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Paper Poster Session
Lessons from surveillance of resistance in Gram-negatives

Distribution of beta-lactamases in Gram-negative pathogens from urinary tract infections in Europe – SMART 2010-2014

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Background: The Study for Monitoring Antimicrobial Resistance Trends (SMART) tracks *in vitro* activity of antimicrobials used to treat intra-abdominal and urinary tract infections (UTI). In this analysis, we identified β-lactamases carried by *Enterobacteriaceae* collected from patients with UTI in European countries from 2010-2014.

Material/methods: Fifty-seven laboratories in 18 countries each collected up to 50 consecutive, non-duplicate Gram-negative isolates from UTI per study year. Susceptibility and extended-spectrum β-lactamase (ESBL) phenotypes were determined using CLSI broth microdilution and interpreted using EUCAST 2015 breakpoints. Per SMART protocol, all ertapenem non-susceptible (ETP-NS; MIC > 0.5 mg/L) isolates and a randomly selected 50% of ESBL-phenotype positive (ESBLp+) *Escherichia coli*, *Klebsiella pneumoniae*, *K. oxytoca*, and *Proteus mirabilis* collected from each country are molecularly characterized for genes encoding ESBLs, carbapenemases (Cpases) and AmpC cephalosporinases.

Results: 10,202 *Enterobacteriaceae* were collected from UTI in Europe in 2010-2014. Of these, 29.9% were non-susceptible to levofloxacin, the first-in-line empiric treatment for UTI, and 3.4% were ETP-NS. 1,313 isolates (647 *E. coli*, 540 *K. pneumoniae*, 60 *Enterobacter cloacae*, 30 *P. mirabilis*, and 36 other *Enterobacteriaceae*) were molecularly characterized. Serine- or metallo-carbapenemases were identified in 37%, 61%, 27%, and 100% of ETP-NS *E. coli*, *K. pneumoniae*, *E. cloacae* and *P. mirabilis* isolates, respectively. ESBLs were found in 94%, 85%, 30%, and 73% of all molecularly characterized isolates of these species.

Phenotype/ Enzyme groups	*E. coli*	*K. pneumoniae*	*E. cloacae*	*P. mirabilis*
Total ESBLp+, ETP-S characterized	620	309	NA	27
ESBL	584	290		20
ESBL+AmpC	7	4		2
AmpC	1			3
Cpase+ESBL		1[a]		
No ESBL, AmpC, or Cpase detected	28	14		2
Total ETP-NS characterized[b]	27	231	60	3
Cpase	2	59	3	
Cpase+ESBL	8	63	3	
Cpase+ESBL+AmpC		14	5	
Cpase+AmpC		4	5	3
ESBL	9	82		
ESBL+AmpC	1	6	10	
AmpC	2		34	
No ESBL, AmpC, or Cpase detected	5	3		
Total characterized	647	540	60	30
Total collected	6307	1761	333	777
% ESBLp+	16.7%	38.7%	NA	8.0%
% ETP-NS	0.4%	13.2%	18.0%	0.4%
% LVX-NS	31.4%	38.1%	22.2%	23.4%

ESBLp, ESBL phenotype; ETP, ertapenem; LVX, levofloxacin; S, susceptible; NS, non-susceptible; NA, not applicable.
[a]VIM-positive isolate that showed intermediate resistance to imipenem (MIC 8 mg/L)
[b]Includes both ESBL phenotype-positive and phenotype-negative isolates

Conclusions: Carriage of ESBLs and Cpases differed between species of *Enterobacteriaceae* most commonly collected from patients with UTI in Europe. Though isolates producing one or more β-lactamases are increasingly common, ertapenem remained active (MIC ≤ 0.5 mg/L) *in vitro* against 96.6% of *Enterobacteriaceae* collected from UTI in Europe in 2010-2014.