

Resistance Still Rising in Enterobacteriaceae from Blood in the UK and Ireland

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Background Enterobacteriaceae, especially *E. coli*, are important agents of bacteraemia. Antimicrobial resistance limits treatment options.

Methods 29 UK and Irish centres collected 6068 blood isolates of Enterobacteriaceae in 2001-2006. MICs were measured centrally by BSAC methods; isolates were 'non-susceptible' if intermediate or resistant by the latest (2007) BSAC/EUCAST breakpoints. ESBL production was inferred from phenotypes; *bla*_{CTX-M} genes were sought by PCR.

Results Non-susceptibility to several agents increased rapidly, and only partly as a result of the spread of multi-resistant strains with CTX-M ESBLs. By 2006, non-susceptibility rates to many established agents were >10%, and some >20%. Carbapenems were generally active, but 27% of *Proteaeae* were imipenem non-susceptible (>2mg/L) and 23% of *Enterobacter* were ertapenem non-susceptible (>0.5mg/L). Meropenem and doripenem had good activity in all organism groups.

Conclusion Increasing ESBL production and resistance to ciprofloxacin and gentamicin in Enterobacteriaceae demands careful choice of empirical therapy since species differ in their resistance profiles, even to related antimicrobials

AMC amoxicillin-clavulanic acid; CAZ ceftazidime; CIP ciprofloxacin; CTX cefotaxime; DOR doripenem; ETP ertapenem; FOX cefoxitin; GEN gentamicin; IPM imipenem; MEM meropenem; TGC tigecycline; TZP piperacillin-tazobactam.

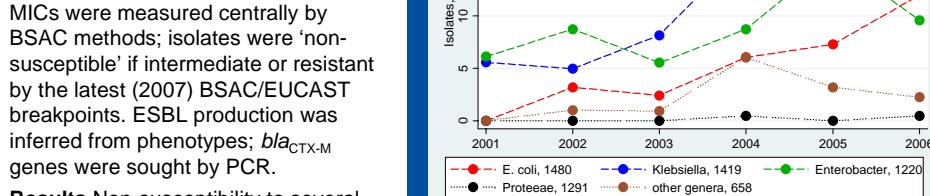
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BSAC Bacteraemia Resistance Surveillance Programme 2001 - 2006. Sponsors: AstraZeneca, Johnson & Johnson, MSD, Novartis, Pfizer, Theravance, Wyeth. **Support:** BSAC.



Prevalence of ESBLs rose throughout the period in *E. coli*, but may now have stabilised after an initial rise in *Enterobacter* and *Klebsiella*. ESBLs remain uncommon in *Proteaeae* and other genera.

The commonest ESBL type in *E. coli* and *Klebsiella* was CTX-M. ESBL-producers were very often also resistant to other (non-β-lactam) antimicrobials - see table below.

Non-susceptibility in ESBL-producers

% of isolates	<i>E. coli</i> n = 76	<i>Klebsiella</i> n = 144	<i>Enterobacter</i> n = 111
CTX-M	78	57	20
CIP > 0.5	79	75	48
GEN > 2	41	65	77
IPM > 2	1	0	0
TGC* > 1	0	21	36

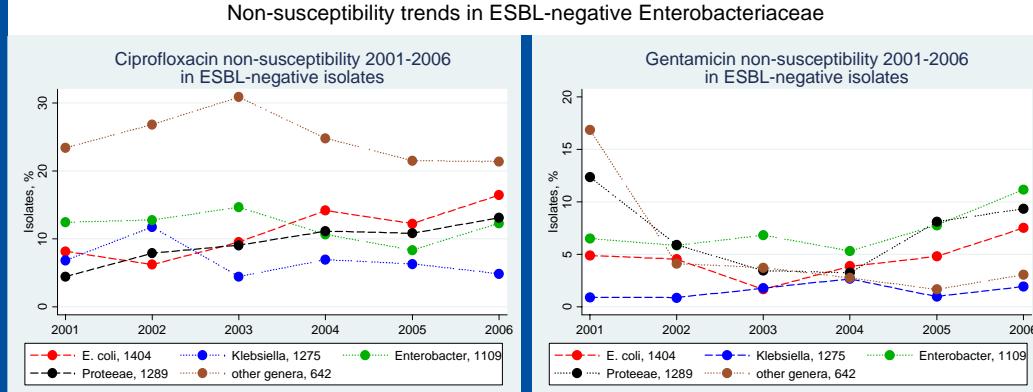
*2002-2006 only

Non-susceptibility breakpoints, mg/L: CIP >0.5, GEN >2, AMC >8, TZP >16, CAZ >1, CTX >1, FOX >8, IPM >2, MEM >2, ETP >0.5, DOR >0.5*, TGC >1.

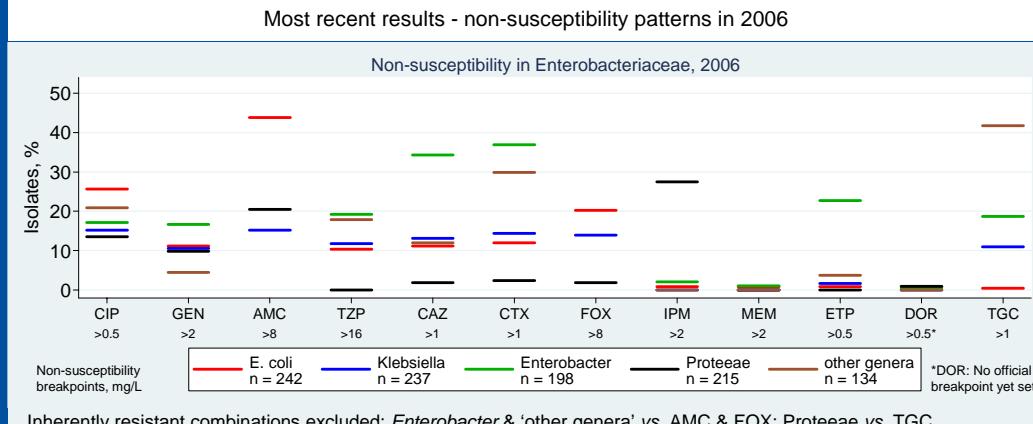
Non-susceptibility breakpoints, mg/L: E. coli n = 242, Klebsiella n = 237, Enterobacter n = 198, Proteaeae n = 215, other genera n = 134.

*DOR: No official breakpoint yet set.

Non-susceptibility in Enterobacteriaceae, 2006



Non-susceptibility to ciprofloxacin and gentamicin also increased markedly in ESBL-negative isolates of some species, as shown above. Similar trends were seen in community- and hospital-acquired infections.



Inherently resistant combinations excluded: *Enterobacter* & 'other genera' vs. AMC & FOX; *Proteaeae* vs. TGC

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