Bacterial meningitis in children: rare, severe, mostly preventable
What should GPs advise Australian parents in 2018?

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Overview

1. Bacterial meningitis in children
   - Organisms
   - Death and long-term sequelae
   - Where are we now?

2. “Free” vaccines for meningitis
   - National Immunisation Program – changes July 1
   - Queensland - high school ACWY program

3. “Extra protection” - vaccines for private purchase
   - Ask and you shall receive

No conflicts of interest

BACTERIAL MENINGITIS IN CHILDREN

Incidence and Sequelae
- Hib most common, Pneumo most sequelae, Meningo most deaths

<table>
<thead>
<tr>
<th>Organism</th>
<th>Hib Incidence</th>
<th>Pneumo Incidence</th>
<th>Meningo Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemophilus influenzae b</td>
<td>46 (31-52)</td>
<td>38 (11-48)</td>
<td>&gt;200 (endemic)</td>
</tr>
<tr>
<td>Streptococcus pneumonia</td>
<td>18 (12-22)</td>
<td>6 (5-9)</td>
<td>1-2 (endemic)</td>
</tr>
<tr>
<td>Neisseria meningitidis</td>
<td>2-10 (epidemic)</td>
<td>2-10 (epidemic)</td>
<td>2-10 (epidemic)</td>
</tr>
</tbody>
</table>

Deaths

<table>
<thead>
<tr>
<th>Region</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest mortality</td>
<td>31 (20-35)</td>
</tr>
<tr>
<td>Lowest mortality</td>
<td>4 (3-6)</td>
</tr>
</tbody>
</table>

Morbidity

| Proportion of survival | 9% (7.1-15.3) | 24.7% (16.2-35.3) | 7.2% (4.3-11.2) |

Hib = Haemophilus influenzae type b
Pneumo = Pneumococcus pneumonia
Meningo = Neisseria meningitidis
Significant long term sequelae even in children who seem normal at discharge

BACTERIAL MENINGITIS – WORTH PREVENTING

IMPACT OF VACCINES GREATEST FOR Hib

Significant long term sequelae even in children who seem normal at discharge

BACTERIAL MENINGITIS post vaccines:
Hib disappears, Pneumo reduces, Meningo varies

Invasive Pneumococcal Disease: breakthrough cases

SITUATION IN 2018: PNEUMO AND MENINGO

Figure A: Prevalence of bacterial meningitis in the USA attributable to Neisseria meningitidis, Streptococcus pneumoniae, N. meningitidis, S. pneumoniae, and Listeria monocytogenes, 1989–2002

Long-term Impact of a 7 + 0 Schedule for 7- and 13-Valent Pneumococcal Conjugate Vaccines on Invasive Pneumococcal Disease in Australia, 2002–2014

Major Article
**7vPCV & 13vPCV 3-dose breakthroughs: 2006-2016**

Breakthroughs > 12 months of age
Pneumonia, not meningitis

![Graph showing breakthroughs](image)

Data source: National Notifiable Diseases Surveillance System

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**Meningococcal disease – emergence of serotypes W and Y**

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**Confirmed IMD cases, Australia 1999-2012**

![Graph showing confirmed IMD cases](image)

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**IMD notification rate by serogroup and year, 1999–2017**

![Graph showing IMD notification rate by serogroup and year](image)

Trends are not shown for serogroups A (n=6) and X (n=2)

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**IMD notification rate by serogroup and age group, 2016-2017**

![Graph showing IMD notification rate by age group](image)

Trends are not shown for serogroups A (n=6) and X (n=2)
Meningococcal disease in infants

MenB death rates 1991-2011 by age group

Mean annual deaths per 100,000 person-years

<2 yrs 0.01 0.02
2-4 yrs 0.04 0.01
5-14 yrs 0.02 0.01
15-24 yrs 0.01
25-49 yrs 0.01
≥50 yrs 0.00

Number of MenB deaths 2006-2011, by age in months (to <2 years)

Aggregate number of deaths


<table>
<thead>
<tr>
<th>Serogroup</th>
<th>Number of deaths</th>
<th>Number of cases</th>
<th>Case Fatality Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>MenB</td>
<td>10</td>
<td>229</td>
<td>4.4%</td>
</tr>
<tr>
<td>MenC</td>
<td>49</td>
<td>686</td>
<td>7.1%</td>
</tr>
<tr>
<td>MenW</td>
<td>23</td>
<td>247</td>
<td>9.3%</td>
</tr>
<tr>
<td>MenY</td>
<td>5</td>
<td>114</td>
<td>4.4%</td>
</tr>
</tbody>
</table>

Where are we in 2018?

- **Hib meningitis**
  - occasional cases in unvaccinated infants

- **Pneumococcal meningitis**
  - significant reduction
  - persistent cases due to non-vaccine serotypes

- **Meningococcal meningitis and sepsis**
  - Type B disease reduced significantly in absence of vaccine peak < 2 years; smaller adolescent
  - Type W and Y emerged; now approx. = type B

Hib, Pneumo and Meningo vaccines – changes July 1

- **Hib vaccine**:
  - hexavalent 2,4,6 months; 12 month booster to move to 18 months as Hib vaccine alone (current Hib-MenC)

- **Pneumococcal vaccine**:
  - 3rd dose to move to 12 months (2+1)
  - High risk kids (Aboriginal and medical conditions) continue 2,4,6 + 12 months

- **Meningococcal vaccines**:
  - MenACWY replaces MenC @ 12 months
  - Adolescent programs for meningococcal vaccination through high schools in Queensland since 2017
  - No MenB vaccine on NIP
Amendment to Immunisation Handbook

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Schedule in previous recommendations</th>
<th>Schedule in current recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>All children in ACT, NSW, TAS or VIC.</td>
<td>3+1</td>
<td>3+1</td>
</tr>
<tr>
<td>Non-Indigenous children in NT, QLD, SA or WA.</td>
<td>(2. 4, 6 and 12 months)</td>
<td>(2. 4, 6 and 12 months)</td>
</tr>
<tr>
<td>Aboriginal and Torres Strait Islander children in NT, QLD, SA or WA.</td>
<td>3+1</td>
<td>3+1</td>
</tr>
<tr>
<td>All children with underlying medical conditions associated with increased risk of PCV13.</td>
<td>3+1</td>
<td>3+1</td>
</tr>
</tbody>
</table>

### 2+1 pneumococcal vaccine and meningitis

- Most 3 dose breakthrough cases after 12 months
- Most pneumonia or empyema
- Moving booster to 12 months will give stronger and more long-lasting protection with same number of doses

**BUT….**

- Meningitis mostly before 12 months
- Experience in UK with 2+1 suggests meningitis cases after 2 doses (between 4 and 12 months) could occur
- Like meningitis, 2 dose meningitis breakthrough rare but serious

### Important points about 2+1

- **Between July 1 and Dec 31 2018:**
  - Infants turning 12 months of age receive PCV13 dose @ 12 months; ie 4 doses (3rd dose @ 6 months)
  - Infants turning 6 months DO NOT get PCV 13 dose
  - No change with high risk babies inc Aboriginal

- **From Jan 1, 2019:**
  - 3rd dose at or slightly before 12 months – no delay!

### Important points about Men ACWY

- **Between July 1 and Dec 31 2018:**
  - ACWY replaces Hib-Men C vaccine @ 12 months
  - Supplies expected soon – no definite date as yet
  - No catch up funded – high school programs continue

- **From January 1 2019:**
  - Cohort turning 18 months receives monovalent Hib vaccine @ 18 months with MMR-V and DTPa
  - Hib risk so low that no issue with delay to 18 months for Hib dose
### Extra Protection: Vaccines for Private Purchase

**PCV 13:**
- Continue to have 3rd dose @ 6 months (4 doses)
- Chemist Warehouse: N/A

**Men ACWY:**
- Infants: Additional doses from 6 weeks
- Children who have previously received Men C
- Chemist Warehouse: Nimenrix = $56

**Men B:**
- Infants: Additional doses from 6 weeks; older children
- Chemist Warehouse: Nov 2017: $110

### Vaccines against Meningococcal Disease – Minimum Doses by Age Group

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Men B (Bexsero)</th>
<th>MenACWY (Menveo)</th>
<th>MenACWY (Nimenrix)</th>
<th>MenACWY (Menactra)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2–&lt;9 months (from 6 weeks)</td>
<td>3 doses</td>
<td>&gt;8 weeks apart</td>
<td>&gt;8 weeks apart</td>
<td>No data</td>
</tr>
<tr>
<td>3 dose Total</td>
<td>3rd dose @ 12m</td>
<td>3rd dose @ 12m</td>
<td>3rd dose @ 12m</td>
<td></td>
</tr>
<tr>
<td>9–&lt;12 months</td>
<td>2 doses</td>
<td>1 dose now 2nd dose @ 12m or &gt;8 weeks</td>
<td>1 dose now 2nd dose @ 12m or &gt;8 weeks</td>
<td>1 dose now 2nd dose @ 12m or &gt;8 weeks</td>
</tr>
<tr>
<td>2 dose Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12–23 months 1/2 doses</td>
<td>2 doses</td>
<td>&gt;8 weeks apart</td>
<td>&gt;8 weeks apart</td>
<td>Single dose</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 doses &gt;8 weeks apart</td>
</tr>
<tr>
<td>24 months + 1/2 doses</td>
<td>2 doses</td>
<td>&gt;8 weeks apart</td>
<td>Single dose</td>
<td>Single dose</td>
</tr>
</tbody>
</table>

1 = UK 2+1 schedule – data suggest similar efficacy

### Meningococcal Disease

**MENINGOCOCCAL VACCINES FOR AUSTRALIANS: INFORMATION FOR IMMUNISATION PROVIDERS**

This fact sheet provides information for immunisation providers on meningococcal disease and the use of meningococcal vaccines in Australia. It can be used in conjunction with the NCIRS fact sheet: Meningococcal vaccine – Frequently asked questions to facilitate discussions with parents or other individuals considering receiving meningococcal vaccines.

### Vaccines against Meningococcal Disease – More Doses in Youngest Infants

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<th>Age Group</th>
<th>Men B (Bexsero)</th>
<th>MenACWY (Menveo)</th>
<th>MenACWY (Nimenrix)</th>
<th>MenACWY (Menactra)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2–6 months (from 6 weeks)</td>
<td>4 doses</td>
<td>&gt;8 weeks apart</td>
<td>&gt;8 weeks apart</td>
<td>No data</td>
</tr>
<tr>
<td>4 dose Total</td>
<td>4th dose @ 12m</td>
<td>4th dose @ 12m</td>
<td>4th dose @ 12m</td>
<td></td>
</tr>
<tr>
<td>6–&lt;12 months</td>
<td>1 dose now 2nd dose @ 12m or &gt;8 weeks</td>
<td>1 dose now 2nd dose @ 12m or &gt;8 weeks</td>
<td>1 dose now 2nd dose @ 12m or &gt;8 weeks</td>
<td></td>
</tr>
<tr>
<td>3 dose Total</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>12–23 months 1/2 doses</td>
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<td>2nd dose @ 12m</td>
<td>Single dose</td>
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<td>2 doses</td>
<td>&gt;8 weeks apart</td>
<td>Single dose</td>
<td>Single dose</td>
</tr>
</tbody>
</table>

1. Highest achievable antibody responses

### Bexsero and Fever

**Prophylactic use of paracetamol with Bexsero® vaccination in children aged <2 years**

Prophylactic use of paracetamol is recommended with every dose of Bexsero® administered to children <2 years of age. This is an exception to the general recommendation not to routinely give paracetamol with vaccinations unless it is for relief of fever or pain following immunisation – refer to The Australian Immunisation Handbook, 10th edition, 2015 update (Chapter 2.3).
SUMMARY: Take home messages -1

1. At population level, bacterial meningitis much less common post Hib, Pneumo and Meningo vaccines but at individual level devastating disease

2. Changes @ 6, 12 and 18 months from July 1:
   - Important that later 3rd dose of PCV13 AT 12m
   - 6 month dose continues for high risk
   - ? Purchase for concerned parents
   - Men ACWY replaces combo Hib-Men C

SUMMARY: Take home messages -2

1. Meningococcal disease individual risk is greatest in first 2 years of life – rare but devastating

2. Doses of Men B (Bexsero) and ACWY (Nimenrix) can be given from 6 weeks of age
   - Protection from one dose uncertain; biggest increase in protection after 2nd dose
   - 3rd dose @ 12 months will likely increase duration of protection

Acknowledgements

Data:
National Notifiable Diseases Surveillance Scheme (NNDSS) & Communicable Disease Network Australia
NCIRS: Dr Sanjay Jayasinghe, Ms Cyra Patel, Dr Clayton Chiu

NCIRS is supported by the Australian Government Department of Health, the NSW Ministry of Health and the Sydney Children’s Hospitals Network.