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Pneumococcal vaccines

The effect of pneumococcal conjugate vaccines on invasive pneumococcal disease amongst children in Ireland, 2007-2014

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**Objectives:** The majority of invasive pneumococcal disease (IPD) infections are caused by a subset of predominant *Streptococcus pneumoniae* serotypes, which are included in the pneumococcal conjugate vaccines (PCV's). PCV7 includes vaccination against serotypes 4, 6B, 9V, 14, 18C, 19F, 23F and was introduced for children <2 years old in 2008 in Ireland. PCV13 also includes additional serotypes 1, 3, 5, 7F, 6A, 19A and replaced PCV7 in 2010. The objective of this study was to assess the serotype distribution and antimicrobial resistance associated with IPD in children (i.e. <5 years of age) following the introduction of PCV7 and PCV13.

**Methods:** *S. pneumoniae* isolates from sterile-sites were submitted for serotyping using multiplex-PCR and serological co-agglutination. Susceptibilities to penicillin, cefotaxime and erythromycin were determined using the E-test method and interpreted according to CLSI guidelines. Reduced susceptibility to penicillin was reported if the minimum inhibitory concentration (MIC) was  $\geq 0.12$ mg/L and cefotaxime or erythromycin if the MIC's were  $\geq 0.5$ mg/L.

**Results:** There was a total of 260 IPD isolates typed in children between July 2007 and June 2014, i.e. seven epidemiological years. Among children <2 years of age ( $n=163$ ) the most common serotypes were 14 ( $n=25$ ), 7F ( $n=22$ ), 19A ( $n=16$ ), 6B ( $n=12$ ) and 19F ( $n=11$ ). Overall there was a 74% decline in the number of IPD cases in children <2 years serotyped from July 2007-June 2008 and the same period in 2013-14. There was a 100% and 67% decline in the number of PCV7 associated serotypes and the additional PCV13 serotypes (PCV13-7) reported in July 2013-June 2014 compared to 2007-08. However, there was a 50% increase in the number of non-PCV associated serotypes in children <2 during this period. There was a decline in the number of IPD cases in children 2-5 years reported from 2007-08 to 2013-14 (21%), with a 100% and 33% decline in PCV7 and PCV13-7 serotypes, respectively. A significant increase was observed in the number of non-PCV associated serotypes from 0 in 2007-08 to 11 cases in 2013-14 ( $p<0.001$ ). Penicillin non-susceptible pneumococci (PNSP) fell from 22% in 2007-08 to 7% in 2013-14, this is most likely influenced by a decline in the number of serotypes associated with PCV7, such as 14 and 9V which are also commonly associated with PNSP. A similar decline in resistance was observed for cefotaxime (from 19% to 7%) and erythromycin (from 13% to 11%).

**Conclusion:** The results demonstrate the positive impact of PCV vaccination for children but the number of non-PCV associated IPD isolates has increased. Continuing surveillance to determine changes in predominant serotypes and antimicrobial resistance will inform future vaccine policies and the choice of empiric antibiotic treatment.