Resistance in Invasive vs. Respiratory Streptococcus pneumoniae in the UK and Ireland Before and After Introduction of 7-valent Pneumococcal Vaccine (PCV7)

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BACKGROUND
7-valent pneumococcal conjugate vaccine (PCV7) was added to childhood immunization schedules in England and Wales in September 2006, and replaced by 13-valent PCV13 in April 2010. Invasive pneumococcal disease incidence fell by estimated 34% from 2000-06 to 2009-10 (86% drop in PCV7 types, 19% rise in others).1

The BSAC Resistance Surveillance Project tracked antimicrobial susceptibility in S. pneumoniae from blood (invasive infections) and community-onset lower respiratory infections (RTI), up to 48 hours in hospital).

METHODS Between Jan 2001 and Dec 2012, 7496 RTI and 2724 blood isolates were collected from 20-39 centres per year. MICs were measured by BSAC agar dilution in two central laboratories and interpreted by BSAC/EUCAST breakpoints. Serotypes were identified for blood isolates only.

RESULTS show resistance to erythromycin (ERY-R, MIC>0.5 mg/L) alone, or in combination with penicillin non-susceptibility, tetracycline resistance or constitutive clindamycin resistance (MICs >0.06, 2 and 0.5 mg/L, respectively).

CONCLUSIONS Following the introduction of PCV7:

- Erythromycin resistance fell among invasive (blood) but not respiratory S. pneumoniae.
- Multiple resistance increased in blood and especially in respiratory S. pneumoniae.
- Previously dominant serotypes 14 and 9V declined in bacteremia, while types not covered by PCV13 - such as 6C, 15A, 22F and 33F - have become more prominent.
- The emergence of 15A is of particular concern as it is very often multi-resistant.

Invasive PCV13 serotypes

- PCV7 serotypes fell from 49% of invasive (blood) infections before PCV7 to 10% from 5 years afterwards. Serotypes 14 and 9V fell most sharply, from 15 and 9% before PCV7 to 2 and <1% after 5 years, respectively.
- The six added serotypes of PCV13 rose from 18% of bacteremias in 2001 to peak at 44% in 2009-10, before retreating to 30%.
- From Oct 2011, non-PCV serotypes made up 60% of the total, with 6C, 15A and 33F emerging from very low levels to account for 4, 3 and 5% of all blood S. pneumoniae.

Erythromycin resistance over time

Resistance to erythromycin alone was quite stable at around 4% among community-onset RTI but combined resistance rose from 7% before PCV7 to 17% in the year after Oct 2011.

In blood S. pneumoniae, resistance to erythromycin alone fell from average 12% before PCV7 to 2% from Oct 2011. Combined resistance to erythromycin and other agents was uncommon at 3% before PCV7 but reached 8% from Oct 2011.