

IN VITRO SUSCEPTIBILITY OF GRAM-NEGATIVE BACILLI TOWARDS SIX NEWER CEPHALOSPORINS

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Summary

The *in-vitro* activities of six newer cephalosporins against 459 recently isolated strains of Gram-negative bacilli were determined using an agar dilution method to establish minimum inhibitory concentrations (mics). The cephalosporins tested were cefotaxime, moxalactam, cefoperazone, ceftriaxone, cefsulodin and ceftazidime. The strains tested included *Enterobacteriaceae*, *Pseudomonas aeruginosa* and *Acinetobacter calcoaceticus*. All the cephalosporins tested showed good activity against *Enterobacteriaceae* with the exception of cefsulodin which was specifically anti-pseudomonal.

INTRODUCTION

The cephalosporins are a family of beta-lactam antibiotics with broad spectrum activity. They are widely used in the treatment of infections. We had previously established the activity of some of the earlier cephalosporins against *Enterobacteriaceae* isolated from patients at the General Hospital, Kuala Lumpur¹. Since then, several newer cephalosporins have been introduced which are characterised by their high activity against Gram-negative bacilli including *Pseudomonas aeruginosa*². This survey seeks to establish the activities of some of the newer cephalosporins against recently isolated strains of Gram-negative bacilli at the General Hospital, Kuala Lumpur.

METHODS

The cephalosporins tested were cefotaxime (Hoechst), moxalactam (Eli Lilly), cefoperazone (Pfizer), ceftriaxone (Roche), cefsulodin (Ciba) and ceftazidime (Glaxo). Antibiotic powders of cefotaxime, moxalactam and cefoperazone were obtained from the respective manufacturers while ceftriaxone, cefsulodin and ceftazidime were kindly provided by Ms Faridah Moosdeen of the Department of Microbiology, The London Hospital Medical College. 459 strains of Gram-negative bacilli were tested for their susceptibility towards the aforementioned cephalosporins by an agar dilution method³. The strains tested were *E. coli* (45 strains), *Klebsiella* sp (46), *Salmonella* sp (48), *Shigella* sp (48), *Enterobacter* sp (46), *Proteus* sp (48), *Acinetobacter calcoaceticus* (45) and *Pseudomonas aeruginosa* (133). These strains were isolated from patients at the General Hospital, Kuala Lumpur during the period 1st June 1982 to 31st May 1983.

RESULTS

The antibacterial activities of the six cephalosporins are summarised in Table 1. The results are expressed as mic 50 and mic 90, that is the minimum concentration of the antibiotic required to inhibit the growth of 50% and 90% of strains tested respectively. The mics are expressed as mg per litre.

Of the six cephalosporins tested, ceftazidime appeared to possess the highest activity against *Acinetobacter calcoaceticus* and *Pseudomonas aeruginosa*. At 16mg/litre ceftazidime inhibited 39 out of the 45 strains of *Acinetobacter calcoaceticus* and 132 out of the 133 strains of *Pseudomonas aeruginosa* tested. At similar concentrations however ceftazidime was less active than cefotaxime, moxalactam and ceftriaxone against the *Enterobacteriaceae* with the exception of *Enterobacter* sp. Cefsulodin was selectively antipseudomonal and had poor activity against the non-pseudomonal strains. Its anti-pseudomonal activity was however impressive, being surpassed only by ceftazidime. Moxalactam, cefotaxime and ceftriaxone possess quite similar activities. They were all highly active against *Enterobacteriaceae*. Their activity against *Enterobacter* sp, *Acinetobacter calcoaceticus* and *Pseudomonas aeruginosa* was however only moderate. Cefoperazone was less active than moxalactam, cefotaxime and ceftriaxone against *Enterobacteriaceae* but more active in the case of *Pseudomonas aeruginosa*. Its activity against *Acinetobacter calcoaceticus* was poor.

DISCUSSION

The pattern of susceptibility shown by the local strains of Gram-negative bacilli is similar to that which has already been reported

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TABLE 1
 ANTIBACTERIAL ACTIVITY OF SIX CEPHALOSPORINS AGAINST
 GRAM-NEGATIVE BACILLI
 O R G A N I S M

	No. of strains	<i>E. coli</i>	<i>Klebsiella</i> sp	<i>Salmonella</i> sp	<i>Shigella</i> sp	<i>Enterobacter</i> sp	<i>Proteus</i> sp	<i>Acinetobacter calcoaceticus</i>	<i>Pseudomonas aeruginosa</i>
Cephalosporin	45	46	48	48	46	48	45	33	
Cefotaxime	0.03	0.03	0.03	0.03	0.12	0.03	16.0	16.0	
	0.03	2.0	0.06	0.03	32.0	0.03	64.0	64.0	
Cefoperazone	0.5	0.5	0.25	0.06	0.25	0.5	128.0	4.0	
	2.0	16.0	0.5	0.12	64.0	8.0	128.0	32.0	
Moxalactam	0.03	0.06	0.03	0.06	0.06	0.12	64.0	16.0	
	0.03	0.12	0.06	0.25	8.0	0.25	128.0	64.0	
Cefsulodin	128.0	64.0	32.0	32.0	128.0	64.0	128.0	2.0	
	128.0	128.0	64.0	64.0	128.0	128.0	128.0	64.0	
Ceftriaxone	0.03	0.03	0.03	0.03	0.06	0.03	16.0	16.0	
	0.03	4.0	0.06	0.03	16.0	0.03	128.0	64.0	
Ceftazidime	0.06	0.06	0.25	0.06	0.12	0.03	4.0	2.0	
	0.12	2.0	0.5	0.12	8.0	0.06	32.0	4.0	

The upper and lower figures for each cephalosporin refer to the mic₅₀ and mic₉₀ respectively expressed in mg/l.

from overseas⁴⁻⁶. The high activity of ceftazidime against *Pseudomonas aeruginosa* and *Acinetobacter calcoaceticus* makes it a useful antibiotic in the treatment of nosocomial infections caused by these organisms. Cefsulodin being selectively anti-pseudomonal may enable the clinician to treat pseudomonal infections without altering the normal commensal flora. Cefotaxime, moxalactam, ceftriaxone and cefoperazone have quite similar activities against the Gram-negative bacilli except in the case of *Pseudomonas aeruginosa* where cefoperazone appears to be more active. Pharmacokinetic differences and potential side-effects may be the major considerations when selecting one of these four antibiotics.

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