

Reliability of the Xpert MRSA NxG assay and the BD MAX MRSA XT assay to detect genetically diverse *mecA/mecC* MRSA and *mecA* drop-out MSSA isolates collected in Europe



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Background

Early screening for MRSA carriage is essential to limit the dissemination of such isolates in hospitals and/or to consider decolonization of patients for reducing risk of infection during hospital stay.

Different molecular kits are available to detect MRSA in nasal swabs. They are mostly based on primers targeting the *mecA* gene and the *SCCmec-orfX* junction.

Increasing reports of atypical *SCCmec* cassettes, novel *mec* gene and ever more diverse genetic backgrounds in MRSA strains as well as emergence of *mecA* drop-out isolates prompted us to test the accuracy of the last versions Xpert MRSA NxG assay (GeneXpert, Cepheid©) and the BD MAX MRSA XT assay (BD Max, Becton Dickinson©) using a selection of *S. aureus* isolates.

Materials and Methods

One hundred and six isolates were included:

- **Group 1: 53 MRSA isolates (43 *mecA*-positive and 10 *mecC*-positive)**, representing the main clones circulating in Europe
 - ✓ Typical *SCCmec* cassette
 - ✓ 33 different *spa*-types
 - ✓ From 22 European countries
- **Group 2: 37 randomly-chosen MRSA isolates** harbouring various atypical *SCCmec* cassette on the basis of molecular data (StaphyType microarrays (Alere©) and/or Kondo's PCR)
 - ✓ 20 different *spa*-types
 - ✓ From 10 European countries
- **Group 3: 16 randomly-chosen *mecA*-drop-out MSSA**, defined as MSSA with residual marker(s) of *SCCmec* cassette on the basis of microarrays
 - ✓ 13 different *spa*-types

All isolates were tested using both Xpert MRSA NxG assay (GeneXpert, Cepheid©) and BD MAX MRSA XT assay (BD Max, Becton Dickinson©) according to manufacturers' instructions.

Results

Ninety-five isolates were correctly identified as MSSA or MRSA by both GeneXpert and BD Max assays.

Thirteen isolates were misidentified by one test:

- In **Group 1** (representative of European MRSA isolates)
 - ✓ 1 by GeneXpert
 - ✓ 3 by BD Max
 - ✓ All *mecC*-positive isolates were correctly identified
- In **Group 2** (MRSA with atypical *SCCmec* cassettes)
 - ✓ 2 by GeneXpert
 - ✓ 8 by BD Max
- In **Group 3** (*mecA* drop-out MSSA)
 - ✓ None by both kits

Characteristics of misidentified isolates

	Clonal Complex	<i>spa</i> -type	Country	<i>SCCmec</i> cassette	<i>mec</i> gene	Result GeneXpert	Result BD Max
Group 1	5	45	France	IV	<i>mecA</i>	MSSA	MRSA
	5	1	Italy	I	<i>mecA</i>	MRSA	MSSA
	8	64	Ireland	IV	<i>mecA</i>	MRSA	MSSA
	7	91	France	V	<i>mecA</i>	MRSA	MSSA
Group 2	8	8	Italy	IV	<i>mecA</i>	MRSA	MSSA
	8	8	Belgium	Non Typeable	<i>mecA</i>	MRSA	MSSA
	8	8	Spain	ccrA2B2+ccrA4B4	<i>mecA</i>	MRSA	MSSA
	8	30	France	ccrA2B2+ccrC	<i>mecA</i>	MRSA	MSSA
	1	127	UK	Non Typable	<i>mecA</i>	MRSA	MSSA
	8	190	Austria	Non Typable	<i>mecA</i>	MRSA	MSSA
	5	777	France	ccrA4B4+ccrC	<i>mecA</i>	MRSA	MSSA
	30	318	France	Non typeable	<i>mecA</i>	MSSA	MRSA
	8	1614	France	ccrA2B2+ccrA1+pls	<i>mecA</i>	MSSA	MSSA

Conclusion

Xpert MRSA NxG assay (GeneXpert) showed a higher accuracy to identify the clinical MRSA clones that are currently circulating in Europe compared to BD MAX MRSA XT assay (BD Max) with 3 versus 11 misclassifications, respectively. These misclassifications related to Xpert MRSA NxG assay are mostly due to MRSA isolates/clones with new or variant *SCCmec* cassette. The discrepancies between GeneXpert and BD Max assays are likely related to a different range of primers targeting *SCCmec* cassette that is likely more wide and optimised in GeneXpert kit.

These data confirmed the permanent need for epidemiological watch for manufacturers involved in the market of molecular screening of MRSA to be able to quickly adapt their kits to the constant emergence of new MRSA clones harbouring new *SCCmec* cassettes.