This sheet includes

- Two species of Enterics.
- Mycobacterium (mainly Mycobacterium tuberculosis).

Enteric bacteria

Campylobacter

-Campylobacter has been discovered only in recent years . This organism is related more to animals than humans . It is produced in animal's abortion especially in small types of animals (sheeps and goats) .

Campylobacter jejuni

-One of Campylobacter organisms that cause human infection (this organism more related to humans contrariwise other Campylobacter organisms which are more related to animals). It has been discovered in 1976 by accident due to outbreak of diarrheal disease in children hospital in London. They found that this organism:

- need special stain (gram stain cannot give this organism morphological characteristics).
- is similar to gram negative spiral form of bacteria that is found in animals intestine which means that the organism transfer from animals to humans by their consumption of food contaminated with Campylobacter jejuni and resulted in type of watery diarrhea with few numbers of RBC (mild bloody to watery diarrhea).

Morphological structure :

Campylobacter jejuni is long curved rod organism with polar flagella that attaches to the mucosa of human and animal intestine.

-Clinical features

- The organism is similar to Shigella in clinical features, both cause abdominal pain. Campylobacter jejuni produces enteritis and abortion in sheep and cattle. Infections in humans come from these infected animals by direct contact, drinking their milk or eating their meat.
- Also, the feature of infection which caused by this organism is similar to the infection that is caused by Staphylococcus aureus , associated with vomiting and watery diarrhea . Infection that is caused by Campylobacter jejuni is also associated with fever (infection that is caused by Staphylococcus aureus dose not cause fever).

- Campylobacter jejuni found in the intestine of chicken in association with another types of Campylobacter species (campylobacter fetus) which might produce the same features of infection that caused by jejuni – under certain conditions-.
- Campylobacter jejuni is not invasive organism , it is rarely reach the blood to form sepsis (when there is severe diarrhea in immune compromised patients and people with langerhans disorder) – like people who have HIV-) .
- Campylobacter jejuni diarrheal disease is a mild disease (self limited) .So there is no need for antibiotics except if there are severe side effects and dehydration , in this state the patient requires hydration and treatment by useful antibiotics .

-Lab diagnosis

- Isolation of this organism is not easy; the optimum temperature of it is growth (41-42 C) (animal temperature).
- Fastidious organism; require certain environments and conditions for growth.
- need selective culture media which contain 3 types of antimicrobial drugs to cause inhibition for other types of species and support the growth of Campylobacter .

-Others

Infections caused by Campylobacter is not common in Jordan but more than in Western countries (in many Western developing countries Campylobacter jejuni is more common in causing diarrheal disease because they have pets in their houses -cats and dogs-);pets carry the pathogen in their intestine but without symptoms . But, that does not mean that we do not have any case (we have some few cases).

Helicobacter pylori

-has similar morphological features with Campylobacter (gram stain), also need similar selective media in culturing. We can use the biochemical test to differentiate between them.

-highly producer of urease which allow this organism to rapture to the tissue of stomach (manage to attach to the minor mucosa of the stomach and make damage in subcutaneous tissue of it by producing urease that gives ammonium chloride to naturalize the acids in the stomach)

- Helicobacter pylori are opportunistic organisms, but they become obligate in some certain conditions (if the person is susceptible to it –certain clinical features will appear-).

-There is no prove how this organism transfers from outside our bodies to inside it, but there are some theories may explain that .One of these theories is:

The close contact between healthy carriers (who carry the organism without symptoms) and susceptible people.

close contact: between the mother and her children, couples , using the same eating or drinking equipments by more than one person (between family members,…) -transferring of organism by saliva-.

Helicobacter pylori might develop in some people during child hood; which means that certain percentage of population carry the organism in their stomachs.

- Study

According to certain study they found that 10% of ten years children in certain country are colonized with Helicobacter pylori. When the children became (18-20) years old; they found that 50% of them are colonized instead of 10%.

- Conclusion:

In any community we have to expect that 50% of the population carry the pathogen (colonized with Helicobacter pylori), but only 2% of colonized people suffer clinical features of disease.

-Clinical features:

- Gastritis and duodenum ulcer.

Severe damage of stomach and part of duodenum mucosa might cause bleeding and destruction of blood vessels. (1-5) % of any population -especially the elderly people- suffer from gastric ulcer and mainly the causative agent of this is Helicobacter pylori, but still we need lab investigation.

- Pain associated with nausea and vomiting (Fake symptoms).

Some Helicobacter pylori colonized people suffer just from these symptoms (fake symptoms). In this state the doctor can detect that this organism is the causative agent only by lab investigation.

The ways to diagnose Helicobacter pylori infection are:

- Biopsy: to take biopsy from the site of infection (stomach mucosa), then to culture it using the same culture media of Campylobacter jejuni and to isolate it.

- Urease test: to look for the presence of urea in the saliva of the infected person.

In lab investigation it is not enough to look for certain antibodies (this is not consider as diagnose for the disease), because these antibodies also produced in healthy carriers. So, we need the above ways to make sure that the causative agent of symptoms is Helicobacter pylori.

- Treatment

- Antibiotics and chemical compounds are not necessary for all people who carry the organism only if the person is suffering from clinical features (vomiting, abdominal pain, gastritis).
- Antibiotics and related drugs –if they are taken- might not be able to eradicate the organism, but might reduce the gastritis and the ulcer effects. So, the patient will suffer from these symptoms again after few months from taking the medication.

-Others

- Helicobacter pylori are not considered as a part of the normal flora. Although we can found that 50% of population is colonized by it and only 2% of them suffer from clinical features, we consider it as opportunistic organism.
- Helicobacter pylori can be associated with some types of cancers and lymphoma (in very few cases).

End of enteric bacteria

Mycobacterium

-Special type of bacteria that affects mainly the respiratory track.
-Has special cell wall structure.
Mycobacterium cannot be differentiated to gram (+) or gram (-). It's cell wall components (myolic acid, fatty acids and long chain fatty acids) make it acid-fast bacilli on staining. Also, the cell wall is very rigid–very hard to be broken down- and this make this type of bacteria survive for a long period (like spore-forming bacteria),especially if there is no sun light (UV light).
Example: if the organism spread out as droplets from lungs of infected person to any surface (table ,floor,..) , it will survive for many years and transfer to others .

-Mycobacterium is related to both humans and animals.
Some species are related to humans while others are related to animals. Species that are related to humans cannot cause infection in animals, but species that are related to animals and birds can cause infection in humans.
Example:

- Mycobacterium tuberculosis var hominis which is related to humans does not cause infection in animals.
- Mycobacterium hobies (wrong spelling - but I couldn't find the species with a close name) which is related to animals can cause the same clinical features of tuberculosis if it transfers to humans.

-Obligate pathogens and non pathogens (complicate feature of Mycobacterium).
The presence of acid-fast bacilli from skin or urine might be not due to true mycobacterium tuberculosis, but due to other species that are part of our normal flora (mycobacterium *smegmatis* flora of genitalia).
- This organism is highly infectious. If there is one person suffers from pulmonary tuberculosis (suffer from active form of tuberculosis; which means that patient has cavities in the lung tissue where you can found the organism).

- In our country if we look over the percentage of asymptomatic people who carry tuberculosis by using tuberculin skin test (this test can show if you are hyper sensitive to Mycobacterium tuberculosis), you can find that our infants free of hyper sensitivity and allergic reaction of Mycobacterium tuberculosis ,but within 10 years (infants become 10 years old) the percentage rises up to reach 50% (half of 10 years old children are infected with Mycobacterium tuberculosis). So, we have a number of (+) cases which are infected by Mycobacterium tuberculosis and they are responsible for spreading the organism in the community.
- In comparison, the percentage of (+) tuberculosis cases (have previous contact with Mycobacterium tuberculosis) in Sweden =0.1%.
- In every community there are asymptomatic people who are infected with Mycobacterium tuberculosis. (Asymptomatic person does not mean that they are patients, but they are the causative of the antigen of tuberculosis).

-Mycobacterium tuberculosis is an intracellular slow growing organism.
This organism needs (15-30) days to grow in comparison to (1-2) days for others. In other words other bacteria types need (15-20) min to let one cell becomes two (generation time of growth) , but this organism needs 24 hours for the one to become two (binary fission process). So, its culture needs atleast one month instead of one-two days. In conclusion, if the person got

the infection during his child hood, years will pass before the symptomatic infection occurs.
-Tuberculosis does not cause just by mycobacterium tuberculosis, there are other organisms .

-Pulmonary tuberculosis
The first feature of the disease that is caused by these organisms is pulmonary tuberculosis because mycobacterium loves to be associated with the presence of high levels of oxygen and this found in lung.
Pulmonary tuberculosis can be symptomatic and non symptomatic.
Symptomatic exudative type associates with the presence of cavities in lungs due to the tissue damage and granuloma production by the organism and this may or may not be associated with the clinical features of the disease.

In developing countries like Jordan up to 90% of children contain few number of this organism-tubercle bacilli- in their lungs (not activated small legions) ,but because of the body's immune response and cell mediated immunity there will be no appearance of clinical features. Once our body immune response decreases, the legions will be activated and produce active productive type of tuberculosis (active type due to endogenous infection).

In brief: The organisms were already in the lung, once there was weakness in immune response they will transform to the active form .

Most cases of tuberculosis in adults and elderly are related to internal sources (endogenous infection).

-Lab diagnosis

It is highly important because any (+) case means that the disease will spread to others.

First we have to take specimen from an infected person and see if there is any acid-fast bacilli bacteria and then stain it with acid- fast especial stain (Ziehl – neelsen stain). Secondly, we have to culture it and make x-ray of the patient's chest (in order to see the legions).

Mycobacterium tuberculoses might disseminate in any internal part of our body or any organ (might associated with meningitis, bone infection, gastrointestinal infection and might excreted from kidney to urine).start as intracellular infection then cause damages to the tissues.

-Treatment

- Especial types of drugs are used to treat the infection that caused by Mycobacterium tuberculosis and they are given in form of triple drug.
- Also there is vaccine (BCG vaccine) against Mycobacterium tuberculosis which protects up to 40-50%.The vaccine obtained from the cell wall and membrane of the bacteria cell by repeated culturing (they repeat the culture process 50 times to release the cell wall and cell membrane components from the bacteria).It is reintroduced after they stopped it few years ago , but because more people become incidence to tuberculosis cases they reintroduce it and students in elementary schools should be vaccinated to be protected from tuberculosis.

Wish you all the best …