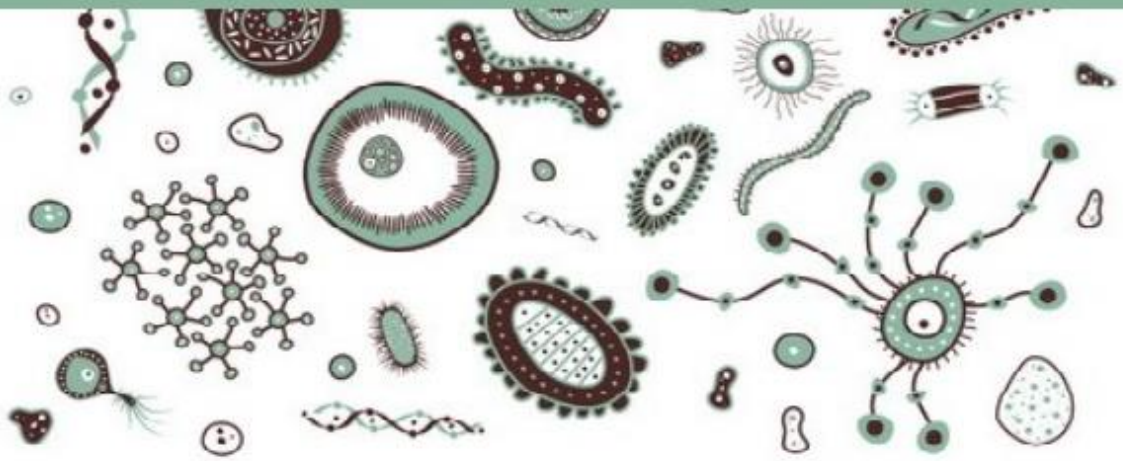
Microbiology



◉ Sheet ○ Slides

Number : 18

Done by :Sinamis Drei

Corrected by: Sondos Al-khateeb

Subject: Mycobacteria (continued)

Doctor: Dr. Asem + Dr. Suzan

3/12/2015

.....

بسم الله الرحمن الرحيم

We've already covered the Mycobacteria , Chlamydia and Mycoplasma . This lecture is going to cover legionella pneumophila and legionnaires' disease.

- This infection is related to other mycoplasma and chlamydia , in relation to cause a disease known as atypical pneumonia .

NOT INCLUDED

just to further understanding

Pneumonia is an infection that causes inflammation of the lungs.
With atypical pneumonia, the infection is caused by different bacteria than the ones that cause typical pneumonia. These include *Legionella pneumophila*, *Mycoplasma pneumonia* and *Chlamydophila pneumoniae*. Atypical pneumonia also tends to have milder symptoms than typical pneumonia.

This type of pneumonia is also sometimes referred to as "walking pneumonia" because it rarely requires bed rest or hospitalization.

This organism was discovered 40 years ago by an accident due to outbreak of lung infection " pneumonia " in soldiers , the outbreak infected about 300 persons , about 10% of them died following infection due to the fact that this organism was not previously well known and rarely associated with human infections .

- The organism belongs to gram negative bacilli , but the amount of LPS (lipopolysaccarides) is less than what is normally found in gram negative bacteria (being similar to mycoplasma and chlamydia in this aspect) .

- Whereas , This organism can be cultured like mycoplasma (where as chlamydia can't be cultured ------ > which is an intracellular organism . so, tissue culture used for detection the presence of it) .

- Clinical features of the legionnaire's disease may confuse with chlamydia , Mycobacteria and viral infections with the difference that this infection is not associated with extreme elevation in body temperature (increase temperature by about 1 degree) . Also , clinical symptoms are not only associated with respiratory tract but also with the gastrointestinal tract , causing abdominal pain , diarrhea and vomiting . furthermore , such symptoms are not associated with all cases (elderly persons and persons who have problems in lung like fibroses / malignancy / heavy smoker /etc.. , are more susceptible to develop the clinical symptoms than young)

The most important feature of this organism :

- Legionella can survive at a wide range of temperature →0-80 !

  Making it the only microorganism that can live in such an extremely high temperature in which all other microorganisms are dead .

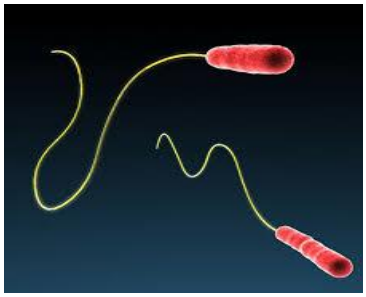
- Infection is not always associated with ingestion of contaminated water , but also , and mainly , by inhalation of water droplets or water spray . once the organism attached to mucosa of respiratory tract , resulted in mild inflammatory reaction which resulted in fever and other clinical symptoms .
  it might cause septicemia , but it mainly intracellularly found in microphages , monocytes and it may be excreted causing clinical infection .

Diagnosis :

special culture media , blood sputum culture , specific antibodies detection (they take blood specimen from the patient and detect the presence of certain antibodies which specific to this organism) , PCR .

treatment

- there is **NO** vaccine , the antibiotics erythromycin and tigecyclin can be used for treatment .



Spirochete group

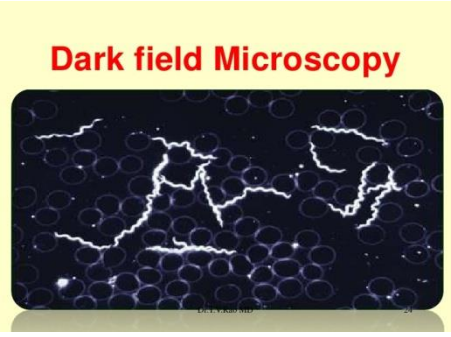
- A special group of spiral bacteria that cannot be classified as gram negative , gram positive , acid fast bacilli … etc . But **why** ?!

this due to the fact that this group has cell wall which similar to gram negative cell wall , which contains LPS(lipopolysaccarides) , but contains more fatty acids , and these bacteria are not easily cultured .

- Morphology of these organisms :

  1.very thin .
  2.multi-folded (curved) .
  3.length up to 25 micrometer ,whereas the majority of G-ve bacteria are less than 0.1 micrometer(which means that spirochete is very long)

- Usually , we use the dark field microscopy (special form of microscopy) to detect them , where the presence of these morphological structures can be recognized from the superficial layers of the smear which exposed to the light .



- Spirochetes are widely distributed in nature , some cause infections in humans , others in animals . Also, it can be transmitted from animals to humans through animals' excretions (feces , urine…etc) . They may contaminate water and food and cause infections when ingested .

- Spirochetes are of two types (groups) :

1. Treponema species :

- some of them can be found as part of our normal flora .

- Alone , they're rarely associated with infections . Together with other microorganisms , they can cause localized infections in the oral cavity (and sometimes in the tonsils) .

2. treponema pallidum:

- causative agent of a sexually transmitted disease known as Syphilis .

Note : the expression "venereal disease " is not specifically used as we have more than one sexually transmitted disease that is often transmitted through sexual contact .

❖ It only causes infections to humans , and never causes infections to animals making it difficult to prove the presence of Treponema pallidum as it also cannot be cultured in any type of artificial media . Therefore , diagnosis of such a disease would be really difficult using culturing methods , and the only way to detect the presence of this bacteria is using specific antibodies against the antigenic structures (cell wall , cell membrane , ..) .

❖ After using antibodies for detection , you sometimes may have to wait for weeks to month to identify the presence of **treponema pallidum**, due to the fact that this organism doesn't only produce one clinical stage of infection , there are **three** stages :

- **The primary stage :** can be easily recognized in extra genitalia , especially in males , as it is usually associated with Mucosa/skin Lesions-chancre on the extra genitalia , and it can be easily clinically observed . these lesions disappear after about two weeks , which means that the patient may recover (if the immune system managed to control the dissemination of spirochetes to the blood stream and lymph system) .

- **The secondary stage :**occurs if the spirochetes disappear from the lesions and disseminate to the blood stream and lymph system .

❖ First and second stages of syphilis can be blocked by the use of antibacterial drug , if the patient did not receive the drug , he might enter the tertiary stage .

- **The Tertiary stage :** is associated with a strong immunological reaction and Granuloma in any part of the body but usually in association with sexual organs , skin , liver and CNS , thus leading to meningitis , jaundice, Granulomatous and nephritis .

  - **Therefore , it is highly important to recognize the first and second stages of the disease , not through culturing methods , but rather using two tests :**

❖ **VDRL(**venereal disease research laboratory) **:** to screen the blood sample for the presence of specific antibodies against Syphilis . This is an obligatory test done in Jordan and many other countries .However , this test can only indicate that you had contact with the spirochete treponema pallidum but still not an absolute result .

❖ **Rapid plasma reagent :** it's similar to the first test , but can be more specific and more associated with the first and second stage of the disease . However , even if the result of this test was positive , this doesn't necessarily mean that this is an actual case of syphilis , we still need

another test (done week to one month after) that is more accurate and can confirm the presence of syphilis infection , this test is known as **Fluorescent Treponema antibody- test (FTA**) .

- If the result of the FTA test was positive , the physician has to report the case for the Ministry Of Health , as it is a really serious disease and any delay in diagnosis or treatment may lead to complications (CNS , jaundice) that leads to death !

3. Borrelia burgdorferi :

The third group of spirochetes .

Note : the name is related to scientist who first discovered the disease .

- Similar in morphological structure to Treponema as they are both spirochetes (cannot be distinguished through morphological structure) .

- Borrelia CAN be cultured in a special culture media and CAN be identified by certain biological disc .

- **Borrelia is associated to two major types of infection :**

1. Lyme disease : an infection related to the skin .

- This organism causes infections to wild animals which can then be transmitted to humans , but **NOT** through direct contact . instead , this infection is usually followed by the presence of a special type of insects known as Ticks , which usually live on the skin of animals and they are normally harmless and fed by sucking the blood of these animals .

Nevertheless , once the animal is infected with borrelia (in its mouth for example) , borrelia will produce coagulation of blood and it will be clotted in his mouth , this makes the animal nervous a little bit , thus the insect (Tick القرادة) leaves it to another (warm) host , usually humans and mainly in the nick and hands exposed , the organism is now injected intradermally and start to produce localized inflammatory action .

Main idea here : It is caused by the presence of these microorganisms in the skin by transmission through the insect as we mentioned earlier.

- The incubation period is usually 1 – 4 weeks .
  (that means you cannot recognize the presence of lesions after 1 to 2or 3weeks)
- The symptoms appear as Single/Multiple Skin Erythematic Lesions . They disappear by the immune system that controls them , otherwise the organism will enter the blood stream and lymphatic system ,
  then lead to many clinical features related to systemic disease including CNS , Jaundice .

- **Diagnosis** :
  It is difficult to recognize the organism because there are many other organisms that produce similar clinical features , it is also difficult to isolated the organism from the lesions of skin or from the blood . so, the only way for Diagnosis is again through detection of specific antibodies .

- Lyme disease is not well recognized in our country and most middle east countries , it is more related to united state , Canada and Russia

  - Other Borrelia species are similar to the one mentioned , they are found in nature and mainly related to animals , and they can **DIRECTLY** be transmitted to humans(not by insects binding but by human head Lice) and might , under certain conditions , follow inhalation or ingestion of contaminated air or water .

  - Not mainly associated with skin lesions (as it is in lyme disease) but mainly with **relapsing fever**.

Note : there are two types of fever , epidemic and endemic .

Treatment :

- Relapsing Fever is often very difficult to treat , due to the fact that this organism resides inside the macrophages and monocytes

(intracellular) , and it requires adequate medical attention , and ingestion of antimicrobial drug in order to be cured .

- **No** vaccine available .

- The presence of **severe headache** may be a sign of infection with this type of spirochetes .

4- leptospiral diseases:

The fifth group .

- Mainly zoonosis (infects animals) and humans , by accident , may acquire an infection NOT through direct contact with animals BUT by ingestion of food or water that contaminated with infected animal's feces and urine .

- Symptoms include : high fever (elevated by one or two degree and not easily diagnosed) , liver cirrhosis , jaundice .

- Again , this infection is not widely seen in our country (due to the lack of sufficient service water , seas, oceans and also animals) , and is found mainly in topical countries .

❖ By this topic , the doctor has finished talking about the most important human pathogens in the introductory course .
❖ Remember that it is not necessary to memorize every single point in sheets , actually you have to memorize everything in the slides, sheets are just for better understanding ☺ .

كلنا ننهزم أمام الموت ، لكن لا شيء أفظع من أن ننهزم أمام الحياة .

The End