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Background: Many jurisdictions report a significant reduction in invasive pneumococcal disease (IPD) in adults following implementation of the pneumococcal conjugate vaccines, 7-valent (PCV7) and 13-valent (PCV13) in childhood immunization programs. This study evaluates the indirect effect of conjugate vaccines on IPD in British Columbia, Canada over a 14 year period (2002–2015).

Methods: Using provincial IPD laboratory surveillance data, we calculated the annual incidence following implementation of PCV7 (September 2004), and PCV13 (September 2010) in adults 18 years of age and older. We also compared incidence rate ratios (IRR) against pre-PCV13 (2004–2010) and pre-PCV7 (2002–2003) baselines for overall and age-specific IPD rates using Poisson regression.

Results: A total of 3793 cases were reported over the 14 year period. The overall annual incidence increased from 4.32 cases per 100,000 population in 2002 to 8.61 cases per 100,000 population in 2015. Overall, IPD has increased by 80% (IRR: 1.80; 95% CI: 1.59–2.04) compared with baseline, especially in adults ≥ 85 years of age (PCV13 vs baseline: IRR: 1.90; 95% CI: 1.25–03.05). This increase was the highest after introduction of PCV7 (IRR: 1.87; 95% CI: 1.65–2.11); the incremental change after introduction of PCV13 was non-significant (IRR 0.96; 95% CI: 0.90–1.03). While PCV7 type IPD plummeted by 76% (IRR 0.24; 95% CI: 0.18–0.31) since introduction of PCV7 compared with baseline, a modest decline in PCV13 type IPD of 20% was seen (IRR 0.80; 95% CI: 0.71–0.89) since introduction of PCV13.

Conclusion: Although PCV7-type IPD has decreased substantially, only a modest reduction in IPD from the additional 6 serotypes in the PCV13 vaccine was observed.

Disclosures. **All authors:** No reported disclosures.

2707. Non 13-Valent Pneumococcal Conjugate Vaccine Serotypes Predominate as Causes of Pneumococcal Otitis Media in Children

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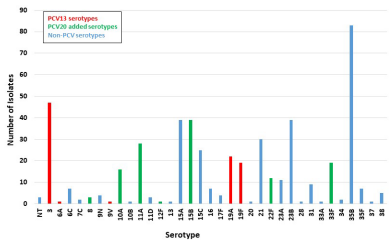
Background: Pneumococcal acute otitis media (AOM) in children due to vaccine-related serotypes (ST) has declined after the introduction of the 13-valent pneumococcal conjugate vaccine (PCV13), although some serotypes, such has 3, 19A and 19F have persisted. Among non-vaccine serotypes, 35B has been shown to contribute substantially to both OM and invasive infections. This study describes the current epidemiology of pneumococcal OM isolates obtained from the U S Pediatric Multicenter Pneumococcal Surveillance Group (USPMPSG).

Methods: From the USPMPSG database, we collected data from patients <18 years of age with pneumococcal OM isolates from 2014 to 2018. Analysis included demographics, immunization status, antimicrobial susceptibility data and serotype. Statistical comparisons included Fisher's exact and Wilcoxon rank-sum tests.

Results: A total of 494 patients with isolates were identified within the time period from 5 children's hospitals. Median age was 1.7 years (range 0–17.6) and 299 (60.5%) were male; 176 (35.7%) had an underlying condition. Thirty-two patients had received no dose of either PCV7 or PCV13. Thirty-five serotypes were identified (3 isolates were non-typeable), of which 6 serotypes [35B (16.8%), 3 (9.5%), 15A (7.9%), 15B (7.9%), 23B (7.9%) and 21 (6.1%)] caused more than half of the total OM infections (figure). Ninety (18.2%) isolates were of PCV13 serotypes. Twenty-five of 476 (5.3%) isolates had a penicillin MIC>2 µg/mL. These were of serotypes 11A, 15A/C, 19A/F, 35B and NT; 10/455 (2.2%) isolates had ceftriaxone MIC>1 µg/mL and were of ST 3, 15A, 19A/F and 35B.

Conclusion: Most pneumococcal OM were caused by non-PCV13 serotypes. Serotype 35B remained the most common serotype among pneumococcal isolates recovered from ear drainage or middle ear cultures. The low proportion of penicillin-resistant isolates along with the increasing proportion of AOM cases being due to non-pneumococcal isolates supports the consideration to switch routine antibiotic treatment for AOM to standard dose amoxicillin-clavulanate from high dose amoxicillin in PCV13 immunized children (*Pediatr Infect Dis J* 2018;37:1255–1257).

Figure. Pneumococcal Serotypes Causing Otitis Media, 2014-2018



Disclosures. **All authors:** No reported disclosures.

2708. Genetic Structure of *Streptococcus pneumoniae* Isolated from Invasive Disease in Korea, 2014–2016

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Background: The extended-valency pneumococcal conjugate vaccines (PCVs) were implemented into Korean national immunization program in 2014. This study investigated the change in genetic structures of *Streptococcus pneumoniae* causing invasive pneumococcal disease (IPD) in Korean children after 10- and 13-valent conjugate vaccine (PCV10 and PCV13, respectively) use.

Methods: Between January 2014 and December 2016, invasive isolates were collected from 23 hospitals throughout Korea. Cases of IPD were defined by isolating pneumococci from normally sterile sites. Each pneumococcal isolate was identified using standard microbiological techniques and serotyped by Quellung reaction. The multi-locus sequence typing (MLST) was analyzed for randomly selected isolates.

Results: A total of 91 pneumococcal isolates were analyzed. Common serotypes were 10A (18.7%), 12F (11.0%), 15A (9.9%), 19A (9.9%), 15B/C (7.7%), 23A (6.6%), 35B (5.5%), and 23B (4.4%). The isolates belonged to 38 sequence types (STs), including 4 newly discovered STs. Of the 4 clonal complexes (CCs), 3 clonal complexes were antibiotic-resistant international clones. CC166 (11.9%) were associated with non-vaccine serotypes (NVTs; 11A, 15B/C, 23A, and 13). Serotypes of CC320 (10.9%) comprised of serotype 19A and 19F. The main serotypes responsible for CC81 (10.9%) were serogroup 15. New serotype-ST combinations were observed, especially in serotype 13 and serogroup 15. Also, a possibility of capsular switch event was noted between serogroup 6 and serogroup 15A.).

Conclusion: The introduction of extended-valency PCVs has resulted in the change of the genetic structure of pneumococcal isolates in Korean children. This study demonstrates that selective pressure from PCV10/13 caused predominant serotypes to be NVTs and genetic changes such as capsular switch events.

Disclosures. **All authors:** No reported disclosures.

2709. Immune Response After Diphtheria and Tetanus Toxoid Booster in Patients with Adult-Onset Immunodeficiency with Anti-interferon-γ Autoantibody

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Background: Immunization were the key of prevention in tetanus and diphtherial disease. Nevertheless, in previous observational study, low seroprotection rate of both diphtheria and tetanus were observed in Thai healthy population. Reduced-dose diphtheria and tetanus toxoid vaccine (dT) was recommended to all adult patients regardless of immunologic status. However, data on vaccine efficacy in interferon gamma (IFN-γ) autoantibody were limited. We therefore conducted clinical study to evaluate efficacy and safety of one dose of dT in IFN-γ autoantibody patient compared with healthy individuals at 4 weeks after vaccination.

Methods: Study was conducted from February to April 2019. Total 18 patients with confirmed IFN-γ autoantibody were enrolled. Baseline tetanus and diphtheria serologic study and 4 weeks after vaccination were examined. Antibody levels were measured with a solid-phase IgG-specific ELISAs (EUROIMMUN, Germany). Geometric mean titers (GMTs) were calculated using the log transformation of serological titers and from taking the antilog mean of the transformed values.

Results: Seroprevalence of tetanus was 94.5% in healthy population compared with 60.1% in IFN-γ autoantibody patients. While, seroprevalence of diphtheria was 27.8% and 77.8%, respectively. After vaccination, all healthy adults had reached seroprotection level in both diphtheria and tetanus. For patients with IFN-γ autoantibody, 88.9% and 94.4% had anti-tetanus toxin IgG and anti-diphtheria toxin IgG level above 0.1 IU/mL, respectively. These results indicated seroconversion rate of 71% for tetanus and 75% for diphtheria after dT vaccination. (Table 2). In the subgroup analysis, unboosted IFN-γ autoantibody patient had lower tetanus seroconversion rate compared with previously boosted patient (50% vs 100%). Active infection was also associated with lower immune response after tetanus vaccination. There was no severe adverse event in both group.

Conclusion: This is the first study on immune response after dT vaccination in IFN-γ autoantibody patient. Seroconversion rate of dT vaccine in IFN-γ autoantibody patient were slightly lower than healthy adults. Active infection and previously unboosted patient provided lower immune response of tetanus.

Baseline characteristics	IFN-γ autoantibody (n=18)	healthy adult (n=18)	p-value
Age	54.22 ± 14.03	44.11 ± 13.37	0.034*
Gender Male	16 (88.9%)	8 (44.4%)	0.005*
Childhood vaccination	15 (83.3%)	17 (94.4%)	0.229
Residence			
Central (Bangkok and adjacent province)	7 (38.9%)	14 (77.8%)	0.018*
Rural	11 (61.1%)	4 (22.2%)	
History of tetanus booster	12 (66.7%)	11 (61.1%)	0.729
History of diphtheria booster	1 (5.6%)	5 (27.8%)	0.287
Comorbidity			
Diabetes mellitus	1 (5.6%)	2 (11.1%)	1
Hypertension	3 (16.7%)	1 (5.6%)	0.603
Dyslipidaemia	3 (16.7%)	2 (11.1%)	1
Other autoimmune disease	3 (16.7%)	0 (0%)	0.229
Chronic kidney disease	5 (27.8%)	0 (0%)	0.045*
Cerebrovascular disease	2 (11.1%)	0 (0%)	0.486
Prednisolone use	2 (11.1%)	0 (0%)	0.486
Hb	12.69 ± 4.92	13.12 ± 1.83	0.736
WBC	11136.11 ± 7280.64	6894.44 ± 1300.48	0.026*
Absolute neutrophil count	7658.89 ± 6156.7	3786.28 ± 1016.14	0.017*
Absolute lymphocyte count	2127.22 ± 549.24	2504.44 ± 621.1	0.062
Absolute eosinophil count	809.44 ± 950.04	194.44 ± 171.16	0.015*

Table 1: Baseline characteristics between patients with IFN- γ autoantibody and healthy adults

	IFN-γ autoantibody (n=18)		healthy adult (n=18)		p-value[b]
Tetanus IgG	**Pre**	**Post**	**Pre**	**Post**	**Post vaccination**
<0.1	7 (38.9%)	2 (11.1%)	1 (5.6%)	0 (0%)	0.151
≥0.1	11 (61.1%)	16 (88.9%)	17 (94.4%)	18 (100%)	
p-value[w]	0.025*		0.317		
Diphtheria IgG	**Pre**	**Post**	**Pre**	**Post**	**Post vaccination**
<0.1	4 (22.2%)	1 (5.6%)	13 (72.2%)	0 (0%)	0.317
≥0.1	14 (77.8%)	17 (94.4%)	5 (27.8%)	18 (100%)	
p-value[w]	0.083		<0.001*		

[b]Mann-Whitney Test (compared between group)
[w]Wilcoxon Signed Ranks Test (compared within group)

Table 2 Study population with positive serology for tetanus and diphtheria prior and after vaccination

History of boosted TT (tetanus IgG; IU/mL)	IFN-γ autoantibody (n=6)		healthy adult (n=7)		p-value[b]
Unboosted	**Pre**	**Post**	**Pre**	**Post**	**Post**
<0.1	4 (66.7%)	2 (33.3%)	0 (0%)	0 (0%)	0.027*
0.1-0.5	0 (0%)	1 (16.7%)	3 (42.9%)	0 (0%)	
0.5-1	2 (33.3%)	0 (0%)	3 (42.9%)	0 (0%)	
1.01-5	0 (0%)	3 (50%)	1 (14.3%)	5 (71.4%)	
>5	0 (0%)	0 (0%)	0 (0%)	2 (28.6%)	
p-value[w]	0.059		0.026*		
≥0.1 (Immunized)	2 (33.3%)	4 (66.7%)	7 (100%)	7 (100%)	0.111
p-value[w]	0.157		1		
Boosted	**(n=5)**		**(n=3)**		**p-value[b]**
1-5 yr	**Pre**	**Post**	**Pre**	**Post**	**Post**
<0.1	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0.172
0.1-0.5	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
0.5-1	2 (40%)	1 (20%)	0 (0%)	0 (0%)	
1.01-5	2 (40%)	4 (80%)	3 (100%)	2 (66.7%)	
>5	1 (20%)	0 (20%)	0 (0%)	1 (33.3%)	
p-value[w]	1		0.317		
≥0.1 (Immunized)	5 (100%)	5 (100%)	5 (100%)	5 (100%)	1
p-value[w]	1		1		
Boosted	**(n=7)**		**(n=8)**		**p-value[b]**
>10 yr.	**Pre**	**Post**	**Pre**	**Post**	**Post**
<0.1	3 (42.9%)	0 (0%)	1 (12.5%)	0 (0%)	1
0.1-0.5	1 (14.3%)	0 (0%)	2 (25%)	1 (12.5%)	
0.5-1	1 (14.3%)	0 (0%)	2 (25%)	0 (0%)	
1.01-5	2 (28.6%)	4 (57.1%)	3 (37.5%)	3 (37.5%)	
>5	0 (0%)	3 (42.9%)	0 (0%)	4 (50%)	
p-value[w]	0.015*		0.026*		
≥0.1 (Immunized)	4 (57.1%)	7 (100%)	7 (87.5%)	8 (100%)	1
p-value[w]	0.083		0.317		

[b]Mann-Whitney Test (compared between group)
[w]Wilcoxon Signed Ranks Test (compared within group)

Table 3 Subgroup analysis in previous tetanus booster and immune response after dT

Disclosures. **All authors:** No reported disclosures.

2710. Novel Analytical Models for Pneumococcal Multiplex Opsonophagocytosis Assay Results from a Healthy Older Adult Population Vaccinated with PCV13

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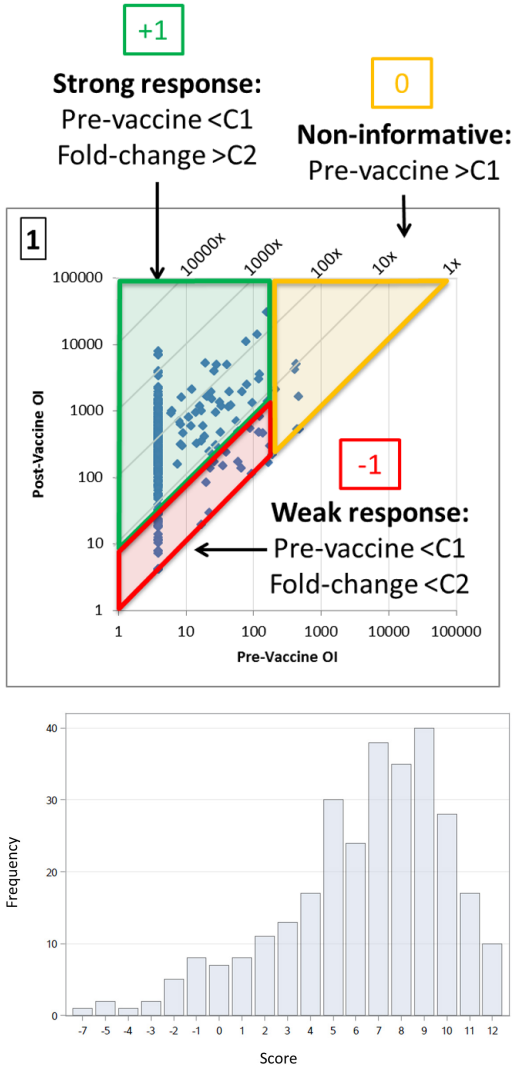
Background: The multiplexed opsonophagocytosis assay (MOPA) measures killing of pneumococci by serum antibodies, and is the primary method for measuring pneumococcal antibodies in adults. However, pre-vaccine opsonic activity and vaccine response are highly variable among serotypes and individuals, and there are currently no criteria to define normal MOPA results.

Methods: We performed post-hoc analysis of data from n = 311 healthy, pneumococcal-vaccine naïve adults aged 55–74 who received 0.5 mL PCV13, and had MOPA performed for PCV13 serotypes (except serotype 3) at baseline, then on days 29 and 181 post-vaccine (Jackson et al. 2018, Vaccine). MOPA results (reported as opsonic index, or OI) were standardized using pneumococcal reference serum 007sp. Pairwise comparisons of proportions of undetectable baseline OI (≤ 4) between serotypes were performed using Pearson's Chi-square. Immunogenicity (mean change in OI at day 29 post-PCV among samples with undetectable baseline OI) was compared between serotypes using one-way ANOVA. We then assigned a score based on cutoffs for pre-vaccine OI (cutoff 1, or C1) and fold-rise in OI at day 29 (cutoff 2, or C2) for each serotype, as shown in Figure 1. The sum of the scores for 12 serotypes was determined for each participant. We plotted the frequency distribution of total scores using different combinations of values for C1 and C2 to visually identify the optimal fit for the left-skewed distribution expected in a healthy population.

Results: Serotype 1 had the highest prevalence of undetectable OI at baseline (77.0%, $P < 0.001$), and serotype 19A had the lowest (8.8%, $P < 0.001$). Immunogenicity was highest for serotype 7F (mean change of 18354, $P < 0.001$ for all comparisons). For vaccine response analysis, C1 = 300 and C2 = 8 produced a left-skewed distribution (Figure 2). Using these cutoffs, the median total score was 7 and the 5th percentile score was −1.

Conclusion: Criteria for normal MOPA results can be developed for single-time-point data, or using a scoring system for vaccine response data that integrates pre-vaccine OI and fold-rise in OI. Additional studies in healthy and disease populations are needed to further optimize diagnostic criteria for discriminating normal vs. abnormal results.



Disclosures. **All authors:** No reported disclosures.

2711. Effectiveness of 13-Valent Pneumococcal Conjugate Vaccine Against Invasive Pneumococcal Disease in Older Adults

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Background: Routine use of 13-valent pneumococcal conjugate vaccine (PCV13) has been recommended for infants since early 2010 and for adults ≥65 years since 2014 when KPNC began routine use of PCV13 in adults. PCV13 vaccine effectiveness (VE) against vaccine-type invasive pneumococcal disease (IPD) has been demonstrated; however, recent surveillance data have been interpreted as showing limited population-level impact of PCV13 on serotype 3 IPD. We estimated PCV13 VE against IPD due to vaccine serotypes at Kaiser Permanente Northern California (KPNC).

Methods: The study period spanned September 2014 through September 2018. The cohort included KPNC members who were aged ≥65 years with no record of pneumococcal polysaccharide vaccine (PPV23) receipt before age 65 years. We compared IPD cases with KPNC members who were the same age on the date of the positive pneumococcal culture using conditional logistic regression, conditioned on age and date, and controlled for sex, race, KPNC service area and membership history, prior season influenza vaccine receipt, PPV23 receipt after age 65 years, risk factors for IPD, and healthcare utilization.