Trends in antibiotic resistance and serotype distribution in Invasive Pneumococcal Disease (IPD) in France from 2003 to 2013; On-going Survey of the French Pneumococcus Network

French Pneumococcal surveillance network

✔ Founded in 1995

✔ Includes 361 laboratories (300 public hospital laboratories and 61 private laboratories)

✔ Biannual national surveys (collection of > 4,000 pneumococcus isolates each year of study: CSF, blood, middle ear fluid, pleural fluid)

✔ Data collected in 23 regional observatories (Observatoires Régionaux du Pneumocoque, ORP)

✔ Coordination with the National Reference Centre for Pneumococci (CNRP) and the Institut de Veille Sanitaire (InVS)

Percentage of admission in medical wards (2011):

- ≥ 80%
- 70 to 79%
- 60 to 69%
- 40 to 59%
Methods

✓ Study period 2003-2013: 22,555 *S. pneumoniae* isolated from CSF (2,221) and blood cultures (20,334) in children (<16 year old – 2,679) and adults (19,876)

✓ MIC of penicillin G (PEN), amoxicillin (AMX) and cefotaxime (CTX) by agar dilution method

✓ Serotyping of a systematic sample of 8,094 strains (latex particles sensitized with antisera from Statens Serum Institute Copenhagen, Denmark)

✓ Statistical analysis, Capture System software (SAS Institute, Cary, NC) Chi-square test for trends (p<0.01)
Results

✓ Evolution of IPD in children (<16 yo)

→ globally, no decline in the IPD after PCV-7 vaccination
→ dramatic decrease of meningitis and bloodstream infections in children after PCV-13 introduction in France
Results

Evolution of IPD in children according to age

- slight decrease of BSI in <2 yo after PCV-7 introduction and ↑ in older children
- after PCV-13 introduction: decrease of IPD whatever the age of the children
- bloodstream infections +++
- significant decrease of meningitis in children <2 yo between 2001 and 2013
Results

✓ Evolution of IPD in adults

→ no decrease of IPD after PCV-7 introduction
→ decrease of IPD after PCV-13 introduction
↓ BSI +++
Results

✓ Evolution of antibiotic resistance

→ decrease in resistance, whatever the antibiotic tested
→ also the case for erythromycin and cotrimoxazole (not shown)
→ for PEN and AMX: slight increase between 2011 and 2013, but not significant
Results

☑ Evolution of serotype distribution of IPD in children

→ near disappearance of PCV-7 serotypes in 2013 (2.5% in 2013 vs 55.6% in 2003)

→ dramatic decrease of the 6 additional PCV-13 serotypes after vaccine introduction (23.9% in 2013 vs 70.4% 2009)

→ increase of non-vaccine serotypes (73.6% in 2013 vs 10.9% in 2003)
  particularly 12F, 24F, 22F, 15A, 10A, 23B, 15C, 38,...

→ “other serotypes”: ↑ number and diversity in 2013 (27 different serotypes in 2013 vs 20 in 2011)
Results

✔ Evolution of serotype distribution of IPD in adults

→ near disappearance of PCV-7 serotypes in 2013 (8.8% in 2013 vs 48.4% in 2003) except for 19F
→ decrease of most of the 6 additional PCV-13 serotypes after PCV-13 vaccination
→ increase of some non-vaccine serotypes: 12F, 24F, 22F, 15A, 23B, 9N, 33F, 23A...
→ “other serotypes”: increase of number but not diversity
Results

✔ Evolution of serotype distribution in children, according to susceptibility to PEN

→ most of the PNSP belonged to vaccine serotypes: ↓ of vaccine serotypes = ↓ of PNSP
→ most of the non-vaccine serotypes were susceptible to PEN
→ the non-vaccine serotypes the most resistant were: 15A/B/C, 23B, 24F and 35B
Results

✓ Evolution of serotype distribution in adults, according to susceptibility to PEN

→ most of the PNSP belonged to vaccine serotypes
→ most of the non-vaccine serotypes were susceptible to PEN
→ the non-vaccine serotypes the most resistant were: 15A/B/C, 6C, 23B, 24F and 35B
Conclusion

- Introduction of PCV-7 not followed by a decrease of IPD in France (also observed in Spain) – cause: initial low uptake of PCV-7 (Lepoutre et al., 2008; Munoz-Almagro et al., 2008)

- Vaccination with PCV-13 rapidly followed by a decrease of IPD in children (<16 year old)
  → in relation with a sharp decrease of serotype 1, 19A and 7F

- Decrease of IPD in older non-vaccinated age-groups

- Decrease in antibiotic resistance

- Dramatic shift in serotype distribution
The French Pneumococcal Surveillance Network

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