Meningococcal Update

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Outline

- Bacteriology
- Epidemiology
- Clinical issues
- Staff health issues
- Prevention
  - Chemoprophylaxis
  - Immunoprophylaxis
History

1805 Geneva - epidemic cerebrospinal fever\textsuperscript{1}
1887 Weichselbaum - first isolated from CSF
1896 Kiefer - healthy carriers
1909 Dopter - serogroups
1930 Sulfonamides
1960s Polysaccharide vaccines
1990s Conjugate vaccines

Albert Neisser
1855-1916

**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**

- **EXPOSURE**
  - Asymptomatic colonisation
  - Localised infection
  - Invasive disease

- Incubation period: 2-10 days
- Antibodies develop within 2 weeks
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, 2002

Source: Public Health Division, Victorian Department of Human Services, 2004
Notified cases of meningococcal infection in Victoria, 1990-2003, by age group

Source: Victorian State IDESS and DIDS notification
Serogroup B & C meningococcal infection in Victoria, 1990-2003

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>
</tr>
</thead>
<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><strong>Total</strong></td>
<td><strong>207</strong></td>
<td><strong>6.3</strong></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 !!
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 Belgium

<2 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)$^1$
- RR 184 (95%CI 60-431)
- bacteriology staff only

Laboratory workers (1996-2000)$^2$
- 13 / 100,000 (95%CI 5-29)
- 0.2 / 100,000 (general population)
- RR 65

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®  Baxter
- Meningitec®  Wyeth
- Menjugate®  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”