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(Article begins on next page)

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Molecular epidemiology of methicillin-resistant *S. aureus* in the ICU setting

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Dear Editor,

Methicillin-resistant *Staphylococcus aureus* (MRSA) is widespread in intensive care units (ICUs) [1]. Several molecular components are important for the definition and genotyping of MRSA, such as Staphylococcal chromosome cassette *mec* (SCC*mec*) type, Panton-Valentine Leukocidin toxin (PVL) or staphylococcal protein A (spa) production. The genotypic characteristics of hospital acquired (HA-MRSA) strains are consistent with SCC*mec* type I, II, III, without PVL production whilst community acquired (CA-MRSA) strains often produce PVL with type IV or V SCC*mec*.

We report here the molecular characteristics of ICU MRSA strains between 2011 and 2013 isolated from blood cultures or respiratory samples. Sensitivity to vancomycin, daptomycin and linezolid was tested with E-test and results were interpreted according to EUCAST breakpoints [2]. All samples were studied by SCC*mec* typing, PVL typing and spa-typing.

There were 62 MRSA strains from respiratory samples (57, 92%) or blood (5, 8%): 54 (87%) HA-MRSA and 9 (13%) CA-MRSA. There were 50 (93%) and 7 (87.5%) respiratory samples amongst HA-MRSA and CA-MRSA strains, respectively. The molecular characterization and *spa* typing analysis are reported in Table 1: most MRSA had SCC*mec* II (35 cases, 56.4%), of which 31 were HA-MRSA. The most common clone was t242 (50%) and it was associated with SCC*mec* type II (87%) and HA-MRSA (89%). All isolates were susceptible to linezolid, whilst 13 and 6 isolates had a MIC for vancomycin or daptomycin, respectively, above the EUCAST breakpoints for sensitivity. Ten of the t242 strains (32%) had a vancomycin MIC>2 mg/L, including one with a daptomycin MIC >1 mg/L. The t242 strain represented 77% (10 out of 13) of MRSA non-sensitive to vancomycin. These strains were further analyzed in order to confirm the high MIC value for vancomycin in a referral microbiology laboratory (MMARL - http://www.labmicrobiologia.unict.it/).

This is the first epidemiological report with t242 as the predominant strain (50%) in Italy, with a higher frequency amongst HA-MRSA cases and associated with lower susceptibility to

vancomycin. A European study in 2005-2006 of MRSA epidemiology from 19 laboratories showed that the prevalent *spa*-types in Italy were t041 (35.8%) and t008 (28.4%) [3].

All the MRSA isolates were sensitive to linezolid, the most effective drug in treating ventilator-associated pneumonia by MRSA. The characterization of MRSA strains with high MICs for vancomycin is important in remembering that vancomycin should be limited to selected cases, perhaps with low MICs, thereby questioning the empiric use in special settings. All the isolates were sensitive to daptomycin, confirming the microbiological activity against MRSA isolated from blood [4-5], even if it has no role in pneumonia.

This is the first Italian report where t242 strains are predominant in the ICU setting, are mainly hospital-acquired and associated with SCC*mec* II genes. These strains are characterized by an increased MIC for vancomycin, whilst susceptibility to linezolid and daptomycin is preserved.

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Conflicts of interest: On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical standards: Ethical Committee, Molinette S. Giovanni Battista Hospital, Turin,Italy: Approval of Collection of data within the ASPIRE 2010 and it has performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

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Table 1. Molecular characterization of MRSA strains and Genetic clusters identified by *spa* typing

SCC*mec*	**N**	**Esotoxin PVL**
I	11 (17.7%)	NEG
II	35 (56.4%)	NEG
III	0	NEG
IV	16 (25.8%)	NEG
Spa typing	**N**	
t242	31 (50 %)	
t001	7 (11.3%)	
t008	8 (12.9%)	
t514	4 (6.4%)	
t223	2 (3.2%)	
Others (one each): t025, t041, t622, t2688, t2731, t3178, t5713, t6731, t8334, t9553	10	