The Belgian nasopharyngeal carriage study of *S. pneumoniae* in healthy infants attending day-care centres: year 1 results

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Introduction and Purpose

PCV13 ⟶ PCV10
***S. pneumoniae* in day-care setting**

- The Belgian pneumococcal conjugate vaccine (PCV) programme moved, since June 2015 in Flanders and May 2016 in Wallonia, from PCV13 to PCV10, excluding serotypes 3, 6A, 19A
- Carriage assessment monitors early impact of a PCV programme change (transmission -> colonisation -> invasive pneumococcal disease (IPD))
- IPD surveillance shows impact of PCV programme in infants <5 years of age (Fig. 1)
- We investigate the impact of the PCV programme change on *Streptococcus pneumoniae* (Sp) nasopharyngeal colonisation in healthy infants aged 6-30 months attending day-care centres (DCC) randomly selected across Belgium

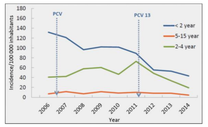

Fig.1: IPD-infections in Belgian children <16 years of age, according to age and date of diagnosis, Pedisurv, WIV-ISP, 2006-2014.

Methods

One nasopharyngeal swab stored in STGG
Culture + qPCR

- Random selection of 85 DCC, stratified per region
- Sample size of 700 in year 1 and 900 in year 2 and year 3 allows detection of 4% changes in carriage of serotypes 6A or 19A over the 3 year observation period
- Region-specific age criteria were applied: 6-30 months in Wallonia and 15-30 months in Flanders and Brussels
- From March till July 2016, trained nurses collected 1 nasopharyngeal swab, basic characteristics and Sp vaccination status, excluding infants with antibiotic (AB) use in the previous 7 days
- Swabs collected in STGG medium were transported within 24 hours to the Sp reference lab (University Hospital Leuven) and frozen (85.2%) or immediately processed (14.8%): after BHI-enrichment, Sp were cultured, serotyped (Quellung) and antimicrobial susceptibility testing was performed (disc diffusion); back-up samples were frozen for molecular analyses
- Bacterial DNA was obtained by automated DNA extraction using NucliSENS® EasyMag® (Biomérieux); Sp DNA was quantified by *lytA*-targeting Taqman qPCR and standard curve was set up using serially diluted *lytA* PCR product of Sp ATCC 49619 strain

Results

60.8% Sp carriage – 5.4% PCV13 serotypes
6.6E+06 DNA copies/µl

Population
- Recruitment target of 700 infants was exceeded (856 participating infants, 760 *per protocol* DCC infants)
- Age (months): mean=21, median=22, age-appropriate vaccination rate (3 doses at 14 months)=94.6% (n=685)
- Dose1=PCV13: 100.0% - Dose2=PCV13: 99.7% - Dose3=PCV13: 96.6%

Main findings
- Carriage prevalence (culture-based) was similar in Wallonia and in Flanders (58.1%-62.3%)
- Vaccine serotype (VT) prevalence was similar in Wallonia and in Flanders (Table 1)
- Carriage prevalence of serotypes 3, 6A, 19A (n=1, 1, 2) was 0.9% (95%CI*: 0.34%-2.21%)
- Erythromycin-resistance was twice as prevalent in Wallonia compared to Flanders, Chi^2: P<0.05 (Table 1)
- Average load of culture-positives was 6.6E+06 copies/µl (95%CI: 3.8E+06-9.4E+06)
- Sp loads were significantly higher in infants with common cold (27.8%), MWU: P<0.05 (Fig. 4)
- AB use in the previous 3 months (33.6%) resulted in lower Sp loads, MWU: P=0.07 (Fig. 4)
- Sp loads were similar in VT carriers (4.4E+06, 95%CI: 1.4E+06-7.5E+06) and in NVT carriers (6.7E+06, 95%CI: 3.7E+06-9.7E+06)

Protocol related findings
- Sampling depth (73.0% ≥1/2 distance nostril-ear lobe, 3.0% <1cm) did not significantly impact carriage (Chi^2: P>0.05) or density (MWU: P=0.08)
- Freezing samples prior to culture (85.3%) did not significantly impact carriage (Chi^2: P>0.05) or density (MWU: P>0.05)

*no continuity correction

Conclusions

Low PCV13 serotype carriage
Density related to common cold and AB use

- General Sp carriage rate, VT carriage rate and carriage density were similar among the Belgian regions
- VT carriage was rare in healthy DCC infants throughout Belgium
- Carriage density was related to AB use and to clinical signs of common cold, but not to VT
- Continued surveillance will demonstrate whether this situation will be maintained under the recent PCV programme change

		Wallonia	Flanders	Overall
PCV vaccinated population (≥2 vaccinations)		98.0	98.7	94.2
VT prevalence (%)	all	5.4	5.3	5.4
	19F	2.0	2.9	2.8
	14	2.0	0.0	0.9
	23B	18.0	11.6	14.0
NVT prevalence (%)	23A	11.7	12.1	10.6
	11A	7.3	8.7	8.6
	co-trimoxazole	33.2	30.9	32.7
	tetracycline	14.6	9.2	10.8
AB resistance (%)	erythromycin	23.9	11.6	16.9
	levofloxacin	0.0	0.0	0.0
	penicillin	0.5	0.0	0.2

Table1: Carriage results based on cultures; PCV=pneumococcal conjugate vaccine, VT=vaccine serotypes, NVT=non-vaccine serotypes, AB=antibiotics

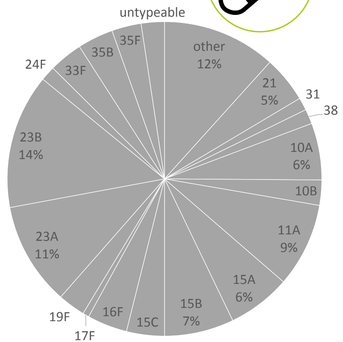

Fig.2: Serotype prevalence in Belgium (other=all serotypes with prevalence <1%)

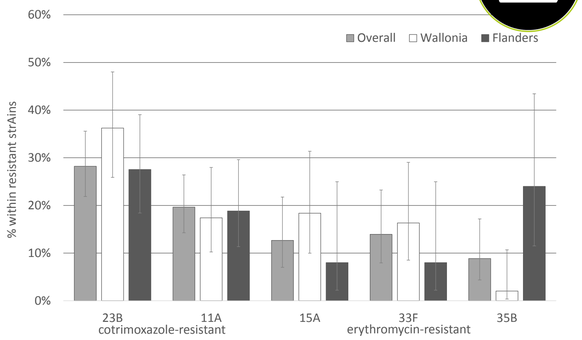

Fig.3: Most prevalent cotrimoxazole-resistant (11A and 23B) and erythromycin-resistant (15A, 33F, 35B) Sp serotypes per region in Belgium (error bars depict 95%CI*)

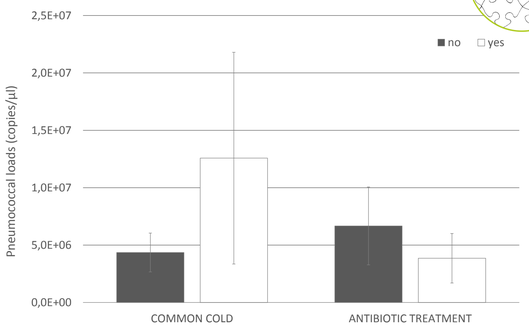

Fig.4: Average Sp concentrations related to presence of common cold or antibiotic use 3 months prior to sampling (error bars depict 95%CI)

Background illustration: www.shutterstock.com

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