

# Microbiological analysis of middle-ear-fluid (MEF) and nasopharyngeal-carriage (NC) of infants with acute otitis media (AOM) in Germany, 7th study year

Matthias Imöhl<sup>1</sup>, Maren Laurenz<sup>2</sup>, Karl Liebetrau<sup>3</sup>, Andreas Busse<sup>4</sup> and Mark van der Linden<sup>1</sup>  
<sup>1</sup>Institute of Medical Microbiology & National Reference Center for Streptococci, University Hospital RWTH Aachen, Aachen, Germany, <sup>2</sup> Pfizer Pharma GmbH, Berlin, Germany, <sup>3</sup> Proinnovera GmbH, Münster, Germany, <sup>4</sup> Pediatric Medical Practice, Tegernsee, Germany

## BACKGROUND AND AIMS

In Germany a general recommendation for pneumococcal conjugate vaccination was issued in 2006. Starting with PCV7, we saw the introduction of PCV10 and the replacement of PCV7 by PCV13 in 2009. We analyzed the pathogens recovered from children suffering from AOM with efflux as well as their nasopharyngeal carriage in the most recent study period from Oct.2014-Oct.2015.

## METHODS

MEF- and NC-swabs were taken from children with spontaneously draining AOM. Serotyping of *Streptococcus pneumoniae* isolates was performed using Neufeld-Quellung reaction.

## RESULTS

In the first three study years, 443, 310 and 210 patients could be included. Because of this declining number of reports, the recruiting-basis was increased from 50 to 75 centers, resulting in 434 patient-reports in year4, 354 (year5), 258 (year6) and 214 (year7; **Fig. 1**).

In the seventh study year 2.3% of children were vaccinated with PCV10, 64.5% with PCV13, 2.5% with PCV10/PCV13, 4.2% were not vaccinated, 28.0% were vaccinated, but the vaccine was unknown and for 0.5% the vaccination states was not obtained. The vaccination rate increased from 73.1% (1st study year) to 95.3% (7th study year) (**Fig. 1**).

81 MEF-samples showed relevant growth and the following pathogens were identified: *Streptococcus pneumoniae* (15/18.5%), *Streptococcus pyogenes* (34/42.0%), *Staphylococcus aureus* (20/24.7%), *Haemophilus influenzae* (12/14.8%) and *Moraxella catarrhalis* (0/0.0%; **Fig. 2**). In year7 nasopharyngeal swabs were obtained from 199 (93.0%) of the patients (**Fig. 3**). NC-rates were: *S. pneumoniae* 54.3%, *M. catarrhalis* 30.7%, *H. influenzae* 42.2% and *S. pyogenes* 20.6%. The carriage rate of *S. pneumoniae* showed a downward trend over the five study periods, but slightly increased in the last two study years. The rates for *M. catarrhalis* and *H. influenzae* seem to remain stable. The *S. pyogenes* carriage rate increased strongly in the fourth

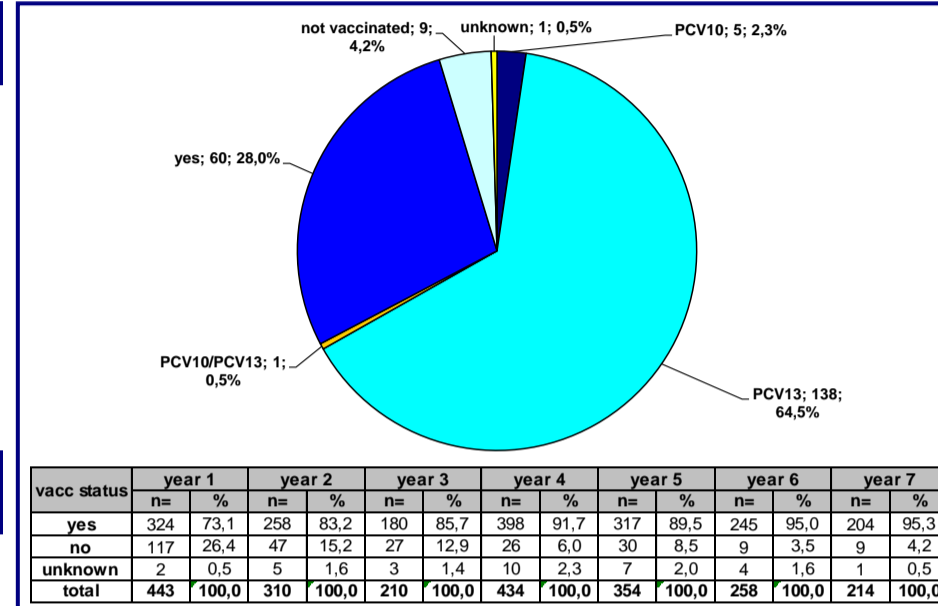


Fig. 1: Vaccination status of 214 children (year 7) with spontaneously draining AOM.

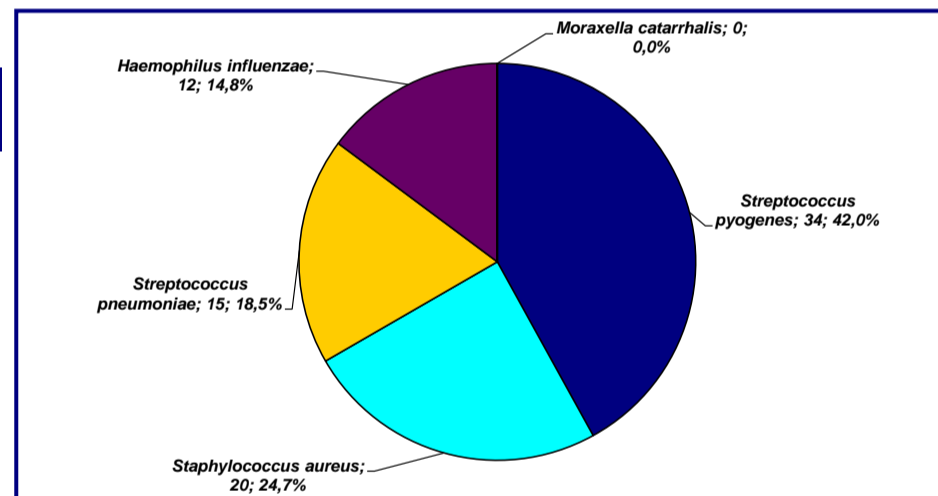


Fig. 2: Characterization of 81 pathogenic isolates from 81 children with spontaneously draining AOM.

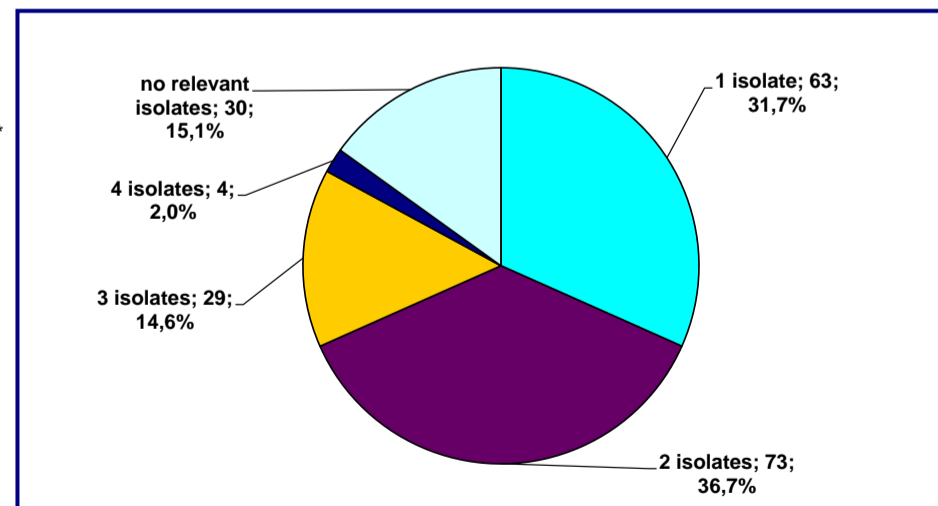


Fig. 3: Positive cultures of 342 nasopharyngeal swabs from 199 children with spontaneously draining AOM.

study year and remained on this high level (**Fig.4**).

In year7 the most prevalent pneumococcal serotype in MEF was 3, in NC: 3, 11A and 23A (**Tables 1A and 1B**). Coverage of PCV13 was 40.0% (MEF) and 20.7% (NC; **Fig. 5**).

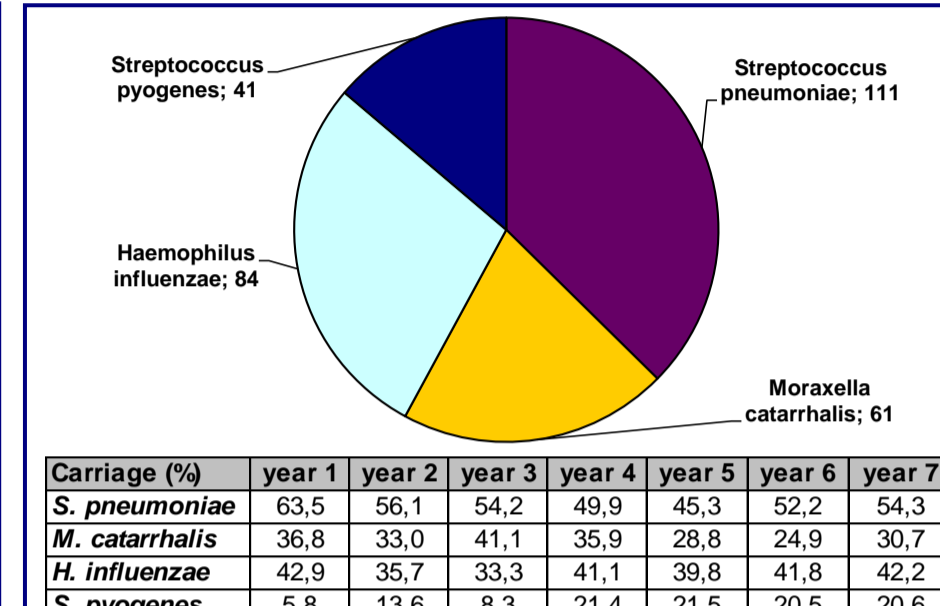


Fig. 4: Characterization of 342 carriage isolates from 199 children with spontaneously draining AOM.

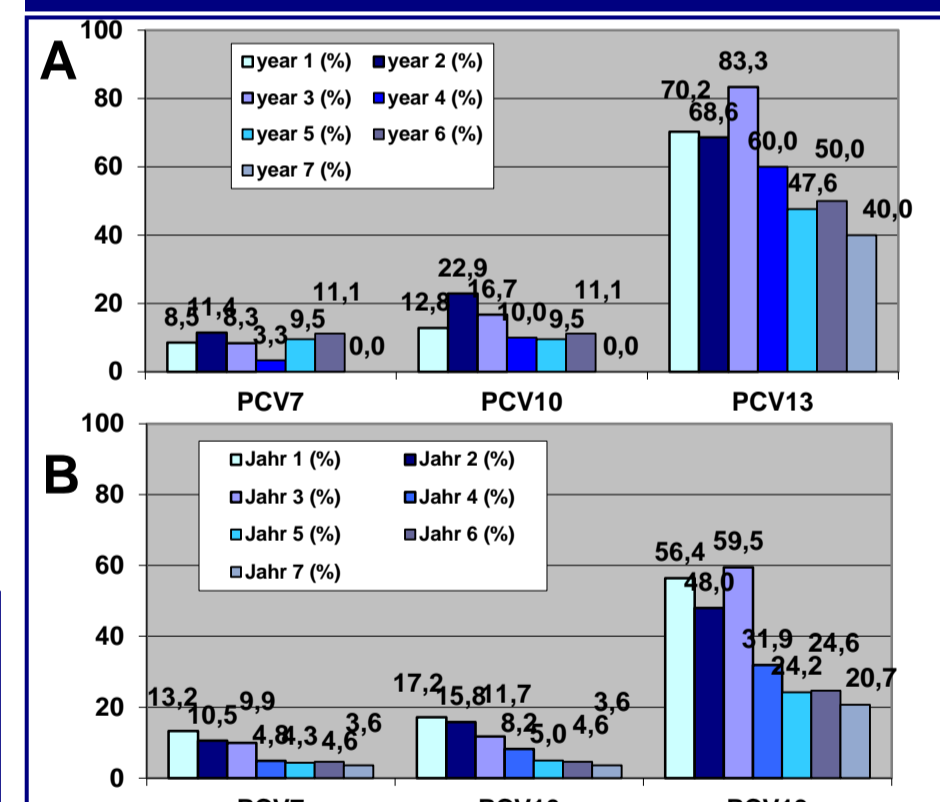


Fig. 5: Coverage of different conjugate vaccine formulations for *S. pneumoniae* isolates from children with spontaneously draining AOM. (A) middle-ear fluid, (B) nasopharyngeal swab.

## CONCLUSIONS

- The prevalence of *S.pneumoniae* in MEF in the 7th study year was as low as in the four preceding study years.
- In the 7th study year serotype 3 was the only remaining vaccine serotype in AOM, with an unchanged prevalence (25-40%), but decreasing absolute case numbers per year (from 17 to 7) over the whole study period.
- There was no particular non-vaccine serotype increasing in MEF isolates.
- Among NC isolates the increase of serotypes 11A and 23A needs further observation.

Table 1: Serotype distribution of *S. pneumoniae* from (A) MEF- and (B) NC-isolates from children with spontaneously draining AOM, during 7 study years. ■ PCV7, ■ PCV10, ■ PCV13

serotype	year 1		year 2		year 3		year 4		year 5		year 6		year 7	
	n=	%	n=	%	n=	%	n=	%	n=	%	n=	%	n=	%
3	17	36,2	9	25,7	4	33,3	9	30,0	8	38,1	7	41,2	6	40,0
19A	10	21,3	7	20,0	4	33,3	6	20,0	2	9,5				
1	2	4,3	2	5,7			1	3,3						
7F			2	5,7	1	8,3	1	3,3						
19F	4	8,5	4	11,4	1	8,3	1	3,3	1	4,8	2	11,8		
23F									1	4,8				
6C			2	5,7										
11A	1	2,1	2	5,7	1	8,3	6	20,0	1	4,8	1	5,9		
12F													1	6,7
15A	1	2,1									1	5,9		
15B			1	2,9							1	5,9		
15C			1	2,9			2	6,7	1	4,8	2	11,8		
16F											1	5,9		
21	3	6,4											1	6,7
22F					1	2,9			1	4,8				
23A	2	4,3	1	2,9					1	4,8	1	5,9		
23B	2	4,3	1	2,9	1	8,3			1	4,8			1	6,7
24F													1	6,7
27									1	4,8				
28A									1	4,8				
31	1	2,1											1	6,7
33F	1	2,1					1	3,3					1	6,7
35B					1	2,9			1	3,3			1	6,7
35C													1	6,7
35F	1	2,1							1	4,8				
38									1	4,8				
NT					1	2,9								
n.d.	2	4,3					1	3,3						
total	47	100,0	35	100,0	12	100,0	30	100,0	21	100,0	17	100,0	15	100,0