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Prevalence and epidemiology of antibiotic resistance in *Pseudomonas aeruginosa* (PA) isolated from low respiratory tract of patients hospitalized in Intensive Care Units (ICU) from 5 Belgian hospitals during the 2004-2008 period.

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Abstract

Objectives: To evaluate the level of resistance of PA towards commonly used antibiotics in ICUs for severe low respiratory tract infection.

Methods: Collection of first PA strains (n=138; non-duplicate isolates) in 5 hospitals over the last 4 years from patients hospitalized in ICU with a suspicion of nosocomial pneumonia. Determination of MICs of 6 commonly used antibiotics by geometric microdilution in cation-adjusted Muller-Hinton broth, with susceptibility assessed according to EUCAST Breakpoints (BP).

Results: Based on EUCAST breakpoints, and using a 20 % resistance cut-off, only amikacin could be considered effective globally as well as in each individual hospital. Meropenem was globally effective, but resistance exceeded the cut-off in 3/5 hospitals. Gentamicin, aztreonam, ciprofloxacin and cefepime were globally ineffective, with resistance exceeding 40 % for cefepime in 2 hospitals. Cefepime-resistant isolates were also often resistant to other antibiotics [GEN, 24 %; AMK; 8 %; ATM, 27 %; MEM, 20 %; and CIP, 20 %].

Conclusions: The level of antibiotic resistance in *Pseudomonas aeruginosa* (including cross-resistance, as illustrated for cefepime) in the ICU surveyed is critically limiting therapeutic options, but in variable way that justifies early and careful assessment of susceptibilities for ensuring appropriate therapy

Introduction

Nosocomial pneumonia in intensive care units (ICU) is a common complication of critical illness and is associated with significant attributable morbidity and mortality, including prolongation of mechanical ventilation and increased risk of death of patient [1]. *Pseudomonas aeruginosa* (PA) is a major cause of nosocomial pneumonia in ICU. Antibiotic selection, however, is made difficult by (i) the low susceptibility of PA to many drugs, and (ii) its frequently observed multiresistant character [2-4].

This triggered us to evaluate the level of resistance of first isolates of PA collected from ICU patients during the 2004-2008 period to anti-pseudomonal aminoglycosides, β-lactams, and fluoroquinolones.

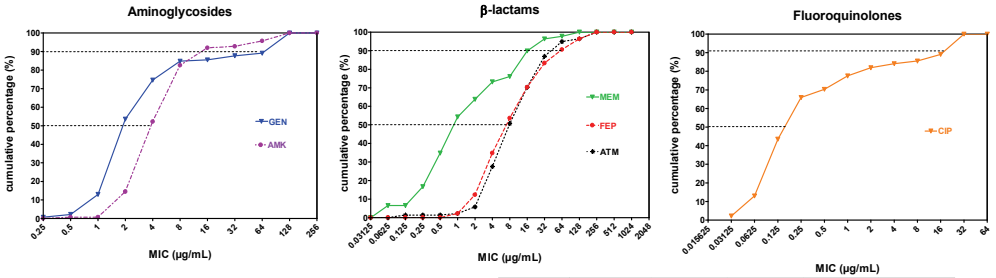
Methods

Bacteria: 138 strains of *P. aeruginosa* were collected from patients admitted in ICU with a diagnosis of nosocomial pneumonia in 5 Belgian hospitals.

MICs: Geometric microdilution in cation-adjusted Mueller-Hinton broth with *P. aeruginosa* ATCC 27853 and PAO1 used as a quality control. Susceptibility assessed according to EUCAST Breakpoints (BP; http://www.eucast.org).

Results

Cumulative MICs distribution for 138 isolates of *Pseudomonas aeruginosa* (PA) towards amikacin, gentamicin, aztreonam, meropenem, cefepime, and ciprofloxacin.



Arrows point to EUCAST breakpoints for S / R.

	GEN	AMK	ATM	MEM	FEP	CIP
Bkpts (≤ S / R >):	4/4	8/16	1/16	2/8	8/8	0.5/1
MIC_{50}/MIC_{90}	2/64	4/16	8/32	1/16	8/64	0.2/16

Cross-resistance (%) among antibiotics

	CIP	FEP	MEM	ATM	GEN
AMK	13%	8%	12%	17%	13%
GEN	19%	24%	16%	25%	
ATM	30%	27%	36%		
MEM	24%	20%			
FEP	20%				

Prevalence of antibiotic resistance (global and by hospital) in 138 isolates of *Pseudomonas aeruginosa*

Figures **in bold** (and circled in yellow) indicate situations (global or per hospital) in which resistance to a given antibiotic exceeds 20 % of isolates

AB	Global		H1 (n=12)		H2 (n=29)		H3 (n=21)		H4 (n=22)		H5 (n=54)	
	$MIC_{50/90}$	I/R [a]	$MIC_{50/90}$	I/R [a]	$MIC_{50/90}$	I/R [a]	$MIC_{50/90}$	I/R [a]	$MIC_{50/90}$	I/R [a]	$MIC_{50/90}$	I/R [a]
GEN	**2/64**	**25.4**	**2/64**	**25.0**	**2/64**	**31.0**	**4/64**	**28.6**	**2/32**	**27.3**	2/8	**20.4**
AMK	4/16	9.4/8.0	4/8	0.0/8.3	4/32	13.3/13.8	8/16	9.5/0.0	4/32	18.2/13.6	8/8	5.6/5.6
ATM	**8/32**	**68.1/29.7**	**6/32**	**66.7/33.3**	**16/32**	**65.5/34.5**	**16/32**	**57.1/33.3**	**16/128**	**63.6/36.4**	**8/32**	**75.9/22.2**
MEM	**1/16**	**12.3/23.9**	1/8	25.0/8.3	**2/16**	**6.9/37.9**	1/4	14.3/4.8	**1/16**	**4.5/27.3**	**1/16**	**14.5/25.5**
FEP	**8/64**	**46.4**	**4/32**	**33.3**	**16/64**	**72.4**	**8/64**	**47.6**	**6/64**	**36.4**	**8/64**	**38.9**
CIP	**0.25/16**	**7.2/22.5**	**0.25/8**	**8.3/25**	**0.5/16**	**6.9/37.9**	**0.25/16**	**9.5/23.8**	0.19/8	0.0/13.6	0.125/16	9.3/16.7

[a] I means > S and ≤ R (for GEN and FEP, only R is given as there is no intermediate according to EUCAST)

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Conclusions

Aminoglycosides: AMK remains effective, while GEN resistance ranges from 20 to 31 %.

β-lactams: MEM resistance is > 20 % in 3 out of 5 hospitals, with a global MIC_{90} of 16 µg/mL. Resistance to FEP was higher than 30 % in all hospitals. About 90 % of the strains were I or R to ATM.

Fluoroquinolone: resistance to CIP ranges from 14 to 38 %.

Cross-resistance: affects about 20-30 % of isolates except for AMK.

The activity of current therapeutic options is highly compromised in nosocomial isolates of PA, with multiresistant phenotypes further complicating antibiotic selection.

Because of the large variability of resistance rates among hospitals, susceptibilities need to be assessed, and the corresponding antibiotic policies defined locally.

References

1. Parker *et al.* (2008). Ventilator-associated pneumonia caused by multidrug-resistant organisms or Pseudomonas aeruginosa: prevalence, incidence, risk factors, and outcomes. *J Crit Care.* 23:18-26.
2. Mesaros *et al.* (2007). *Pseudomonas aeruginosa*: resistance and therapeutic options at the turn of the new millennium. *Clin Microbiol Infect.* 13: 560-78.
3. Discoll *et al.* (2007) The epidemiology, pathogenesis and treatment of *Pseudomonas aeruginosa* infections. *Drugs* 67: 351-68.
4. Rossolini & Mantengoli (2008). Antimicrobial resistance in Europe and its potential impact on empirical therapy. *Clin. Microbiol. Infect.* 14 S::2-8.

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