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Comparative Study to Amino Glycoside Antibiotics Resistance of Staphylococci Strains Isolated from Wounds at Brazzaville

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Abstract: ***In order to improve the antibiotherapy and fight against the hospital infections, 52 Staphylococcus stains screened from the matter of patients have been tested for their sensitivity with seven antibiotics of the family of aminosids. The method of standard antibiogramm on Mueller Hinton medium was assayed. Isolation was made on Chapman agar. Identification has revealed 42 strains of Staphylococcus aureus and 10 coagulase-negative staphylococci. Resistance tests have shown the appearance of identical phenotypes in the two categories of staphylococci. However the resistance to aminosids is more important to the strains of Staphylococcus aureus.***

Keywords: *Staphylococci*, résistance, amino-glycoside antibiotics, infections

1. Introduction

The bacteria of *staphylococcus* genus are presents in all environments. They are associated to the skin or to the mucous. In the hospital environment the *staphylococcus* are the most isolated bacteria. They are responsible of many infections [4, 7].

The widespread incidence of antibiotic resistance across various strains of *S. aureus*, or across different species of *Staphylococcus* has been attributed to horizontal gene transfer of genes encoding antibiotic/metal resistance and virulence. A recent study demonstrated the extent of horizontal gene transfer among *Staphylococcus* to be much greater than previously expected, and encompasses genes with functions beyond antibiotic resistance and virulence, and beyond genes residing within the mobile genetic elements [3]. The development of molecular typing methods has enabled the tracking of different strains of *S. aureus*. This may lead to better control of outbreak strains. A greater understanding of how the staphylococci evolve, especially due to the acquisition of mobile genetic elements encoding resistance and virulence genes is helping to identify new outbreak strains and may even prevent their emergence[8].There are many antibiotics used in the treatments of staphylococci caused- infections. Among them are amino-glycoside. Although, nowadays selection of the antibiotics pressing, the lack of hygienic conditions and the growing number of sick people are among factors which enhance the growth and emergence of strains which are resistant to usual antibiotics. Whatever, the type of bacteria that resistance has become a word problem of public health [2]. In order to contribute to the improvement of the dealing and the fight against hospital infections, the present work is interested in the study of the staphylococci comparative resistance to aminoglycosids.

2. Materiel and Methods

2.1 Strains isolation and used antibiotics

Samples of matter from wounds of based-hospital sicks were collected and cultured in Chapman agar medium [4, 9, 13]. The genus staphylococcus, Gram positive bacteria were isolated and identified by using cultural and biochemical characters with Chapman media (production or not of yellow pigment). Identification was confirmed by the tests of catalase and coagulase.

7 aminosids were used. : Streptomycin (S), kanamycin (K), Tobramycin (T), Gentamicin (GM), Amikacin (Ak), Néomycin (Nm), Nétilmicin (Net).

2.2 Strains susceptibility

Strains were tested for their susceptibility to amino-glycoside by the standard method of antibiogramm, by disc diffusion on Mueller Hinton (Sanofi Pasteur),[1, 6, 9, 10]. Petri dishes were incubated at 37°C from 18 to 24 hours; diffusion diameter was measured and compared to the references diameter of the French society of microbiology [11-12]. The phenotypes of resistance have been determined with the results of antibiogramm by measuring the inhibition diameter.

3. Results

A total of 52 strains were isolated, among 42 of *S.aureus* (80%) and 10 coagulase-negative S*taphylococci* CNS (19%).**Table I** presents the results of the sensitivity and resistance tests of the *staphylococci* to amino-glycoside. In **table I**, the general resistance of *staphylococci* is about 68,70% and it is at 54,29% for CNS. The antibiotic family of amino-glycoside exhibits different activities in *S.aureus* strains and in the CNS strains.

In *S.aureus* strains, the resistance to kanamycin and tobramycin is high respetively (97,60 %) and (80,96 %). The rate resistance of streptomycin and neomycin are 66,66 % and 64,28 %. The getamicin , the nétilmicin and the amikacin have been the most active aminosids with respectively 61,91 %, 59,52 % et 50,00 % .

For CNS, 30 % of strains are resistant to amikacine and gentamicin. The netilmicin has been inactivated by 40% of the strains. Although, the activity is at the average for the neomycin and the tobramycin with 50 % of resistances strains for each type. The less active (most inactive) antibiotics are the streptomycin and the kanamycin with respectively 80 and 90 % of resistant strains.

4. Discussion

Observed global resistance has been very high in the *S.aureus* strains. These results are opposed to those of Anne Decoster which emphases that CNS strains are more resistant than the *S. aureus* strain.

The rats resistance to amikacine, netilmicin and gentamin are comparable to those got by ar Dagnra and al.. [4].

The most involved describeb mecanism in 95% of cases which explain the resistance to aminosids is the enzymatic inactivation by three groups of well known codified enzymes. [1,14].These enzymes are: The acetyltransférases (AAC), les nucleotidyltransferases), les phosphotransferases (APH).

Observed phenotypes are present in both *Staphylococcus aureus* strains and the coagulase négative staphylococci strains. Although, the predominance is observed in the K and the KT phenotypes of *S.aureus* strains. The KTGM phenotype revealed than the resistance to gentamicin can inactivate all the aminoglycoside and lead to endemic resistance ; while the KT phenotype has arelation with the strains resistant to meticillin (meti-R) ; This phenotype appeared to 80% of *S.aureus* strains. The aminosids activities to staphylococci are indeed inhibited to Mety –R strains.

The apparition of the same phenotypes in the same genus can be explained by the crossed transmission of resistance genes by the phenomenon of conjugation [3].

5. Conclusion

The staphylococci resistance to aminods have become very important, *S. aureus* strains present a global resistance to aminosids which is very high comparing to the CNS. Although, the amikacin, the gentamicin, the nétilmicin and the neomycin can be used. . In order to improve anti-staphlylococci treatments, these antibiotics have to be associated with glycopeptides or with fluoroquinolones.

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Table 1: Activities of 7 aminosids to different types of staphylococci

Tested ATB	S (*S. aureus*) (%)	S(CNS) (%)	R (*S.aureus*) (%)	R (CNS) (%)
K	1 (2,40)	1(10)	41 (97,60)	9(90)
T	8 (19,04)	4(40)	34 (80,96)	6(60)
GM	16 (38,09)	7(70)	26 (61,91)	3(30)
Ak	21 (50,00)	7(70)	21 (50, 00)	3(30)
Net	17 (40,48)	6(60)	25 (59,52)	4(40)
S	14 (33,34)	2(20)	28 (66,66)	6(60)
Nm	15 (35,72)	5(50)	27 (64,28)	5(50)
Total	**92 (31,29)**	**32(45,71)**	**202 (68,70)**	**38(54,29)**

Legend: S= number of sensitive strains, R= number of resistant strains,
() are the percentage of sensitivity and resistance, CNS= coagulase- negative Staphylococci, ATB= Antibiotics.

The following figure is showing the predominant resistant phenotypes observed in the study.

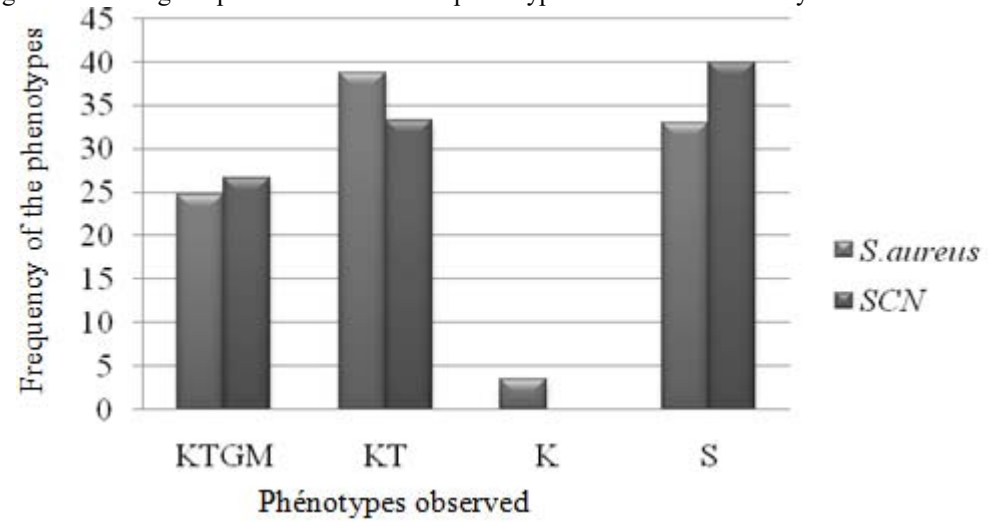

Figure 1 : resistant phenotypes of staphylococci to aminosids