



Original Research Article

## Speciation and Antibigram of Clinically Significant Coagulase Negative Staphylococci

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### ABSTRACT

**Background:** Coagulase negative staphylococci (CoNS), once considered as non-pathogenic commensal of skin and mucus membrane have emerged as important pathogen.

**Aim:** The aim of this study is to determine species of CoNS and antimicrobial susceptibility pattern of species obtained from various clinical specimens.

**Materials and Methods:** A total of 79 Coagulase negative staphylococci (CoNS) isolated from various clinical specimens during the study period. After confirming the isolates as CoNS, species-level identification was performed by simple, non-expensive conventional methods and antibiotic sensitivity testing was also performed by Kirby –Bauer disc diffusion method.

**Results:** Maximum number of CoNS were isolated from blood samples followed by urine samples. *S.epidermidis* was the predominant isolate from most of the clinical specimens. Majority of the CoNS species were sensitive to amikacin followed by gentamicin. Least sensitivity was shown towards Ampicillin and Amoxicillin. All CoNS species remained susceptible to Teicoplanin and Vancomycin.

**Conclusion:** Coagulase negative Staphylococci have emerged as potential pathogens which were earlier considered as commensals. Antibiotic susceptibility patterns of CoNS against antibacterial agents revealed maximum resistance. Hence, there is a need to adopt simple, reliable and non-expensive methods for identifying and determining the antibiotic sensitivity of CoNS.

**Key Words:** Coagulase negative staphylococci (CoNS), Speciation and antibiotic susceptibility

### INTRODUCTION

Coagulase negative staphylococci (CoNS), once considered as non-pathogenic commensal of skin and mucus membrane have emerged as important cause of health care associated infections (HCAI).<sup>[1]</sup> CoNS are consisting of 39 Species and 16 Species of them are known to cause infection in human.<sup>[2]</sup> It belongs to family Micrococcaceae and genus Staphylococcus.

They are gram positive, cluster forming cocci.<sup>[3]</sup> The most common species of CoNS implicated in human infections are *Staphylococcus epidermidis*, *Staphylococcus haemolyticus* and *Staphylococcus saprophyticus*.<sup>[4]</sup> However the role of other species like *S. hominis*, *S. warneri*, *S. simulans*, *S. lugdunensis*, *S. schleiferi*, *S. saccharolyticus* and *S. cohnii* in human infections is recently known.<sup>[5]</sup>

Since the 1970s, CoNS is recognized as important etiologic agents of a wide variety of human nosocomial infections. They account for 9% of nosocomial infections. [2] Patients at risk include those with intravascular catheters, or other foreign bodies in place, prosthetic devices, postoperative sternal wound infections and immunocompromised hosts. [6] These infections are difficult to treat because of the risk factors and the multiple drug resistant nature of the organisms. [7] Hence this study was conducted to determine the species distribution and antibiotic susceptibility profile of CoNS isolated from various clinical specimens.

## MATERIALS AND METHODS

The present study was conducted in the Department of Microbiology, Vinayaka Missions Medical College, Karaikal. A total of 79 non-repeat CONS were isolated and studied over a period of nine months from November 2012 to July 2013 from various clinical specimens. The isolates were considered clinically significant when isolated in pure culture from infected sites.

The isolates were identified as CONS by colony morphology, Gram stain, catalase test and coagulase test (slide and tube coagulase). Bacitracin susceptibility was performed to exclude Micrococci and Stomatococcus species. [8] These isolates

were subcultured on nutrient agar and subjected to battery of biochemical tests for speciation of CoNS. The biochemical tests were selected from Kloos and Schleifer scheme. [5] These included sugar fermentation test, phosphatase test, urease production, acetoin production, ornithine decarboxylation reaction, nitrate reduction and novobiocin and bacitracin sensitivity test.

The antibiotic susceptibility testing of the isolates was performed on Mueller Hinton agar by Kirby –Bauer disc diffusion method [9] against the following antibiotics. Ampicillin, Amoxycillin, Cefotaxime, Cotrimoxazole, Erythromycin, Gentamicin, Amikacin, Teicoplanin, Vancomycin. *Staphylococcus aureus* ATCC 25923 was used as control strain.

All the statistical analysis was done by simple percentage method.

## RESULTS

A total of 79 CoNS were isolated from various clinical specimens. Maximum number of CoNS were isolated from blood samples 25(31.65%) followed by urine 24(30.38%). *S.epidermidis* was the predominant isolate from most of the clinical specimens except urine, where *S.saprohyticus* was predominant.(Table.1) Out of 79 CoNS isolates, 47(59.49%) were from Intensive Care Unit setting.

Table 1: Species-wise distribution of CONS in the various clinical specimens

species	Blood	Urine	Pus	Sputum	Ear	Throat	Body fluid	Total
<i>S. epidermidis</i>	12	8	7	6	2	-	2	37(46.84%)
<i>S. saprophyticus</i>	6	10	3	-	-	-	-	19(24.05%)
<i>S. hemolyticus</i>	4	4	2	-	-	1	-	11(13.92%)
<i>S. hominis</i>	2	2	1	1	-	-	-	6(7.60%)
<i>S. lugdunensis</i>	1	-	3	-	-	-	-	4(5.07%)
<i>S. cohnii</i>	-	-	-	-	1	-	-	1(1.26%)
<i>S. warneri</i>	-	-	-	-	-	1	-	1(1.26%)
<b>Total</b>	<b>25(31.65%)</b>	<b>24(30.38%)</b>	<b>16(20.25%)</b>	<b>7(8.86%)</b>	<b>3(3.80%)</b>	<b>2(2.53%)</b>	<b>2(2.53%)</b>	<b>79(100%)</b>

Majority of the CONS species were sensitive to amikacin (82.28%) followed by gentamicin (63.29%), erythromycin

(60.76%). Least sensitivity was shown towards ampicillin (15.19 %), followed by amoxicillin (18.99%), cotrimoxazole

(36.71%). However, all CoNS species remained susceptible to teicoplanin and vancomycin. (Table.2)

Table.2: Antibiotic susceptibility pattern of CoNS.

Antibiotic	No. of sensitive isolates	Percentage (%)
Ampicillin	12	15.19
Amoxicillin	15	18.99
Cefotaxime	35	44.30
Cotrimoxazole	29	36.71
Erythromycin	48	60.76
Gentamicin	50	63.29
Amikacin	65	82.28
Teicoplanin	79	100
Vancomycin	79	100

## DISCUSSION

Coagulase Negative Staphylococci (CoNS) are part of normal flora of skin and mucous membrane, previously they were generally considered contaminant having little clinical significance but now they have been recognized as important pathogen responsible for community or hospital acquired infections. [10] predisposing host factors in infections caused by CoNS include, immunocompromised status, chronic illness, presence of foreign body and presence of one or other type of indwelling prosthetic medical devices rather than change in virulence of organism. [11]

Many clinical microbiology laboratories do not identify CoNS to the species level, even when these microorganisms are detected in blood or cerebrospinal fluid. However, as the pathogenic significance of CoNS increases, it may become more important to identify the isolate up to species level.

In our study, CoNS were isolated frequently from blood samples 25(31.65%) followed by urine 24(30.38%) and pus 16(20.25%). According to the study conducted by Usha M.G et al, [12] frequency of CoNS from various clinical samples were blood (52%) followed by pus (32%) and urine (12%). In our study, the most commonly isolated species was *S. epidermidis* 37(46.84%), similar to other

studies as shown by Subadra Singh *et al* and Sheik *et al*. [13,14] The second most common species in our study was *S. saprophyticus* 19(24.05%). Similar results were seen in other studies also. [10,15] However, in other studies *S. hemolyticus* was the second most common species isolated. [14,16]

In the antibiotic susceptibility analysis, it was found that most of the isolates were resistance to ampicillin and amoxicillin. This is in agreement with the study conducted by Goyal R *et al*. [10] Most of the isolates were sensitive to amikacin (82.28%). However, all the isolates remained susceptible to vancomycin and teicoplanin. This finding about vancomycin is in accordance with studies. [17,18] However, vancomycin resistant strains of CoNS were reported by other studies. [19,20] According to the CDC recommendations for preventing the spread of vancomycin resistance, vancomycin is recommended when CoNS is isolated from multiple blood cultures; vancomycin is not the most suitable option when only one in a series of blood cultures is CoNS positive. [21]

## CONCLUSION

Coagulase negative Staphylococci have emerged as potential pathogens which were earlier considered as commensals. There is also an increased resistance among these isolates against commonly used antibiotics. *S. epidermidis*, *S. saprophyticus*, and *S. haemolyticus* were most commonly isolated species from various clinical specimens. Glycopeptides have become the drugs of choice for the management of infections caused by Coagulase negative staphylococci. Hence, species level identification and their antibiogram is required to avoid decreased susceptibility to glycopeptides.

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