

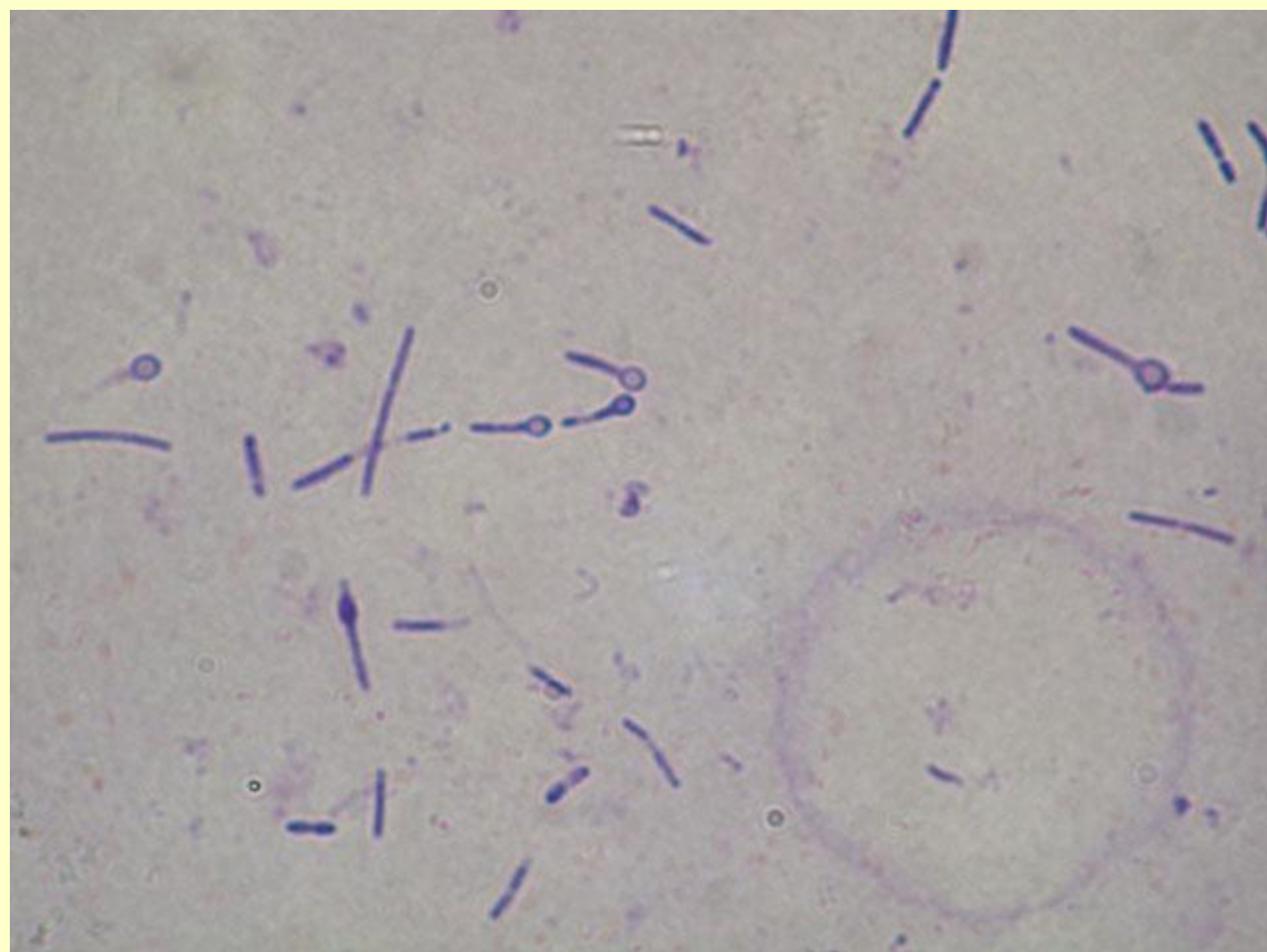
	Bacillus	Clostridium
Morphology	Endospore-forming Gram-positive rods	
Spore	Spores not wider than bacteria	Spores wider than bacteria
Oxygen requirement	Aerobes	Obligate anaerobes

Clostridium tetani



Morphology: Gram + rods, terminal endospores
(„drumstick”)

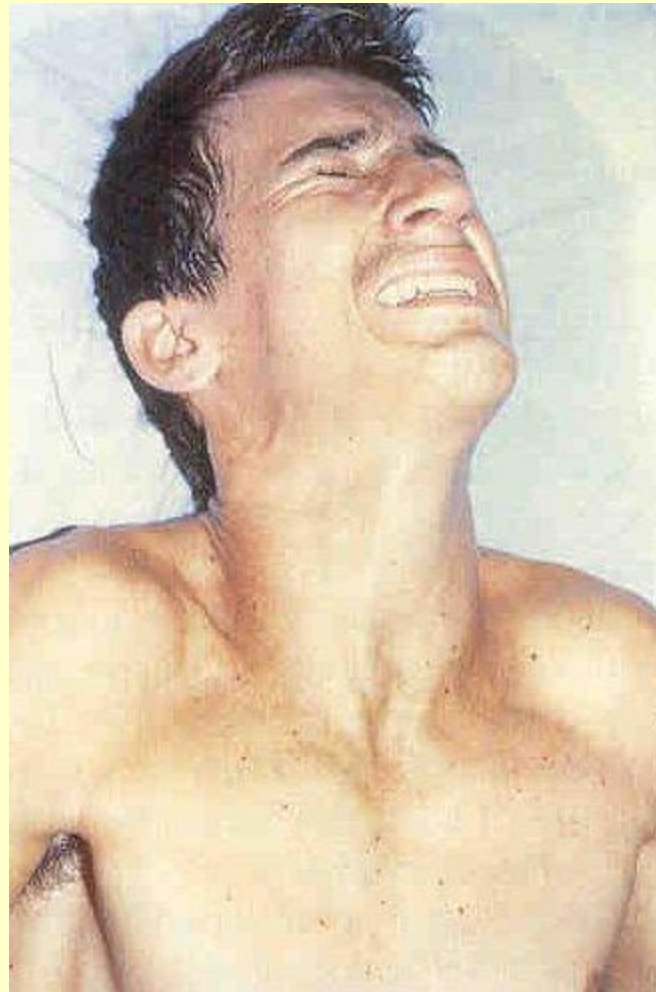
Culture:

- anaerobic, BA
- Demonstrate toxin production of isolate
(precipitation, mice inoculation)



Pathogenicity

- Spores enter **wound** in skin 
- Germinate (anaerobic cond.) and produce exotoxin: tetanospasmin (neurotoxin)
- intraaxonal (retrograde) transport to CNS
- Inhibits release of glycine (inhibitory mediator) at synapses  enhanced neurotransmission
- Spastic paralysis (too strong muscle contractions)
 - **Trismus** (lockjaw)
 - **Risus sardonicus** (grimace of the face)
 - **Opisthotonus** (spasms of the extensors of the back)
 - Respiratory failure: death



Tetanus



Tetanus

Clostridium tetani

Treatment:

- Tetanus immune globuline
- Penicillin G
- Respiratory support
- Muscle relaxants (benzodiazepines)

Prevention:

- General immunisation with toxoid (boosters)
- Wounds:
 - cleaned, debrided
 - Booster toxoid +/- tetanus Ig

Histotoxic Clostridia

Cause clostridial **myonecrosis/gas gangrene**

C perfringens, C novyi, C septicum

C histolyticum, C sordelli, C fallax

- Source of infection: intestinal tract, soil
 - Virulence factors: toxins/enzymes:
 - α -toxin : lecithinase (membrane damage)
 - Collagenase
 - Hyaluronidase
 - Several others
- } spreading of infection



C perfringens - EM



Clostridium perfringens

Pathogenesis of gas gangrene

- Traumatic injuries

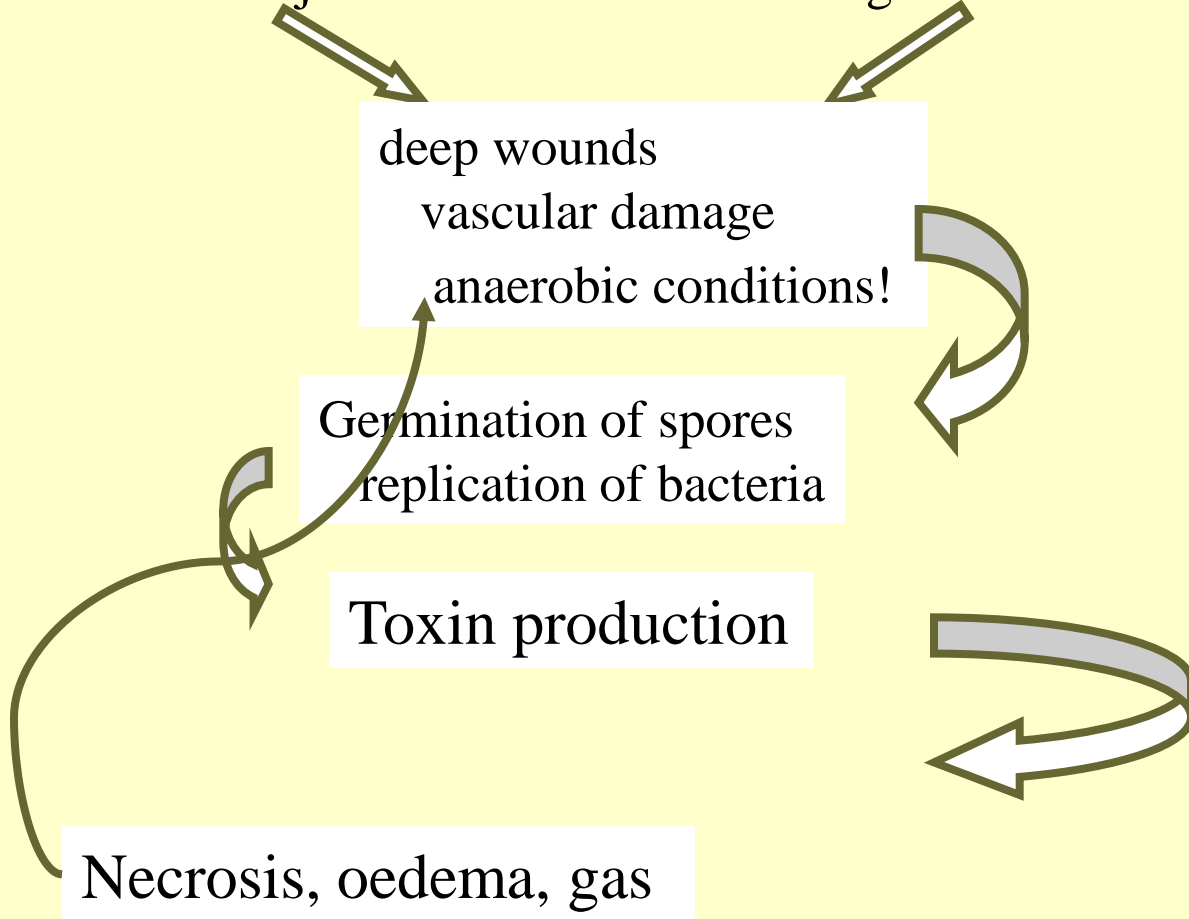
Endogenous infections

deep wounds
vascular damage
anaerobic conditions!

Germination of spores
replication of bacteria

Toxin production

Necrosis, oedema, gas



Diagnosis

- Direct demonstration from wound (no spores)
- Culture: BA (anaerobic)
- Identification: fermentation tests, demonstration of toxins/enzymes

Prevention

- Cleansing of contaminated wounds
- Penicillin profilaxis

Treatment

- Surgical removal of infected tissue
- Penicillin
- Polyvalent antitoxin
- Hyperbaric oxygen

Lactobacillus

- Morphology: Gram positive rods
- Culture: aerotolerant anaerobes/microaerophiles
- Classification:
 - Homofermenters: L. casei, L acidophilus, L salivarius
(lactic acid)
 - Heterofermenters: L fermentum, L buchneri, L oris
(lactic acid + acetate/ethanol/CO₂)
- Habitat: oral cavity, GI tract, vagina
- Pathogenicity: frequently found in deep carious lesions
causative role ?
- Lactobacillus count (saliva): associated with dietary carbohydrates

Corynebacterium diphtheriae

- *Morphology:* club shaped Gram positive rod
- *Transmission:* air-borne droplets
- *Disease:* toxin mediated
toxin: Inhibits protein synthesis by ADP-ribosylating EF-2

local symptoms (*pharynx, larynx, nasal cavity*)

fibrin-rich exsudate +
dead leukocytes, RBC, tissues } 

pseudomembrane



occasional suffocation

remote symptoms → myocarditis, arrhythmia → sudden death
toxin spread via circulation !



Nasopharyngeal diphtheria



Diphtheria
pseudomembrane

Corynebacterium diphtheriae

- *Laboratory diagnosis:*

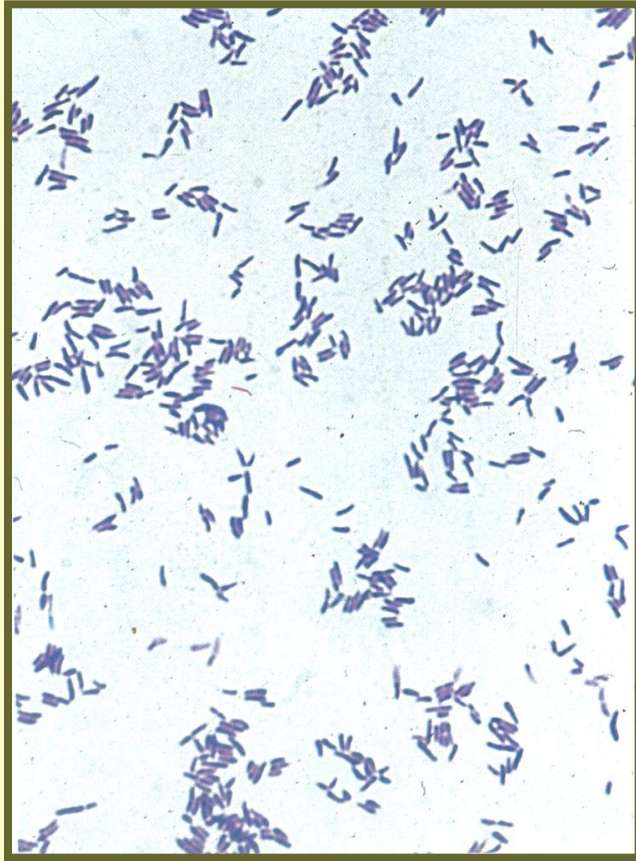
culture *isolate on Löffler medium*
identify on Clauberg agar

test toxin production *Elek-test (gel precipitation)*
(lysogenic phage encoded)

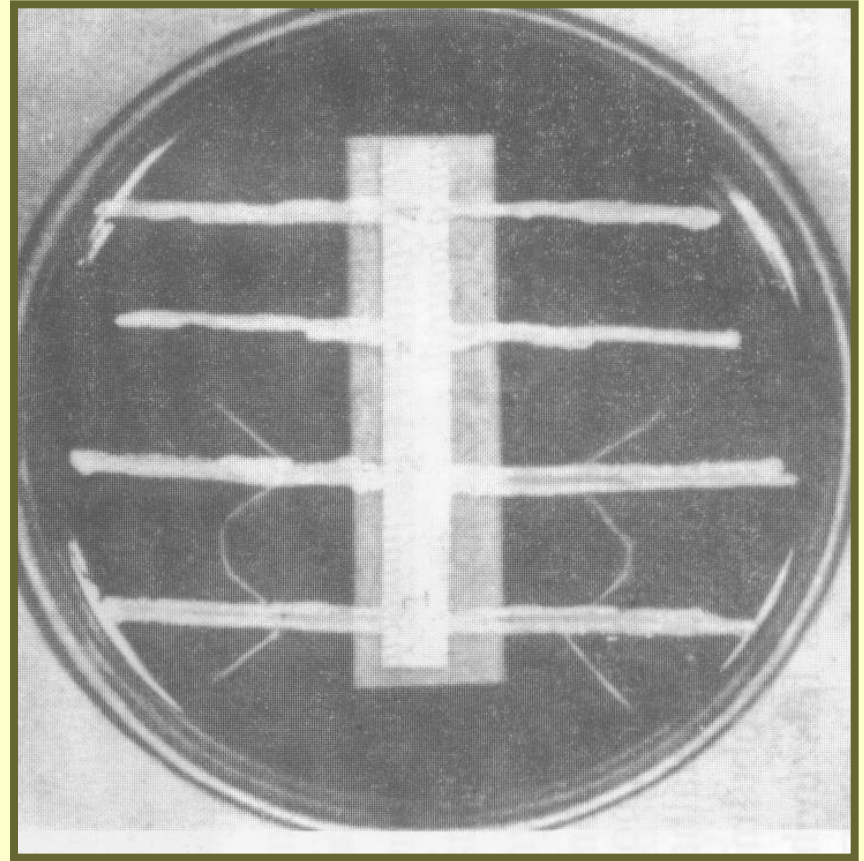
- *Prevention:* **toxoid type vaccine (>10 years protection)**

- *Therapy in unvaccinated, infected persons (e.g. newborns):*
antitoxin, macrolids, supportive

Corynebacterium diphtheriae



Gram stain



Elek test