Since it was first reported in the 1960s, methicillin-resistant *Staphylococcus aureus* (MRSA) has been a major cause of a variety of infectious syndromes in patients exposed to the healthcare environment.1 In Taiwan, MRSA was first documented in the early 1980s and increased rapidly in the 1990s.1 Nowadays, MRSA is endemic in most hospitals in Taiwan and accounts for 53–83% of all *S. aureus* isolates.1 However, from the late 1990s, community-associated (CA) MRSA has become a major concern worldwide.2 CA-MRSA causes a variety of diseases, ranging from skin or soft tissue infection to severe invasive diseases, such as sepsis, necrotizing pneumonia, and necrotizing fasciitis.1,2 CA-MRSA strains worldwide are thought to have unique microbiological characteristics such as limited antibiotic resistance (except to β-lactam antimicrobial agents), different exotoxin gene profiles (e.g. Panton–Valentine leukocidin; PVL), and smaller staphylococcal cassette chromosome mec (SCCmec) variants: either SCCmec type IV, or less frequently, type V or a variant, type V_T.3

In Taiwan, CA-MRSA infections have been reported increasingly in pediatric patients since 2002. The rate of MRSA was estimated as 44% in pediatric cases of CA *S. aureus* infections, after pooling the data from retrospective studies with similar designs between 1997 and 2001.1 Currently, the CA-MRSA strains that cause infection in Taiwan are characterized by multiple antibiotic resistance (including clindamycin, erythromycin, tetracycline and chloramphenicol), which differs from those in the United States,4 with skin and superficial soft tissue infections being the major clinical manifestations. However, significant morbidity and mortality from CA-MRSA infections have been reported increasingly in pediatric cases.1,5 They have common pulsed-field gel electrophoresis (PFGE) patterns that differ from those of the major pandemic clones of hospital-acquired MRSA isolates. Also, the genotype has been identified as sequence type (ST) 59 by multilocus sequencing typing; they possess PVL and staphylococcal enterotoxin B and may have acquired SCCmec type V_T (now designated type VII), or less frequently, type IV.4,6,7

The importance of antibiotic stewardship for CA-MRSA disease in Taiwan can be demonstrated in four different ways. Several previous community-based studies and the latest island-wide survey have assessed the extent of MRSA in the community, and have revealed a high prevalence of colonization with multidrug-resistant MRSA.3,6,8 Compared with that among healthy children during the period 2001–2002, the prevalence of nasal MRSA colonization among healthy pediatric patients was estimated as 44% in 2002. Moreover, the rate of CA-MRSA infections in pediatric patients has been increasing steadily since 2002. Therefore, the growing prevalence of nasal MRSA colonization and CA-MRSA infections in pediatric patients has led to the importance of antibiotic stewardship in the management of CA-MRSA disease in Taiwan.
children in Taiwan has increased significantly, from 1.9% in 2001 to 9.5% in 2005–2006 for Northern Taiwan and from 3.3% to 6.7% for Southern Taiwan.\(^8\) This increasing trend in prevalence of community MRSA colonization might account for the emergence of CA-MRSA disease in Taiwan. Additionally, the high level of multidrug resistance among CA-MRSA strains, in association with the previously reported excessive use of antibiotics in Taiwan, highlights the problem of antibiotic selective pressure.\(^9\)

The second aspect concerns the relationship between nasal strains of PVL-positive MRSA and CA disease, evidence of which has been provided by antimicrobial drug susceptibility testing, SCC\(\text{mec}\) typing, exotoxin profiling, and PFGE typing.\(^6\) Our recently published prospective observational study has disclosed that previous antibiotic use is associated with PVL-positive MRSA colonization.\(^10\) Therefore, appropriate use of antimicrobial drugs might be a strategy for limiting the incidence of CA-MRSA disease in Taiwan.

The third aspect is related to the novel molecular characteristics of ST59 CA-MRSA strains in Taiwan. Takano et al\(^7\) have shown that the major PVL-positive CA-MRSA ST59\(_{\text{Taiwan}}\) strain possesses a tetracycline-resistance-conferring (\(\text{tetK}\) positive) penicillinase plasmid and a multidrug-resistance gene cluster (a possible composite transposon), which imply indirectly the high antibiotic selective pressure in our community.

Finally, from the management point of view, most authorities recommend that the therapeutic strategy for CA-MRSA infections should be based on the severity and site of disease in areas with high prevalence of methicillin resistance, such as Taiwan.\(^1,4\) CA-MRSA infection is most often manifested in the skin and superficial soft tissue and responds well spontaneously or after incision and drainage, with or without susceptible antibiotic treatment. Thus, the use of glycopeptides or linezolid should be reserved for patients with invasive CA-MRSA infections or those that involve deep-seated areas of the body, to limit the impact of increasing antimicrobial resistance.

In the past, the rapid emergence of resistant bacteria in Taiwan has been spurred on by the ease of obtaining antibiotics from over-the-counter drug stores, as well as the widespread use of antimicrobial agents in animal husbandry. In 2001, government policy prohibited antibiotic use for acute respiratory tract infections without evidence of bacterial infection, which resulted in a decrease in the use of penicillins, cephalosporins and macrolides, and also reduced macrolide-resistant group A streptococci.\(^11\) Thus, an effective strategy for antibiotic stewardship must be multifaceted and include education of physicians and patients about appropriate antimicrobial use, surveillance of antimicrobial resistance and use, and development of alternative treatment that circumvents the need for antimicrobial therapy. In addition, Schneider-Lindner et al\(^12\) have reported recently an association between receipt of antimicrobial agents and diagnosis of CA-MRSA in the United Kingdom, which is particularly strong for previous exposure to fluoroquinolones and macrolides. Further studies are warranted to elucidate the specific antimicrobial drugs that may cause selection pressures that favor the acquisition of antibiotic resistance in \(S.\) \(aureus\) in the community, to limit the spread of CA-MRSA in Taiwan.

References

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