Skin Lesions in Barracks: Consider Community-Acquired Methicillin-Resistant *Staphylococcus aureus* Infection Instead of Spider Bites

Guarantor: Richard S. Vetter, MS*†
Contributors: Benedict B. Pagac, BS‡; Ronald W. Reiland, MS§; David T. Bolesh, RN MSN§; David L. Swanson, MD¶

Recent outbreaks of mysterious skin lesions on multiple personnel at several military facilities were initially blamed on spiders. Requests were made for pest inspection and control to remedy the situation. Greater scrutiny of the situation led to a hypothesis that instead of spiders, an infectious outbreak of community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA) should be investigated as the etiology. Subsequent culturing of the lesions on personnel at one facility confirmed this bacterial etiology. Barracks, as well as other close quarter military living conditions, are ripe environments for the establishment, persistence, and spread of CA-MRSA. Military medical personnel should consider CA-MRSA as a more likely etiologic agent than spider bites for cutaneous eruptions in which there are multiple lesions on one person or multiple patients with similar lesions.

Introduction

Skin lesions resembling bites of brown recluse spiders can have many different etiologies. They can be caused by infections (bacterial, fungal, viral), inflammatory and metabolic diseases (diabetic ulcer, pyoderma gangrenosum, erythema multiforme), or by arthropods either directly (ticks, fleas) or as vectors (Lyme borreliosis, flea-born diseases) to name a few of many examples.[1,2] Spiders, in general, are frequently blamed for causing skin disease incidents based completely on speculative, unsubstantiated associations and historical prejudice; in almost every case, no spider is seen biting or is collected in the incident.[3,4] Emerging research is showing that a bacterial infection is sometimes the actual culprit in outbreaks occurring in communal settings such as military barracks. Obviously, when spiders are assumed to be the etiology, this leads to an improper, ineffective medical and pest eradication remedy and prolongs the discovery of the correct causative agent and the subsequent proper treatment.

Community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA) is a bacterial infection that is receiving increased recognition in the medical and entomological communities for its ability to cause skin lesions. It is a contagious condition that typically occurs in facilities where many people are housed in close quarters for long periods of time.[5] In the civilian world, CA-MRSA is associated with prisons, other correctional facilities, nursing homes, long-term health care facilities, sports camps, and other similar settings of prolonged housing with high human density. It stands to reason that military barracks and ships would be at risk for CA-MRSA.

We report here several cases in military facilities where spiders were initially suspected as causing skin lesions in multiple personnel and the documentation of one episode involving two personnel where CA-MRSA was confirmed as the actual etiology.

Methods

One of us (B. B. Pagac) is a pest management consultant to Army installations located in 21 northeastern states. From October 2003 to November 2004, multiple Army personnel experienced outbreaks of skin lesions that were attributed to spider bites at five facilities: Fort Monmouth (New Jersey), Fort Lee (Virginia), Fort McNair (District of Columbia), Aberdeen Proving Ground, and Fort Meade (both in Maryland). Requests were made for inspection and spider control measures, which were typically conducted by installation Preventive Medicine personnel, public works pest management operators, or a regional pest management consultant. Visual inspections for spiders, webbing, and prey carcasses were conducted. Assessment procedures typically included flashlight-assisted inspections of voids above dropped ceilings, closets, spaces behind furniture, bunks, and room objects. Linens, bedding, and windowsills were also examined. Sticky traps were used in all cases to detect spiders and to determine whether a notable number of non-spider arthropods were present, suggesting a food source for spiders.

After several episodes without successful resolution of the outbreaks through entomological control measures, consideration was given to the diagnosis of CA-MRSA at the Virginia facility reporting lesions ascribed to spider bite. Results of cultures with bacterial antibiotic susceptibility determinations were made available by Laboratory Services, Kenner Army Health Clinic, Fort Lee, Virginia. At the five facilities, we tallied the minimum number of personnel exhibiting skin lesions thought to be caused by spider bites. Accurate definitive numbers at most of the facilities were not determinable due to the lengthy period of time between the initial incident and the subsequent follow-up investigation; in many cases affected personnel and the attending medical corps were no longer stationed at these facilities and could not be located.

Results

No arthropods of confirmed medical importance were found at any of the five military facilities. At Fort McNair, orb weaver

*Department of Entomology, University of California, Riverside, CA 92521.
†Biology Division, San Bernardino County Museum, 2024 Orange Tree Lane, Redlands, CA 92374.
‡U.S. Army Center for Health Promotion & Preventive Medicine, Building 4411, Llewellyn Avenue, Fort Meade, MD 20755-5225.
§Kenner Army Health Clinic, Medical Department Activity, 700 24th Street, Fort Lee, VA 23801.
¶Department of Dermatology, Mayo Clinic, 13400 East Shea Boulevard, Scottsdale, AZ 85259.
This manuscript was received for review in May 2005 and accepted for publication in January 2006.

spiders of the genus *Neoscona* (family Araneidae) were found. Operators at a minimum of four installations applied pesticides (e.g., permethrin) even though no medically important arthropods were present. Presumably arthropods of some type were present in these cases because this is a pesticide label requirement that is necessary before application.

At the Fort Lee facility, lesions were documented in at least 23 personnel, from which confirmation of CA-MRSA was made in two barracks residents who were roommates. The other four facilities had the following minimum number of personnel with lesions attributed to spider bites: Monmouth (N = 10), McNair (N = 6), Aberdeen (N = 6), and Fort Meade (N = 3). In one instance, assessment of the lesions as spider bites was made by the attending physician; it is unknown whether physicians were involved in assessments of presumed spider bites at the other facilities.

Discussion

Methicillin-resistant *Staphylococcus aureus* (MRSA) is an emerging cause of skin and soft tissue infections due to increased resistance of the bacteria to antibiotics. In the 1990s, nosocomial infections due to MRSA became a problem of global magnitude. In the past half-decade, infections due to MRSA have also become commonplace in the community among people who have little or no contact with health care settings.[6] These infections are designated as CA-MRSA. Most CA-MRSA infections are mild, but some advance to more serious systemic infection, bacteremia, and death.[7] Transmission of CA-MRSA has been reported most frequently in specific populations (e.g., children, sports participants, jail inmates).[8-10] Predisposing risk factors for outbreaks of CA-MRSA include the increased use of antimicrobial agents, close skin-to-skin contact, close person-to-person proximity, a contaminated environment, suboptimal hand and personal hygiene,[10] a roommate with skin infection, family members working in health care,[11] and conditions that may predispose to breaches in skin integrity such as harsh physical activity. All of these conditions are potentially met in the military domiciles. The common and necessary nature of multiple individuals housed in small living quarters such as barracks and onboard ships, the potential for interpersonal contact, as well as the sharing or inadvertent contact of personal belongings create an optimal breeding ground for the development, maintenance, and spread of CA-MRSA in military surroundings.

Spiders are commonly blamed for causing skin lesions. In particular, recluse spiders (genus *Loxosceles*) are frequently implicated as dermonecrotic agents, oftentimes in areas of North America where they are extremely rare or have never been documented.[2,12-18] For example, in a medical surveillance report from Fort Benning, Georgia[19] in 1997 (when MRSA was relatively unknown), alleged brown recluse spider bites were blamed for a military outbreak of dermal injuries with minimal evidence of spider involvement. At the basic training facility, "brown recluse spider bites" were reported in 36 of 980 military personnel. The diagnosis was based on clinical presentation of lesions "consistent with brown recluse spider envenomation." Despite no corroborative evidence of actual recluse spiders, the authors describe "attack rates" for individual companies and refer to this as the "largest outbreak of brown recluse spider envenomation in a defined population over a short period." Fort Benning is on the southeasternmost margin of brown recluse spider territory,[2] so populations of this spider, although possibly present, would be sporadically distributed. Inspection of the facility by entomologists from Preventive Medicine Services resulted in only one shed spider skin which was reported to be from a brown recluse. Considering what we now know about MRSA and CA-MRSA, bacterial infections by *Staphylococcus aureus* are far more likely explanations for this episode than spider bite.

Overall, improper diagnoses of spider bites have been given to patients with cutaneous anthrax, lymphoma, basal cell carcinoma, Lyme borreliosis, pyoderma gangrenosum, and other serious and potentially debilitating or deadly conditions.[2]

In North America, *Loxosceles* spiders are the only spiders that are proven capable of causing dermonecrotic lesions.[2] Bites by these spiders manifest as single lesions in a given patient; most bites heal well with no or minimal medical intervention and most bites heal without noteworthy scarring.[20] The infamy of this spider is exaggerated in part due to the tendency of the medical community to emphasize lesions with severe necrosis, which are rare manifestations of venom insult.[2]

The *Neoscona* orb weaver spiders found at the one facility in Virginia are typically harmless. When bites occur, they result in mild symptoms such as local erythema, edema, and pruritis for a few days before resolving.

In a diagnostic situation, a caregiver can almost always rule out a spider bite when there are multiple contemporaneous lesions on one person, multiple consecutive lesions on one person, or multiple persons with lesions. In the cases presented here, the presentation by several affected individuals living communally virtually excluded spider involvement, and instead suggested a communicable disease. Although CA-MRSA was confirmed by culture at one of the five locations, all facilities involved multiple personnel expressing lesions (an average of nearly 10 people per installation) and the scenarios are similar enough to postulate that CA-MRSA was also the etiology in the other incidents.

The treatment of CA-MRSA necessarily follows the determination of antibiotic susceptibility of the cultured *Staphylococcus*. CA-MRSA isolates typically retain susceptibility to some antibiotics such as minocycline or trimethoprim-sulfamethoxazole,[21] but no assumptions of susceptibility can be made in this evolving disease.[22] Management should also include surgical drainage of abscesses and the application of clean, dry wound dressings. Infected persons, their cohabitants, and caregivers should receive training about hand and personal hygiene using soap and water or alcohol-based hand gels. Frequently touched surfaces should be cleaned with antiseptic cleansers. Mupirocin applications to the nares are commonly advocated although recently concerns have arisen over the emergence of mupirocin-resistant MRSA.[23]

Conclusions

Military medical personnel must be vigilant for CA-MRSA outbreaks. When spiders are blamed instead, medical and entomological personnel divert their efforts onto the wrong remedial pathway and delay the correct assessment of the situation. Additionally, the historical prejudice in blaming spiders may

cause the unwarranted dispensing of pesticide control measures in living quarters as happened at four of the facilities mentioned here. Even worse, eradication or preventive measures performed by afflicted, untrained personnel (instead of by professional pest control operators) could result in the reckless and inappropriate dispensing of dangerous physical or chemical interventions that may further increase health risk.

Caregivers of all disciplines are becoming more aware of the prevalence of MRSA and CA-MRSA. However, there remains a bias by medical providers to blame spiders as the cause of dermatologic outbreaks when there is no valid incriminating evidence to do so. Health care in military settings will improve through education of military caregivers regarding the clinical expressions of MRSA and the improbability of spider bite epidemics.

References

1. Isbister GK, Whyte IM: Suspected white-tail spider bite and necrotic ulcers. Intern Med J 2004; 34: 38–44.
2. Swanson DL, Vetter RS: Bites of brown recluse spiders and suspected necrotic arachnidism. N Engl J Med 2005; 352: 700–7.
3. Isbister GK: Necrotic arachnidism: the mythology of a modern plague. Lancet 2004; 364: 549–53.
4. Vetter RS: Myths about spider envenomation and necrotic skin lesions. Lancet 2004; 364: 484–5.
5. Dominguez TJ: It's not a spider bite, it's community-acquired methicillin-resistant *Staphylococcus aureus*. J Am Board Fam Pract 2004; 17: 220–6.
6. Naimi TS, LeDell KH, Como-Sabetti K, et al: Comparison of community- and health care-associated methicillin-resistant *Staphylococcus aureus* infection. JAMA 2003; 290: 2976–84.
7. Centers for Disease Control: Four pediatric deaths from community-acquired methicillin-resistant *Staphylococcus aureus*–Minnesota and North Dakota, 1997–1999. MMWR 1999; 48: 707–10.
8. Centers for Disease Control: Methicillin-resistant *Staphylococcus aureus* infections in correctional facilities–Georgia, California, and Texas, 2001–2003. MMWR 2003; 52: 992–6.
9. Begier EM, Frenette K, Barrett NL, et al: A high-morbidity outbreak of methicillin-resistant *Staphylococcus aureus* among players on a college football team, facilitated by cosmetic body shaving and turf burns. Clin Infect Dis 2004; 39: 1446–53.
10. Kazakova SV, Hageman JC, Matava M et al: A clone of methicillin-resistant *Staphylococcus aureus* among professional football players. N Engl J Med 2005; 352: 468–75.
11. Campbell KM, Vaughn AF, Russell KL, et al: Risk factors for community-associated methicillin resistant *Staphylococcus aureus* infections in an outbreak of disease among military trainees in San Diego, CA in 2002. J Clin Microbiol 2004; 42: 4050–3.
12. Russell FE, Gertsch WJ: For those who treat spider or suspected spider bites. Toxicon 1983; 21: 337–9.
13. Kunkel DB: The myth of the brown recluse spider. Emerg Med 1985; 17: 124–8.
14. Vetter RS, Bush SP: Reports of presumptive brown recluse spider bites reinforce improbable diagnosis in regions of North America where the spider is not endemic. Clin Infect Dis 2002; 35: 442–5.
15. Vetter RS, Bush SP: The diagnosis of brown recluse spider bite is overused for dermonecrotic wounds of uncertain etiology. Ann Emerg Med 2002; 39: 544–6.
16. Vetter RS, Cushing PE, Crawford RL, Royce LA: Diagnosis of brown recluse spider bites (loxoscelism) greatly outnumber actual verifications of the spider in four western American states. Toxicon 2003; 42: 413–8.
17. Vetter RS, Edwards GB, James LF: Reports of envenomation by brown recluse spiders (Aranae: Sicariidae) outnumber verifications of Loxosceles spiders in Florida. J Med Entomol 2004; 41: 593–7.
18. Bennett RG, Vetter RS: An approach to spider bites: erroneous attribution of dermonecrotic lesions to brown recluse or hobo spider bites in Canada. Can Fam Physician 2004; 50: 1098–101.
19. Nee MA, Craig SC, Milstrey EG, et al: Brown recluse spider bites among infantry trainees, Fort Benning, Spring 1997, pp 10–11. Medical Surveillance Monthly Report. Aberdeen Proving Ground, MD, U.S. Army Center for Health Promotion and Preventive Medicine Services, 1997.
20. Anderson PC: Missouri brown recluse spider: a review and update. Mo Med 1998; 95: 318–22.
21. Reynolds R, Potz N, Colman M, et al: Antimicrobial susceptibility of the pathogens of bactearemia in U.K. and Ireland 2001–2002: the BSAC Bacteraemia Resistance Surveillance Programme. J Antimicrob Chemother 2004; 53: 1018–32.
22. von Eiff C, Lubritz G, Heese C, Peters G, Becker K: Effect of trimethoprim-sulfamethoxazole in AIDS patients on the formation of the small colony variant phenotype of *Staphylococcus aureus*. Diagn Microbiol Infect Dis 2004; 48: 191–4.
23. Walker ES, Vasquez JE, Bullock H, Sarubbi FA: Mupirocin-resistant, methicillin-resistant *Staphylococcus aureus*: does mupirocin remain effective? Infect Control Hosp Epidemiol 2003; 24: 342–6.