GI
MICROBIOLOGY

6

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In this lecture , we are gonna further examine , GIT-Infections-causative bacteria , particularly 3 new genera :

The Brucellae, Leptospira and Mycobacterium of the GIT .

*Brucella is the causative microbial pathogen of : Brucellosis .

*Leptospira is also responsible for the pathogenesis of : Leptospirosis .

The latest clinical condition is most probably asymptomatic , however , the minor symptomatic cases exhibit a wide-spectrum of symptoms , collectively , can be examined in the outline of Weils syndrome , to be clarified soon .

*abdominal mycobacterial TB : whose most common route of development is ingestion of Mycobacterium bovis – contaminated , unpasteurized milk , with animal (particularly cow) source of contamination .

THE BRUCELLAE

Gram -ve , non motile , non-spore forming , unencapsulated coccobacilli .

• The brucellae are obligate parasites of animals and humans and are characteristically (in an obligate to facultative manner) located intracellularly.

• They are relatively inactive metabolically.

Under the genus , are 8 members related in DNA composition , consequently categorized ALL to belong into one unique specie , Brucella melitensis , with remaining members considered as biovars of the specie.

4 out of these members are obligate to animals and typically does not undergo zoonotic transmission to human .

The remaining 4 represent our concern , as they are causative to human infectious , Brucellosis , here they are :

1-Brucella melitensis : typically infects goats , the most usual to infect humans .

2.Brucella suis, typically infects swine and pigs

3.Brucella abortus, cattle , its name indicates its biologic effect , abortion , but pay attention to the fact that only animal victims of such bacteria are vulnerable and susceptible to this effect , while human hosts are safe , this mainly refers to the multiplication -and- growth-enhancing conditions

provided by a chemical label , Erythritol , present on the placental and fetal calf membranes of cattle , whereas human placental membrane lacks such infectious facilitating conditions (Erythritol) .

4. Brucella canis,that infects dogs.

- Other species are found only in animals ,as stated before (DO NOT infect humans)

. • Although named as species, DNA relatedness studies have shown there is only one species in the genus, B melitensis, with multiple biovars

All the Previous Biovars exhibit aerobic Oxygen behavior , with a BIG exception of Abortus that is microaerophilic , with optimal activity at low oxygen tension and 5-10% CO2 supplement .

• The disease in humans, brucellosis (also called undulant fever, Malta fever , Gibraltar fever , Mediterranean (the name refers to its vast distribution in the region , until health care professionals stated the diagnostic principle of : Brucellosis until proven opposite only when apparently examining virtual characteristic manifestation related to the disease , although it might be common with other pathologic conditions . but the endemic limits the expectation and adds credits of certainty to the choice of Brucellosis) , Brucellosis is characterized by an acute bacteremic phase , that is CRITICALLY IDENTIFIED by

1-theUP-DOWN- FLUCTUANT , wavy, irregular ,intermittent pattern of associated fever , which worsens in the daily time period of afternoon till evening , however , the fever is revealed and the body sweats and dampens down its temperature at night , and the pattern is repeated in a daily manner .

2- musculoskeletal symptoms : malaise , myalgia , arthralgia , general tiredness , misery (upset – dissatisfied state) .

By such circulatory transmission Brucella targets Reticular Endothelial organs of liver – spleen – bone morrow , to initiate (followed by) a chronic stage that may extend over many years and may involve many tissues

Brucellosis is highly contagious , it carries highly remarkable risk of transmission that causes practitioners and specialists to avoid dealing with human- Brucellae contaminated samples , and adds value of vulnerability to clinical medical personnel when communicating with infected patients .

Pay attention to the clinical and etiological background differences in between Mediterranean fever (Brucellosis – infection – associated) and the Familial Mediterranean Fever (FMF) (autoinflammatory genetic disorder that mainly affects people of Mediterranean origin)

Morphology and Identification

The appearance in young cultures varies from cocci to rods 1.2 µm in length, with short coccobacillary forms predominating.

They are gram negative but often stain irregularly, and they are aerobic, nonmotile, and non-spore forming.

• Brucellae are adapted to an intracellular habitat, and their nutritional requirements are complex.

• Whereas B abortus(seeks microaerophilic conditions) requires 5–10% CO2 for growth, the other three species grow in air.

• Catalase and oxidase are produced(catalase – oxidase positive) by the four species that infect humans.

• They are killed by boiling (60 ◦C for 15 minutes to achieve sterilization) and pasteurization (which again indicates an important common route of transmission : ingestion of contaminated unpasteurized milk) but are resistant to freezing and drying .

Brucellae exhibit metabolic carbohydrate utilization , but lacks a fermenter behavior towards them .

Epidemiology

Brucellae are animal pathogens transmitted to humans by accidental (Direct), as well as occupational contact with infected animals" (eg, farmers, veterinarians, and slaughterhouse workers) (Animals are the main natural reservoir of Brucellae) feces, urine, milk, or tissues , and several other animal body fluid .(consequently , the underlying generated Brucellosis is described as zoonotic).

The common sources of infection for humans are

FIRSTLY : Intestinal tract : Ingestion of

A- contaminated unpasteurized milk (upon such medium , Brucellae can survive colonization till nearly 2 weeks) ,

B- contaminated milk products and cheese (dairy elements),(upon the latter dairy environment , Brucellae persist longer nearly up to 4 months) .

Cheese made from unpasteurized goat's milk is a particularly common vehicle for transmission of brucellosis.

SECONDLY : oral or conjunctival mucosal exposure into intact infected tissues or inhalation of volatile ones , such risk mostly threatens veterinarian , farmers and butchers .

THIRDLY : percutaneous exposure to contaminated needles , blood volatile splashes ,when dealing with patient Brucellae -infected samples , such risk mostly threatens medical personnel

FOURTHLY: Recently , vaccines have appeared on the area to offer preventive credits to animals , However , Accidental percutaneous injection of the live – attenuated vaccine strains of B. abortus (S19 and RB51) and B. melitensis (Rev 1) can cause disease.

B. melitensis and B. suis have historically been developed as biological weapons by several countries and could be exploited for bio-terrorismmiology .

Pathogenesis

• Although each species of Brucella has a preferred host, all can infect a wide range of animals, including humans.

• The common routes of infection in humans are the intestinal tract (ingestion of infected milk), mucous membranes (droplets), and skin (contact with infected tissues of animals). Cheese made from unpasteurized goats' milk is a particularly common vehicle.

• The organisms progress 1st from the portal of entry ,via lymphatic channels, it performs intracellular infectious attitude , either in the mono nuclear cells at the blood , or macrophages in tissues , until being carried out to the regional draining lymph nodes , to the thoracic duct and the bloodstream, distributes them to the reticular parenchymatous organs(liver – spleen – bone morrow) .

As a response , an inflammatory caseous Granulomatous nodules (our immune response to intracellular infections ,) try to limit the infection when an immune cellular bunch of epithelioid and giant cells surround the infected cells , which forms a core of central necrosis , that may develop into abscesses form in lymphatic tissue, liver, spleen, bone marrow, and other parts of the reticuloendothelial system.

In such lesions, the brucellae are principally intracellular.

• Osteomyelitis, meningitis, or cholecystitis also occasionally occurs (as side septic complications .

The main histologic reaction in brucellosis consists of proliferation of mononuclear cells (Shell of the granuloma), exudation of fibrin, coagulation necrosis, and fibrosis .

. • The granulomas form and consist of epithelioid and giant cells, with central necrosis and peripheral fibrosis.

Clinical Findings

• The incubation period ranges from 1–4 weeks (from the onset of exposure

The onset of disease is insidious, with the following DURING THE INITIAL BACTERIMIC PHASE .

1-malaise

2- undulant fever, that usually rises in the afternoon; and falls during the night is accompanied by drenching sweat, along with

3-musculoskeletal weakness, aches, and sweats , deep pain(but of different spectra of distribution as age differs) and disturbances of motion, mainly due to spondylitis in vertebral bodies which suggests osteomyelitis

Previously, such disturbances (abnormal gait (walking)) were typical presentation , the key to develop virtual apparent diagnosis for the widely spread Brucellosis Endemic in the region . (brucellosis until proven otherwise)

TO SUM UP : Brucellosis presentation can be of three forms :

1-ONLY Undulant , and a subside myalgia , arthralgia , malaise .

2-For CHILDREN : Undulant fever accompanied by MONOarthritis , particularly in the hip and knee joints .

3-For ELDERLY : Undulant fever accompanied by low-back , hip joint pain

The following symptoms are of generalized Brucella infection generally subside in weeks or months, although localized lesions and symptoms may continue 1-gastrointestinal and nervous symptoms.

2-Lymph nodes enlarge (due to the infectious portal of entry),

3-And the spleen becomes palpable (Hepatosplenomegaly contributes to differential diagnosis of Brucellosis .

4- Hepatitis may be accompanied by jaundice.

.

• After the initial infection, a chronic stage may develop, characterized by weakness, aches and pains, low-grade fever, nervousness, and other nonspecific manifestations compatible with psychoneurotic symptoms.

Diagnostic Laboratory Tests :

Brucellosis Diagnosis is kind of insidious and can be referred to as diagnostic puzzle .

➢A. Specimens • Blood should be taken for culture, biopsy material for culture (lymph nodes, bone, and so on), and serum for serologic tests.

➢B. Culture , Brucella can grow on all common laboratory media

• Brucella species bacteria grow on commonly used media , those supplied by Fetal Calf Serum(FCA) , including trypticase-soy medium with or without 5% sheep blood, brain–heart infusion medium, and chocolate agar

. • The typical virulent organism forms a smooth, transparent convex shaped colony; upon culture

• Brucella selective agar , specifically designed to culture Brucella species bacteria , (and Campylobacter species). The medium is highly enriched and—in reduced form—is used primarily in cultures for anaerobic bacteria.

Colonization occurs within 3 weeks , a relatively long period , and in many cases the medium gives negative culture results (non-effective diagnostic method)

C. Serology , the most dependable diagnostic method

• Immunoglobulin M (IgM) antibody levels start to rise during the first week of acute illness, peak at 3 months, and stay up to more than two years , that's why the are not considered as effective diagnostic serologic target .

IgG and IgA antibody levels in parallel time lines rise about 3 weeks after onset of acute disease, peak at 6–8 weeks, and remain high during chronic disease.

There are two types of these serologic Brucellosis diagnostic tests :

Agglutination and Non-agglutination ones

❑Agglutination test :

Commonly called SAC : Serum agglutination test

: If IgG – specific agglutinin occurs , when obtained serum is tittered (diluted)above 1:80, this indicates active infection (diagnostic marker). (some books refer to the titration level of (1:60))

Individuals injected with cholera vaccine may develop agglutination titers to brucellae.

❑Non – agglutination ELISA assays

IgG, IgA, and IgM antibodies may be detected using enzyme-linked immunosorbent assay (ELISA), which uses cytoplasmic proteins as antigens. These quantitive assays tend to be more sensitive and specific than the agglutination test especially in the setting of chronic disease .

Here are three phenomena leading to confusion of Brucella serologic diagnosis :

1-prozone phenomenon : a false negative response resulting from high antibody titer during sample preparation , which interferes with formation of antigen- antibody lattice .

2-postzone phenomenon : a false-negative test resulting from high antigen titer during sample preparation , which interferes with the formation of the antigen-antibody lattice .

Both phenomena are overcome by Coombs test and fixation of titration levels .

3- blocking antibodies : presence of human antibodies masking the target ones , can be overcome by using Anti-human globulins .

4- cross reactive antibodies , of previous Yesinia , Salmonella ,vibrio infections or current tularemia condition , can mimic the target one and result in false positive diagnosis .

Treatment & Immunity

- For best results, the first line management and treatment must be prolonged. Combined treatment with a tetracycline (eg, doxycycline) and either streptomycin (one gram per day) for 2–3 weeks (45 days) or rifampin for 6 weeks is recommended

• Brucellae may be susceptible to tetracyclines, rifampin, trimethoprim–sulfamethoxazole, aminoglycosides, and some quinolones.

Symptomatic relief may occur within a few days after treatment with these drugs. However, because of their intracellular location, the organisms are not readily eradicated completely from the host.

Prevention, and Control :

mostly directed for animal reservoir to limit the zoonotic transmission.

Available vaccines target animals but not human , such vaccines form the accidental percutaneous source of infection threatening vets .

• Eradication of brucellosis in cattle can be attempted by test and slaughter strategy , active immunization of heifers with avirulent live strain 19, or combined testing, segregation, and immunization. Cattle are examined by means of agglutination tests.

• Active immunization of humans against Brucella infection is experimental.
• Control rests on limitation of spread and possible eradication of animal infection, pasteurization of milk and milk products, and reduction of occupational hazards wherever possible.

LEPTOSPIRE

* Traditionally, the genus Leptospira comprised two species:

the pathogenic L. interrogans and the free-living L. biflexa,

now designated L. interrogans sensu lato and L. biflexa

sensu lato, respectively.

*leptospire is the causative microbial pathogen of : Leptospirosis

* Leptospirosis characterized by a broad spectrum of clinical manifestations, varying from asymptomatic infection to fulminant, fatal disease (Weil's Syndrome).

*Weil's Syndrome is a triad:

1. Hepatitis
   → diagnosis: 1) elevated liver enzymes 2) hepatomegaly 3) jaundice
2. Nephritis
   → diagnosis :blood urea nitrogen retention
3. Hemorage

→most common hemorage is **pulmonary**

2 nd most common site is intra cranial hemorage

*Kidney involvement in many animal species is chronic and results in the shedding of large numbers of Leptospirae in the urine; this is probably the main source of environmental contamination resulting in infection of humans.

* Leptospirosis is uratic disease , can be transmitted to humans ant between humans

* Human urine also may contain spirochetes in the second and third weeks of disease.

* **what is rout of transmission ?**urine , Exposure to water or other materials contaminated with animal or human urine.

***what is the most implicated animal urine that cause infection and transmission ?** Rats and white rodents .(Soooo,one of **main preventive** measures is control of rats)

***what is the rout of entry and exposure ?** mainly, skin followed by mucosal (skin cuts , abrasion and eyes) and rarely by ingestion .

Leptospira interrogans

Morphology :

* Leptospirae are [1] tightly coiled,[2] thin, [3]flexible

[4]5–15 µm long, with[5] very fine spirals 0.1–0.2 µm wide;

one end is often[6] bent, forming a hook (or question mark). They are[7] motile.

* [8]it is neither gram positive nor negative

* They are actively motile (they possess [9]two priplasmic flagella) , which is best seen using a dark-field microscope.

* out side info. About **priplasmic flagella** : flagella that are located in the periplasmic space, which is the area between the bacterial cell wall and the cytoplasmic membrane.
also known as **axial filaments** or **endoflagella**

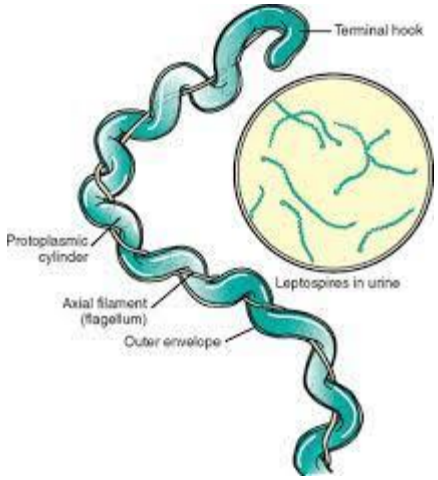
From where it get energy ?

* they are [10] aerobic

*Leptospirae derive energy from oxidation of long-chain fatty acids and cannot use amino acids or carbohydrates

as major energy sources. Ammonium salts are a main

source of nitrogen.



* Leptospirae can survive for weeks in water, Particularly at alkaline pH.

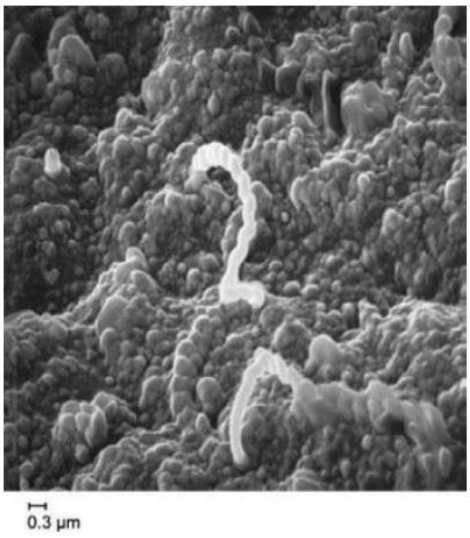
Epidemiology

* Leptospirosis essensialy an animal infection (zoonotic disease).it transmite in the context of urine and excreta of infected animal .

* Leptospirosis has a worldwide distribution but occurs most commonly in the tropics and subtropics because the climate and occasionally poor hygienic conditions

favor the pathogen's survival and distribution.

Look at this sketchy pic



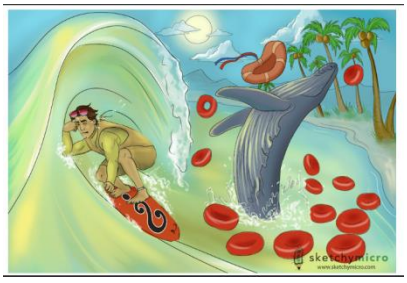
Leptospire interrogans under electron microscope

*Current information on global human leptospirosis varies but indicates that approximately 1 million severe cases occur per year, with a mean case–fatality rate of nearly 10%.

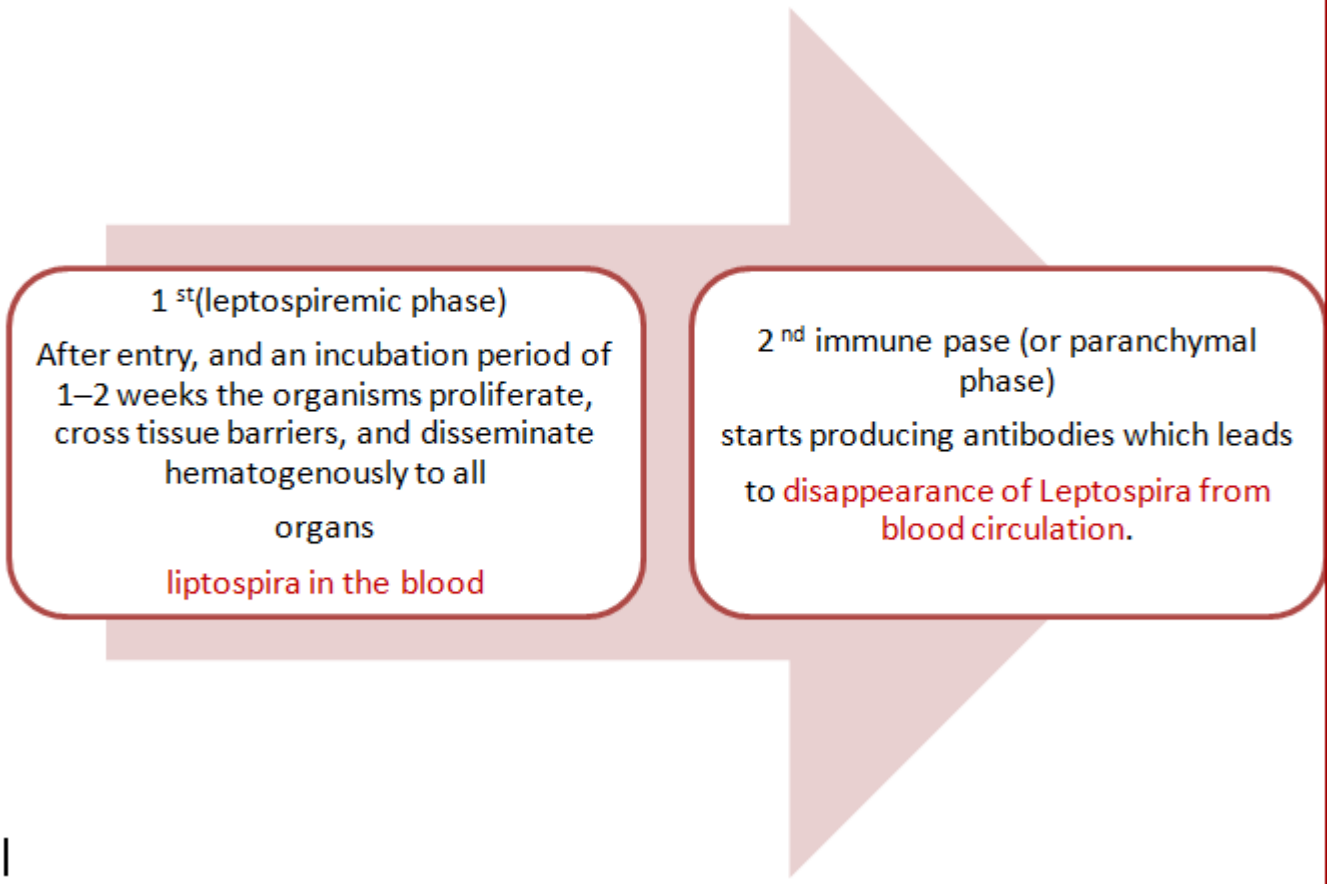
*The vast majority of infections with Leptospira cause no or only mild disease in humans. A small percentage of infections (~1%) lead to severe, potentially fatal complications.

Pathogenesis

Infected animal (rodents or human as example) →urine and excreta → contaminated water or other materials (even tissues of infected animal)→skin cuts followed by mucosa (rarely by ingestion) →liptospire cross tissue barrier <u>after period up to 2 weeks</u> → they disseminate hematogeneously (see the blood in sketchy)→ they establish themselves in parenchymatous organs (particularly liver and kidneys)



DISEASE IS BIPHASIC



*more info about second phase :

*They then establish themselves in the parenchymatous organs (particularly liver and kidneys), producing hemorrhage and necrosis of tissue and resulting in dysfunction of those organs (jaundice, hemorrhage, nitrogen retention) ,IgM antibody titer rises .

Clinical Findings

*The illness is often biphasic. After initial improvement, the second phase develops when the IgM antibody titer rises. It manifests itself often as “aseptic meningitis” with an intense headache, stiff neck, and pleocytosis of the CSF.

*presentation acutly look like “aseptic meningitis” aseptic refer to viral meningitis .

* Pleocytosis of the cerebrospinal fluid (CSF) is a condition characterized by an abnormally high number of white blood cells (WBCs) in the CSF

cells all types (why all types ? because aseptic refer to viral meningitis .

* Nephritis and hepatitis may also recur, and there may be skin, muscle, and eye lesions.The degree and distribution of organ involvement vary in

the different diseases produced by different Leptospirae in various parts of the world.

* Human urine also may contain spirochetes in the second and third weeks of disease.

* The doctor presented a scenario where a swimming pool is contaminated with urine containing Leptospira bacteria, and people who swim in this pool have show[1] conjunctivitis without exudates just erythema and[2]musculoskeletal symptoms, especially myalgia (muscle pain) it's more a flu-like illness(fever, chills, headache, nausea, vomiting, abdominal pain) .

* Many infections are mild or subclinical. Hepatitis is frequent in patients with leptospirosis. But this does not ignore that it is a fatal disease with bleeding and multi-organ failure (Weil's Syndrome)

Diagnostic Laboratory Tests

A. Specimens

→ Specimens consist of [1] whole blood,[2] CSF, or [3] urine and [4]tissues for microscopic examination and culture.

B. Microscopic Examination

→ Dark-field examination or thick smears stained by the Giemsa technique

B. Culture

→ Leptospirae grow best under aerobic conditions at 28–30 C in semisolid medium (e.g., Ellinghausen-McCullough-Johnson- Harris EMJH) in 10 mL test tubes with 0.1% agar and 5-fluorouracil.

→ Growth is slow, and cultures should be kept for at least 8 weeks.

D. Serology

→ MAT and ELISA.

→ serology technique for Leptospira is called MAT (microscopic agglutination test)

→ Very high titers may be attained (>1:10,000)

- **EMJH** is **selective** for Leptospira
- **Culture or serology** are **definitive**

Treatment &Immunity

*Treatment of mild leptospirosis should be with oral doxycycline, ampicillin, or amoxicillin. الدكتور وهو بشرح حكا بدوش علاج

* it is good to start treatment as early as possible to prevent parenchymal organs (liver and kidney)disorders or failure.

*Severe leptospirosis and Weil's Syndrome should be treated with IV penicillin as soon as the diagnosis is consider.

*keep in mind tetracycline antibiotics could work (e.g :Minocycline Doxycycline and Demeclocycline)

* Serovar-specific immunity follows infection, but reinfection with different serovars may occur. Clarification to this statement is the writer note:

* Leptospira bacteria are classified into different serovars based on variations in the surface antigens of the bacterial cells. When a person is infected with a specific serovar, their immune system produces antibodies that are specific to that serovar , so reinfection may occur.

Prevention, and Control

* main preventive measures is control of rats as they are the main reservoir.

* Leptospirae is excreted in urine both during the active illness and during the asymptomatic carrier state.

* Leptospirae remain viable in stagnant water for several weeks; drinking, swimming, bathing, or food contamination may lead to human infection. Persons most likely to come in contact with water contaminated by rats (e.g., miners, sewer workers,farmers, and fishermen) run the greatest risk of infection.

* Avoidance of exposure to urine and tissues from infected animals through proper eyewear, footwear, and other protective equipment. Targeted rodent control strategies could be considered.

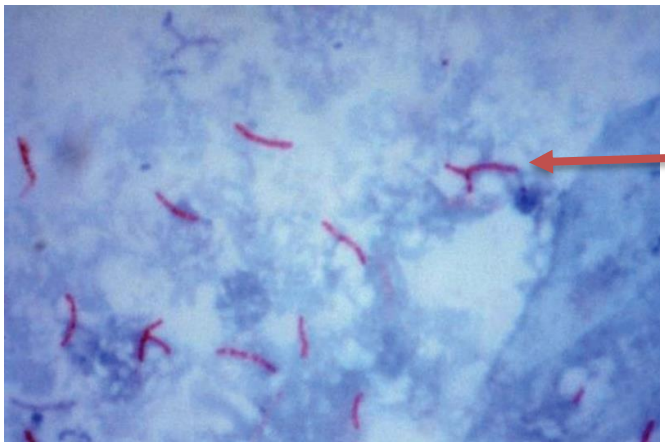
* Vaccines for agricultural and companion animals are generally available, and their use should be encouraged. No human vaccines

Mycobacterium Tuberculosis (Mtb)

Tuberculosis (السّل أو التدرّن) receives a remarkable attention by Health Ministry which singles a complete directorate for the follow -up of HIV and Tuberculosis , within the field of communicable disease management .

- The family mycobacterium tuberculosis complex(MTC) can cause Tuberculosis (TB) in humans and other livings .
- It includes M. tuberculosis (Mtb) the prototype , Mycobacterium africanum, Mycobacterium bovis, Mycobacterium microti, Mycobacterium caprae, Mycobacterium pinnipedii, Mycobacterium suricatte, Mycobacterium mungi, Mycobacterium dassie, Mycobacterium oryx and Mycobacterium canetti.
- pathogenic Mtb is a characterized to be slow growing ,obligate aerobe, facultative intra- cellular bacterium , non-spore forming, non-motile acid fast bacilli.

*Mtb intracellular infection is contained by the adaptive immune system through the inflammatory caseating .



Acid fast bacillus

The previous sputum addresses obtained sample of pulmonary Tuberculosis , the infectious mycobacterium can only be visualized by means of red carbol fuchsin stain that can penetrate the complex lipid cell wall of pathogen under appropriate heating .

Soon after , the preparation is washed by acids and alcohol , and treated by blue counter stain , however the initial red stain survive among until the end of this acidic preparational journey , this resistance behavior of the carbol fuchsin stain gave rise to common nomenclature of mycobacteria as acid fast bacilli .

Mtb was not discovered until the 19th century, when Robert Koch utilized this previous new staining method (ZN stain) and applied it to sputum from patients discovering the causal agent of the disease Tuberculosis (TB) , consequently Mtb is commonly known as Koch bacillus.

Our major clinical form focus of tuberculosis is the abdominal one , familiar to be referred to Mycobacterium bovis infection , which human usually encounter upon the ingestion of unpasteurized contaminated milk products

Epidemiology

Two TB-related conditions exist; 1-latent TB infection (LTBI) , without symptoms -signs , and are not contagious cannot spread TB to others , waiting for the right moment of activation , for instance at immune compression

• About one third of the worlds population is infected with TB bacteria (TB latency) . However, only small proportion of those latent – infected will undergo activation and become sick with TB ,

2- active TB disease.

A significant epidemiological formula related to tuberculosis is :

10:3:1 . In each 10 cases of exposure to tuberculous bacilli

: 6 are capable to clear the infection by innate and adaptive immune systems .

: 3 out of the remaining 4 develop latent infection

: and only 1 of the ten cases develops active tuberculosis .

• TB is considered an airborne infectious disease , major route of transmission is mainly respiratory , consequently , Pulmonary TB is predominant among other extrapulmonary clinical forms , and responsible for about 80% of Mtb infectious cases .

The most common extrapulmonary TB form is tuberculous lymphadenitis , followed by pleural TB ,

Although M. tuberculosis complex organisms can be spread through un-pasteurized milk, direct inoculation and other means which gives rise to abdominal TB that takes place in **10-15%**of extrapulmonary cases .

*Abdominal tuberculosis (TB) includes involvement of the gastrointestinal tract, peritoneum, lymph nodes, and/or solid organs .Abdominal TB comprises around **5** percent of all cases of TB

Important **Abdominal TB can be in one of 4 sub forms : tuberculous lymphadenopathy (inside the abdominal cavity) -peritoneal tuberculosis (most common form),GI tuberculosis and Visceral Tuberculosis involving solid organs .

• TB remains a leading cause of infectious diseases morbidity and mortality. In 2015, an estimated 10.4 million new TB cases were seen world wide.

• The primary site of TB is usually lung, from which it can get disseminated into other parts of the body. The other routes of spread can be contiguous involvement from adjacent

tuberculous lymphadenopathy the affected area is next to or touching another area that is also affected or primary involvement of extrapulmonary organ it can start in an organ outside the lungs.

Gastrointestinal TB

*The abdominal TB, which is not so commonly seen as pulmonary TB, can be a source of significant morbidity and mortality and is usually diagnosed late due to its nonspecific clinical presentation.

- Rout of transmission of TB to GI:

1)Tuberculosis of the abdomen may occur via reactivation of latent TB infection or by ingestion of tuberculous mycobacteria (as with ingestion of unpasteurized milk, or sputum or undercooked meat).

2) In the setting of active pulmonary TB or miliary TB spread throughout the body via the bloodstream and form tiny, millet seed-like lesions in multiple organs, abdominal involvement may develop via hematogenous spread via contiguous spread of TB from adjacent organs direct spread (such as retrograde spread from the fallopian tubes in females and spinal cord in both males and females) or via spread through lymphatic channels.

- The mucosal layer of the GI tract can be infected with the bacilli with formation of epithelioid tubercles(granuloma)in the lymphoid tissue of the submucosa. After 2-4 weeks, caseous necrosis of the tubercles leads to ulceration of the overlying mucosa which can later spread into the deeper layers and into the adjacent lymph nodes and into peritoneum. Rarely, these bacilli can enter into the portal circulation or into hepatic artery to involve solid organs like liver, pancreas and spleen.

Gastrointestinal TB clinical finding

*The symptoms of tuberculosis depend on whether it is pulmonary or extrapulmonary or both but the main symptom is fever and night sweats.

*The clinical presentation tends to be non-specific, with abdominal pains and general complaints.

* the main symptoms of abdominal TB is **abdominal pain and a palpable mass**.

*Although any portion of the gastrointestinal tract may be affected, the terminal ileum and the cecum are the sites most commonly involved . Abdominal pain (at times similar to that associated with appendicitis) and swelling, obstruction, hematochezia, and a palpable mass in the abdomen are common findings at presentation. Fever, weight loss, anorexia, and night sweats are also common.

Laboratory diagnostic methods

- ❖ PCR

❖Smear microscopy:

*Three specimens from each patient with suspected TB should be examined microscopically for Acid Fast Bacilli AFB (classically Ziehl-Nielsen) or mycobacteria can be demonstrated by yellow fluorescence after staining with auramine(new technique).

❖Culture

*the disadvantage of it takes up to 8 weeks .

*Both liquid and solid mycobacterial cultures should be performed for every specimen, and recovered isolates should be According to standard criteria (Lowenstein-Jensen or Middlebrook 7H10), Radiometric broth culture (BACTEC radiometric system). mycobacterial growth indicator tube (MGIT**).**

* BACTEC and MGIT are growth indicator tubes but specificity is low they may end in false negative.

*Culture for acid fast bacilli is the most specific test for TB and allows direct identification and determination of susceptibility of the causative organism.

❖A nucleic acid amplification test (NAAT), Tuberculin skin tests (TSTs), Interferon-gamma release assays (IGRAs) are commonly used as well**.**

* (TSTs) and (IGRAs) show past exposure without indicating time fo this exposure , (TSTs) give false positive if patient is vaccinated or environmental macrobacteria.

Treatment

*Because it is intracellular infection treatment take at least 6 months .

*The course of TB treatment depends on whether the individual is in the latent or active stage, and on his or her probability of risk.

*Treatment of TB usually involves a drug cocktail, or a mixture of multiple drugs, with an intensive initial 2-month phase in this phase 4 drugs are used Isoniazid (INH), Rifampin (RIF), Pyrazinamide (PZA), and Ethambutol (EMB)., followed by a slower 4- to 6-month continuation phase 2 drugs of the four above the patient continue on that's why it is called continuation phase

* the main anti-tuberculosis drugs used in the chemotherapy of TB are: isoniazid (INH), rifampin(RIF), pyrazinamide (PZA), and either ethambutol (EMB) or streptomycin (SM).

* Isoniazid preventive therapy IPT is the recommended treatment for LTBI but the regimen's main drawback is the duration of therapy for latent TB, isoniazid is the drug of choice for 9 months .

Prevention

*The TB vaccine is Mycobacterium bovis Bacillus Calmette–Guérin (BCG), an attenuated vaccine derived from M. bovis, is the only licensed vaccine against tuberculosis (TB). It is a live attenuated vaccine, meaning that it contains weakened bacteria that can still stimulate the immune system but are not strong enough to cause disease in healthy individuals.

* (BCG) efficacy range from 0-80 %

*The best way to prevent TB is to diagnose and isolate infectious cases rapidly and to administer appropriate treatment until patients are rendered noninfectious (usually 2–4 weeks after the start of proper treatment) and the disease is cured.

*Additional strategies include BCG vaccination and treatment of persons with LTBI who are at high risk of developing active disease.

" هل السعي يضمن حتمية الوصول ؟

نعم يضمن حتمية الوصول ...

ليس بالضرورة إلى ما سعيت إليه من البداية , ولكنه

حتمًا سيوصلك إلى مكان يستحق السعي من اجله "