

Serotype replacement in invasive pneumococcal disease following vaccination: fact or fiction?

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Background

- Invasive pneumococcal disease (IPD) is a major vaccine preventable infection in children
- Seven-valent conjugate-vaccine (PCV7) does not protect against all pneumococcal serotypes
- Universal vaccination of children under-two years recommended in Germany in July 2006
- Non-vaccine serotypes (NVS) might replace vaccine serotypes
- Pre-vaccination data were analysed to detect secular trends in NVS before universal vaccination
- IPD exhibit strong seasonality starting in July and peaking in winter months

Methods

- IPD surveillance:
 - 1997 – 2006: active population based laboratory surveillance of children under 16 years of age with paper-based monthly questionnaires (zero reporting)
 - Beginning from 2007: passive web-based surveillance “PneumoWeb”, recording IPD cases of all ages (fig 1) by 100 sentinel laboratories
- Chi2-trend test of under-16y olds between 07/97-06/06
 - Total NVS as share of all serotypes
 - Individual NVS comprising more than 5% of NVS
- Proportion of NVS in under-2 year olds 07/97- 06/06 compared with 07/06 – 06/07 using Chi-square

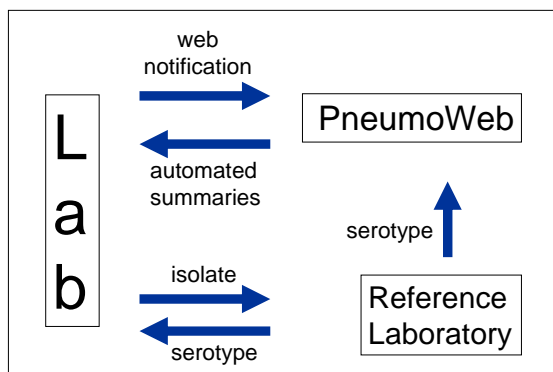


Figure 1: Flow of information and isolates within PneumoWeb

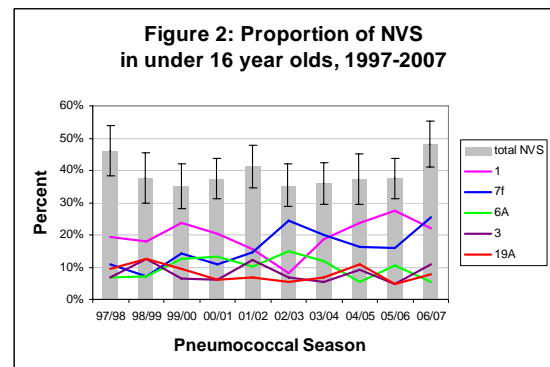


Figure2: Proportion of total non vaccine serotypes (NVS, grey bar) relative to all isolates including 95% confidence intervals, proportion of individual NVS (coloured lines) relative to all NVS. Isolated from under 16 year olds between 1997 and 2007.

Results

- No secular trend in proportion of total NVS in children ($\text{Chi}^2=0,005$; $\text{df}1$; $p=0,94$) prior to general vaccination
- Variability in individual serotypes: serotype 7F had a significant upward trend ($\text{Chi}^2=7,48$; $\text{df}1$; $p=0,006$), serotypes 1, 6A, 3, 19A had no trend
- no significant difference in proportions of NVS in under-2 year old between time prior to and after vaccination ($\text{Chi}^2=0,41$; $\text{df}1$; $p=0,521$)

Conclusions

- NVS trends prior to vaccination show heterogeneous patterns with type 7F increasing despite no trend in total NVS
- No serotype replacement observed
- Although slight increase in proportion of NVS relative to all isolates in season 2006/07, it might be too early to measure vaccine effect on pneumococcal community
- Efficient IPD-surveillance such as PneumoWeb essential to detect serotype replacement