Editorial

Methicillin-Resistant *Staphylococcus aureus*

Managed care. Malpractice. Malingering. Medicine might be more marvelous minus this medley of "m"s. And now: MRSA. Methicillin-resistant *Staphylococcus aureus*. Mmmm . . ..

Michael Pollan, bestselling author and professor of journalism at the University of California, Berkeley, where he is also director of the Knight Program in Science and Environmental Journalism, reported in the December 16, 2007 *The New York Times Magazine* that "MRSA, the very scary antibiotic-resistant strain of *Staphylococcus* bacteria . . . is now killing more Americans each year than AIDS—100,000 infections leading to 19,000 deaths in 2005, according to estimates in *The Journal of the American Medical Association*. For years now, drug-resistant staph infections have been a problem in hospitals, where the heavy use of antibiotics can create resistant strains of bacteria. It's Evolution 101: the drugs kill off all but the tiny handful of microbes that, by dint of a chance mutation, possess genes allowing them to withstand the onslaught; these hardy survivors then get to work building a drug-resistant superrace. The methicillin-resistant staph that first emerged in hospitals as early as the 1960s posed a threat mostly to elderly patients. But a new and even more virulent strain—called 'community-acquired MRSA'—is now killing young and otherwise healthy people who haven't set foot in a hospital. No one is yet sure how or where this strain evolved, but it is sufficiently different from the hospital-bred strains to have some researchers looking elsewhere for its origin."[1]

Also as reviewed in *The New York Times*,[2] "MRSA infection is an infection with a strain of *Staphylococcus aureus* bacteria that is resistant to antibiotics known as beta-lactams. These antibiotics include methicillin, amoxicillin, and penicillin. *Staphylococcus aureus* ('staph') are common bacteria that normally live on the skin. The bacteria also live harmlessly in the nasal passages of roughly 30% of the U.S. population. Staph can cause infection when they enter the skin through a cut or sore. Infection can also occur when the bacteria move inside of the body through a catheter or breathing tube. The infection can be minor and local (for example, a pimple), or more serious.

"Most staph infections occur in people with weak immune systems, usually patients in hospitals and long-term care facilities. MRSA infections in hospitalized patients are known as healthcare-associated MRSA (HA-MRSA). People who have been hospitalized or had surgery within the past year are at high risk for HA-MRSA. People receiving certain treatments, such as dialysis, are also at high risk. MRSA bacteria account for a large percentage of hospital-acquired staph infections.[2]

"Over the past several years, MRSA infections in people not considered high-risk have increased. These infections, known as community-associated MRSA (CA-MRSA), occur in otherwise healthy people who have no history of hospitalization in the last year. Many such infections have occurred among athletes who share equipment or personal items (such as towels or razors) and children in daycare facilities."[2] Notably, "Few antibiotics are available to treat more serious MRSA infections. These include vancomycin (Vancocin, Vancoled), trimethoprim-sulfamethoxazole (Bactrim, Bactrim DS, Septra, Septra DS), and linezolid (Zyvox)."[2]

Worse, in 2008, news of a new, multidrug-resistant strain of CA-MRSA was reported in the *New York Times*.[3] Citing a study reported in the *Annals of Internal Medicine*,[4] *The Times* reports that "the authors warned that unless microbiology laboratories were able to identify the strain and doctors prescribed the proper antibiotic therapy, the infection could soon spread and become a wider threat."[3]

Again, notably, "A single clone of community-associated MRSA, USA300, was not seen before 2000 but is now widely disseminated in 38 U.S. states, Canada, and 9 European Union countries and can cause unusually severe human diseases, including necrotizing fasciitis, sepsis, endocarditis, and pneumonia. Infections occur predominantly among healthy, community-dwelling per-

0749-8063/08/2405-$34.00/0
doi:10.1016/j.arthro.2008.02.006

sons lacking traditional risk factors for MRSA. Whereas hospital-associated MRSA strains are resistant to multiple antimicrobial classes, USA300 and other community-associated MRSA strains are typically resistant to β-lactams and 1 or 2 other drug classes . . . (however) a multidrug-resistant USA300 (has) accumulated multiple resistance genes, rendering it resistant to β-lactams, fluoroquinolones, tetracycline, macrolide, clindamycin, and mupirocin."[4]

While bacterial resistance to antibiotics is a problem well know to readers of *Arthroscopy,* we find the epidemic of MRSA to be of particular clinical concern. Readers should thus note, in the current issue, the report of "MRSA-Induced Septic Arthritis After Anterior Cruciate Ligament Reconstruction," by Kurokouchi et al.[5] To the authors' knowledge, it is the first report of this complication in the English-language literature. Readers should especially note that, in contrast to the typical clinical course of joint sepsis after ACL reconstruction—resolution of sepsis with graft salvage when arthroscopic lavage and debridement and antibiotic treatment is initiated within 1 week after index surgery—in the reported case, multiple operations, graft and hardware removal, and administration of antibiotics for over a month were required until C-reactive protein levels "became negative."

Based on the reports from the lay press,[1-3] the internal medicine literature,[4] and our own journal,[5] *Arthroscopy* readers are cautioned to have a heightened index of suspicion for MRSA as a potential cause of joint or systemic sepsis. Risk factors for HA-MRSA and CA-MRSA have been recently reviewed in the *Journal of the American Academy of Orthopaedic Surgeons*[6] and are summarized in Table 1.

TABLE 1. *Risk Factors for MRSA*

HA-MRSA
Hospitalization, surgery, dialysis, or residence in a long-term care facility within 1 year
Permanent indwelling catheter or percutaneous medical device
Previous MRSA
Proximity to or contact with a patient colonized or infected with MRSA
Recent antimicrobial therapy
CA-MRSA
Athletes in contact sports (e.g., basketball, fencing, football, rugby, volleyball, weightlifting, wrestling)
Children in day care
Homeless persons
Intravenous drug users
Men who have sex with men
Military recruits
Alaskan natives
Native Americans
Pacific Islanders
Prison inmates
Antibiotic use within the preceding year
Close, crowded living conditions
Compromised skin integrity
Contact with contaminated surfaces (e.g., wrestling mats)
Frequent skin-to-skin contact
Shared items
Suboptimal cleanliness

Data from Marcotte et al.[6]

If MRSA is suspected, readers should notify their institutional microbiology laboratory of the concern with a goal of allowing the laboratory to more rapidly identify the specific bacterial strain and sensitivity so that proper antibiotic therapy can be prescribed. Pending such identification, prophylactic implementation of antimicrobial agents that will specifically cover MRSA is recommended[6] in consultation with the pharmacy, the microbiology laboratory, and infectious disease, internal medicine, and/or primary care services. In addition, measures recommended to control MRSA infections in hospital and elective surgical settings include written MRSA standards, cohort nursing, nonselective screening of all admissions to orthopaedic wards, screening and decolonization of all patients having elective orthopedic procedures (especially those including prosthetic implants), use of polymerase chain reaction as a diagnostic tool, ring-fencing of beds, separate wound-dressing rooms for each ward, signal-colored isolation gowns and storage carts facilitating the use of separate supplies for patients with MRSA, intensified surveillance and feedback of MRSA data, "flagging" of formerly positive MRSA patients, gendine antiseptic dye coating of orthopaedic implants, and perioperative prophylaxis using nasal mupirocin and topical triclosan.[7-11] Readers are encouraged to carefully review the cited references and to determine the incidence and susceptibility of HA-MRSA and CA-MRSA in their local communities in order to develop clinically relevant, evidence-based protocols for MRSA prophylaxis and treatment.

While we agree with Michael Pollan that MRSA is "scary," we advocate action as opposed to fear. Mindful management of MRSA may minimize morbidity and mortality. Mmmm . . ..

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