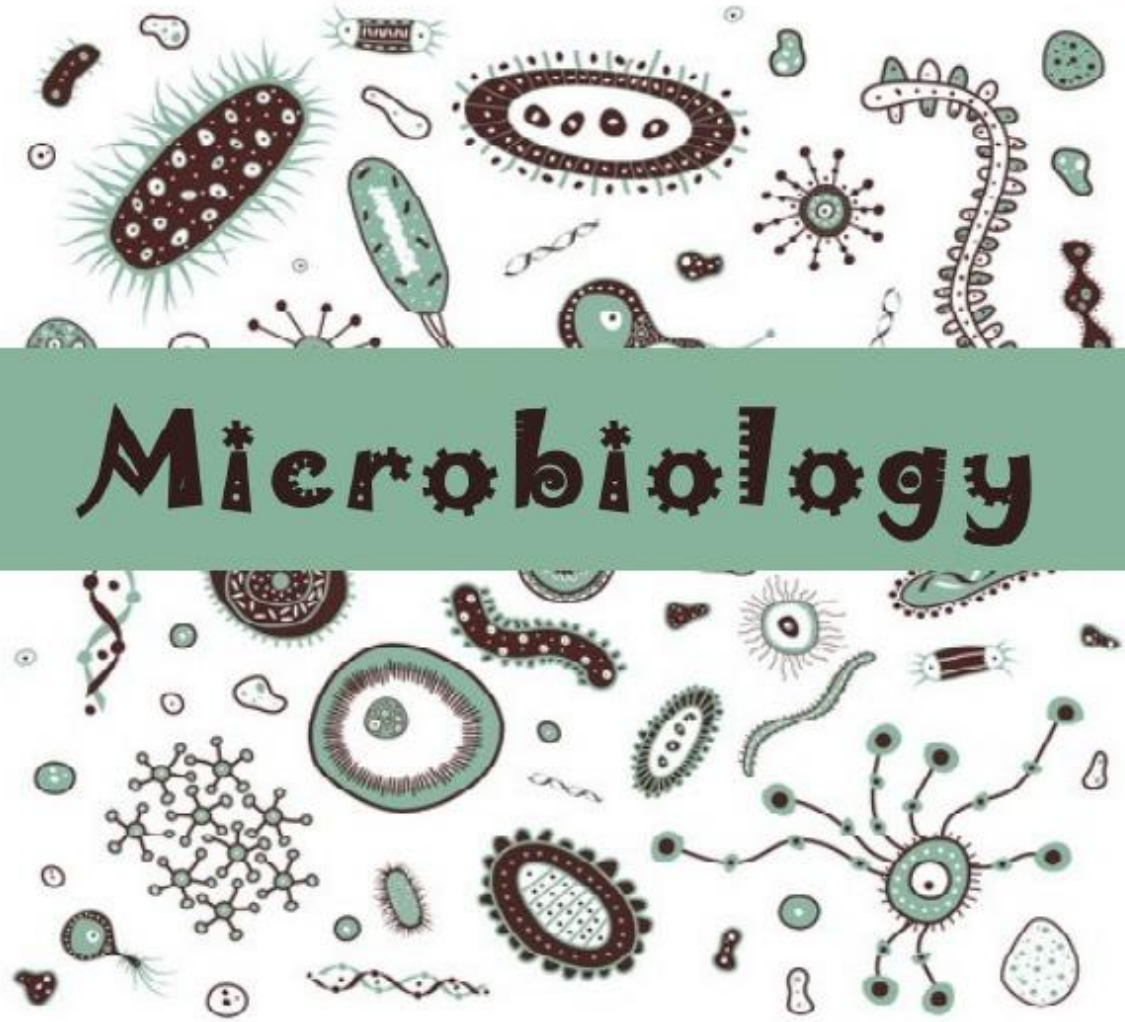

Microbiology

◉ Sheet ○ Slides

Number : 11

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Subject: Gram-positive Bacilli

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Gram positive bacilli:

-it appears dark violet under LM.

-it's rod in shape.

In general:

We divide gram positive bacilli into :

1. **Not spore forming bacilli :**
   Such as: corynebacteria that can be non-pathogenic or pathogenic (diphtheria). These bacteria are considered as pleomorphic bacilli (have variety of morphologic structures).
2. **Spore forming bacilli :**
   a-aerobic such as : bacillus.
   B- anaerobic such as : clostridia.

Concerning ***aerobic /anaerobic spore forming bacilli:***

1.these are widely distributed in nature(soil , dust, vegetations, human and animal intestines, feces and water).

2. they can survive dryness.

3.they can contaminate food article and they are considered highly resistant to heat "at least 30 minutes of boiling, autoclave ".

4. In general these bacteria are not widely associated with what we call invasive clinical infectious "not easily cause infection like: sepsis, skin infections, wound infection ".

Aerobic bacilli groups:

- Bacillus cereus.
- B.subtilis.
- B.anthracis.

Bacillus cereus:

An important species that produces ***enterotoxins.***

Remember that spore forming bacteria have **two forms:**

1.***Inactive (spore):*** no secretions .

2.***Active (in vegetative cells.)*** : in this form these bacteria liberate toxins (enterotoxins) and other secretions.

Types of enterotoxins:

1.***Heat stable enterotoxins:*** "can't be easily inactivated by boiling temperature requiring at least 20 minutes ".

2.Labile enterotoxins :"easily destroyed by boiling for few minutes ".

So food which is contaminated with these enterotoxins might cause food poisoning if only warmed with low temperatures.

Note: the term "***food poisoning "***or "***food intoxication"*** means that we don't necessarily have the i*nfectious agent (we don't have infection*) , we have toxins (enterotoxins) produced by that organism. "That's why ***we don't need antibiotics*** ".

The food poisoning related to cereus is somehow similar to the poisoning caused by ***staph.aureus*** which also produces heat stable toxins.

The ***incubation period*** for this poisoning: might be short (1hr) or extended (24hrs), but mostly it's for few hours.

How many hours the incubation period lasts depends on the ***amount of toxins present.***

The first clinical feature to be noticed is vomiting, abdominal pain, rarely fever, maybe diarrhea.

Within 24 hours, the patient will recover ***without the use of any drugs.***

Bacillus subtilis:

This type doesn't produce toxins, so it's not associated with food poisoning, it might be associated with infections (wound infection, sepsis)or during surgeries and any manipulation in the skin.

It might reach blood stream via injectable drugs, this clinical case is mostly in immunocompromised patient, infant (it's not highly pathogenic organism so it rarely causes infection to a healthy person).

Bacillus anthracis:

Anthracis means the blackness of any material "anthrax =فحم"

This organism is mainly found in the intestinal tract of large animals, like horses, as part of their intestinal flora.

Note: cereus and subtilis might be found in the intestinal tract of humans and animals without any significant harm and in very few numbers.

If the animal was subjected to any injury in its intestinal tract like during tracing other animals,

the anthracis will migrate to the liver causing severe cirrhosis, blackness and eventually death.

This bacteria is ***considered highly pathogenic!***

Why??

-it's associated with a special type of capsules(polypeptide capsules).

"remember that capsules are usually polysaccharides but here we have polypeptides ".

-it also produces certain virulent factors and toxins that cause hemorrhage , damage to blood vessels, if it reaches the lung, it causes pneumonia and death within 24 hrs (it can be very dangerous if it is i**nhaled**".

It can be easily distributed in the air "used as a biological weapon in wars, can cause death within a short period ".

Lab diagnosis for all aerobic spore forming bacteria:

It's easy, you first get the sample from any infected tissue or food article, and culture the specimens usually on blood or chocolate agar ,no need for special type of cultural media, within 24 hrs we will recognize the presence of the organism, and identify it using chemical substances.

In relation to B.cerues it's important to identify and recognize the excreted toxins, because not all bacillus cereus strains might be producers of toxins,30-40% are non toxigenic .

Food poisoning in relation to bacillus cereus is very common in preparation with rice, in our culture we use huge amounts of rice to make "mansaf :p" ,so if you keep the leftovers for 24 hrs not in refrigerator, you have to expect that if there's a contamination there will be toxins, so in the next day you will not recook the mansaf you will warm it a bit and that won't be enough to inactivate toxins, leading to a food poisoning .

"If you are a mansaf lover, and you didn't put it in refrigerator,don't try to be very smart and eat it on breakfast :p"

Chinese people eat boiling rice and discard the leftovers .

This also can be applied to meat ,etc .

- ***Clostridia :***

Obligate anaerobes,spore forming bacteria.

Clostridium is the genius, we have many species and associated diseases.

Some species:

1- Clostridium tetani.
2- Clostrdium perfringens.
3- C.botulinum.
4- C.difficile.

In general these are widely distributed in nature, might be a part of intestinal and human flora. they produce both exotoxins and enterotoxins "some produce exotoxins and excrete enzymes, other secret toxins only"

Their toxins might be heat stable or labile.

1- Clostrdium tetani:

The causative agent of tetanus which is a fatal disease .

It's easy to get infected by C.tetani following any injuries, especially those contaminated with soil and dust.

Once these organism manage to lodge "تستقر"in a subcutaneous tissue, where there is a damage and injury, because of the low presence of oxygen “reduced blood flow” these conditions will allow the bacteria to be converted from the spore form to the vegetative form and produce tetanus toxins (tetanospasmin)

These toxins are then carried out by the blood to the CNS affecting neurons and causing paralysis of all body muscles. “starts with the muscle of the jaw, the patient might die within 48 hrs”.

feeling any constriction in the localized muscles of the organ infected,or any respiratory problems, ***the treatment*: to cut the infected organ and clean all infected tissues***(surgical debridement)***, and we give ***antibiotics*** because usually the contamination doesn't only occur with only one type of bacteria, so we need to kill all infectious bacteria. We also give the patient a serum with certain **antibodies and toxoids (tetanus vaccine).**

The treatment should be fast and in emergency rooms in hospital. However, we are lucky that this organism produce only one type of toxins, so we can easily produce toxoids and vaccines .

“As we mentioned earlier the triple vaccine for diphtheria and whooping cough and tetanus”

But immunization in fact isn’t 100% and decreases with time, so soldiers and those who exposed to injuries must be given vaccines again.

The lab diagnosis is not really easy, and might not really be necessarily, because you don't have time to take sample and wait for it, we need only to confirm the presence, but the treatment begins before the confirmation. It is easily to recognize the spore and vegetative form because it's large “other are difficult because they are small in size and have bulging “

So the lab diagnosis here isn't for clinical purposes, the physician must start the treatment even before the confirmation.

2- Clostrdium perfringens:

This type of bacteria is a special type as it produces not only exotoxins but also enterotoxins, so these when they reach the intestines under certain conditions might produce enterotoxins these will cause a clinical case of watery diarrhea at the beginning , might be more severe and cause necrotizing colonialists and damage to the colon, and produce bloody diarrhea :(

“If ingested in large numbers will cause infection and watery diarrhea “

If any wound contaminated with these bacteria, they will produce toxins and enzymes like collagenases and proteases these will liquefy the tissue and cause damage to it “like in muscles and subcutaneous tissue “.

And these toxins if carried in the blood stream to other places in the body will cause other damages.

To prevent any complications you have to proceed without delay as the following, cleaning the damaged tissue as fast as possible will prevent the development of all the previous features and thus preventing something we call it “gasgangrene: myonecroses and toxins”

This is recognized by liquification of tissue and sever damage, so we cut the whole affected area within a safe margin “depends on the severity of the damage” we also give antibiotics.

We don't give anti-toxins or vaccines: because we don't have only one type of toxins produced, we have many so we can't easily produce vaccines and prevent the damage.

This organism has some features related to bacillus cereus, it might produce enterotoxins during the vegetation in food, and might produce food poisoning exactly like B.cerues.

And we have similar clinical features “keep in mind that this case isn't infection, it’s intoxication, no antibiotics needed”.

Food poisoning is self limited in major of healthy patients, those who are very young or very old and other with severe underling disease will lose more fluids, these will be given IV SALINE fluid. Healthy people will recover without medications .

Lab diagnosis: it's more important in certain case to know the causative agents in diarrhea to identify the necrotizing colitis.

Wounds are contaminated with more than one type of bacteria “we give more antibiotics “

3- Clostrdium botulinum:

It has a histological importance.

Causative agent of botulism .

It causes food poisoning mainly in canned food “rich with proteins” if it wasn't sterilized we might have severe intoxication.

“Along time ago before refrigerator, people used to do some drying methods to preserve food, if these were in large numbers they might be contaminated with variety of organism and be poisonous “

Botulism is a very harmful toxin; in nanograms are enough to kill a person due to damage of CNS. The intoxication is very rapid and affects kidney, respiration.

*please refer to the slides :)

Forgive me for any mistakes

لك في هذا العالم شيء..فقم ^_^

The end