

### Revised Abstract

**Background:** The Study for Monitoring Antimicrobial Resistance Trends (SMART) has tracked susceptibility of intra-abdominal infection (IAI) pathogens since 2002. Globally increasing rates of multi-drug resistant, extended-spectrum beta-lactamase-producing (ESBL+) *Escherichia coli* require knowledge of local ESBL prevalence in order to optimize therapy. This report summarizes 2009 *E. coli* data from SMART in Latin America (LA). **Methods:** 859 IAI *E. coli* from 19 sites in 11 countries in LA were sent to a central lab for identification confirmation, ESBL status using Clinical and Laboratory Standards Institute (CLSI) guidelines, and both microdilution susceptibility testing for ertapenem (Etp), imipenem (Imp), piperacillin-tazobactam (PT), ampicillin-sulbactam (AS), ceftazidime (Caz), cefotaxime (Cft), ceftazidime (Caz), cefepime (Cpe), amikacin (Ak), ciprofloxacin (Cp), and levofloxacin (Lvx). Susceptibility (%S) was compared for hospital-associated (HA) vs community-associated (CA) infection. Statistical significance was determined using Fisher's Exact Test. **Results:** *E. coli* %S was  $\geq 90$  for 5 drugs (Etp 100, Imp 100, Ak 97, Cfx 90, PT 90). %S for all other cephalosporins was  $< 90$ ; Cp and Lvx were  $< 60$ ; AS  $< 35$ . Drug %S values varied from country to country, with Imp, Etp, Ak, and Cfx showing the most consistency. Comparing HA to CA *E. coli*, 8 drugs (AS, Cpe, Cft, Cfx, Caz, Cax, Cp, Lvx, PT) had significantly lower %S in HA infection ( $P < .05$ ). The ESBL+ *E. coli* rate for LA overall was 22%, ranging from 0% in Puerto Rico and Panama to 41% in Mexico; %S of all drugs except Etp and Imp was significantly lower for ESBL+ than ESBL- isolates ( $P < .001$ ).

#### Conclusions:

- Etp and Imp were the most active *in vitro* vs IAI isolates of *E. coli*, followed by Ak, Cfx, and PT; 3<sup>rd</sup> and 4<sup>th</sup> generation cephalosporins and fluoroquinolones were all  $< 90\%$  active.
- Etp and Imp were 100% active vs HA and CA *E. coli*, while many other drugs showed diminished activity vs HA isolates.
- The ESBL+ rate in IAI *E. coli* in LA was 22%, with individual country rates ranging from 0% to 41%.
- Only the carbapenems and amikacin inhibited  $> 90\%$  of ESBL+ isolates.
- Therapy of IAI in Latin America due to *E. coli* should take local ESBL+ rates into account, since only Etp, Imp, and Cfx inhibited  $> 90\%$  of such isolates, and the quinolones inhibited  $< 30\%$ .

### Introduction

The Study for Monitoring Antimicrobial Resistance Trends (SMART) has tracked susceptibility of intra-abdominal infection (IAI) pathogens since 2002. This program and other studies have documented globally increasing rates of extended-spectrum beta-lactamase-producing (ESBL+) *E. coli*, in both hospital- and community-acquired IAI. However, large differences exist between the ESBL+ rates observed in individual countries, sometimes even those adjacent to each other. In light of such variability, knowledge of local ESBL prevalence is required in order to optimize therapy. This report summarizes *E. coli* susceptibility data from SMART 2009 in Latin American countries (LA).

### Materials & Methods

859 IAI *E. coli* collected in 2009 from 19 sites in 11 countries (Argentina-2, Brazil-1, Chile-2, Colombia-2, Dominican Republic-1, Ecuador-1, Guatemala-1, Mexico-4, Panama-1, Puerto Rico-1, Venezuela-3) in LA were sent to a central lab (International Health Management Associates, Inc., Schaumburg, IL) for identification confirmation, ESBL status using Clinical and Laboratory Standards Institute (CLSI) guidelines [1], and antimicrobial susceptibility testing for ertapenem (Etp), imipenem (Imp), piperacillin-tazobactam (PT), ampicillin-sulbactam (AS), ceftazidime (Caz), cefotaxime (Cft), ceftazidime (Caz), cefepime (Cpe), amikacin (Ak), ciprofloxacin (Cp), and levofloxacin (Lvx). Minimum inhibitory concentrations (MICs) and production of extended-spectrum beta-lactamase (ESBL) were determined using custom MicroScan dehydrated broth microdilution panels (Siemens Medical Solutions Diagnostics, West Sacramento, CA), following manufacturer and CLSI guidelines [1,2]. Quality control was done each day of testing following CLSI guidelines [1]. Susceptibility (%S) was compared for hospital-associated (HA) vs community-associated (CA) infection. An IAI was defined as HA if the specimen was cultured  $\geq 48$  hours post admission to hospital, and CA if the specimen was cultured  $< 48$  hours post admission to hospital. Statistical significance was determined using Fisher's Exact Test, two-tailed.

### References

- Clinical and Laboratory Standards Institute, 2010. *Performance Standards for Antimicrobial Susceptibility Testing; Twentieth Informational Supplement*. CLSI document M100-S20. Clinical and Laboratory Standards Institute (CLSI), Wayne, PA 19087-1898 USA.
- Clinical and Laboratory Standards Institute, 2008. *Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria That Grow Aerobically; Approved Standard—Seventh Edition*, in Document M7-A7. Clinical and Laboratory Standards Institute (CLSI), Wayne, PA 19087-1898 USA.

### Acknowledgements

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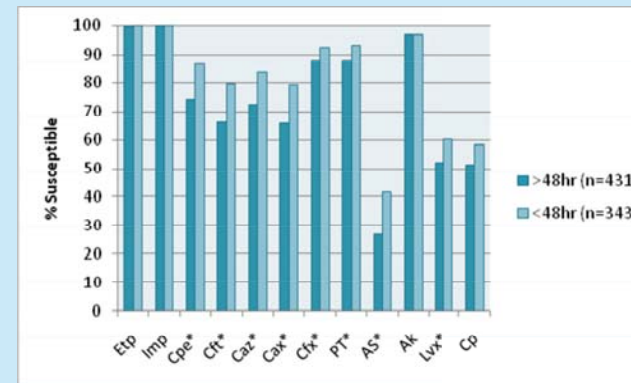
### Results

**Table 1. Percent susceptibility of *E. coli* from IAI in Latin America in 2009; values  $\geq 90$  are shaded.**

Country	N	Etp	Imp	Cpe	Cft	Caz	Cax	Cfx	PT	AS	Ak	Lvx	Cp
Argentina	89	100	100	97	93	96	93	96	97	44	100	74	71
Brazil	33	100	100	91	88	94	88	97	97	61	94	73	73
Chile	107	100	100	79	75	85	75	98	92	42	100	68	67
Colombia	82	100	100	94	88	88	88	95	85	37	96	73	72
Dominican Rep.	34	100	100	88	79	85	79	91	91	9	100	44	44
Ecuador	83	99	100	73	59	75	58	84	89	18	96	43	42
Guatemala	62	100	100	82	76	77	74	97	97	32	92	63	61
Mexico	189	100	100	61	52	57	52	81	89	29	98	38	38
Panama	22	100	100	100	100	100	100	95	100	64	100	50	50
Puerto Rico	22	100	100	100	100	100	100	95	91	64	100	73	73
Venezuela	136	100	100	88	78	81	78	87	82	24	94	50	47
Latin America	859	100	100	81	74	79	74	90	90	33	97	56	55

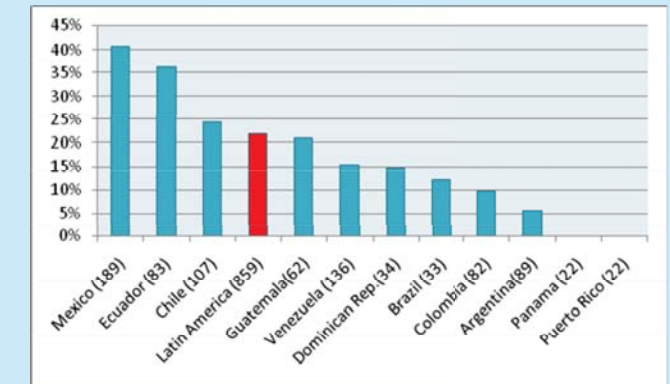
Etp=ertapenem, Imp=imipenem, Cpe=cefepime, Cft=cefotaxime, Caz=ceftazidime, Cax=ceftriaxone, Cfx=cefexitin, PT=piperacillin-tazobactam, AS=ampicillin-sulbactam, Ak=amikacin, Lvx=levofloxacin, Cp=ciprofloxacin.

**Figure 1. Percent susceptibility of *E. coli* from hospital-acquired ( $> 48$ hr) and community-acquired ( $< 48$ hr) IAI in Latin America in 2009. Asterisks indicate  $P < .05$ .**

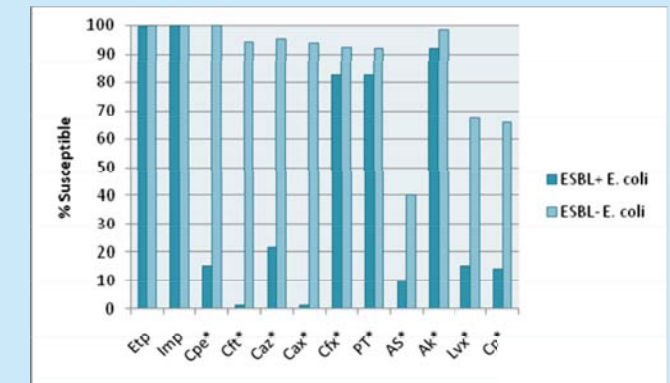


Etp=ertapenem, Imp=imipenem, Cpe=cefepime, Cft=cefotaxime, Caz=ceftazidime, Cax=ceftriaxone, Cfx=cefexitin, PT=piperacillin-tazobactam, AS=ampicillin-sulbactam, Ak=amikacin, Lvx=levofloxacin, Cp=ciprofloxacin.

**Figure 2. ESBL+ *E. coli* rates in IAI in Latin America in 2009, by country (n).**



**Figure 3. Susceptibility percentages of ESBL+ and ESBL- *E. coli* from IAI in Latin America in 2009. Asterisks indicate  $P < .05$ .**



Etp=ertapenem, Imp=imipenem, Cpe=cefepime, Cft=cefotaxime, Caz=ceftazidime, Cax=ceftriaxone, Cfx=cefexitin, PT=piperacillin-tazobactam, AS=ampicillin-sulbactam, Ak=amikacin, Lvx=levofloxacin, Cp=ciprofloxacin.

### Conclusions

- Ertapenem and imipenem were the most active *in vitro* vs. IAI isolates of *E. coli*, followed by amikacin (97%), Cfx (90%), and PT (90%); 3<sup>rd</sup> and 4<sup>th</sup> gen. cephalosporins and fluoroquinolones were all  $< 90\%$  active.
- All study drugs except ertapenem, imipenem, amikacin, and ciprofloxacin had significantly lower activity against HA than CA *E. coli*.
- Although the ESBL+ rate in IAI in Latin America overall was 22%, rates in individual countries ranged from 0% (Panama, Puerto Rico) to 40.7% (Mexico).
- Susceptibility of ESBL+ *E. coli* was significantly lower than that of ESBL- isolates for all drugs except the carbapenems, and exceeded 90% only for ertapenem, imipenem, and amikacin.
- Therapy of IAI in Latin America due to *E. coli* should take local ESBL+ rates into account, since only ertapenem, imipenem, and amikacin inhibited  $> 90\%$  of such isolates, and the quinolones inhibited  $< 16\%$ .