

Micro summary

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Slide # 6

Micro - Slide 6

All things from slides are in BOLD& BLACK, other in RED are -
form sheets- for more understanding, bettawfeq :D

Corynebacteria Group

- **Gram-positive Pleomorphic Bacilli** (different morphologies)
- **Diphtheroides**
- **Aerobic**
- They are considered part of the **Normal Flora** of the upper **Respiratory tract** (specially between the **pharynx and the tonsils**), **Urinary tract, Skin**
- **Mostly nonpathogenic in healthy conditions.** (cause only mild infections).

There are two types of Corynebacteria:

- 1) Non-pathogenic : part of the normal flora.
- 2) Pathogenic : can cause some diseases

1) **Corynebacterium diphtheriae:** (classified into a toxigenic group & non-toxigenic group)

Highly infectious & Human pathogen .. Spread by droplets by carriers/ Clinical cases , Mostly children (who are not immunized with DPT vaccine are highly susceptible to Diphtheria)

Once it is attached to the mucosa –especially to that of the pharynx-, it adheres and produces inflammatory reactions, the toxins and enzymes released by the bacteria produce **severe inflammation** (pseudomembranous inflammation) in the **Throat-Pharynx-Larynx** and cause **severe sore**

throat , Necrosis in Liver, heart (because of toxins reached to, through blood stream)

Diphtheria Toxin is a potent toxin, which is produced by the lysogenic strains of *Corynebacterium* (a strain of bacterium that is infected with a bacteriophage, that carry the toxin gene).

High Fatality without antibiotics treatment.

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

Lab Diagnosis:

Corynebacteria bacilli have at their endings metachromatic granules, demonstrated using stains other than gram stain, e.g. **Albert's stain direct smear & Throat culture..**

Within the first 24-48 hour we won't be able to differentiate between *Corynebacterium diphtheria* and *Haemophilus influenzae* cocci. So we culture it using **Tellurite Blood Medium** which is **ONLY** selective for *Corynebacterium*.

Toxin test to confirm *C.diphtheria* toxic isolates.

Treatment: Early antibiotic treatment

Spore Forming Bacilli

- **Gram+ve Spore-forming small/Large Bacilli**
- **Aerobic/Anaerobic**
- **Survive long period in dryness**
- **Resist boiling temperature**
- **Common in nature (Soil, Dust, Vegetations, Human /Animal Intestines, Feces & Water)**

- Mostly Saprophytes..Putrefaction of organic compounds..
- Few Pathogenic species causing disease in humans/Animals.
- Rapid growth 24-48h

Aerobic Bacilli Group:

Bacillus cereus: Easily contaminated Food (Rice, Meat, Fish, Dairy products) by Heat-stable Enterotoxin causing Food-poisoning (food intoxication)

*NOT dangerous UNLESS it produces toxins.

*Survive the initial cooking process, however to inactivate the spores must exposed to high temp. or/and refrigeration.

Incubation Period 1-24 Hrs, Vomiting & Diarrhea, No Fever.. Very rare invasive infections (& rarely associated with death, its toxicity is mild)

No Need for Antibiotic.

B. subtilis: (It is found in the intestines of adults and children as part of the normal flora, It is non-toxigenic to humans) Opportunistic Pathogen it can enter the blood stream during surgery cause Wound infect , Sepsis

Mostly infants, Immunocompromid patients (elderly).

B. anthracis: (name is originated from the BLACKness of infected tissue)

Common cause of intestinal fatal disease in animals but less in humans. (It's fatal because the bacteria will reach the blood stream then the liver, causing liver cirrhosis, and then the animal will die)

It has **polypeptide capsule & Other potent virulence factors.**

- (1) **Human Cutaneous Anthrax- chronic Lesions** (*B. anthracis* produce a variety of toxins and extracellular products causing chronic skin lesions but not systemic infection). **Treatment: Surgery & antibiotics**
- (2) **Inhalation *B. anthracis* spores causes hemorrhagic Pneumonia {Pulmonary anthrax} & Septicemia, and cause death (High mortality) since the damage is not easily treated with antibiotics.**
***Biological War Agent** (toxic form of the bacteria (small particles) to be dispersed in the atmosphere and inhaled).

Lab Diagnosis: Culture Specimens mainly from Skin Ulcer, Rarely Blood / Sputum

Culture on Blood & Chocolate Agar.

Anaerobic Clostridia Group:

Spore forming bacilli.. Exo- Enterotoxins.. Heat-Stable /Labile .. Exo-& Endogenous Infection.. High Fatality without Treatment. (so rapid diagnosis is crucial).

1) *Clostridium tetani*:

Tetanus *(highly fatal disease .. Without treatment)

***Localized infection/-Surface-Deep Tissue injury caused by releasing potent neurotoxin binds to the neurons CNS (Tetanus toxin / tetanospasmin), 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.. Overall body muscle spasm.. Respiratory & heart failure.. Rapid death**

Treatment:

-Surgical Debridement (to produce aerobic condition)

-Antibiotics (& anti-serum)

-Tetanus Vaccine (tetanus toxoids, to enhance the immune response of the body)

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

(But It is not easy to prove that *Clostridium tetani* is the cause of the infection because

1. In the ER, there is NO time to collect proper specimens and send them to the lab.

2. The number of *Clostridia* in clinical specimens is low so they're difficult to culture)

So to diagnose a patient we have to:

1. focus on the clinical features and on the history of the case (car accident, contamination...etc.) or

2. by the presence of toxins in the serum of a patient -using PCR-

*Tetanus is not very common now, but it still occurs among soldiers or those who have had car accidents.

2) Clostridium perfringens & Others Species:

Toxigenic & Invasive .. Endo or Exo Infections..May be infect intestines..

***Release various Toxins & Enzymes /virulence factors** (are spreading factors which are involved in the spreading of infection from the infected tissue to the non-infected tissue)

1) Collagenase, 2) Hyaluronidase , 3) Hemolysins (which destroy RBCs by attacking their plasma membrane).

***Infection due to contamination deep wounds.. multiplication in damaged tissue** (germinate from the dormant spore to the vegetative form, within a very short period) **causing Gasgangrene** (gas in infected tissue from the fermentation process , spread rapidly from lower to upper part of the body) – **Myonecrosis - Cellulitis.. Septicemia**

****A common cause of Food-Poisoning.. food (meat) or intestine.. Enterotoxin . Incub 6-24 Hrs, Intense watery diarrhea abdominal cramps.. No Fever**

Treatment: Surgical Debridement/ Amputation (because the toxins that are secreted will spread everywhere in the body and affect all internal organs) **& Antibiotics(2-3 types because its mixed infection usually)..**

***No Preventative Vaccine**

Lab Diagnosis: Culture specimens.. Aspirated fluid Wound/Blood (fluid removed from the infected tissue using a needle or syringe) .. Gram-stain , PCR detect toxins.

3)C .botulinum :

Food-borne botulism is intoxication .. Ingestion of foods contain preformed *toxin* (is a neurotoxin, called *Botulinum*, highly potency, 1 Microgram of it is enough to kill any person within 24 hours)

Heat-stable exotoxins.. destroyed at (at least) 20min /100C.

Contamination Canned food.. Meat, Fish, Beans.

Botulism: Clinical symptoms begin 8-36 hours after toxin ingestion with weakness, dizziness, dryness mouth, Nausea, Neurologic features.. blurred vision, inability to swallow, difficulty in speech, weakness of skeletal muscles and Respiratory paralysis..

By Inhibition the release of the neurotransmitter acetylcholine..

No Fever.. Now rare cases(because autoclaves are used to sterilize cans)

Diagnosis & treatment: Clinical features.. Difficult to detect toxin/bacteria.. Antitoxin serum treatment (NOT antibiotic) , Support therapy {intubation & ventilator support}.. High fatality.

4)Clostridium difficile:

Part flora human intestines, 20 % carriers ..

Endo-infection/ Common Nosocomial infection..

***Following long antibiotic usage , (After treatment with Amoxicillin, Lincomycin-Clindymicin, Cephalosporines) leading to increase number of vegetative spore forming bacteria**

****Produces two toxins:**

-Toxin A is enterotoxin .. causes fluid accumulation in the Intestines (diarrhea)

-Toxin B is an extremely lethal (cytopathic) toxin (kills mucosa cells)

*** Under normal healthy intestinal flora C.difficile can't produce toxins, but any change in the pH or disruption of the intestinal flora enhance the growth of Clostridium difficile and the production of toxins which cause a disease known as:**

Pseudomembranous Colitis.. Bloody Diarrhea..

Antibiotic associated diarrhea.. Fatal..

Treatment: Stop usage offending antibiotic.. Replace by Metronidazole or vancomycin

Lab Diagnosis:

***Identification of Toxins in Stool specimen by immunological test (ELISA)**

***Less -or No- Culture**

***No Available vaccine**

