Diseases due to *Neisseria* spp

Generally two major diseases, meningitis and gonorrhea
Neisseria

• General Characteristics:
  – Gram-negative diplococci, in pairs, with adjacent sides flattened (kidney-bean shaped)

• Pathogenic *Neisseria* are:
  – *N. meningitidis*
    • meningitis, and meningococcemia
      – arthritis, endocarditis & primary pneumonia, purpura fulminans, hemorrhagic skin and gangrene
    • can kill within hours of infection
  – *N. gonorrhoeae*
    • gonorrhea

– The above are pyogenic (pus forming) and very sensitive to environmental factors.
N. meningitidis Disease

- Virulence factors: capsule and endotoxin
- 13 capsular serotypes; carrier rate is 3-30%
- Carrier rate higher in military personnel
- Disseminated disease (meningococcemia) may occur with or without meningitis
- Meningitis mortality rate may be 100% untreated; 8-10% with treatment
- Transmission is by aerosol droplets; close contact facilitates transmission
- Susceptible age groups: 6-24 mo.; 10-20 yrs.
Neisseria Meningitis

- Carrier state in some children, *nearly normal flora*
  - Epidemics in schools & military camps
- Nasal invasion to brain
  - invades mucosal cells then blood stream
  - IgA1 protease
- LPS induces intense endotoxemia of brain due to TNF, IL-1
  - fevers, headache, coma, petechia = pathognomonic
  - spinal tap confirms

- Meningococcemia:
  - Vascular collapse with DIC leading to
  - skin petechiae & ecchymoses
  - numerous emboli**
  - Shock**
    - multiple infarcts
    - purpura fulminans
  - May induce death within hours
- Gram smears of CSF
  - typical Gm- diplococci
- Treatment: anti-inflammatory & penicillin
Neisseria meningitidis with hyper-blebbing of LPS
Pneumococcal meningitis, purulent material below dura mater due to invasion of brain by Strept in an alcoholic
Meningococci invade this sub-arachnoid space.
Dissemination of the Meningococcus. Figure 18.27 (T)
Meningococcemia showing subcutaneous hemorrhage

Petechia

Ecchymoses
Fatal meningococcal septicemia
confluent hemorrhages of skin
Purpura fulminans with gangrene
Purpura fulminans with gangrene of right hand
Gangrene of foot in 4 yr old with meningococcus
Gangrene of hand due to meningococcal infection
Loss of limbs from meningococcal purpura fulminans
Terminal meningococcal septicemia with DIC and scattered petechiae over abdomen and trunk
Neisseria gonorrhoeae

- Historical**
- Typical Gm - cocci
  - numerous pili
- 200 per 100,000 (this is high!!)
- annually 1 case per 100 females
- difficult to control*
  - penicillin resistance
- Infection risk:
  - men=20-35%
  - women=60-90%
  - Also spread via anal, oral sexual behavior
- Public apathy is serious problem
  - “its only clap”
  - No. 2 reportable disease in USA
- More symptomatic in males than females
- Not part of normal flora
- N. gonorrhoeae are environmentally sensitive
  - no fomite transmission
  - Virulence factors: LPS, IgAase, pili, proteases, etc.
Gonococcal Disease

- Pyogenic (WHAT??)
  - LPS stimulates PMN activity
- pili adhere to columnar epithelium
  - males=urethra
  - females=cervix*
  - invasion thru or between cells
- antigenic variation
  - no vaccine
- mucosal infection not limited to genitals
  - eyes, mouth, anus

*Neisseria diplococci in gonorrhea pus*
Gonorrhea in males

- Urethritis
  - 2-7 days after infection
  - dysuria*
  - purulent discharge
  - strictures*
- rectal gonorrhea
  - tenesmus*
  - bleeding
  - discharge
- Disseminated gonococcal Infection
  - septicemia
  - polyarthritis
  - endocarditis
  - conjunctivitis

Urethral discharge, primary symptom
Gonorrhea in Females

- 80% Asymptomatic
- Inflammation of vaginal cervical junction
  - dysuria, abdominal pain, discharge, 50% rectal infection, PID*
- CMI induces severe scarring of mucosal surfaces
  - Infection may spread to fallopian tubes
    - salpingitis
    - ectopic pregnancies
    - (20% sterility rate)

Salpingitis in a female (laparoscopy)
Gonorrhea-scared fallopian tube

Sometimes sterility is the first indication of infection
Pelvic inflammatory Disease, PID

- Gonorrhea only one cause
- fever, chronic lower abdominal pain, leukocytosis, salpingitis pelvic abscesses,
- Infertility, ectopic pregnancies, etc.
- 275,000 cases per year in USA
- Other causes: Chlamydia trachomatis
Other issues of gonorrhea

- Pharyngeal gonorrhea
  - from oral sex
- Meningitis
- Epididymitis, etc
- 45% penicillin resistance
- In Children*
- Conjunctivitis
  - Ophthalmia neonatorum
  - in past major cause of blindness>50%*
  - Silver nitrate or antibiotic treatment for all neonates
- Treatment issues*

Ophthalmia neonatorum in untreated week old child