SUPPLEMENT ARTICLE

Skin and Soft-Tissue Infections Caused by Community-Acquired Methicillin-Resistant *Staphylococcus aureus*

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Community-acquired methicillin-resistant *Staphylococcus aureus* (MRSA) infection has become epidemic. Skin and soft-tissue infections (SSTIs) are the most frequent forms of the disease. Obtainment of culture specimens is important for documentation of the presence of MRSA and for susceptibility testing to guide therapy. Purulent lesions should be drained whenever possible. In areas where community-acquired MRSA isolates are prevalent, uncomplicated SSTI in healthy individuals may be treated empirically with clindamycin, trimethoprim-sulfamethoxazole, or long-acting tetracyclines, although specific data supporting the efficacy of these treatments are lacking. In healthy patients with small purulent lesions, drainage alone may be sufficient. In patients with complicated SSTI requiring hospitalization or intravenous therapy, vancomycin is the drug of choice because of the low cost, efficacy, and safety. Linezolid, daptomycin, and tigecycline are also effective, although published studies on the last 2 agents for the treatment of SSTI due to MRSA are more limited. Dalbavancin, telavancin, and ceftobiprole are investigational agents that may expand our therapeutic options for the treatment of SSTI caused by MRSA.

First recognized in 1960, methicillin-resistant *Staphylococcus aureus* (MRSA) was considered to be a medical oddity. Now, MRSA is the most common nosocomial bacterial pathogen isolated in many parts of the world [1–3]. In the past, community-acquired MRSA (CA-MRSA) infections tended to occur in patients with frequent health care contact or, less commonly, in specific groups of patients, such as intravenous drug users [4]. During the past decade, however, there has been a dramatic change in the epidemiology of community-onset infections caused by MRSA [1, 5]. Young, healthy individuals who lack classic risk factors for MRSA infection are often affected [6–9]. CA-MRSA infections, which were first described in small series of adult and pediatric patients presenting with skin and soft-tissue infections (SSTIs), pneumonia, or bacteremia [9–11], have become a significant public health threat in the United States and abroad [2, 12]. In the United States, a single clone of CA-MRSA (USA 300 ST-8) has become the most prevalent cause of staphylococcal SSTI acquired in the community [13, 14] and has moved into the inpatient setting, causing not only SSTIs but also invasive diseases [15–17].

CA-MRSA: A BLURRED DEFINITION

In the United States, strains of CA-MRSA carry the staphylococcal cassette chromosome (SCC) *mec* type IV (usually clone USA 300), and most carry the gene for Panton-Valentine leukocidin (PVL) [6, 7, 13]. From an epidemiologic standpoint, the definition of CA-MRSA is problematic. Most studies have used a time-based definition (e.g., infections recognized within 24–72 h after hospital admission) [18]. However, *S. aureus* can persist as a colonizer for months or years [19, 20], leading to misclassification of the source. Indeed, some "community-onset" infections may in fact be caused

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by hospital-acquired strains and vice versa [18, 19, 21]. CA-MRSA is invading US hospitals [15, 16, 21]. Thus, the distinction between CA-MRSA and hospital-acquired MRSA (HA-MRSA) [21–23] is blurring. Nevertheless, the presence of SCC*mec* type IV and the presence of PVL have been useful molecular markers of CA-MRSA strains [24].

HOST AND RISK FACTORS FOR CA-MRSA SSTI

CA-MRSA causes infection in many different hosts, ranging from healthy children and adults to people with underlying diseases and extensive health care contact. CA-MRSA infections have been reported in healthy newborns [25, 26], healthy children [8–10, 27], healthy adults [6, 7], pregnant women [28], postpartum women [29], intravenous drug users [30], prisoners [31, 32], homeless persons [30], men who have sex with men [33], athletes [34–36], tattoo recipients [37], soldiers [38–40], Native American communities [41], and Pacific Islanders [42]. More groups will surely be added to this list. SSTIs caused by CA-MRSA and those caused by HA-MRSA are different in several respects [22]. SSTIs due to CA-MRSA predominantly affect children, young adults, and middle-aged adults [7, 8, 13, 43, 44]. The median age for adults infected with CA-MRSA ranges from 20 to 47 years [6, 44, 45]. SSTIs due to CA-MRSA are more frequent among males [44, 46, 47] and nonwhite individuals [7, 13, 45, 48]. Many patients with CA-MRSA infections do not have recognized risk factors for the acquisition of MRSA [6, 7, 21, 27, 49]. Spider bites are commonly reported by patients who have SSTI caused by CA-MRSA [7, 50]. This is not because a spider bite has actually occurred but because the cutaneous lesion of CA-MRSA infection can be similar in appearance to that of a spider bite [50, 51].

Direct contact with infected patients [7], colonized subjects [38, 52], or a contaminated environment [35, 49] is implicated in the transmission of CA-MRSA infection. Crowding and sharing of personal items appear to be important factors. Transmission has occurred through activities in which direct contact and turf abrasions are common—for example, among football players [34, 35], wrestlers [53], and military trainees [39]. Recently, heterosexual transmission was described [52]. Intrafamilial spread of CA-MRSA is frequent and most certainly accounts for an increasing number of cases [6, 27, 54]. In 10%–18% of cases, MRSA-infected patients recall having close contact with persons who had similar skin infections (e.g., boils) [6, 7, 55]. This percentage is often higher in closed communities [40]. In addition, as with HA-MRSA, previous colonization with CA-MRSA [38, 56] was related to subsequent development of infection.

PVL: A MAJOR VIRULENCE FACTOR IN SSTI?

In contrast to nosocomial strains of MRSA, most strains of CA-MRSA carry genes for PVL [6, 57, 58]. PVL-positive strains of *S. aureus* are associated with tissue necrosis and abscess formation [59, 60]. However, it is unclear whether PVL is mediating these effects [61, 62]. The role of PVL as a major virulence factor is more established in other infections, such as pneumonia [63]. Other than genes for PVL, CA-MRSA strains may carry exotoxin genes, which may result in significant skin damage [14]. For example, exfoliative toxin genes (*eta* and *etb*) have been described in children with impetigo [64] and in patients with toxic-shock syndrome caused by CA-MRSA [65].

CLINICAL PRESENTATION OF SSTI CAUSED BY CA-MRSA

CA-MRSA strains can produce a variety of SSTIs, ranging from impetigo to life-threatening necrotizing fasciitis (table 1) [46, 66]. Abscesses and cellulitis are the most common lesions [44, 67, 68]. Approximately 50%–75% of patients present with abscesses, and 25%–50% with cellulitis [43, 44, 46, 68]. These infections commonly present as single lesions involving the extremities [6, 39]. Systemic signs of inflammation are variable [6, 44]; fever and leukocytosis are often absent in patients with abscess. Abscesses are frequently accompanied by central necrosis and surrounding cellulitis [47]. Furuncles (boils) are very characteristic [67], are often multiple, and frequently occur in outbreaks [49, 69]. Lesions can be primarily necrotic and can progress to abscesses and cellulitis [70]. Recurrence is common [68] and is probably related to high rates of MRSA colonization among these patients [49]. Folliculitis caused by CA-MRSA is a less frequent form of presentation [43, 46], usually with erythematous folliculocentric pustules, which can compromise uncommon localizations (e.g., periumbilical) [71]. Impetigo and scalded-skin syndrome due to CA-MRSA (usually in children) are also uncommon forms of the disease [46]. Pyomyositis and myositis due to CA-MRSA are uncommon infections usually involving the lower extremities or pelvis. Pain and fever are almost invariably present. Unlike with viral myositis, an increase in WBC count is common, and creatine kinase levels are often within normal range [72]. Some patients have associated bacteremia and septic shock; muscle drainage is required in most cases.

A subacute form of necrotizing fasciitis has occurred in middle-aged patients, usually associated with a history of intravenous drug use or comorbid conditions, such as hepatitis C or diabetes [66]. Importantly, fewer than half of these patients received a preoperative diagnosis of necrotizing fasciitis. Infrequently, strains of CA-MRSA can produce systemic syndromes affecting the skin, such as staphylococcal toxic-shock syndrome [65], Waterhouse-Friderichsen syndrome [73], and purpura fulminans [74].

Requirement of hospitalization for adult patients with SSTIs due to CA-MRSA is variable, ranging from 16% to 44% of cases [6, 13, 30, 43, 44, 46, 67]. The outcomes at 30 days for

Table 1. Skin and soft-tissue infections (SSTIs) caused by community-acquired (CA) methicillin-resistant *Staphylococcus aureus* (MRSA).

Type of infection	Comment
Direct SSTI	
Impetigo	More frequent in children (although usually caused by group A streptococci)
Folliculitis	Usually cured with topical or no antibacterial therapy
Furuncles (boils)	Frequently described in outbreaks and with contacts who have similar infections; probably underreported
Cellulitis	Very frequent; probably underreported, given the less-certain microbiology
Abscess	The most-common infection type caused by CA-MRSA
Pyomyositis	Infrequent; more common in children
Necrotizing fasciitis	Rare but life threatening; most cases are subacute and in patients with comorbid conditions
Surgical-site infection	Part of hospital invasion of CA-MRSA
Systemic syndrome mediated by toxins and affecting the skin	
Staphylococcal toxic-shock syndrome	Described in children; associated with *eta, etb,* and other similar genes, rather than *tst* gene
Purpura fulminans and Waterhouse-Friderichsen syndrome	Very rare; associated with MRSA pneumonia (due to PVL-positive strains); all patients have died
Scalded-skin syndrome	In children, frequently with PVL-negative strains

NOTE. PVL, Panton-Valentine leukocidin.

patients with SSTI caused by CA-MRSA do not appear to be different from those for patients with infections caused by community-acquired methicillin-susceptible *S. aureus* (CA-MSSA) [68]. In general, the prognosis for patients with SSTI due to CA-MRSA is very good. Death is quite uncommon, and the rate is certainly lower than that among patients infected with nosocomial MRSA [6]. However, the recurrence of lesions is frequent [28, 68].

THERAPY FOR CA-MRSA

Surgical drainage. Surgical drainage is crucial for the cure of furuncles and soft-tissue abscesses and, therefore, is recommended for the treatment of these conditions in all patients [75, 76]. Incision and drainage are required for ~80% of patients presenting to the emergency department with acute, purulent SSTI [7, 44]. Patients with abscesses caused by CA-MRSA infection are frequently cured with drainage alone. Separate observational studies noted that a significant proportion of patients who underwent drainage and received inadequate or no antibacterial therapy were cured [43, 44, 47, 68, 77]. A recent randomized clinical trial reported cure rates of >85% for patients who underwent drainage and received placebo, as well as for those who underwent drainage and received cephalexin [78].

The correlation between abscess size and outcome remains controversial. Children with abscesses that are >5 cm in diameter were more likely to experience failure of incision and drainage therapy without effective antibiotic therapy [77]. Such an association was not observed in adults [44]. Given the lack of prospective studies, clinical judgment should determine for which patients surgical drainage alone is appropriate. For example, healthy, reliable, nondiabetic patients with small lesions and no systemic signs of infection [79] for whom close follow-up can be achieved are certainly candidates for surgical drainage alone.

Antibiotic therapy. Despite the fact that many patients with drainable lesions can be cured with surgical drainage alone, effective antibacterial therapy may improve cure rates even further, especially among patients with large abscesses or cellulitis. Cure rates among patients with SSTI due to CA-MRSA who received active antibacterial therapy were higher than those among patients who received inactive therapy (95% vs. 87%, respectively) [44]. In geographic areas with a high prevalence of CA-MRSA (e.g., >15% of community *S. aureus* isolates show methicillin resistance), empirical therapy should not be based solely on clinical characteristics. Clinical and epidemiological factors do not adequately discriminate between CA-MRSA and CA-MSSA in patients with SSTI [55].

US FOOD AND DRUG ADMINISTRATION (FDA)–APPROVED AGENTS

General characteristics of FDA-approved and investigational agents are presented in table 2. Most relevant trials involving patients with SSTI are displayed in table 3. Remarkably, there

Table 2. Principal characteristics of US Food and Drug Administration (FDA)–approved and investigational agents for complicated skin and soft-tissue infection due to methicillin-resistant *Staphylococcus aureus* (MRSA).

Agent type and name	Mechanism of action	Bactericidal effect	Post-antibiotic effect, h	Serum half-life (for normal renal function)	Adjustment for renal insufficiency	Normal dosage	Route
FDA approved							
Vancomycin	Cell-wall synthesis inhibition	Slow, time dependent	~1.5	6 h	Yes	15 mg/kg every 12 h	iv
Linezolid	Ribosomal protein synthesis inhibition (50S ribosomal subunit)	No	~2	~5 h	No	600 mg every 12 h	iv or po
Daptomycin	Membrane depolarization	Rapid, concentration dependent	~5	~9 h	Yes[a]	4 mg/kg every 24 h	iv
Tigecycline	Ribosomal protein synthesis inhibition (30S ribosomal subunit)	No	NA	~40 h	No	50 mg every 12 h (100-mg initial dose)	iv
Investigational[b]							
Dalbavancin	Cell-wall synthesis inhibition	Concentration dependent	NA	~10 days	Probably[a]	1000 mg on day 1, followed by 500 mg on day 8	iv
Telavancin	Dual: cell-wall synthesis inhibition and membrane depolarization	Rapid, concentration dependent	~4	~8 h	Yes	10 mg/kg every 24 h	iv
Oritavancin	Cell-wall synthesis inhibition (and membrane depolarization?)	Rapid, concentration dependent	≤1.5	18 h[c]	NA	1.5–3 mg/kg every 24 h	iv
Ceftobiprole	Cell-wall synthesis inhibition (PBP2a)	Time dependent	~1	~4 h	Yes	500 mg every 12 h	iv

NOTE. iv, intravenous; NA, not available; po, by mouth; PBP2a, penicillin-binding protein 2a.

[a] With creatinine clearance <30 mL/min.

[b] With ≥1 phase 3 study completed.

[c] γ terminal half-life of ~15 days.

Table 3. Most relevant trials for agents with activity against methicillin-resistant *Staphylococcus aureus* (MRSA) in patients with skin and soft-tissue infection (SSTI).

Agent type and name [reference]	Comparator, design, and randomization ratio	Hospitalization required at enrollment	Patients with abscesses, %	No. of patients with MRSA/total no. of patients treated[a]	Agent vs. comparator cure rates for MRSA infection,[b] % (95% CI for the difference)
FDA approved					
Vancomycin	Standard of care	…	…	…	…
Linezolid[c] [80]	Vancomycin, open label, 1:1	Yes	26	285/1180	88.6 vs. 66.9 (12.38–30.97)
Daptomycin [81]	Vancomycin, double blinded, 1:1	Yes	24	64/1092	75 vs. 69.4 (−28.5 to 17.4)
Tigecycline [82]	Vancomycin, double blinded, 1:1	Yes	28	65/1116	78.4 vs. 76.5[d]
Investigational[e]					
Dalbavancin [83]	Linezolid, double blinded, 2:1	Not necessarily (iv therapy required)	32	278/854[f]	NA
Telavancin [84]	Vancomycin, double blinded, 1:1	Not necessarily (iv therapy required)	42	579/1867	90.6 vs. 86.4[g] (−1.1 to 9.3)
Oritavancin [85, 86]	Vancomycin/cephalexin, double blinded	NA	NA	NA/1769	NA
Ceftobiprole [87]	Vancomycin, double blinded, 1:1	NA	48	121/784	91.8 vs. 90

NOTE. FDA, US Food and Drug Administration; iv, intravenous; NA, not available.

[a] "No. of patients with MRSA" refers to the total number of patients with MRSA isolated at baseline in the microbiologically evaluable population, unless otherwise noted; "total no. of patients treated" refers to all patients who were randomized and received at least 1 dose of the study medication.

[b] Cure rates in the microbiologically evaluable population with MRSA infection, unless otherwise noted.

[c] Registrational studies of linezolid included patients with different MRSA infections and patients with diabetic foot infection (see the "US Food and Drug Administration (FDA)–Approved Agents" section for details).

[d] Information on the FDA label (total of 71 microbiologically evaluable patients with SSTI due to MRSA) [89].

[e] With ⩾1 phase 3 study completed.

[f] There were 278 patients with MRSA infection in the microbiologically evaluable intention-to-treat population; the microbiologically evaluable population with MRSA infection should be fewer patients.

[g] Cure rates in clinically evaluable patients with MRSA.

is an increasing proportion of patients with both MRSA infections and MRSA abscesses enrolled in these trials. This finding probably reflects the epidemic of CA-MRSA infection.

For decades, vancomycin has been the standard therapy for patients with SSTI due to MRSA. In addition, vancomycin is the antibiotic most extensively studied in clinical trials involving patients with SSTI. More than 2000 patients with SSTI, including >500 patients with MRSA infection, were given treatment with vancomycin in randomized, controlled trials [80–82, 84, 88]. Cure rates among evaluable patients infected with MRSA in phase 3, randomized, double-blind trials have ranged from 69% to 90% [81, 87]. Vancomycin has also been shown to be relatively safe [81, 87].

Linezolid, an oxazolidinone with bacteriostatic activity, can be administered twice a day, either orally or intravenously with identical bioavailability. The efficacy of linezolid therapy for patients with complicated SSTI due to MRSA was studied in an open-label, randomized, controlled trial in which 285 patients in the microbiologically evaluable population had MRSA infection (table 3). Although the trial did not find an overall difference in efficacy between patients with complicated SSTI treated with vancomycin versus those treated with linezolid, linezolid treatment was found to be superior to vancomycin treatment in almost all study populations, including the subgroup of patients with MRSA infection [80]. It should be noted that, in this open-label study, vancomycin achieved lower cure rates among patients infected with MRSA (~67%) than were observed in other studies in which the drug was used as a comparator. Another study comparing linezolid therapy with vancomycin therapy for patients with various MRSA infections included 64 evaluable patients with SSTI. Cure rates were 79% and 73% for linezolid treatment and vancomycin treatment, respectively [88]. Finally, in a study of patients with diabetes-associated foot infections, 18 patients with MRSA infection were evaluable, and 13 (72%) were cured [93]. Pediatric studies have provided only limited evidence supporting the use of linezolid therapy for children with complicated and uncomplicated SSTIs due to MRSA [94, 95].

Daptomycin is a cyclic lipopeptide that is rapidly bactericidal and active against almost all gram-positive cocci, including MRSA [96]. Intravenous daptomycin was approved by the FDA in 2003 for the treatment of patients with complicated skin and skin-structure infections, including those infected with MRSA. Daptomycin treatment was noninferior to vancomcyin treatment in 2 registrational studies involving patients with complicated skin and skin-structure infections. A total of 64 patients with MRSA were microbiologically evaluable (table 3) [81]. In this group of patients, cure rates for daptomycin treatment and vancomycin treatment were comparable (75% vs. 69.4%, respectively).

Tigecycline is a broad-spectrum glycylcycline designed to avoid both *tetK* (tetracycline-specific efflux-mediated) resistance and *tetM* (target modification) class resistance to tetracyclines [97]. Tigecycline was recently approved by the FDA

for the treatment of patients with SSTI, including those infected with MRSA. In 2 registrational studies, 65 patients with MRSA were microbiologically evaluable [82]. Cure rates among these patients were 78.4% and 76.5% for tigecycline treatment and vancomycin treatment, respectively [89]. Importantly, most strains of MRSA in these tigecycline studies were SCC*mec* type IV and PVL positive [90].

INVESTIGATIONAL AGENTS

Dalbavancin is a semisynthetic lipoglycopeptide with a long half-life compatible with weekly dosing [98]. Dalbavancin is bactericidal against gram-positive cocci, including MRSA. In a phase 3 study comparing dalbavancin therapy with intravenous or oral linezolid therapy for 14 days, 278 patients with MRSA infection were enrolled and received at least 1 dose of study medication (table 3). Although cure rates in these patients were not specifically reported, eradication of MRSA was achieved in 91% of patients who received dalbavancin treatment and in 89% of those who received linezolid treatment [83].

Telavancin is a lipoglycopeptide with a dual mechanism of action and is rapidly bactericidal against gram-positive cocci, including MRSA [84, 99]. Registrational phase 3 studies comparing telavancin therapy with vancomycin therapy in patients with SSTI included 579 clinically evaluable patients with MRSA infection. In this group of patients, telavancin treatment showed a trend toward superiority when compared with vancomycin treatment (90.6% vs. 86.4%) [84]. It is of note that this program enrolled the largest number of patients infected with MRSA of any clinical trial and that most strains of MRSA were SCC*mec* type IV and PVL positive [91].

Oritavancin is a semisynthetic glycopeptide, has a long half-life, and is rapidly bactericidal against gram-positive cocci, including MRSA [92]. Although 2 phase 3 studies of oritavancin treatment were completed some years ago, complete release of the results is still pending [85, 86]. In one of these studies, 33 patients with MRSA infection were clinically evaluable; cure rates were 74% and 80% for oritavancin treatment and vancomycin treatment, respectively [86].

Ceftobiprole is a broad-spectrum third-generation cephalosporin that is active against both MSSA and MRSA infections [87]. A phase 3 study compared ceftobiprole therapy with vancomycin therapy for patients with complicated skin and skin-structure infections, including 121 patients with MRSA infection in the microbiologically evaluable population. In patients infected with MRSA, cure rates were 91.8% for ceftobiprole and 90% for vancomycin. Other investigational agents active against MRSA are in development, and phase 2 and 3 studies involving patients with SSTI are being conducted. Among these agents are iclaprim, a new selective dihydrofolate inhibitor, and ceftaroline, a new broad-spectrum cephalosporin [100, 101].

OFF-LABEL AGENTS: EVIDENCE OF EFFICACY

With the epidemic of CA-MRSA infection, there is an increasing off-label use of antibiotics, such as trimethoprim-sulfamethoxazole (TMP-SMX), clindamycin, and long-acting tetracyclines. Unfortunately, there are no randomized, controlled trials to support the use of these antibiotics for patients with skin infections caused by MRSA. TMP-SMX has not been approved by the FDA for the treatment of *S. aureus* infections [79]. However, in vitro data show that TMP-SMX is bactericidal against strains of CA-MRSA [102]. In the early 1990s, a randomized, controlled trial compared TMP-SMX treatment with vancomycin treatment for a variety of *S. aureus* infections. In this trial, 32 patients with skin infections caused by *S. aureus* were evaluated for the efficacy of treatment with TMP-SMX or vancomycin, and all patients with MRSA infection were cured [103]. In a Boston outpatient clinic, the increasing empirical use of TMP-SMX over time was paralleled by improving rates of clinical resolution for patients with SSTI [104]. TMP-SMX in combination with rifampin was also used successfully for a limited number of patients with CA-MRSA infection [105]. Whether TMP-SMX is effective to treat group A streptococci, also a common cause of SSTI, is not known [79]. When group A streptococci are part of the differential diagnosis, other treatment alternatives (e.g., clindamycin) should be considered [79].

Although FDA approved for the treatment of serious infections caused by *S. aureus,* clindamycin is not specifically approved for the treatment of MRSA infection because of the high level of resistance to clindamycin among HA-MRSA strains [79]. With the epidemic of CA-MRSA infection, clindamycin is now commonly used to treat SSTI. Evidence to support the use of clindamycin for patients with SSTI due to CA-MRSA, however, is limited to children [8, 106]. In one observational study, >300 children received empirical intravenous therapy, and 207 were then given an oral formulation; all children were cured, regardless of the antibiotic therapy [8]. In theory, clindamycin use may have advantages over more-traditional treatments because of the drug's ability to inhibit protein synthesis and, thus, to turn off toxin production in CA-MRSA [107]. The evidence for effective use of long-acting tetracyclines (doxycycline and minocycline) in patients with SSTI due to MRSA is quite limited. In one case series, 15 of 16 patients were cured [108]; 1 discontinued drug use because of an adverse event. Two patients given treatment with minocycline also received concomitant treatment with rifampin. In a different study, 5 patients with CA-MRSA infection were cured with 4–12 weeks of doxycycline therapy [109]. Tetracyclines are not recommended for children <8 years of age or pregnant women. Rifampin is commonly prescribed in combination with other antibiotics for treatment of SSTI due to MRSA. However, there are virtually no data showing a clinical benefit from this practice. Therefore, for most patients with

SSTI caused by MRSA, adjunctive therapy with rifampin cannot be recommended.

CA-MRSA strains differ from nosocomial MRSA strains in their susceptibility to different classes of antibiotics [16, 57]. CA-MRSA strains are usually susceptible to TMP-SMX, rifampin, and gentamicin [13]. Most strains are also susceptible to clindamycin [13], although resistance to the drug is variable and, in some areas, appears to be increasing [110, 111]. Resistance to clindamycin can be inducible (i.e., inducible macrolide-lincosamide-streptogramin B resistance). To detect inducible resistance to clindamycin, a D-zone test should be performed [112]. The relationship between inducible resistance to clindamycin and treatment failure is poorly defined [113, 114].

CA-MRSA strains are generally susceptible to tetracyclines. Resistance to the long-acting tetracyclines doxycycline and minocycline is probably overestimated because these drugs usually are not tested in vitro. Many laboratories report only tetracycline-specific susceptibility. In CA-MRSA strains, resistance is mostly associated with *tetK* [14], which encodes a tetracycline-specific efflux pump. This pump does not efflux doxycycline and minocycline. Thus, the long-acting tetracyclines may be active even when resistance to tetracycline is detected [79]. Finally, resistance to macrolides and quinolones is common among strains of CA-MRSA [6, 7, 13]. Given the different patterns of resistance between CA-MRSA and HA-MRSA, obtainment of culture samples from patients who present with SSTI should be reemphasized.

DECOLONIZATION

There are no data to support decolonization (e.g., nasal mupirocin and chlorhexidine body washes) for patients infected with MRSA. An expert panel in collaboration with the CDC has suggested that decolonization may be reasonable in 2 clinical situations: (1) for patients with multiple documented recurrences of MRSA infection and (2) for ongoing MRSA transmission in a closely associated and well-defined cohort of individuals (e.g., a household) [79]. Other recommendations for prevention among patients with SSTI due to CA-MRSA can be found on the CDC Web site [115].

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