can cause infection and require treatment. MRSA refers to strains of *S. aureus* that are resistant to the antibiotic methicillin and a host of other drugs used to treat infection.

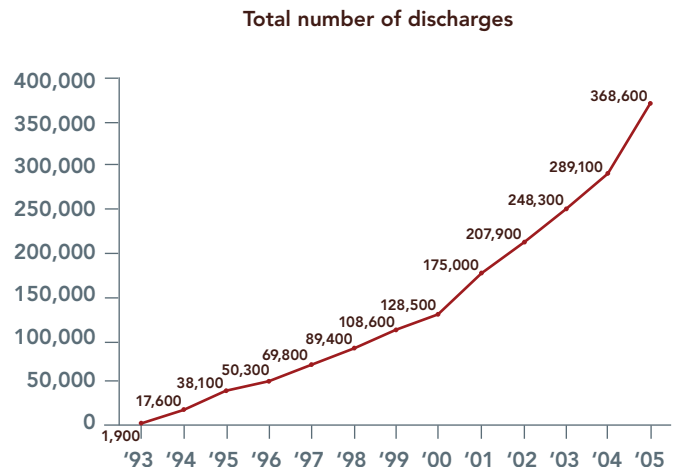
### Vital Statistics

- MRSA is responsible for at least 11,000 U.S. deaths and 80,000 invasive infections per year.<sup>1</sup>
- Patients with MRSA can be twice as likely to die as patients with staph infections that can be treated with methicillin.<sup>2</sup>
- Annual costs of treating hospitalized MRSA patients are between \$3.2 billion and \$4.2 billion in the United States.<sup>3</sup>

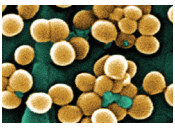
### SEVERE INFECTIONS CAUSED BY MRSA<sup>4</sup>



### HOSPITAL STAYS WITH MRSA INFECTIONS (1993–2005)<sup>5</sup>



SOURCE: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 1993-2005



## MRSA: METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS*

### MRSA Is Becoming Resistant to a Growing Number of Antibiotics

MRSA is most commonly resistant to antibiotics used to treat conventional staph infections.<sup>6</sup>

- Beta-lactams (penicillins and cephalosporins)
- Fluoroquinolones (e.g., levofloxacin)
- Macrolides (e.g., erythromycin, azithromycin)

MRSA can usually be treated with “last-resort” antibiotics, but some resistance has been reported to:<sup>7</sup>

- Clindamycin<sup>8, 9</sup>
- Vancomycin<sup>10</sup>
- Linezolid and daptomycin<sup>10,11</sup> (the last two novel drugs approved to treat drug-resistant *S. aureus* infections).

The information provided here is for general educational and informational purposes only. In no way should it be considered as offering medical advice, and it is not intended nor implied to be a substitute for professional medical advice. Please consult your healthcare provider to determine the appropriateness of the information for your own situation or if you have any questions regarding a medical condition or treatment plan.

Learn more and get involved at  
[WWW.PEWTRUSTS.ORG/ANTIBIOTICS](http://WWW.PEWTRUSTS.ORG/ANTIBIOTICS).

The Pew Health Group's Antibiotics and Innovation Project addresses the growing public health challenge of multidrug-resistant infections by supporting policies that stimulate and encourage the development of antibiotics to treat life-threatening illnesses.

<sup>1</sup> Centers for Disease Control and Prevention, Antibiotic Resistance Threats in the United States, 2013, September 2013, [www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf](http://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf).

<sup>2</sup> M. Whitby, M.L. McLaws, and G. Berry. “Risk of death from methicillin-resistant *Staphylococcus aureus* bacteraemia: a meta-analysis,” *Med J Aust* 175, no. 5 (2001):264-7.

<sup>3</sup> E. Rojas and L. Liu, “Estimating the annual hospital excess cost of methicillin-resistant *Staphylococcus aureus* infections in the United States,” presented at International Society for Pharmacoeconomics and Outcomes Research (IPSOR) Tenth Annual International Meeting, Washington, DC, May 2005.

<sup>4</sup> H. Boucher, L. G. Miller, and R. R. Razonable, “Serious Infections Caused by Methicillin-Resistant *Staphylococcus Aureus*,” *Clin Infect Dis* 51 Suppl 2(2010): S183-97.

<sup>5</sup> A. Elixhauser and C. Steiner, “Infections with *Methicillin-Resistant Staphylococcus Aureus* (MRSA) in U.S. Hospitals, 1993–2005,” HCUP Statistical Brief #35. July 2007. Agency for Healthcare Research and Quality, Rockville, MD. [www.hcup-us.ahrq.gov/reports/statbriefs/sb35.pdf](http://www.hcup-us.ahrq.gov/reports/statbriefs/sb35.pdf).

<sup>6</sup> K. Chua et al., “Antimicrobial Resistance: Not Community-Associated Methicillin-Resistant *Staphylococcus Aureus* (CA-MRSA)! A Clinician’s Guide to Community MRSA — Its Evolving Antimicrobial Resistance and Implications for Therapy,” *Clin Infect Dis* 52, no. 1 (2011): 99-114.

<sup>7</sup> C. Liu et al., “Clinical Practice Guidelines by the Infectious Diseases Society of America for the Treatment of Methicillin-Resistant *Staphylococcus Aureus* Infections in Adults and Children,” *Clin Infect Dis* 52,no.3(2011):e18-55.

<sup>8</sup> L. L. Han et al., “High Frequencies of Clindamycin and Tetracycline Resistance in Methicillin-Resistant *Staphylococcus Aureus* Pulsed-Field Type Usa300 Isolates Collected at a Boston Ambulatory Health Center,” *J Clin Microbiol* 45, no. 4 (2007): 1350-2.

<sup>9</sup> R. E. Mendes et al., “Characterization of Baseline Methicillin-Resistant *Staphylococcus Aureus* Isolates Recovered from Phase Iv Clinical Trial for Linezolid,” *J Clin Microbiol* 48, no. 2 (2010): 568-74.

<sup>10</sup> A. Mangili et al., “Daptomycin-Resistant, Methicillin-Resistant *Staphylococcus Aureus* Bacteremia,” *Clin Infect Dis* 40, no. 7 (2005): 1058-60.

<sup>11</sup> P. Wilson et al., “Linezolid Resistance in Clinical Isolates of *Staphylococcus Aureus*,” *J Antimicrob Chemother* 51, no. 1 (2003): 186-8.