SLIDE 6

EDITED BY FARH BILAL

P.S: ALL ADDITIONS TO THE SLIDES WERE TAKEN FROM THE BOOK

The Jordan University-Faculty of Medicine

Gram-Positive Bacilli

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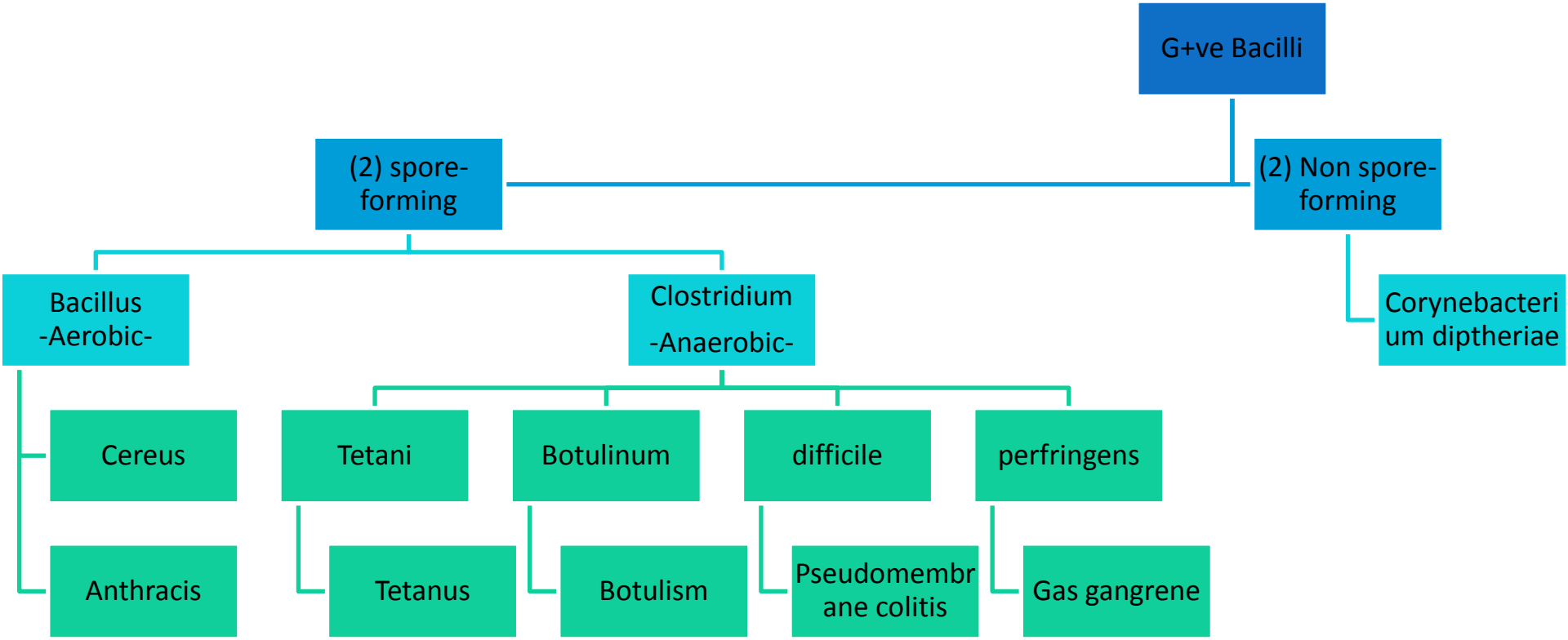
Everything written in blue is from the book.
Clinical Microbiology Made ridiculously simple


G+ve Bacilli
(2) spore-forming
(2) Non spore-forming
Bacillus -Aerobic-
Clostridium -Anaerobic-
Corynebacterium diptheriae
Cereus
Anthracis
Tetani
Botulinum
difficile
perfringens
Tetanus
Botulism
Pseudomembrane colitis
Gas gangrene

NON SPORE FORMING BACILLI

Corynebacteria Group

Gram-positive Pleomorphic Bacilli (Diphteroides)

Aerobic, Normal Flora in Respiratory,Urinary tract, Skin and Mostly nonpathogenic in healthy conditions.

Corynebacterium diphtheriae: Highly infectious & Human pathogen, Spread by droplets by carriers/ Clinical cases patients are Mostly children. It causes Severe sore throat. Inflammation Throat-Pharynx-Larynx ,it colonizes in the pharynx and release Diphtheria Toxin to the heart and brain

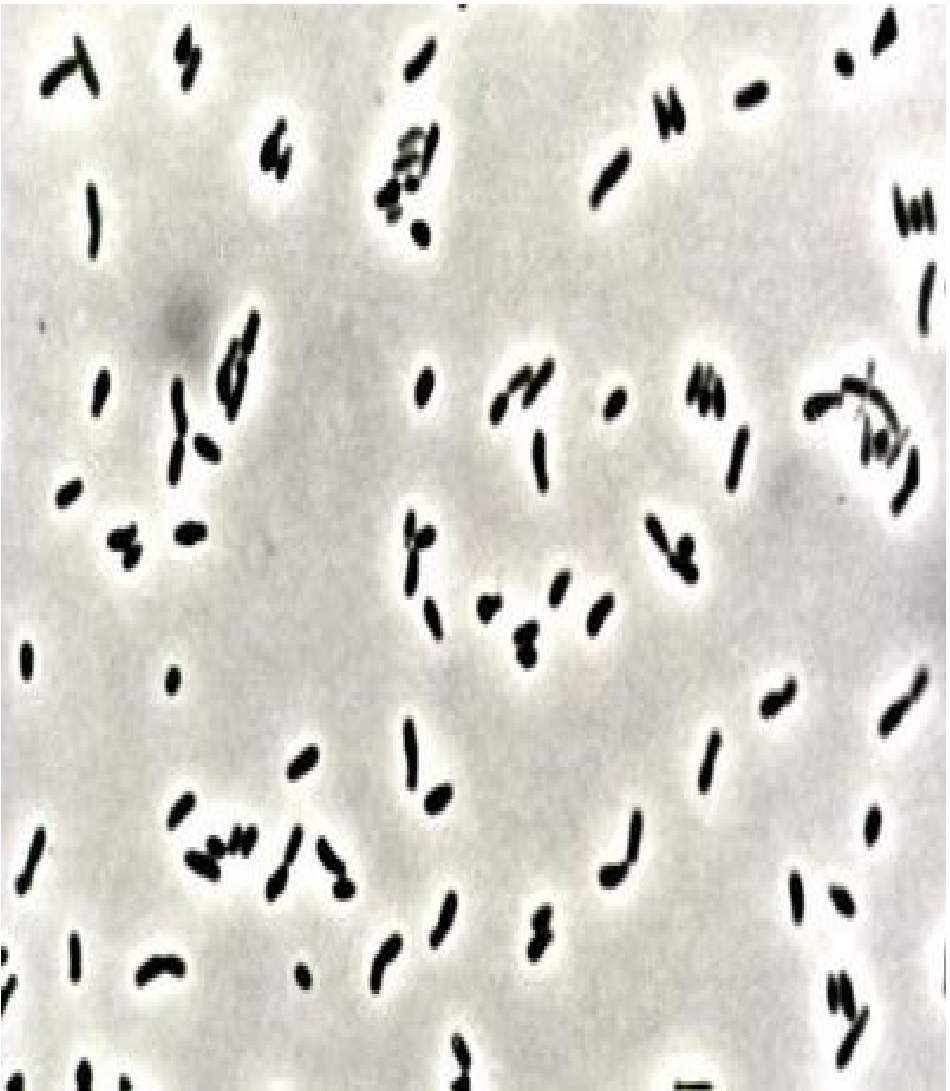
Causes Necrosis in Liver, heart.

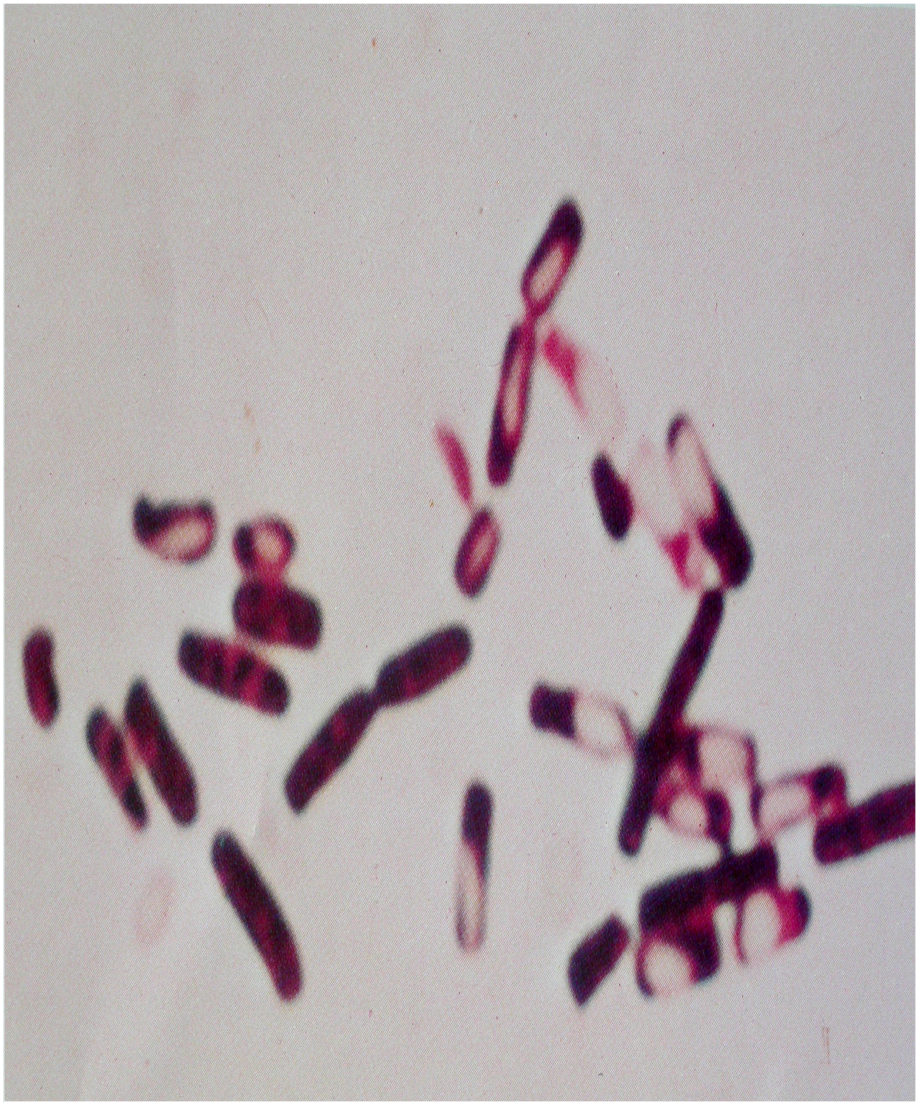
it is activated after being lysogenized. Toxin gene carried on bacteriophage Lysogenic strains.. High Fatality without antibiotics treatment.

Prevention: Diphteria Toxoid (**Triple Vaccine, DTP**) . Three doses 2-4-6 age months children.

Lab Diagnosis: Albert's stain direct smear & Throat culture.. Tellurite Blood Medium (TELL yoUR InTErn). Toxin test is to confirm *C.diphtheria* toxic isolates, but we have to administrate Early antibiotic treatment.

Corynebacteria-Bacillus species





SPORE FORMING BACILLLI

Spore Forming Bacilli

Gram+ve Spore-forming small/Large Bacilli ..

- They are divided according to their like/dislike for oxygen to Aerobic (Bacillus) and Anaerobic (Clostridia)
- Survive long period in dryness and Resist boiling temperature, UV light and disinfectants.
- Common in nature: Soil and Dust.
- Vegetates in Human /Animal Intestines. Found and transmitted by Feces & Water.
- Mostly Saprophytes..Putrefaction of organic compounds.. Few Pathogenic species causing disease in humans/Animals.
- Rapid growth 24-48h

<u>Aerobic Bacilli Group:</u>

- Bacillus is divided into:

1. B. Anthracis
2. B.Cereus –be serious!-.

Bacillus :Cereus!

- ***Bacillus cereus***:
- Easily contaminated Food (Rice, Meat, Fish, Dairy products).. Causes food poisoning.how? By realeasing enterotoxins in food even after cooking "if survived".
- It has 2 enterotoxins:

1- Heat-stable Enterotoxin

2- Heat-Labile Enterotoxin

- Incubation Period is 1-24 Hrs
- Symptoms: Vomiting & Diarrhea and Nausea and No Fever
- No Need for Antibiotic?? It's resistant to penicillin and no need because food poisoning caused by the pre-formed enetertoxin of cereus so they will not alter the course of this patient's symptoms.
- Very rare invasive infections.

- ***B. subtilis***: Opportunistic Pathogen.. Wound infect , Sepsis.. Mostly infants, Immunocompromid patients.

Bacillus : Anthracis

- ***B. Anthracis***:

- Common cause of intestinal fatal disease in animals. Causes the anthracis disease. less humans, transmitted from direct contact with the infected animals or indirectly by handling with infected animals products.

- They're unique because having **Polypeptide capsule** .. One of the virulence factors and it inhibit phagocytosis of the vegatative bacteria.
- Other potent virulence factors.. Edema factor, protective agent and lethal factor.
- Human Cutaneous Anthrax- chronic Lesions. – black lesions with a rim of edema, painless, called malignant pustule-
- Inhalation *B. anthracis* spores causes **hemorrhagic Pneumonia** –not actually pneumonia, it realeased in lung then transported to mediastinal lymphnodes where they germinate and causes mediastainum hemorrhage and widening >> pleural effusion.- & **Septicemia**.
- **High mortality** because as soon as they're activated they produce exotoxins causes necrotic lesions within intestine and many other things! And this the reason of high mortality rates , **Biological War Agent.**

- Treatment: Surgery & antibiotics –ciprofloxacin and doxycyclin-

- **Lab Diagnosis**: Culture Specimens, Skin Ulcer... Rare Blood / Sputum .. Culture on Blood & Chocolate Agar.

Clostridia, spore forming anaerobic.

Anaerobic - Clostridia Group- :

1. C.Tetani
2. C.Botulinum
3. C.Difficile
4. C.Perfrigens

- Spore forming bacilli
- Exo- Enterotoxins
- 2 types of toxins :

1. Heat-Stable toxin
2. Heat-Labile toxin

- Exo-& Endogenous Infection
- High Fatality without Treatment.

1) *Clostridium tetani*:

- Causes Tetanus which is a highly fatal disease if Without treatment. And it's a Localized infection happens with Surface-Deep Tissue injury forming an anearobic environment for spores.
- Release potent neurotoxin binds to the neurons CNS (**Tetanus toxin / tetanospasmin**) how? It's transmitted from the motor end plate to the CNS.
- This toxin is produced by vegetative cells grow in necrotic tissues under anaerobic conditions.

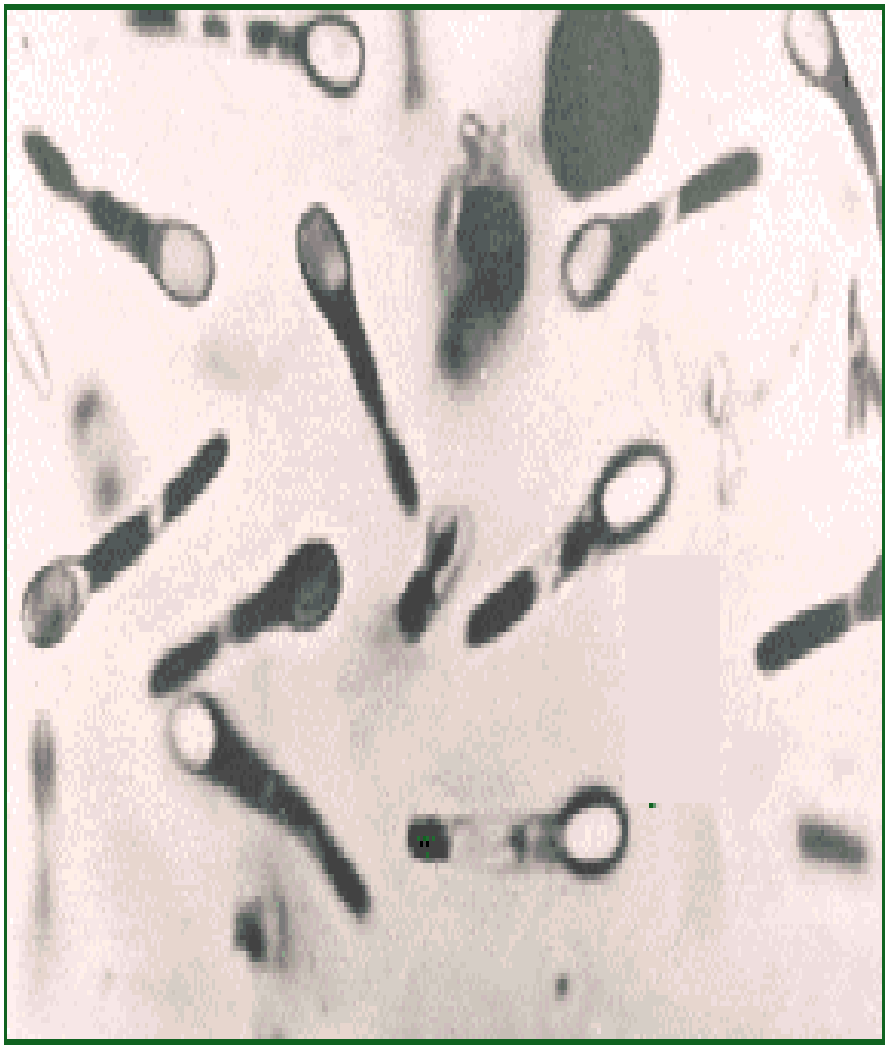
- ***Cl.tetani*** multiplies locally and symptoms appear remote from the infection site.
- Toxin causes spasm in face & jaw –lockjaw: mortality is high once reached this level- , Overall body muscle spasm which can lead to Respiratory & heart failure >> Rapid death.

Why? Because tetanus toxin inhibit the inhibitory NTs like GABA which leads to sustained muscle contraction .

- Treatment: Surgical Debridement to remove any remaining source of it, Antibiotics metranidazole or penicillin and Tetanus Vaccine.

- Lab Diagnosis: Aspirated specimens from damaged Tissues.. Direct Gram-stain.. Culture on Anaerobic-blood & chocolate agar

Clostridium tetani



2- Clostridium perfringens & Others Species:

Is Toxigenic & Invasive and produce Endo or Exo toxins which will cause Infections..

Infect : wounds and muscle traumas and might be in contaminated food.

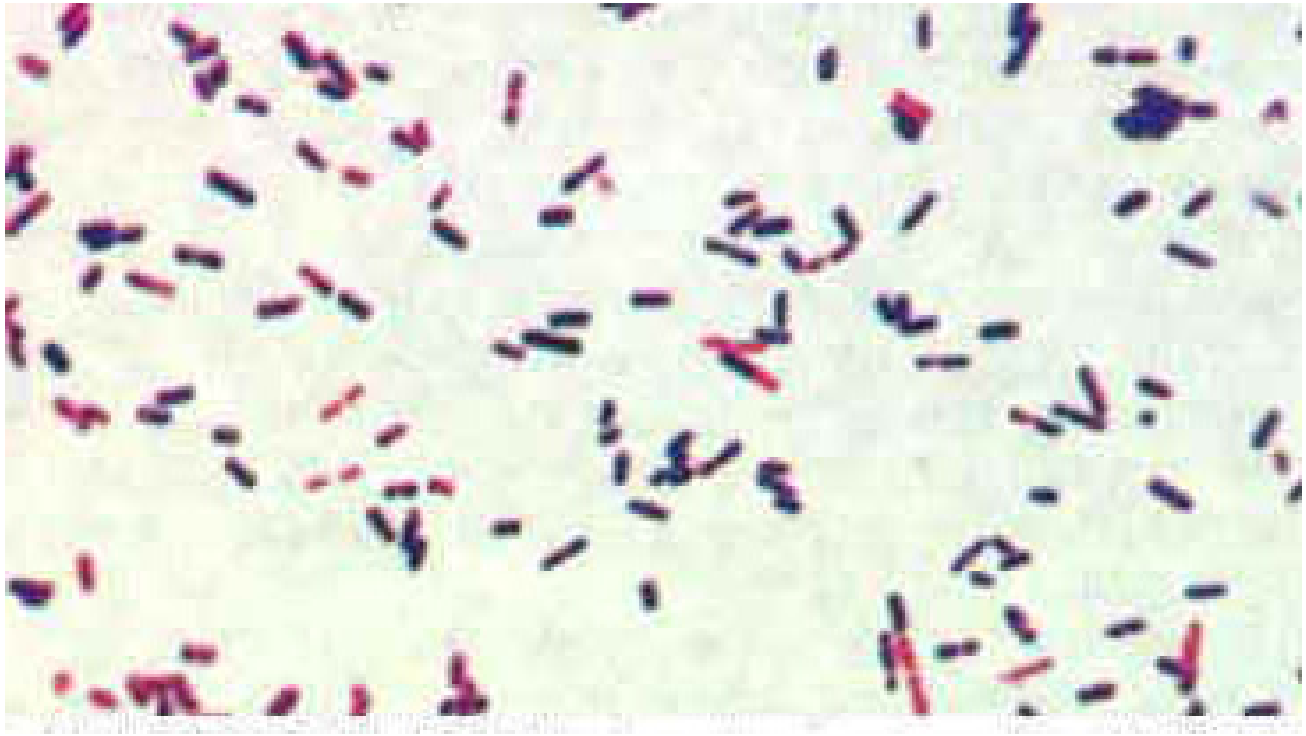
May be infect intestines which will cause watery or bloody diarrhea.

Release various Toxins & Enzymes /virulence factors and enzymes like Collagenese, Hyaluronidase.

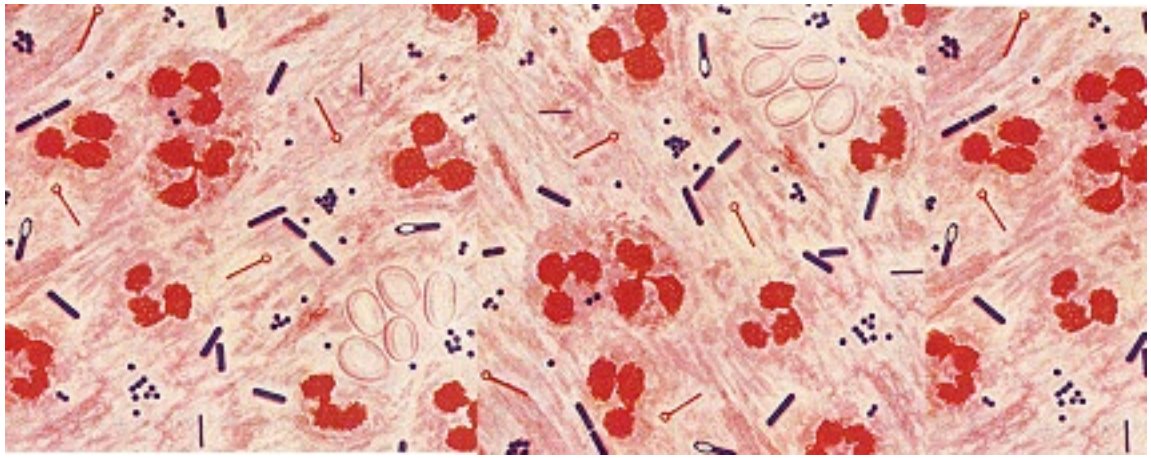
- Infection due to contamination in deep wounds then multiplication occur in damaged tissue causing Gasgangrene : -Myonecrosis which gas is destroying adjacent muscles or/and Cellulitis "wound infection" -and causes Septicemia
- A common cause of Food-Poisoning like meat infect intestine releasing Enterotoxin which form gas. Incub 6-24 Hrs, results in intense watery diarrhea and abdominal cramps with No Fever

- **Treatment: Surgical Debridement with Amputation & Antibiotics** .. No Preventative Vaccine
- **Lab Diagnosis**: Culture specimens.. Aspirated fluid Wound/Blood .. Gram-stain , PCR detect toxins.

Clostridium perfringens



Wound Infection with Mixed Clostridia & Other Bacteria



3) C .botulinum :

- ✓ Food-borne botulism is **intoxication** –- الأكل اللي موجودة فيه مسمم
- ✓ Ingestion of foods contain preformed toxin that happens when we store food contain clostridia so we're giving an anaerobic environment to activate it like freezing bags, cans and jars..
- ✓ it has Heat-stable exotoxins, And destroyed at 20min /100C.
- ✓ Contamination Canned food.. Meat, Fish, Beans.

Botulism –the disease caused by it- :

Clinical symptoms begin 8-36 hours after toxin ingestion with weakness, dizziness, dryness mouth, Nausea, Neurologic features because it blocks the release of Ach from presynaptic terminals and motor endplate. blurred vision, inability to swallow, difficulty in speech, weakness of skeletal muscles and Respiratory paralysis and no fever..Now rare cases.

Diagnosis & treatment: Clinical features.. Difficult to detect toxin/bacteria..

- Antitoxin serum treatment, and Support therapy -ventilation for patients until the respiratory muscles resume activity-..
- High fatality.

4) ***Clostridium difficile***:

« Because of clostridium difficile it becomes very difficile to give patients antibiotics:P»

It's Part of intestinal flora, 20 % carriers. Causes Endo-infection/ Common Nosocomial infection, Following a long antibiotic usage. –it happens after using broad spectrum antibiotic because it kills normal flora and give a chance to C.difficile to grow and release exotoxins.

- Produces two toxins: Toxin A: is enterotoxin causes fluid accumulation in the Intestines>>diarreha and Toxin B : is an extremely lethal (cytopathic) toxin for colonic cells.

Pseudomembranous Colitis: Bloody Diarrhea, Antibiotic associated diarrhea.. Happens After treatment with Amoxicillin, Lincomycin-Clindymicin, Cephalosporines) can be Fatal.

Treatment: Stop usage offening antibiotic and Replace by Metronidazole or vancomycin.

Lab Diagnosis: Identification of Toxins in Stool specimen by immunological test, Less Culture.