

# Characterization of resistance in Gram-negative urinary isolates using existing and novel indicators of clinical relevance: a 10-year data analysis

Márió Gajdács<sup>1\*</sup>, Zoltán Bátori<sup>2</sup>, Marianna Ábrók<sup>3</sup>, Andrea Lázár<sup>3</sup>, Katalin Burián<sup>3,4</sup>

<sup>1</sup> Department of Pharmacodynamics and Biopharmacy, Faculty of Pharmacy, University of Szeged; 6720 Szeged, Eötvös utca 6., Hungary

<sup>2</sup> Department of Ecology, Faculty of Sciences, University of Szeged; 6726 Szeged, Közép fasor 52., Hungary; [zbatory@gmail.com](mailto:zbatory@gmail.com) (Z.B.)

<sup>3</sup> Institute of Clinical Microbiology, Faculty of Medicine, University of Szeged; 6725 Szeged, Semmelweis utca 6., Hungary; [abrok.marianna@med.u-szeged.hu](mailto:abrok.marianna@med.u-szeged.hu) (M.A.), [lazar.andrea@med.u-szeged.hu](mailto:lazar.andrea@med.u-szeged.hu) (A.L.)

<sup>4</sup> Department of Medical Microbiology and Immunobiology, Faculty of Medicine, University of Szeged; 6720 Szeged, Dóm tér 10., Hungary; [burian.katalin@med.u-szeged.hu](mailto:burian.katalin@med.u-szeged.hu) (K.B.)

\* Correspondence: [gajdacs.mario@pharm.u-szeged.hu](mailto:gajdacs.mario@pharm.u-szeged.hu); Tel: +36-62-341-330 (M.G.)

**Abbreviation list:** CES: *Citrobacter-Enterobacter-Serratia*; DTR: difficult-to-treat resistance; mDTR: modified difficult-to-treat resistance; mcDTR: modified difficult-to-treat resistance for *Escherichia coli*; MDR: multidrug-resistance; n.s.: not significant; NFGNB: non-fermenting Gram-negative bacteria; PDR: pandrug resistance; SXT: sulfamethoxazole-trimethoprim; UDR: usual drug resistance; Wt: wild-type; XDR: extensive drug resistance

**Supplementary Table S1.** Distribution of *Escherichia coli* isolates among different resistance categories,

2008-2017			
Resistance category	Outpatient isolates	Inpatient isolates	Statistics
Wt/susceptible	39.4%	34.1%	n.s.
UDR	60.6%	55.9%	n.s.
mDTR	0.8%	2.2%	$p=0.043$
mcDTR	0.6%	1.9%	$p=0.04$
MDR	0.2%	3.4%	$p=0.018$
DTR	0.01%	0.01%	n.s.
XDR	0%	0%	-
PDR	0%	0%	-
Highest ratio of resistant isolates for:	Ciprofloxacin	Ciprofloxacin	-

Supplementary material S1

Supplementary Table S2. Distribution of *Klebsiella* spp. isolates among different resistance categories,

2008-2017			
Resistance category	Outpatient isolates	Inpatient isolates	Statistics
Wt/susceptible	40.4%	45.7%	n.s.
UDR	59.6%	54.3%	n.s.
mDTR	0.4%	5.9%	$p=0.011$
MDR	0.3%	2.7%	$p=0.028$
DTR	0.2%	0.3%	n.s.
XDR	0.1%	0.1%	n.s.
PDR	0%	0%	-
<b>Highest ratio of resistant isolates for:</b>	Ciprofloxacin	SXT	-

Supplementary Table S3. Distribution of *Citrobacter-Enterobacter-Serratia* (CES) isolates among different resistance categories, 2008-2017

Resistance category	Outpatient isolates	Inpatient isolates	Statistics
Wt/susceptible	14.0%	10.1%	n.s.
UDR	86.0%	89.9%	n.s.
mDTR	5.5%	17.0%	$p=0.009$
MDR	2.0%	8.3%	$p=0.016$
DTR	1.2%	1.9%	n.s.
XDR	0%	0.2%	n.s.
PDR	0%	0%	-
<b>Highest ratio of resistant isolates for:</b>	Ciprofloxacin	SXT	-

Supplementary Table S4. Distribution of *Proteus-Providencia-Morganella* isolates among different resistance categories, 2008-2017

Resistance category	Outpatient isolates	Inpatient isolates	Statistics
Wt/susceptible	31.8%	22.2%	$p=0.036$
UDR	68.2%	77.8%	$p=0.034$
mDTR	13.5%	22.9%	$p=0.02$
MDR	7.6%	10.3%	$p=0.047$
DTR	0%	0.2%	n.s.
XDR	0%	0%	n.s.
PDR	0%	0%	-
<b>Highest ratio of resistant isolates for:</b>	SXT	SXT	-

Supplementary material S1

Supplementary Table S5. Distribution of *Pseudomonas aeruginosa* isolates among different resistance categories, 2008-2017

Resistance category	Outpatient isolates	Inpatient isolates	Statistics
Wt/susceptible	52.6%	45.0%	n.s.
UDR	47.3%	55.0%	n.s.
MDR	6.8%	11.4%	$p=0.028$
DTR	5.3%	8.6%	$p=0.042$
XDR	0.8%	2.9%	$p=0.049$
PDR	0%	0%	-
<b>Highest ratio of resistant isolates</b>	Ciprofloxacin	Levofloxacin	-

Supplementary Table S6. Distribution of *Acinetobacter* spp. isolates among different resistance categories, 2008-2017

Resistance category	Outpatient isolates	Inpatient isolates	Statistics
Wt/susceptible	45.5%	11.1%	$p<0.001$
UDR	54.5%	88.9%	$p<0.001$
mDTR	11.4%	22.6%	$p=0.018$
MDR	7.2%	13.3%	$p=0.02$
DTR	5.0%	11.7%	$p=0.024$
XDR	2.6%	8.8%	$p=0.036$
PDR	0%	0%	-
<b>Highest ratio of resistant isolates</b>	SXT	SXT	-