Low proportion of mupirocin resistance in S. aureus isolates collected from four Belgian nationwide surveillance between 2005 and 2014.

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OBJECTIVES
Mupirocin is a topical antimicrobial that has been widely used for decolonisation strategies of Staphylococcus aureus. Resistance to mupirocin was rapidly reported reducing the effectiveness of eradication regimens. Two categories of resistance to mupirocin are described: low level resistance (MLLR) (MIC 2-256 mg/L), resulting of independent spontaneous mutation events in the gene encoding isoleucyl-tRNA synthetase (ileS), and high level resistance (MHLR) (MIC ≥ 512 mg/L) acquired by a plasmid-encoded mupA gene or by a novelty described mupB gene. The aim of the study was to determine the prevalence of mupirocin resistance and to explore resistance mechanisms among a large collection of S. aureus isolates (n = 1971).

METHODS

Bacterial strains
A total of 1244 MRSA isolates and 727 MSSA isolates, collected from four nationwide surveillances conducted between 2005 and 2014 (n=100-116 Belgian hospitals), were analysed for their resistance to mupirocin. Identification and oxacillin resistance were confirmed by PCR.

Antimicrobial susceptibility testing
Antimicrobial susceptibility testing was realised by agar dilution or broth microdilution method. MHLR was confirmed by E-Test.

Detection of mupirocin resistance
A new multiplex PCR was performed for the detection of the mupA/mupB genes involved in MHLR. MLLR was further analysed by sequencing a fragment of the ileS gene.

Target identification Primer Sérieux (5’ – 3’)
Mupirocin high level of resistance (mupA)
mupA-F CTA GAA GTC GTT GGA GTG TGA 674 Seah et al., AAC 2012; 56:1916-20
mupA-R AGT GCA TAA GAT CAT AAG ACG
Mupirocin high level of resistance (mupB)
mupB-F CCG ATG GTT AGC TTT ACG TGA 1650 Rammang et al., AAC 1996. 40:2930-3
mupB-R AGC TGG AGC TCT ACG CGA
S. aureus-specific region of the thermolabile gene
nuv-F GCC ATT GAT GAT GAT ACG GTT 279 Bratzelet al., APMS 1993; 101:681-8
nuv-R AGC CTAGCC TGG TGA AGC TAA AGC
Mupirocin low level of resistance
mupL1/2FR CCG ATT GAT TGC TGG CAT GA 472 This study
mupL1/2RR TCA AAG TTT TCA TAG TGG TTT AGC

Molecular typing
All strains were spa typed and grouped into spa CCs using the Ridom StaphType software.

RESULTS

Strain collection from four Belgian national wide surveillances

Evolution of mupirocin resistance among the 4 national surveillances

Control strains were included in each test run: Carter (LLMR and mupA-negative), Eagles and F89 (both HLMR and mupA-positive) and MUP87 (HLMR and mupA-positive). The expected sizes of the amplified DNA fragments were 279, 1650 and 674 bp for the nuc, mupA and mupB genes, respectively.

More than 90 % of resistant S. aureus strains belonged to three major spa-clonal complex corresponding to major epidemic MRSA genotypes found in Belgian hospitals.

CONCLUSIONS

This first Belgian nationwide 10-year surveillance shows a low prevalence of mupirocin resistance among MRSA (5.2%) and MSSA (0.7%) circulating in hospitals.

Resistance in S. aureus was mainly mediated by the presence of mupA gene (59.9%) and the V588F point mutation in ileS gene (38.6%).

Mupirocin resistant strains belonged to major epidemic clones found in Belgium, highlighting the importance of monitoring resistance to topical agents used in decolonisation programs.

REFERENCES

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