



HAL
open science

Impact of skin antiseptics on the prevalence of antibiotic–antiseptic cross–resistance genes in *Staphylococcaceae*

Matthieu Boisson, Jeremy Guénézan, Bertrand Drugeon, Christophe Burucoa, Gaël Rambault, Lila Couteau, Olivier Mimoz, Maxime Pichon

► To cite this version:

Matthieu Boisson, Jeremy Guénézan, Bertrand Drugeon, Christophe Burucoa, Gaël Rambault, et al.. Impact of skin antiseptics on the prevalence of antibiotic–antiseptic cross–resistance genes in *Staphylococcaceae*. 33rd ECCMID 2023: European Congress of Clinical Microbiology & Infectious Diseases 33rd ECCMID, Apr 2023, Copenhagen, Denmark. hal-04141254

HAL Id: hal-04141254

<https://hal.science/hal-04141254>

Submitted on 26 Jun 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Impact of skin antiseptics on the prevalence of antibiotic-antiseptic cross-resistance genes in Staphylococcaceae

Matthieu Boisson^{1,2,3}, Jeremy Guénézan, Bertrand Drugeon^{2,3}, Christophe Burucoa^{1,2,3}, Gaël Rambault^{2,3}, Lila Couteau^{2,3}, Olivier Mimoz^{1,2,3}, Maxime Pichon^{1,2,3}

¹ INSERM U1070, PHAR2 Pharmacology of Antimicrobial Agents and Antibiotic resistance, Poitiers, France ³ University Hospital of Poitiers, Poitiers, France ² University of Poitiers, Medicine and Pharmacy faculty, Poitiers, France Contact: maxime.pichon@univ-poitiers.fr

Introduction

- 2 billion intravascular devices (IVDs) are sold in the world annually (300 million in the USA - 25 million in France) (1). Occurrence of infectious complications mainly by Staphylococcus aureus (17.3%) and Pseudomonas aeruginosa (4.9%) (2). Recommendation of the French Society of Hospital Hygiene: use of an antiseptic solution prior to catheter insertion, with broad-spectrum biocidal activity (bacteria, viruses, fungi, etc.) (ie. CHXOH : Chlorhexidine or PVI OH : Polyvidone iodine, both with OH : Alcohol; DAK : Sodium Hypochlorite in the youngest)(3). However, the association between antiseptic exposure and antibiotic resistance remains debated, despite the identification of potential cross-resistance genes (4).

Objective

To evaluate in Staphylococcus spp. isolated from colonized/infected IVDs the presence of antibiotic-antiseptic cross-resistance genes according to the antiseptic molecules used.

Methods

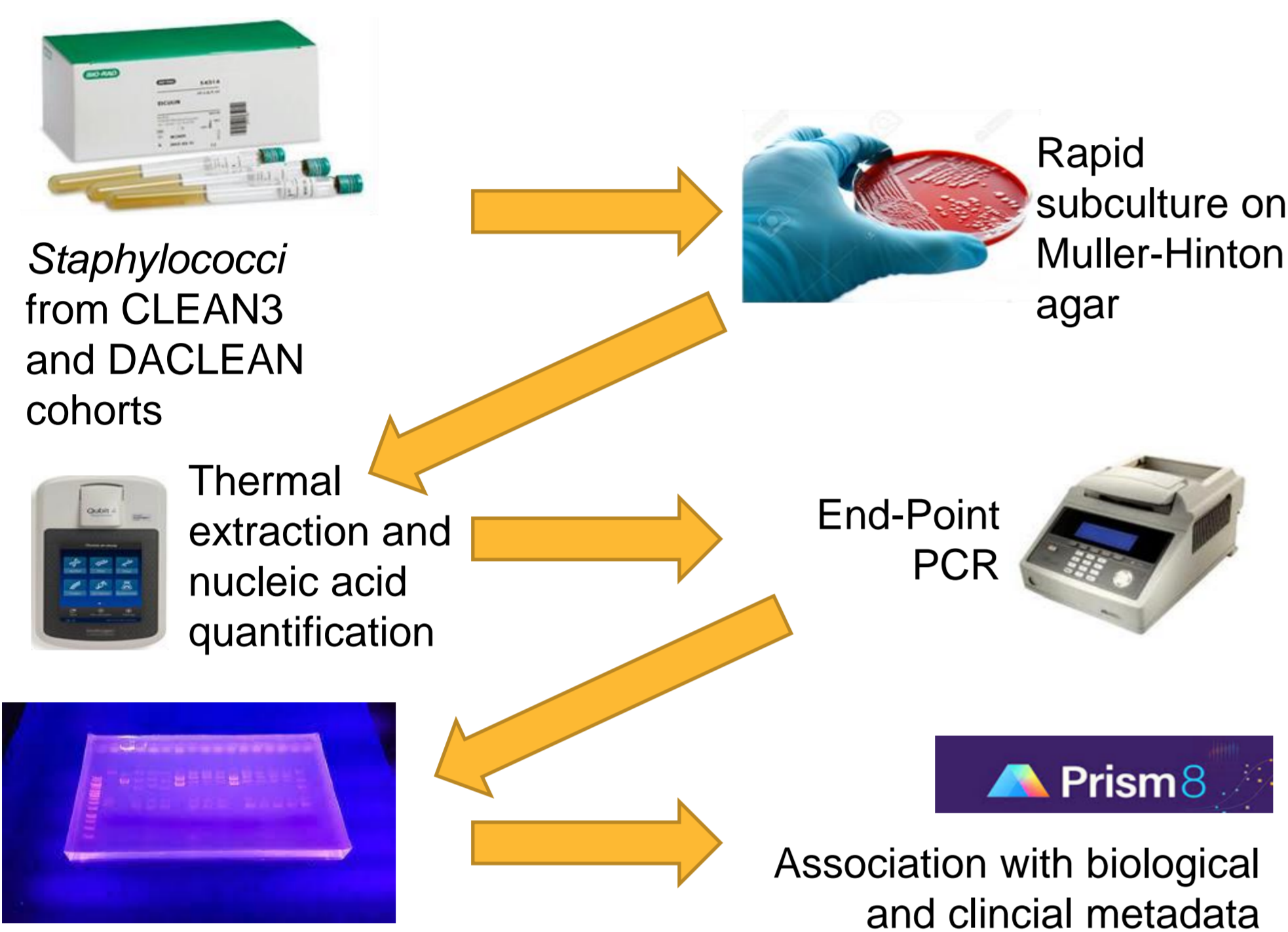


Figure 1. Analysis protocol. The strains studied (n=154) were derived from the CLEAN3 and DACLEAN clinical studies (5,6). Staphylococci were grown on blood agar before being extracted by heat shock (95°C 5 min). Extracts were assayed/diluted (100 ng per reaction) before amplification and separation of PCR products on agarose gel before statistical analysis according to the antiseptic used.

Table 1. Multiplexed PCR protocol. Amplifications were enabled by the primers published by Conceicao in two separate PCRs (7). Checks on agarose gels have been performed at the same time.

Discussion

Antibiotic resistance is different between clinical strains isolated after exposure to antiseptic molecules

In contrast to phenotypic antibiotic resistance, the results suggest that CHX selects fewer strains with cross-resistance genes than other antiseptics.

Conclusion

Larger studies are needed to evaluate the impact of antiseptic procedure on other strains of clinical interest, both Gram-positive and Gram-negative, such as Enterobacterales and Pseudomonales.

References

- 1. Tuffaha, H.W. et al. Appl Health Econ Health Policy 12, 51–58. 2014
2. Khan, H.A. et al. Asian Pacific Journal of Tropical Biomedicine 5, 509–514. 2015
3. SF2H Antiseptie de la peau saine avant un geste invasif chez l'adulte : recommandations pour la pratique 2016.
4. Kampf G. Antibiotics (Basel). 2019 Feb 1;8(1):13
5. Drugeon B. et al. J Hosp Infect. 2022
6. Guenezan J. et al. Lancet Infect Dis. 2021
7. Conceição T et al. Antimicrob Agents Chemother 60:678–681.

Results

Table 2. Distribution of the analyzed strains according to the antiseptic procedure.

Table 2. Distribution of the analyzed strains according to the antiseptic procedure.

Table 4. Antiseptic-antibiotic cross-resistance genes vary according to the antiseptic used. Bacteria selected by the CHG antiseptic protocol are significantly less frequent carriers of resistance genes (p<0.05) compared to other antiseptics.

Table 4. Antiseptic-antibiotic cross-resistance genes vary according to the antiseptic used. Bacteria selected by the CHG antiseptic protocol are significantly less frequent carriers of resistance genes (p<0.05) compared to other antiseptics. sepA is statistically associated with qacA/B, smr and mepA (p<0.05). norA tends to be associated with lmrS (p<0.1).

Table 6. Association of resistance genes with colonization of intra-vascular devices. A trend is found between low bacterial concentration and sepA or the association qacA/B+sepA (p<0.1).

Table 6. Association of resistance genes with colonization of intra-vascular devices. A trend is found between low bacterial concentration and sepA or the association qacA/B+sepA (p<0.1).

Table 8. Association of different resistance genes with antibiotic resistance phenotypes. Resistance to beta-lactams, quinolones, aminoglycosides and rifampicin varies with the genes found (p<0.05) with the exception of norA and mepA (p>0.05)

Table 8. Association of different resistance genes with antibiotic resistance phenotypes. Resistance to beta-lactams, quinolones, aminoglycosides and rifampicin varies with the genes found (p<0.05) with the exception of norA and mepA (p>0.05)

Table 3. Comparison of cross-resistance gene prevalence according to the antiseptics used. Strains isolated after selection by CHG have fewer cross-resistance genes. (p<0,05).

Table 3. Comparison of cross-resistance gene prevalence according to the antiseptics used. Strains isolated after selection by CHG have fewer cross-resistance genes. (p<0,05).

Table 5. Association of the different resistance genes with each other. sepA is statistically associated with qacA/B, smr and mepA (p<0.05). norA tends to be associated with lmrS (p<0.1).

Table 5. Association of the different resistance genes with each other. sepA is statistically associated with qacA/B, smr and mepA (p<0.05). norA tends to be associated with lmrS (p<0.1).

Table 7. Difference in prevalence of cross-resistance genes according to Staphylococceae species. lmrS, mepA and the qacA/B+sepA combination are significantly more frequent in S. aureus (p<0.05).

Table 7. Difference in prevalence of cross-resistance genes according to Staphylococceae species. lmrS, mepA and the qacA/B+sepA combination are significantly more frequent in S. aureus (p<0.05).

Table 9. Antibiotic resistance of strains isolated after antiseptics differs depending on the molecule used. The use of CHX is more frequently associated with resistance to beta-lactams, quinolones, aminoglycosides and rifampicin, than other antiseptic molecules (p<0.05).

Table 9. Antibiotic resistance of strains isolated after antiseptics differs depending on the molecule used. The use of CHX is more frequently associated with resistance to beta-lactams, quinolones, aminoglycosides and rifampicin, than other antiseptic molecules (p<0.05).