Meningococcal Update

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Outline

- Bacteriology
- Epidemiology
- Clinical issues
- Staff health issues
- Prevention
  - Chemoprophylaxis
  - Immunoprophylaxis
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
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<tbody>
<tr>
<td>1805</td>
<td>Geneva - epidemic cerebrospinal fever&lt;sup&gt;1&lt;/sup&gt;</td>
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<tr>
<td>1887</td>
<td>Weichselbaum - first isolated from CSF</td>
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<td>1896</td>
<td>Kiefer - healthy carriers</td>
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<tr>
<td>1909</td>
<td>Dopter - serogroups</td>
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<tr>
<td>1930</td>
<td>Sulfonamides</td>
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<tr>
<td>1960s</td>
<td>Polysaccharide vaccines</td>
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<tr>
<td>1990s</td>
<td>Conjugate vaccines</td>
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Neisseria meningitidis

- Gram negative diplococcus
- Polysaccharide capsule
- Pili allow attachment
Transmission

- Respiratory droplets
  - nose, mouth, conjunctiva
- Usually asymptomatic source
- Close, direct contact
  - kissing, smoking, sharing utensils/food
Nasopharyngeal Carriage

Carriage rates:
- community: < 5 %
- adolescents: 15 - 25 %
- household: 20 - 40 %
- military: 60 - 80 %

Duration of carriage: 9.6 months
Pathogenesis

- Incubation period: 2-10 days
- Antibodies develop within 2 weeks

EXPOSURE

- Asymptomatic colonisation
- Localised infection
- Invasive disease
What causes invasive disease?

**Bacteria**
- capsule
- IgA1 protease
- iron uptake (Tbp)

**Host**
- lack of immunity
- age
- crowding
- respiratory infection
- smoking (OR 4.1)
What causes invasive disease?

Host

Complement Deficiency
- C5-C9 600 x
- Properdin 250 x

Asplenia or immunosuppression
- congenital or acquired
Epidemiology

- Winter-Spring peak
- Periodic epidemics
- Bimodal age distribution
  - 0-4 years
  - 15-25 years
Invasive Meningococcal Disease rates in Victoria, 2001

Source: Public Health Division, Victorian Department of Human Services, 2002
Notified cases of meningococcal infection in Victoria, 1990-2002, by age group

Source: Victorian State IDESS and DIDS notification data
Serogroup B & C meningococcal infection in Victoria, 1990-2002

Source: State Neisseria Reference Laboratory, Microbiological Diagnostic Unit, University of Melbourne
Annual number of deaths from meningococcal disease in Victoria
Meningococcal disease in Victoria 2002

<table>
<thead>
<tr>
<th>serogroup</th>
<th>cases</th>
<th>mortality (%)</th>
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<tbody>
<tr>
<td>B</td>
<td>55</td>
<td>3.6</td>
</tr>
<tr>
<td>C</td>
<td>88</td>
<td>11.4</td>
</tr>
<tr>
<td>Total</td>
<td>207</td>
<td>6.3</td>
</tr>
</tbody>
</table>

C:2a:P1.7-2,4  !!!
Clinical Presentation

- Septicaemia
- Meningitis
- Rarely:
  - arthritis
  - pneumonia
  - myocarditis / pericarditis
  - conjunctivitis / endophthalmitis

High index of suspicion!!
Clinical Presentation

- Fever, pallor, rigors, sweats
- Nausea, vomiting, (diarrhoea)
- Headache, neck stiffness, photophobia
- Lethargy, confusion, seizures
- Rash !!

Conjunctival petechiae
Clinical Presentation

- Disseminated intravascular coagulation
- ‘Septic shock’
Laboratory diagnosis

- **Specimens:**
  - blood (50%)
  - CSF (90%)
  - rash/buffy (20%)

- **Nucleic acid amplification**
  - sensitivity >90%
  - prior antibiotics
  - strain typing

- **Serology - IgM**
  - retrospective diagnosis
Transmission Risks

- Prolonged close contact
- Household risk 200 - 1000x
- Secondary attack rates:
  - adults 0.25%
  - children < 1yr 10%
  - (military 2 - 5%)
- 20% of secondary cases are co-primary infections
Day-Care Centres

Several reports

Risk uncertain

Epidemic in Belgium¹

<3 years 76x
2-5 years 23x

Nosocomial Transmission

- Not as communicable as folklore or television portrays!
- Meningococcal pneumonia >> septicaemia / meningitis
- Large droplets >5µm
- Range of ~ 0.5 metres
Risks to Health Care Workers

**England & Wales (1982-96)**

- >0.5 hours of face to face contact within 24 hours of antibiotic administration
- attack rate 0.8/100,000 HCW
- RR 25 (95%CI 5-76)

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Risks to Health Care Workers

**Laboratory workers (1985-99)**
- RR 184 (95% CI 60-431)
- bacteriology staff only

**Laboratory workers (1996-2000)**
- 13 / 100,000 (95% CI 5-29)
- 0.2 / 100,000 (general population)

Prevention

- Droplet precautions for 24 hours
- Keep patients separated by >0.5m
- Mask for:
  - intubation
  - respiratory procedures (suction, bronchoscopy etc)
  - examination of oropharynx
- Avoid mouth-to-mouth resuscitation!
Prevention - Chemoprophylaxis

- Given to close contacts:
  - household
  - child care (previous 7 days)
  - mouth-to-mouth resuscitation
  - (endotracheal intubation, suctioning)
Prevention - Chemoprophylaxis

- Preferably within 24 hours
- Treat concurrently
- Eradication therapy in index case

Several regimens:

- rifampicin (5-)10mg/Kg (up to 600mg) BD 2days
- ceftriaxone 125/250mg IM single dose
- ciprofloxacin 500mg orally single dose
Prevention - Chemoprophylaxis

**Rifampicin**

- 80 - 85% eradication
- no liquid preparation
- red coloured secretions (80%)
- exclude pregnancy
- altered drug metabolism (P-450 induction)
  - OCP efficacy
Prevention - Chemoprophylaxis

**Ceftriaxone**
- 97% eradication
- Single dose
- Safe in pregnancy
- Painful!

**Ciprofloxacin**
- 95% eradication
- Single dose
- Avoid if pregnant/breastfeeding
Prevention - Immunoprophylaxis

**Polysaccharide vaccines**
- A, C, Y, W135
- mencevax® & menomune®
- peak 1 month, decline > 2 years
- hypo-responsiveness
- short term protection for travel
- outbreaks
- immunocompromised
- ineffective in children < 2 years
Prevention - Immunoprophylaxis

Conjugate vaccines

- NeisVac-C<sup>®</sup> Baxter
- Meningitec<sup>®</sup> Wyeth
- Menjugate<sup>®</sup> Chiron/CSL
Prevention - Immunoprophylaxis

Conjugate vaccine advantages
- immunogenicity
- memory
- salivary IgA / IgG
- Serogroup replacement
- Capsular switching (B / C)
- Multivalent conjugate vaccines in development
Meningococcal vaccine: adverse events

- uncommon
- minor local symptoms
  - redness / swelling / pain / itch
- general symptoms
  - fever
  - irritability
  - drowsiness
  - headache
  - vomiting / diarrhoea
“And here’s a lollipop for being so brave”