

The Prevalence of Methicillin-Resistant Coagulase-Negative *Staphylococcus* in a Tertiary Care Hospital in North India

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ABSTRACT

One hundred isolates of coagulase-negative *Staphylococcus* (CoNS) were collected from various clinical specimens. Of these 100 isolates, 25 isolates were methicillin-resistant CoNS (MR CoNS). Regarding antimicrobial susceptibility testing by minimum inhibitory concentration (MIC) determination, rifampicin was the highly active drug with MIC ranging from 0.125 to 0.25 µg/mL. Three isolates were resistant to vancomycin, with MIC ranging from 8 to 16 µg/mL. This emergence of vancomycin resistance in MR CoNS in our institute may pose therapeutic problems, and therefore the empirical antibiotic for treatment of suspected infections caused by CoNS should be prescribed according to antimicrobial susceptibility testing. (*J Infect Dis Antimicrob Agents* 2008;25:13-7.)

INTRODUCTION

Coagulase-negative *Staphylococcus* (CoNS), often considered to be avirulent commensals, are of increasing clinical importance, especially as a cause of nosocomial infection.¹ They are implicated as the causative agents of infections in immunocompromised hosts, particularly in patients with cancer, burnwound, end-stage renal disease, transplantation, and indwelling intravenous catheters, shunts or prosthetic devices.^{2,3} An increased methicillin resistance among CoNS

isolates has been observed among isolates from patients with nosocomial infections.⁴

Since there are a very few studies regarding the prevalence and antimicrobial susceptibility pattern of methicillin-resistant CoNS (MR CoNS) in our country, the present study was aimed to determine the magnitude of MR CoNS in our institute in North India.

MATERIALS AND METHODS

In the present study, 100 isolates of CoNS

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were collected from various clinical specimens including the pus, urine, blood, cerebrospinal fluid, and peritoneal fluid. The species of these CoNS were further identified, according to the standard microbiological procedures.⁵ All of these isolates were isolated repeatedly from the same patients. All the isolates were also studied for the slime production test.⁶ Antimicrobial susceptibility test was performed by modified Stokes disk diffusion method⁷ and the minimum inhibitory concentration (MIC) test.⁵ *S. aureus* (NCTC-6571) was used as a quality control strain. In Stokes method, the plate is divided into three parts, the bacterium is inoculated on the central one-third, and the control is inoculated on upper one-third and lower one-third of the plate. However, in modified Stokes method, the test bacterium is inoculated on the upper one-third and lower one-third, and the control is inoculated on the central one-third of the plate.

RESULTS

A total of 100 isolates of CoNS were studied. The most common clinical specimen isolated was the blood (45 isolates), followed by the pus (25), the urine (20), the cerebrospinal fluid (CSF) (5), and the peritoneal fluid (5). The most common species of these isolates was *S. epidermidis* (83%), and *S. saprophyticus* was

the predominant species of the urine isolates (85%) (Table 1). The slime production was positive in 88 of 100 isolates.

Of 100 isolates of CoNS, 25 were MR CoNS. Vancomycin and rifampicin were the most effective drugs against these 25 MR CoNS with 88 percent susceptibility, and erythromycin was the least effective drug with 32 percent susceptibility (Table 2).

Regarding the MIC testing, all 25 MR CoNS had oxacillin MICs ranging from 4 to 32 µg/mL (Table 3). Eight percent of MR CoNS had vancomycin MIC of 16 µg/mL, with the MIC range of 0.125-16 µg/mL. MR CoNS were highly susceptible to rifampicin, with the MIC range of 0.125-8 µg/mL.

DISCUSSION

Hospital-acquired infections caused by CoNS present an increasing problem in most countries. At present, CoNS are well established causative agents of some infectious diseases, and continue to be among the common contaminants of any specimens obtained across an intact cutaneous surface. In the present study, 100 CoNS isolates were obtained from various clinical specimens from patients with clinical illness.

S. epidermidis accounted for 83 percent of all isolates, and was commonly isolated from the blood

Table 1. The frequency of coagulase-negative *Staphylococcus* from 100 clinical specimens.

Specimen (n = 100)*	<i>S. epidermidis</i>	<i>S. saprophyticus</i>
Blood (45)	45	-
Pus (25)	25	-
Urine (20)	3	17
Cerebrospinal fluid (5)	5	-
Peritoneal fluid (5)	5	-
Total	83	17

*The number in parenthesis represents the number of specimens.

Table 2. The susceptibility pattern of all 25 methicillin-resistant coagulase-negative *Staphylococcus* determined by modified stokes method.

Antibiotic	Disc content (g)	Susceptible number (%)	Resistant number (%)
Vancomycin	30	22 (88)	3 (12)
Teicoplanin	30	20 (80)	5 (20)
Rifampicin	5	22 (88)	3 (12)
Fusidic acid	10	20 (80)	5 (20)
Clindamycin	2	17 (68)	8 (32)
Erythromycin	5	8 (32)	17 (68)
Ciprofloxacin	1	13 (52)	12 (48)
Co-trimoxazole	25	10 (40)	15 (60)
Gentamicin	10	10 (40)	15 (60)

Table 3. The minimum inhibitory concentration of all 25 methicillin-resistant coagulase-negative *Staphylococcus*.

Antibiotics	MIC ($\mu\text{g/mL}$)											
	<0.06	0.125	0.25	0.5	1	2	4	8	16	32	64	≥ 128
Oxacillin	-	-	-	-	-	-	12	7	2	4	-	-
Vancomycin	-	1	21	-	-	-	-	1	2	-	-	-
Rifampicin	-	20	2	-	-	-	-	3	-	-	-	-
Clindamycin	-	-	5	12	-	-	-	3	3	2	-	-
Erythromycin	-	-	-	-	-	6	2	-	12	1	2	2
Chloramphenicol	-	-	-	-	-	5	4	3	4	-	7	2
Ciprofloxacin	-	-	6	7	-	-	-	10	2	-	-	-
Gentamicin	-	-	-	-	5	4	1	-	-	-	12	3

(54.2%). *S. saprophyticus* was isolated only from the urine. The exact reason of urinary tract infection by *S. saprophyticus* is not clear, but it has been thought to be due to its ability to split urea in the urine by the ureas enzyme.⁸

In the present study, the slime production was shown to be positive in 88 percent of 100 CoNS isolates. The slime is one of the virulence factors of

CoNS as it helps in attaching the organism to the artificial surfaces, and thus causing subsequent colonization or infection. It also has an inhibitory action against antimicrobial activity of glycopeptide antibiotics.^{9,10}

In the present study, 25 percent of all CoNS isolates were methicillin resistant. The similar result has been reported from previous studies.¹¹⁻¹⁴

MR CoNS are usually resistant to several antimicrobials, and this antimicrobial resistance pattern was also observed in the present study. In the present study, MR CoNS were resistant to erythromycin (68%), gentamicin (60%), cotrimoxazole (60%), ciprofloxacin (48%), teicoplanin (20%), vancomycin (12%), and rifampicin (12%). Modified Stokes method is not recommended by Clinical Laboratory Standard Institute of the United States. According to the MIC method, MR CoNS showed vancomycin MIC in the range of 0.125-16 µg/mL. Emerging vancomycin-resistant CoNS isolates have been reported from India and other countries.^{15,16} The exact mechanism of vancomycin resistance in CoNS is still unknown and may pose therapeutic problems. It is thus recommended to determine the species of CoNS isolated from clinical specimens other than the urine, in accompanied with antibiotic susceptibility testing.¹⁷

As of the multidrug-resistant nature of MR CoNS, every effort should be made to eradicate infections caused by MR CoNS by taking strict infection control policy.

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