Gram-Positive Irregular Non-Spore-Forming Bacilli
• Pleomorphic and stain unevenly
• 20 genera
  _ Corynobotacterium
  _ Mycobacterium
  _ Nocardia
CORYNEBACTERIA (AEROBES)

- Causes localized inflammation (pseudomembrane, greyish white exudate) and generalized toxaemia

- Prevalent in baby’s after 3-6 months (that’s why DPT is given at 3, 5, 7 months, boosters at 18 months and at school entry), very high in young children
Morphology

• Gram/+ve/palisade/Chinese letter arrangement

• Irregular swellings at one end - club shaped.

• Corynebacteria tend to pleomorphism in microscopic and colonial morphology.
• On blood agar Small granular & gray with irregular edges and may have small zones of hemolysis.

• Grow aerobically on ordinary media
a. *Corynobacterium diphtheriae*

Normal flora of nasopharynx in about 10%

- Diphtheria caused when infected by lysogenic bacteriophage

b. Diptheroids

- Normal flora of skin
- Usual contaminants of samples
- Can cause disease in ‘compromised’ host

C. ulcerans C. haemolyticum

C. Ps. diphtericum C. Xerosis
• Rare in developed countries/ third world countries

• Nose, Nasopharynx, skin aerobic, facultatively anaerobic

• Nasal carriers are very dangerous
Epidemiology

• It is rare in developing countries, a disease of the third world countries. Still highly prevalent in the former Soviet Union.

• Spread through droplets.
Corynebacterium diphtheriae

- 2 – Transmission
- Close contact with the droplets from human carriers or active infections
- Occasionally fomites or contaminated milk
• Loeffler's serum slope  Blood telurite agar (black colonies)

• Morphological differences

• **Three** biotypes
  **Gravis** (severe)
  **Inter-medius** (intermediate)
  **Mitis** (mild)
Types of Diphtheria

- Faucial
- Laryngeal
- Nasal
- Conjunctival
- Vulvovaginal
- Otitic
- Cutaneous around the mouth and the nose
Effect of toxins

1. **Local** (inflammatory reaction, low grade fever, nausea, vomiting, enlarged cervical nodes, severe swelling in the neck)

2. **General**

   Toxaemia and acts on the myocardium and on motor nerves and adrenals

**Complications**

a. Pseudomembrane may extend to larynx and cause airway obstruction

b. Myocarditis / Polyneuropathy

- Degenerative changes in the liver, adrenals, kidneys
Pathology

• Toxin is absorbed in the mucus membrane and causes destruction of epithelium and causes a superficial inflammatory response.

• Necrotic epithelium becomes embedded in exuding fibrin and red and white cells, with bacteria-

• Grayish pseudomembrane is formed over the tonsils and pharynx and larynx.
• How to identify the immune persons
  Shick test – suitably diluted stabilized toxin intradermally (0.2ml), localized erythema (1-3cm) in 2-4 days, means no or little antibodies 0.005U/ml
Corynebacterium diphtheriae

- 4 – Factors of pathogenicity
- Non invasive bacteria
- Local multiplication (mucus)
- Secretion of diphtherotoxin
  - Local lesions
  - Diffusion
Corynebacterium diphtheriae

• 4 – Factors of pathogenicity
  • Proteic toxin (cytotoxin)
    – fragment B binds to and endocytosed by mammalian target cells in the heart & nervous system
    – fragment A inhibit protein synthesis of the cell
  • antigenicity
    – Protective antibodies
    – vaccination (toxine formaline → anatoxine)
Pseudomembrane
Diagnosis

- Direct smear - Albert's stain
- Culture - Loffler's serum slope/blood agar/blood telurite agar

Check the toxigenicity

- Animal inoculation
  - Death within 96 hrs
  - Guinea pigs/rabbits
    - Elek’s plate test
    - PCR
Elek’s test
Elek's plate test
Filter paper with antitoxin
Precipitation
Strain
Management –

1. Patients - isolation of the patient / bed rest/antibiotic treatment/antitoxins (horse serum)DAT 10000-20000U ,IV

Penicillin/erythromycin/teracycline/rifampicin/clindamycin

2. Contacts – immunize if not (toxoid) – adults should be shick tested or given low dose as immunization of immune adults can result in severe reaction.
   - prophylactic antibiotic – erythromycin
   - swab nose and throats of contacts
Corynebacterium diphtheriae

• 6 – Management:
  - Prevalent in baby’s after 3-6 months (that’s why DPaT is given at 3, 5, 7 months, boosters at 18 months and at school entry), very high in young children
  - Older children and adults  Td
Gaston Ramon
3. Community – immunization
DIPHTHERIA

**DIAGNOSIS**

Clinical suspicion
Swab for culture
Toxin production

**PREVENTION**

Immunization (toxoid)

**TREATMENT**

Penicillin
Anti-diphtheretic serum
Maintaining airway
Supportive
Propionibacterium

- Similar to corynobacterium
- Anaerobic, nontoxigenic
- Propionibacterium acne
- Resident of pilosebaceous glands of human skin and URT
- Lipase production
- Acne vulgaris
The stages in the formation of an acne lesion:
ACTINOMYCETES (FACULTATIVELY ANAEROBES)

- Fermentative gp: Actinomyces, Arcanobacterium and Rothia
- Oxidative gp: Actinomadura (actinomycetoma), Nocardia (nocardiosis), Streptomycyes and related species.
Actinomycosis

- *A. israelii* – the commonest
- *A. meyeri*
- *A. naeslundii*
- *A. odontolyticus*
- *A. viscosus*
6. *Actinomyces israelii*

- Has branching filaments
- Facultative anaerobes
- Normal flora of oral cavity, tonsils and intestine
- Causes ‘Actinomycosis’ characterised by multiple abscess and granuloma formation
- Tissue destruction, fibrosis and sinus formation
ACTINOMYCOSIS

• Mostly in cervico-facial region
• Endogenous infection
• Can get
  – Thoracic actinomycosis (aspiration)
  – Pelvic actinomycosis (IUCD)
  – Rarely haematogenous spread
• Treatment
  – Surgical
  – Long term penicillin
Cervicofacial disease
Diagnosis

- Specimens – open biopsy, aspiration material

- Sulphur granules (yellowish mycelial masses)

- The discharge should mix with sterile saline in a universal bottle and allow to stand, particles will separate out.
• Place between 2 slides

• Crush and gram stain

• Gram positive branching filaments
ACTINOMYCOSIS
Nocardiosis

- **N. brasiliensis**: pulmonary pathogen
- **N. asteroides** and **N. caviae**: opportunists
- Infections:
  - Pulmonary
  - Cutaneous
  - Subcutaneous
Nocardiosis

- Branched, strictly aerobic bacillus
- Environmental saprophytes (exogenous infection)
- Lightly acid-fast
- Uncommon causes of opportunistic pulmonary disease
- Causes primary post-traumatic or post-inoculation lung disease
Cutaneous nocardiasis
Figure 22.33
Nocardiosis, a case of pulmonary disease that has extended through the chest wall and ribs to the cutaneous surface.
Nocardiosis

• Diagnosis and treatment:
  sputum, pus, CSF, biopsy
  gram positive coccobacilli with braches
  Cotrimoxazol, Amikacin, Imepenem, Cefotaxim