

Fluoroquinolone Resistance and its Association with Other Resistances in *Streptococcus pneumoniae* in the UK and Ireland

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Introduction

- A surprising lack of association between resistance to ciprofloxacin and other classes of antimicrobial in *S. pneumoniae* has been reported previously.
- We investigated fluoroquinolone and other resistances further in a large ongoing surveillance study.

Methods

- The BSAC Respiratory Resistance Surveillance Programme¹ received 3584 non-duplicate isolates of community-acquired lower respiratory *S. pneumoniae* from 27 UK and Irish laboratories over the five winters 1999-2000 to 2003-2004.
- MICs were determined centrally by the BSAC agar dilution method and interpreted using BSAC criteria.

¹Reynolds, R., Shackcloth J., Felmingham, D. *et al.* (2004). Antimicrobial susceptibility of lower respiratory tract pathogens in Great Britain and Ireland 1999-2001 related to demographic and geographical factors: the BSAC Respiratory Resistance Surveillance Programme. *JAC* 52, 931-943.

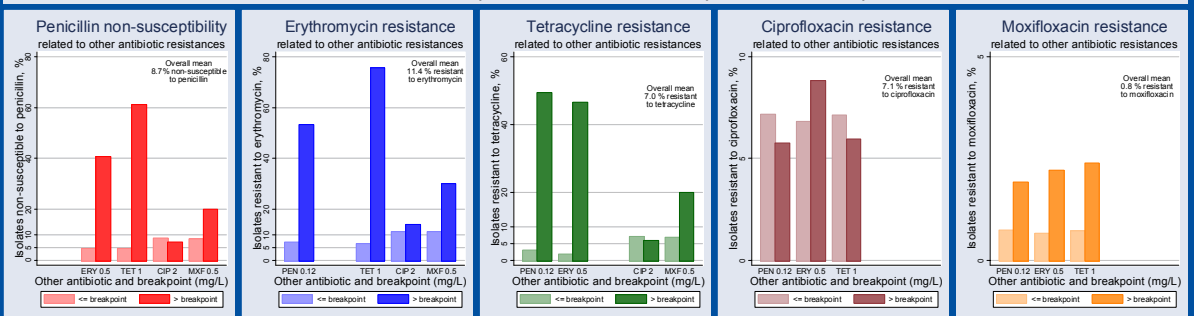
Results

- Overall resistance rates were PEN-NS 8.7% (PEN-R 0.4%), ERY-R 11.4%, TET-R 7.0%, CIP-R 7.1%, MXF-R 0.8%.
- There was a strong association between PEN-NS, ERY-R and TET-R, as found previously, with resistance rate ratios between 7 and 24 and p-values < 10⁻¹⁰⁰.
- No significant association was found between CIP-R and PEN-NS, ERY-R or TET-R, although the study had 80% (95%) power to detect an increase from 7.2% CIP-R among PEN-S to 12% (14%) in PEN-NS isolates. Resistance rate ratios were 0.8 to 1.3, p > 0.1.
- MXF-R was significantly but not strongly associated with PEN-NS, ERY-R and TET-R. Resistance rate ratios were between 2.3 and 3.4, and p-values 0.005 to 0.026.
- In 2799 isolates tested with both MXF and GEM (1999-2003), resistance was practically coincident. 14 of the 16 MXF-R isolates were also GEM-R; the remaining 2 had GEM MICs on the breakpoint of 0.25 mg/L.
- A CIP MIC >8 mg/L was a good marker for MXF-R, identifying 29/30 MXF-R and only 3/3554 MXF-S isolates.

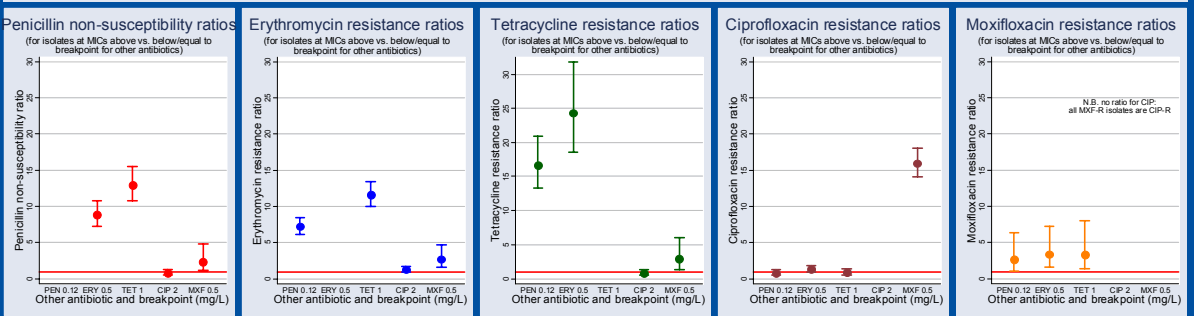
Conclusions

- Resistance to moxifloxacin and gemifloxacin is very rare (<1%) in respiratory *S. pneumoniae* in the UK and Ireland.
- Resistance to moxifloxacin and gemifloxacin is only weakly associated with resistance to non-fluoroquinolone antimicrobial classes.

Resistance rates for each antimicrobial compared for isolates susceptible/non-susceptible to other antimicrobials



Resistance rate ratios with 95% confidence intervals



Relationships between resistances to fluoroquinolones

CIP-R vs. MXF-R			CIP MIC >8 mg/L vs. MXF-R			GEM-R vs. MXF-R		
	MXF-S	MXF-R		MXF-S	MXF-R		MXF-S	MXF-R
CIP-I	3,331	0	CIP <= 8 mg/L	3,551	1	GEM-S	2,783	2*
CIP-R	223	30*	CIP > 8 mg/L	3*	29	GEM-R	0	14*
* CIP MICs for marked isolates: 1 @4, 2 @16, 8 @32, 19 @64 mg/L			MXF MICs for marked isolates 2 @0.25, 1 @0.25 mg/L			GEM MICs for marked isolates: 2 @0.25, 9 @0.5, 5 @1 mg/L		

Abbreviations and breakpoints (mg/L) S susceptible; I intermediate; R resistant; NS non-susceptible. CIP ciprofloxacin (S≤0.12, R>2, I otherwise); ERY erythromycin (S≤0.5, R>0.5); MXF moxifloxacin (S≤0.5, R>0.5); PEN penicillin (S≤0.06, R>1, I otherwise); TET tetracycline (S≤1, R>1).

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Organism ID and Susceptibility Testing J. Shackcloth⁵, A. Williams⁵, L. Williams⁵
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