# Editorial

# MRSA: an old and new enemy

***Giovanni B. Orsi*** Associate Professor

Department of Public Health, University of Rome, "La Sapienza", Piazzale Aldo Moro 5, 00185 Rome, Italy.
Email: giovanni.orsi@uniroma1.it

In this issue of the Journal, there is an article[1] focussing on methicillin-resistant *Staphylococcus aureus* (MRSA), exploring the potential risk of MRSA aerosolised in healthcare environments. Indeed, patient-to-patient or healthcare workers' hands represent the main mode of transmission, but airborne transmission may be under-emphasised as the number of studies is limited. Therefore, more investigations are needed to enlarge our knowledge on the subject.

MRSA first appeared in the UK in 1961,[2] soon after the introduction of methicillin into clinical practice and thereafter rapidly spread to hospitals in Europe, the USA[3], Australia[4] and around the world.

This pathogen causes a vast spectrum of clinical diseases, ranging from benign superficial skin infections to severe life-threatening conditions such as bacteraemia, endocarditis, pneumonia, abscesses and soft or bone-tissue infections.[5]

A distinctive feature of MRSA strains is their resistance not only to all β-lactam antibiotics, but also to a wide range of other antimicrobials, which makes MRSA infections difficult to manage and costly to treat. Susceptibility is sometimes recorded only to glycopeptides and to a few new drugs such as linezolid, daptomycin and tigecycline.[6] However, in the late 1990s, MRSA strains with intermediate or reduced susceptibility to vancomycin were reported, first in Japan and then in other countries.[7]

Nowadays, MRSA is considered a major problem in many hospitals, although rates vary greatly from country to country. Differences are caused largely by uneven control and isolation measures, hand hygiene practices, antibiotic prescribing behaviours and allocation of resources.[8]

In the USA, >50% of hospital-acquired *S. aureus* isolates in intensive care units are MRSA.[9] In Europe, although there is a prevalent north–south gradient, as MRSA strains are rare in Scandinavia and more frequent in southern Europe, some variation between geographic areas remains unclear.[6] In a recent survey by the European Antimicrobial Surveillance System, which considered over 50 000 blood samples, the highest prevalence was seen in Greece (44.4%), the UK (41.5%) and Italy (40.9%), whereas the lowest prevalence was observed in Sweden (0.8%), Holland (0.6%) and Denmark (0.6%).[10] Japan has one of the highest prevalences in the world,[11] and a high prevalence is also recorded in Australia.[12]

For every person infected with MRSA, many more are colonised by the organism. A national survey carried out in the USA estimated that 1.5% of US residents carried MRSA,[13] and it is well known that MRSA carriers are at higher risk for MRSA infection.[14]

*S. aureus* infections may have five times the risk of in-hospital mortality compared with inpatients without this infection,[15] and a recent meta-analysis, evaluating the impact of methicillin resistance on patient outcome, clearly demonstrated that MRSA is associated with a significant twofold higher mortality rate compared with methicillin-sensitive *S. aureus*.[16]

Over recent decades, the epidemiological and microbiological aspects of MRSA have been widely investigated, yet uncertainty remains about the best approach to prevent and control this worldwide plague. Several guidelines to prevent and control MRSA infections are available in many countries, although they vary.[17,18] Controversy exists principally because of the increasing endemicity of MRSA, difficulty in eliminating the microorganism from colonised or infected patients, increasing prevalence of community-associated MRSA (CA-MRSA), applicability of the 'seek and destroy' strategy in high-endemic areas and disadvantages in active surveillance culturing.

A recent systematic review on MRSA hospital management showed that intensive, concerted interventions, including isolation policies, can substantially reduce MRSA rates, even in settings with a high endemic level.[19]

As pointed out by Collignon *et al.*,[20] we need to vigorously apply the basic components of any infection control activity. Identification of MRSA carriers, strict contact precautions and antibiotic stewardship represent key points to control MRSA diffusion. Emphasis is required on improving hand hygiene as the cornerstone of infection control.[21,22] Hand hygiene reduces morbidity and mortality from all healthcare-associated infectious pathogens, not just MRSA. An impressive experience was described by Johnson *et al.*,[23] which encourages a strategy expansion.


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Traditionally, MRSA is considered a healthcare-associated pathogen in hospital patients (HA-MRSA), with well-described risk factors. However, in the past decade, serious infections have been isolated with increasing frequency in community patients (CA-MRSA) without established risk factors.[24,25] CA-MRSA infections represent a major cause of concern for physicians, who must consider this microbial aetiology not only in cases of hospital acquisition, but also in patients coming from the community without any risk factors for MRSA colonisation or infection. Clinicians should recognise, on the basis of the presence of specific risk factors, those patients who have a high likelihood of infection by these microorganisms. A correct choice of empirical antibiotic therapy and the development of new drugs with good activity against methicillin-resistant strains appear the most useful tools to reduce the morbidity and mortality associated with these infections.

CA-MRSA and HA-MRSA infections are caused by strains that are distinct in terms of genetic background, epidemiology, clinical spectrum and antimicrobial resistance. HA-MRSA strains imply resistance to multiple antibiotics and carriage of staphylococcal cassette chromosome mec (SCC mec) type I, II or III, whereas CA-MRSA implies carriage of SCC mec IV, eventual production of Panton-Valentine leukocidin and comparatively limited antimicrobial resistance.[26]

A considerable number of reports are beginning to appear in the literature describing the organism and associated infections. However, there is a lack of consensus as to the terminology used to describe CA-MRSA. This confusion is further compounded by the recent emergence of CA-MRSA transmission within hospitals.[27]

Because of different definitions of community-acquired infections used in the literature, and the limited number of population-based studies that include molecular typing techniques, the reported prevalence of MRSA in the community varies widely.[28–30] In a meta-analysis, Salgado *et al*.[31] showed that the pooled MRSA colonisation rate among community members was 1.3%, but when people with healthcare contacts were excluded, the MRSA prevalence was 0.2%. European data are limited: the prevalence of CA-MRSA upon admission to a Geneva hospital in Switzerland was reported to be 0.1%,[32] and 0.03% in the Netherlands.[33]

Clinicians increasingly face a challenging clinical dilemma: should empirical therapy for presumed or proven *S. aureus* infections acquired in the community include β-lactam regimens, traditionally effective against only methicillin-sensitive *S. aureus*, or should therapy against MRSA be included? A practical approach is to utilise the presence or absence of risk factors for MRSA to determine the empirical treatment regimen.

MRSA aetiology must be considered in all patients who present at hospital with signs and symptoms of systemic infection and one or more of the identified risk factors for MRSA colonisation or infection. Particular attention should be directed to those patients with multiple healthcare contacts, a previous history of MRSA infection, chronically ill and/or with long-term indwelling catheter.

The epidemiology of MRSA is evolving rapidly. For a long period this pathogen was confined to hospitals, but over the past decade we have seen an alarming increase in the number of CA-MRSA cases. Recently, CA-MRSA transmission has occurred in healthcare settings, leading to healthcare-associated infections. Therefore, population-based studies on MRSA prevalence in the community and interaction with hospitals are needed.

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