Carbapenem-non-susceptibility in gramnegative bacteria: Data from the German Antibiotic Resistance Surveillance System (ARS) from 2008-2011

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Introduction

Carbapenem-resistance in gramnegative bacteria has emerged as a serious public health problem worldwide requiring consistent and intensified surveillance efforts. Data from ARS, the German Antibiotic Resistance Surveillance system, are presented.

Material & Methods

ARS is a voluntary, laboratory based surveillance system collecting resistance data of all clinical pathogens and sample types. Data are transmitted electronically to the central data-base of the national public health institute (Robert Koch Institute). Data on carbapenem-non-susceptibility of *Escherichia coli (E. coli), Klebsiella pneumoniae (K. pneumoniae), Acinetobacter baumannii (A. baumannii) and Pseudomonas aeruginosa* (P. aeruginosa) from 2008 to 2011 are presented. In enterobacteriaceae carbapenem-non-susceptibility is defined as non-susceptibility to ertapenem, in nonfermenters as simultaneous non-susceptibility to imipenem and meropenem. For all analyses only data from hospitals participating over the whole time period have been considered. Copy-strains and screening samples have been excluded.

Results

Data on carbapenem-non-susceptibility are presented in table 1. While from 2008 to 2011 cefotaxim (CTX)-non-susceptibility in *E. coli* rose from 7.0 % to 9.7 %, ertapenem-non-susceptibility remained constantly under 1%. In *K. pneumoniae* non-susceptibility to CTX and ertapenem slightly increased from 9.9% to 11.2% and 0.5% to 1.6%, respectively. Ertapenem-non-susceptibility presents with a higher level and stronger increase on Intensive Care Units (ICU) as compared to general wards, showing a rise from 1.4% in 2008 to 3.8% in 2011.

Table 1: Carbapenem-non-susceptibility-rates in *Escherichia coli, Klebsiella pneumoniae, Acinetobacter baumannii and Pseudomonas aeruginosa* stratified by ward type from 2008 to 2011.

	2008		2009		2010		2011	
	Isolates	R/I***	Isolates	R/I	Isolates	R/I	Isolates	R/I
Klebsiella pneumoniae*	n	%	n	%	n	%	n	%
Hospital care, overall	872	0.5	1254	0.9	1299	0.7	1194	1.6
Intensive Care Units	212	1.4	252	0.8	288	2.1	265	3.8
General wards	660	0.2	1002	0.9	1011	0.3	929	1.0
Escherichia coli*								
Hospital care, overall	3481	0.3	4904	0.1	5339	0.1	5217	0.1
Intensive Care Units	635	0.9	671	0.4	731	0.1	755	0.1
General wards	2846	0.1	4233	0.0	4608	0.0	4462	0.1
Acinetobacter baumannii								
Hospital care, overall	754	9.2	662	5.0	710	13.1	540	15.4
Intensive Care Units	124	21.0	111	11.7	135	20.7	116	20.7
General wards	630	6.8	551	3.6	575	11.3	424	13.9
Pseudomonas aeruginosa								
Hospital care, overall	6474	12.5	7512	13.4	8067	14.4	7663	15.0
Intensive Care Units	1118	26.1	1329	25.1	1452	28.0	1437	25.6
General wards	5356	9.6	6183	10.8	6615	11.4	6226	12.6

*non-susceptibility to ertapenem, **combined non-susceptibility to imipenem and meropenem, ***R/I, resistant/intermediate

Among *A. baumannii*-strains, exhibiting non-susceptibility to imipenem and/or meropenem, more than 90% presented with a combined non-susceptibility to both carbapenems, which in relation to all *A. baumannii*-strains rose from 9.2% in 2008 to 15.4% in 2011. Due to different resistance mechanisms, *P. aeruginosa* harbours a higher percentage of single non-susceptibility to imipenem or meropenem, which showed a decrease in favour to combined non-susceptibility to both carbapenems increasing from 12.5% in 2008 to 15.0% in 2011. Non-susceptibility rates of ICUs showed a higher level than general wards, but in contrast to *K. pneumoniae,* the rates of 2008 and 2011 did not differ considerably. The increase of carbapenem-non-susceptibility was primarily seen on general wards. In both nonfermentors the highest carbapenem-non-susceptibility rates were found in respiratory samples as compared to all other sample types.

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Conclusions

In contrast to *E. coli*, *K. pneumoniae* showed an increase of ertapenem-non-susceptibility over time with focus on ICUs. The rise of combined non-susceptibility to imipenem and meropenem in *A. baumannii* and *P. aeruginosa* was more prevalent on general wards. Consequent implementation of infection control measures, early and effective action in outbreak situations and the establishment of antibiotic steward ship programs are indispensable for the containment of further spread.

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