Suggested Reference


Copyright

Items in ResearchSpace are protected by copyright, with all rights reserved, unless otherwise indicated. Previously published items are made available in accordance with the copyright policy of the publisher.

https://researchspace.auckland.ac.nz/docs/uoa-docs/rights.htm
Introduction

- *Streptococcus pneumoniae* (pneumococcus, *S. pneumoniae*) is a major childhood pathogen implicated in mucosal infections and invasive disease (IPD).
- Colonisation of the nasopharynx (NP) by *S. pneumoniae* is a key event prior to development of disease.
- Children <2yrs have high rates of NP colonisation (10-70%); higher rates in disadvantaged populations.
- South Auckland is an area with a large Maori and Pacific population and areas of socioeconomic deprivation. Children from this area have high rates of IPD.
- NZ introduced the 7-valent pneumococcal conjugate vaccine (PCV7) to the national immunisation schedule, switched to PCV10 in 2011 and PCV13 in 2014.
- Internationally, introduction of PCV has led to a decline in IPD and reduced carriage of vaccine serotypes. Alteration in antimicrobial resistance of pneumococcus is also seen in both NP and invasive *S. pneumoniae* isolates following PCV.
- We aimed to document the changing NP pneumococcal serotypes and antimicrobial resistance with our changing PCV schedule in an area of disproportionate high IPD.

Methods

- Nasopharyngeal aspirates (NPA) from children aged <2 years presenting to Kidz First with acute respiratory infection (ARI) between Aug 2007 - Aug 2008 (pre-PCV7), between Aug 2009 - Aug 2010 (post-PCV7), and Aug to Nov 2014 (post-PCV10) were collected.
- NPA samples were either immediately cultured or stored at -70°C. NPA were cultured for *S. pneumoniae* on both columbia, nalidixic acid agar and horse blood agar. Colonial variants were detected visually in ≤4 instances and isolated as separate pure growth for susceptibility and serotyping. This demonstrated 2 distinct serotypes within 1 sample (co-colonising serotypes).
- *S. pneumoniae* susceptibility testing was done by Kirby-Bauer disc diffusion method and serotyping by Quellung reaction at the national reference laboratory (Institute of Environmental Science and Research).

Serotype

- Elimination of PCV7 serotypes from NP is seen over the 3 time periods. Increased 19A carriage along with persisting non-vaccine serotypes 35 nontypable/ nontypable and increasing 15 and 11A serotypes were seen post PCV10 (Figure 1 and Figure 2).

Antibiotic susceptibility

- PEN-NS was found in 94/209 (45%) of isolates pre-PCV7, declined to 58/191 (31%) post PCV7 introduction and 10/50 (20%) in post PCV10 era (Figure 3).
- CEF-NS was found in 76/209 (36% of) isolates pre-PCV7; declined to 19/191 (10%) post PCV7 and 4/50 (8%) post PCV10 (Figure 4).
- Overall a decrease in cotrimoxazole and tetracycline resistance between study periods was observed with erythromycin and clindamycin resistance remaining the same.

Multi-drug resistance (MDR): MDR: defined as resistance to 3 antibiotics in addition to PEN-R (MIC >2).

Serotypes and antibiotic resistance

- Pre-PCV7, serotypes 19F, 6B, 14, 9V, 23F accounted for vast majority of PEN-R (plus non-typable serotypes).
- Along with non-typable serotypes these serotypes continued to be associated with PEN-R post PCV7 (9V, 19F and to a lesser extent 6B, 14, 23F).
- In 2014, post PCV10, PEN-NS isolates were either nontypable or 19A with 6B and 15A representing one each of non-susceptible isolates. PEN plus resistance in 3 other antibiotics were all serotype 19A (5/10 isolates).

Discussion

- Isolation of *S. pneumoniae* from the NP of young children provides a "snapshot" into patterns of common circulating serotypes and antibiotic resistance. PCV give mucosal immunity against vaccine serotypes but colonisation rates are maintained by serotype replacement.
- Prior to PCV7 Pen NS and Cef-NS rates were significantly higher amongst NP *S. pneumoniae* when compared with isolates from IPD national surveillance of IPD (Pen-NS 22% amongst IPD isolates for children aged <2 years in 2008).8
- Significantly decreased Pen-R, Pen-NS, and multidrug resistance was seen following implementation of PCV. This is in the face of rising community antimicrobial consumption reported in NZ over the last ten years.5
- Pre-PCV7 antibiotic resistance was predominantly related to high carriage of serotypes 19F and other PCV7 serotypes. Currently resistance observed with serotype 19A reflects international and national IPD trends.
- Although emergent serotype 19A is covered by recently introduced PCV13, serotypes 15 subtypes may be emergent and future vaccine serotype candidate.

Limitations

- Small numbers in post-PCV10 cohort as this collection is ongoing.
- Observed carriage rates slightly declined over our 3 cohort time periods (30% to24%). Overall carriage rates are low compared with the only other NZ data which showed *S. pneumoniae* carriage in children with established ear disease aged <3 years was 43%, and 29% amongst healthy controls.
- Our lower carriage rates may be due to storage of NPA (pre and post PCV7) or younger age in later cohort (post PCV10).

Acknowledgements: Thank you to Auckland University Summer Students Leader, Tony (Tony) (2015) and Billy Silakawa (2016). Funding: Grateful to Research Auckland University (RSF) and MBIE and the summer studentship programme (RSF) 2015-16.

References:

5. Streptococcus pneumoniae - Clinical Laboratory Standards Institute oral penicillin treatment criteria used. Penicillin intermediate (PEN-I) = MIC 0.12-1μg/mL; Penicillin resistance (PEN-R) = MIC≥2μg/mL.
8. Stewart J, McBride C. Microbiology Laboratory, Middlemore Counties Manukau District Health Board, Auckland. 4. Kidz First, Counties Manukau District Health Board.