

GENTAMICIN RESISTANCE IN GRAM—NEGATIVE RODS

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Summary

Gentamicin resistance among Gram-negative rods is a significant problem in the General Hospital, Kuala Lumpur. The overall incidence of gentamicin resistance for all aerobic Gram-negative rods isolated over a period of one year was 7.8%. There is a need for a more controlled antibiotic policy to be practised in order to overcome this serious problem.

INTRODUCTION

The emergence of gentamicin-resistant Gram-negative rods has been documented by various authors.¹⁻³ Most studies have emphasised the importance of gentamicin-resistant *Pseudomonas aeruginosa*. Recent reports, however, have implicated the role of gentamicin-resistant *Enterobacteriaceae* as serious causes of hospital infection.³⁻⁵ Starting from 1st January 1979, the Bacteriology Laboratory, Faculty of Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur instituted a surveillance programme for all gentamicin-resistant organisms including Gram-negative rods isolated in the laboratory. The results of this surveillance over a one year period are reported.

MATERIALS AND METHODS

Clinical specimens were received from patients in the General Hospital, Kuala Lumpur. All aerobic Gram-negative rods isolated were tested for their susceptibility to gentamicin using the Stokes method of disc sensitivity testing.⁶ In addition, all isolates of *Pseudomonas aeruginosa* were tested for their susceptibilities to carbenicillin, tobramycin and amikacin. The disc contents of the antibiotic discs used were gentamicin 10ug, tobramycin 10ug, carbenicillin 100ug and amikacin 30ug. The control organisms used in the sensitivity tests were *E. coli*

NCTC 10418 and *Pseudomonas aeruginosa* NCTC 10662.

RESULTS

Out of 2777 Gram-negative rods isolated during the period of study, 217 were found to be resistant to gentamicin. Details of these isolates are shown in Table 1. Excluding repeated isolates from the same patient, the gentamicin-resistant Gram-negative rods were isolated from 197 patients. The location in the hospital of these 197 patients is shown in Table 2. The clinical specimens from which the gentamicin-resistant organisms were isolated are listed in Table 3. The sensitivity patterns of gentamicin-resistant *Pseudomonas aeruginosa* to carbenicillin, tobramycin and amikacin are listed in Table 4.

DISCUSSION

Antibiotic resistance is one of the major reasons for failure of antibiotic treatment of infections due to bacteria. The occurrence of gentamicin-resistant Gram-negative rods was first documented in 1971.⁷ Since then, a general trend of increasing resistance has been noted.^{8,9} In this survey 9.2% of *Pseudomonas aeruginosa* isolates were resistant to gentamicin. This is considerably higher than the figure of 5.0% quoted for a London hospital.³ However this figure is

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TABLE 1
RATES OF GENTAMICIN RESISTANCE AMONG VARIOUS GRAM-NEGATIVE RODS

Organism	Total isolated	Number resistant to gentamicin
<i>Klebsiella</i> sp	707	41 (5.8%)
<i>Pseudomonas aeruginosa</i>	684	63 (9.2%)
<i>E. Coli</i>	606	31 (5.1%)
<i>Enterobacter</i> sp	268	26 (9.7%)
<i>Proteus</i> sp	208	14 (6.7%)
<i>Acinetobacter</i> sp	206	32 (15.5%)
Others	98	10*
Total	2777	217 (7.8%)

*Comprises 3 *Moraxella* sp, 3 *Serratia* sp, 3 *Pseudomonas* sp, and 1 *Citrobacter* sp.

TABLE 2
LOCATION OF 197 PATIENTS INFECTED BY GENTAMICIN-
RESISTANT GRAM-NEGATIVE RODS

Ward	Number of patients
Paediatric wards	58
Orthopaedic wards	48
Special care units	41
General surgical wards	24
General medical wards	21
Others	5
Total	197

TABLE 3
TYPES OF SPECIMENS FROM WHICH GENTAMICIN-
RESISTANT GRAM-NEGATIVE RODS WERE ISOLATED

Specimen	Number of isolates
Urine	67 (29.9%)
Pus	58 (25.8%)
Surface swabs	57 (25.4%)
Blood	24 (10.7%)
Respiratory	18 (8.0%)

TABLE 4
ANTIBIOTIC SENSITIVITY PATTERNS OF GENTAMICIN-RESISTANT
PSEUDOMONAS AERUGINOSA
TO CARBENICILLIN, TOBRAMYCIN AND AMIKACIN

Pattern	Number of isolates
Sensitive to all 3 antibiotics	0
Sensitive to amikacin and carbenicillin	2
Sensitive to tobramycin and amikacin	5
Sensitive to amikacin only	54
Resistant to all 3 antibiotics	2
Total	63

lower than the 11.6% found in an American hospital.¹⁰ The resistance rate of *Pseudomonas aeruginosa* to tobramycin (8.5%) is only slightly lower than that for gentamicin but the resistance rate to amikacin is only 0.3%. Amikacin is, therefore, a valuable substitute antibiotic when gentamicin resistance is encountered.

Resistance to gentamicin among *Enterobacteriaceae* has been shown to be on the increase. Outbreaks of gentamicin-resistant *Klebsiella* sp have been reported in hospitals?^{11,12} In this study, the rates of gentamicin resistance in *Klebsiella* sp and *E. coli* are 5.8% and 5.1% respectively. This is similar to the finding of a rate of 5.5% among non-pseudomonal Gram-negative rods in an American hospital.¹⁰ There is little information on gentamicin-resistant *Acinetobacter* sp. A resistance rate of 20.0% was reported by Drasar *et al.*³ The resistance rate of *Acinetobacter* sp to gentamicin in this study is 15.5%. *Acinetobacter* sp is a widespread environmental contaminant and is more often a coloniser than a pathogen. However, an outbreak of hospital infection caused by *Acinetobacter* has recently been reported.¹³

The highest rates of gentamicin resistance appear to occur in the Paediatric and Orthopaedic wards. Although we do not have exact figures, it is our general impression that there is a more frequent use of gentamicin in these two areas and that the gentamicin resistance is a result of this widespread use. Urine was the most common source from which the gentamicin-resistant organisms were isolated. The majority of these urine specimens (57 out of

67) were catheter urine specimens from patients with in-dwelling catheters. These cases probably represent hospital acquired infections as a result of the urinary catheterisations.

The true prevalence of gentamicin resistance among Gram-negative rods in Malaysia is not known. From this study in only one hospital, it is shown that gentamicin resistance in Gram-negative rods is a significant problem. The emergence of gentamicin-resistant organisms is related to the widespread and indiscriminate use of gentamicin.^{1,4,14} Strict antibiotic policies should be adopted in hospitals to control the use of antibiotics. Continued uncontrolled use of antibiotics may lead to increased resistance to presently useful antibiotics thus necessitating the use of more toxic and expensive alternatives.

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