

In the Name Of Allah, The Most Gracious, The most merciful

■ Objectives :) :-

- 1- List diseases correlate with Bacterial skin infection.
- 2- List the diseases contribute to fungal skin infections
- 3- General lab diagnosis and treatment of Fungal skin infection

****less Common Bacterial Skin Infections:**

1) Skin rashes caused by N. Gonorrhoea (STD)

- Generally, In relation to skin infection, it is not necessarily means the presence of the Organism in the infected tissue of the skin, but, it might be manifest in form of skin rashes.
-E.g. N.gonorrhoea in certain cases, it might associated with presence of skin rashes , it might also associated with skin Rashes following treatment but this skin rashes are only in form of allergic reaction and not that important. In addition, the presence of rashes is rare.

-- There is no acute infection. (No vaginal discharge no urethral discharge).

2) Soft chancre /chancroid caused by Haemophilus ducreyi:

- It is Like other species in **hemophilus** (genera) which are found in the upper respiratory tract are gram (-ve) bacilli but this type is associated mainly with genital tract infection causes (genital ulcer).

-- **Epidemiology:** It is a sexually transmitted disease in certain tropical and subtropical countries especially in African ones. **Pathogenesis:** the organism can be disseminated during sexual contact and might be associated with developing of painful and severs ulcers over the extra genitalia. this ulcers are developed from persist previous lesions and can't be easily disappeared so it persist for few weeks to few months. It is not associated with virginal or urethral discharge nearly similar in this property with treponema palladium the causative agent of syphilis. **Identification (Diagnosis):** it is easily demonstrated into gram (-ve) bacilli as well as using a culture media ;but this organism therefore the disease is not found in our countries.

3) **Syphilis: caused by Treponema pallidum**, Making similar lesion of the soft chancre but in syphilis the lesions appear nearly for one week and then disappear as we know the developmental stages of the disease 1ry 2ry etc

-- **Chancroid** caused by H.ducreyi are more sever and easily distinguished from syphilis as they have their persistent lesion which lasts for weeks to months

- So *Treponema pallidum* and *Haemophilus ducreyi* might produce ulceration in extra genitalia and sometimes they would not be easily distinguished using clinical means by observation of lesions especially Soft chancre /chancroid (*Haemophilus ducreyi*)). *H. ducreyi* produce more severe inflammatory reaction and more ulceration than *T. pallidum*.

4) **Meningococemia**: normally *Neisseria meningitidis* produce acute meningitis, but the acute meningitis can't occur except if the organism had been already present in the blood. therefore in acute infection might at the same time you recognize the feature of meningitis, blood sepsis and later as a complication even after the treatment the skin of patient might develop a hemorrhagic(lesions) due to thrombosis which (were) at the beginning allergy ((Skin Rashes)).so what you 'd find lately are certain dangerous hemorrhagic skin lesions associated with further complications.

5) **Rickettsial disease**: caused by type of gram (-ve) bacilli which is hard to be cultured, it can't be demonstrated with gram stain but it can be detected by molecular techniques and not by artificial culture (you can't culture in other organism). normally you can culture the causative agent of rickettsia in animal culture or tissue culture and this procedure will require nearly 2-4 weeks ; It's rare in Jordan . **So diagnosis based mainly on: 1) clinical feature.2) serological means (Demonstration of specific antigen or antibodies).**

-- There are many types of *Rickettsia*, each has certain specification, the most common 2 are:

1st) **R. prowazeki**: which cause epidemic typhus Not Typhodal fever which have the same clinical features at the beginning of continuous high fever, Headache ,coma with GI symptoms ; later causes hepatosplenomegally and disseminated vascular coagulation, ...etc.

- It is transmitted by body lice from human to human and don't contribute with vit D deficiency.
- Typhus is more dangerous than typhodal fever and more associated with severe internal bleeding
- The acute form of epidemic typhus only found in Elderly people, rarely in other ages and it is a fatal disease if not treated with antimicrobial drug and in the past there were no antimicrobial drugs so a lot of the people in the past died following the complication of infection. so it is a fatal disease associated with high mortality.
- recognized in forms of outbreaks as in school etc.

2-R. rickettsii (Spotted fever): similar to the first type but found in certain countries and transmitted from animal to human by ticks and rarely from human to human with more cases in countries with mountains " also called rocky mountain spotted fever"

- It is less dangerous than epidemic typhus cause the body response more toward the infection producing more form so it might not require the treatment of Antibacterial drugs.
- Often Rickettsia Multiply first in the endothelial cells of the blood stream and produce thrombosis, bleeding, vasculitis and associated exactly with systemic type of infection in relation to all internal body organs including GIT, Liver, spleen, kidney ...etc.
- DIAGNOSIS OF Rickettsia: Serological more than culture which is difficult to use.
- Treatment: Drug of choice is Tetracycline in severe forms .

6) Cutaneous Black Lesions caused by **Bacillus anthracis**.

-- **Bacillus anthracis: Epidemiology:** aerobic spore forming bacteria found usually in the intestines of the large animals and excreted from these animals into environment therefore, it is very common in the soil in association to vegetation.

-- **Pathogenesis,** Bacillus anthracis is maybe a causative agent for skin subcutaneous lesions especially if it manage to log in injured skin where might produce ulceration slowly and this ulceration might be recognized into the form of black nodule which is require treatment by surgical means and might be systemic debridement. common among farmers who are in close contact with animals. the lesion colored with brown to black color

7- Myonecrosis , Cellulites and gas gangrene caused by **Clostridium perfringens** which is anaerobic spore forming bacteria found widely in the nature, easily can contaminate our skin and if there is any injury especially severe injuries associated with damage of subcutaneous tissue and if the organism might to reach the anaerobic part of these tissues it will be associated first with simple Cellulites, Fasciitis ,Myonecrosis and finally gas gangrene. Often the infection is so severe and need surgical debridement or even amputation of the infected organ and using of antimicrobial drug due to the fact that infection with clostridium perfringens in form of gas gangrene or myonecrosis often a mix infection and not only related to anaerobic spore forming bacteria but you might have other organism associated whither gram (+ve) or gram (-ive). It is similar to staph aureus by which by producing a variety of exotoxins and a variety of extracellular enzymes including ,Lipases ,collagenases ..etc. . infection with c.perfringen is so extensive and rapid so within a short period of 24 -48 hours might form a severe damage in the infected tissue especially in subcutaneous tissue, in association with developing large amount of gases and edema which produce more damage in the blood vessels and infected organ.

8) Lyme disease. Causative agent: **Borrelia Burgdorferi:**

This bacteria is gram negative bacilli. It is difficult to be cultured and it could be cultured using Broth media (Not Agar). We usually take a blood from the infected patient we suspect it contain the bacteria and use infant mouses (MICE) to increase the number of Bacilli and later to study these and classify into different types because we have more than 100 serotype in relation to cell wall composition. **Lyme disease** manifested by the presence of lesions especially in the upper part of the body and mostly in the neck. It might even be associated with annular erythematic lesions due to allergic reaction mostly and not inflammatory , and it's not associated with lymphadenitis and fever. These lesions might disappear and then reappeared Later and associated with a wider type lesions in many parts of the body.

Lyme disease has 2 stages: - 1st- associated with presence of rashes or spots.

2nd -Larger than the 1st type and more associated with allergic reaction and presence of specific antibody and antigen which is circulating in the blood and produce neurological disorders mostly affect the C.N.S and might affect the heart and produce a form of myocarditis. Lyme disease is a serious one but it is found in countries like USA, Canada and many other but not in our country; transmitted by ticks from wild animals to the humans Lyme disease **Detected by** the presence of either antigen or antibody of *Borrelia Burgdorferi* , and the culture is very difficult

9) Bartonellosis. Causative agent (Bartonella species):

-- **Bartonella** as genus is gram negative bacilli. difficult to grow in normal culture media in labs. It requires special culture media

-- **Bartonellosis** is common in our country especially in families who have cats in their homes. it is associated often with scratching of cats or cat bites. The infection often started in the skin often as a mild lesions and later will be ulcerations. The organism might disseminated into regional lymph node producing lymphadenitis. It might produce systemic infection in children. it is more dangerous if the bits and scratches are related to face because of developing more severe form of the infection in relation to lymphadenitis and sepsis. so, the severity of infection is related to location by what it is more severe in the face more than in other parts of the body. **Treatment:** the organism can be easily treated using antibacterial drug if has been suspected and in relation to the cat but sometime it is hard to establish of infection so you have to guess the cause of infection(he means if the patient don't has never been reported of being bitten by a cat).

10) Cutaneous Tuberculosis: (Causative agent: *Mycobacterium marinum-ulcerans*, very rare and uncommon by *M.Tuberculosis*):

- Mycobacterium marinum-ulcerans is a complex type of mycobacteria found in cold water, usually swimmer might acquire the infection if he has any injury in his skin. once the organism lodge in the injured site in the body it produces skin lesions which is at the beginning described as a mild lesion without a presence of any inflammatory reaction. It may cause Erythema and it might develop Granuloma slowly and in such case this is a clue for chronic ulceration which require surgical treatment or sometimes anti-tuberculosis.

-Mycobacterium Tuberculosis often cause pulmonary infection, but the pulmonary infection might disseminate to any organ in the body often internal organ or rarely associated with specific lesions in the skin. So cutaneous tuberculosis is not common with mycobacterium tuberculosis.

11) **Leprosy: (EJOZAM)'' Causative agent : M. leprae'' :-**

-- **leprosy**

-- it is a devastating type of disease. very rare in occurrence in Jordan and often rarely imported from other country (patient comes from other countries to us with leprosy. As Jordan receives and cure 150,000 Arab patients so there are several few cases might be found coming often from Yemen Or Sudan). **Diagnosis:** very difficult and might be confused with many other fungal disease and even might be diagnosed as infection by mycobacterium tuberculosis or other mycobacterium therefore, establishing diagnosis of Leprosy requires certain experience. Available **Laboratory methods of detection** is not enough due to the fact that mycobacterium leprae couldn't be cultured. it can be demonstrated as slightly acid fast bacilli by using acid fast stain (Ziehl -Neelsen stain) and often the infection is related more to cooler part of the body especially in the face, Mostly related to eyebrows, the septa of the nose or ear-lobes even the surface of the neck (lesion)

-- Demonstration of acid fast bacilli and especially in mild form called "Tuberculoid form", very few type of bacilli might be founded so it is not easy establish a presence of these acid fast bacilli in the infected area because of few numbers and what you see here more is developing an allergic reaction. Usually in the infected area we recognize tissue damage and even some liquefaction even in ear lobe, if you press the ear lobe of the patient, it will be separated without feel of pain because of the infection of the innervating nerve by these bacilli , so the patient become without sensation .Anesthetic lesion will be developed (without sensation , pain etc....).later on , the organism might disseminate into any part of body and produce more dangerous form of leprosy which known as "lepromatous type "

Leprosy Forms :

- 1- **Tuberculoid form:** Mild form, called tuberculoid because of the similar and typical lesions with that of mycobacterium.--It is associated with few acid fast bacilli. if you

use lepromin skin test which is similar to tuberculin skin test it might indicate the presence of allergic reaction (cell mediated reaction) to this antigen so lepromin test become positive due to the intact immune response of the patient in case of mild form as well as feeling of the pain ((in the mild form)) . 2- **The severe form (lepromatous type)**: we have numerous acid fast bacilli, Lepromin test is negative due to allergy overwhelming the immune response and there is a loss of nerve sensation in the infected area. this severe form is very difficult to treat (life threatening) and the patient will die and through long period of infection he might lose some organs especially the exposed parts (lobes , nose fingers ... etc).clinical features correlate to leprosy are very devastating. It is even unknown why leprosy establishing in some races without others (3a nas wnas) .There are many immunologic and genetic factor expected to be associated with leprosy. In most cases, it is spread through long-term close contact with a person who has the disease .generally, leprosy cases found in closed communities, like villages with low standard of hygiene especially who has close contact with animals. IP of the disease extending from few months up to 40 years or longer. The infection is not easy to be established in immunocompetent patient !!! .leprosy is associated with race, black skin is more susceptible and that completely contradict with the slides -_-.

- Number of Leprosy cases in the world range from 5-6 millions mostly found in India representing 60 % of all Leprosy cases around the world and it is even spread in other few countries like (Sudan, Yemen, Indonesia, etc.).
- Lab diagnosis: A skin biopsy may show characteristic granulomas with mixed inflammatory cell infiltrate in the deeper layers of the skin, the dermis and involvement of the nerves ; so lab diagnosis is difficult .
- **Treatment** Of leprosy: Few drugs might prescribe but these drugs can't eradicate or eliminate the organism mostly Dapsone and Clofazimine and these drugs mainly directed to Mycobacterium Leprosy not against the other types of acid fast bacilli. **WHO (world health organization)** recommend treatment by a long-life combination of 2 drugs, either Dapson with rifampicin ,or Rifampin, with Clofazimine in A cycle of 3-6 months "so a combination of anti-tuberculosis and anti-lyprotic drugs". **Aim of treatment:** using the aforementioned drugs in a cycle of 3-6 months in order **to control and reduce the severity of infection** and even **reduce** the transmission incidence of the disease. So the medication here used for reducing the severity and not eradicating the infection 100% .In addition, using of BCG vaccine along with leprosy vaccine might also reduce the severity if the infection which should be prepared in animals by special purification processes .It is under examination but used in some countries.

****Fungal skin infection:**

**** Fungal skin infections divided into 2 parts:**

1st Skin infection cause by filamentous fungi(dermatophytes) :

1)Tinea Corporis : lesions either be minimum or in form of spots and changes in the color, it either associated with hyper-pigmentation or hypo-pigmentation in the skin. If there are lesions associated with more erythematic reaction and may even with inflammatory reaction associated with bacteria, it is annular and only one or two lesion will present in the exposed part of the body. so here we got 1 or 2 spot not like the infection of **tinea versicolor** which is associated with many spots not 1 or 2 small or large. By the manifestation of this few lesions we recognize the disease and treat it with antifungal drug.

2)Tinea Pedis :lesions related to the feet. It is common in adult an elderly persons and not in children. it is found to be infect the males and females in the same range. It can be associated with inflammation in intradigital spaces between toes. it might affect the nails. It might spread into other parts of body to the Groin and associated with other type of Tinea called **Tinea Cruris**. **Treatment of tinea pedis** is very difficult and it can't be eradicated. The treatment only reduce the severity of inflammatory reaction , allergic reaction..etc .but, it always flair up in association with molds, activities...etc.

3)Tinea Cruris : Skin infection related to pelvic area in "Groin" .it is found mainly among men than women ; caused by Epidermophyton spp

4) Tinea Capitis : it is mainly related to **children**. It is related to hair shaft, scalp and it can be so sever associated with hair lose if the infection persist in the hair follicles. **Treatment:** systemic and topical treatment to get rid of the infection.

5) Tina unguium /Onychomycosis /Causative agent of dermatophytes are (**Trichophyton ,Microsporum** note can be caused by other filamentous fungi like Mucor and aspergillus and finally could be caused by **Candida**.)

-it is very common in females than males. It is associated with change of color, thickness of the nail under contact with hot water and detergent and the nail becomes brittle and thickened ; common in Diabetes, Suppressed immunity patients .

-- change of color has 2 conditions . **1)**If it is cause by dematophytes especially **Trichophyton** and **Microsporum** >>> Nail color change into yellowish color. **2)** if the infection related to other filamentous fungi (aspergillus and Mucor) >>> Manifested by appearance of Brown to Black color with more dangerous and severe infection associated later with loss of the nail. **Treatment:** Antifungal drug **followed** by nail removal and not only use of anti-fungal drug . " the treatment should be followed by removing of the nail and not only use of antifungal drug". In certain cases there is at the same time fungal infection of the nail as well as an infection of the nail folding where there is pus

accumulation might be cause ((nail folding infection)) by Bacterial infection like staph or infection by candida. **In such cases the treatment should contain antifungal medication as well as antibacterial one ; because it's very difficult to treat .**

- **Dermatophytes represented by 3 Important genera.** They are Trichopyhton, Microsporum and Epidermatophyton spp. These dermatophytes are widely distributed in nature can be associated with skin of human and animals in route of transmission through which it can be transmitted from person to person or animal to person.
- Infection of dermatophytes is not easily to be established. There are some factors included in enhancing the skin infection in one to other these factors are: **1st –The immune response**, as we all don't have the same immune response toward the infection by dermatophytes even in the same family members there is individuals might be more susceptible to be infected by one of dermatophyte infections (Tinea corporis , Tinea capitis ...etc) than others.**2nd-Extensive body hygiene:** by using of specific type of detergent might induce the infection because it is reduce the immunity of the skin to acquire infection of these dermatophytes which is easily can be found in the nature especially associated with animal and domestic ones like cats and dogs. There is always specific type of dermatophyte in the skin of cats or dogs can be transmitted to us in close contact especially to children.
- Sometimes **examination by a dermatologist** is acquired in developing of any lesion, in order to distinguish between very simple type of skin infection which is caused by lipophilic yeast a part of our normal body flora which causes Tinea Versicolor/ Pityriasis

2nd skin infections caused by yeast :

1) Tinea Versicolor/Pityriasis: / causative agent Malassezia furfur(lipophilic yeast) :

It is part of our normal flora. ****it** is recognized in students under stress conditions. ******* It is mainly change of the color in one part or other parts!! The infection is mainly occurs in face or hand...Etc. it is not so serious or important or associated with other systemic disease because it is a lipophilic yeast only activated under certain conditions.

2) head Dandruff / causative agent (Trichosporon spp of yeast)

-- Trichosporon spp divided into 2 types:**1) Trichosporon** associated with black piedra.**2) Trichosporon** associated with white piedra. Manifestation of black or White piedra means recognizing of ulceration in scalp and not hair in form of nodules and this could be large enough to be recognized through hair Brush. **Treatment: Topical** treatment and

sometimes systemic drug. **Black and white piedra** are associated with low standards of hygiene in relation of washing of the hair or body.

3) **Candidiasis** / Causative agent: *C. albicans* & other species: it is related mainly to infection of the oral cavity , Vaginal infection and to lesser extent to the skin. (Related mainly to Mucosal infection).In skin infection, Candida might be associated with skin lesions in any part of the body especially in the association with hand, intradigital space .Candida associated with a continuous contact with hot water , detergent and wounds especially in patients who are suffering from uncontrolled Diabetes Mellitus or Immunocompromised patients

**** skin diseases which is correlate to immunological reaction (neither fungal nor bacterial Infections but immunological reaction):**

1) **Psoriasis:** it is not considered to be caused by infectious agent, it is (more?) immunologic reaction

****Skin diseases recognized as complications in association with Dimorphic Fungi:**

***Dimorphic Fungi** found in tissues in vivo in form of yeast like structures while in culture they produce filaments and spores.

**** There are 2 diseases under this category , there are**

1st)Blastomycosis/ Causative agent : *Blastomyces dermatitidis*:

- Despite the name which might be confused by which you could think that the organism is mainly associated with dermatitis(skin infection) while in fact the skin infection developed as a result of complication following the presence of organism in the internal organs of the body and following the developed of oral blastmycois..By other word , first you recognize the disease in relation to mucosa and later in relation to the skin "so it's secondary"

2nd) Histoplasmosis / Causative agent: *Histoplasma capsulatum*.

- Manifested as granulomas in the lung ,Systemic infection and the complication might associated with developing ulceration and skin is secondary in developing of infection.
- **Treatment:** Systemic using of drug.

**** Lab diagnosis :**All diagnosis of dermatophytes as well as skin infection can be established by direct preparation from skin, nerve, hair...etc By using KOH to demonstrate the presence of yeast cell or filaments in the infected area.

****culture:** It is required sometimes for identifying the epidemiology of the disease and the type of dermatophytes (Sabouraud Dextrose agar at room temp.) but it's slow in growth

ChromCandida agar is used for rapid identification of common *Candida species*.

****Treatment:**

- Most skin infections might respond quickly (rapidly) to use of antifungal drug.
- Most skin infections respond very well to topical antifungal drug by interacting with Ergosterol causing Fungal cell membrane disruption
- There are many available types of azol drugs like micronazole clotrimazole, econazole..etc all have the same mechanism of action (Systemic).they are all successful treatment in relation to fungal infection
- Treatment period extends from 1 week – 4weeks according to site and severity of infection

Past paper questions related to Dr.Asem Material:

1)Which of the following is associated with cutaneous black lesion :

A)Collustridium prefrinjis B) Bacillus anthracis C) Candida D)Chancroid

** Answer is B

2)which of the following can infect nails

A)Candida . B) trichophyton C)Streptococcus D)a+b. E-All (A+b+C)

**answer is D .Hint : Onychomycosis.

3)which of the following don't contribute with Group B Hemolytic Streptococci :

A)Pyrogenic . B) Necrotic vesicle C) Catalase Positive. D) Cellulitis

The answer is A

4) the doctor miss explaining p.Aruenosia and jumped directly to B.Anthraxis but it is found in the slides and this is a p.p question related to it

-- the bacteria that produce Green –Blue Pus is

A)pseudomonas Arguenosa B) C.Prifrinjis C) B.Cerus D) B .Anthraxis . E) non of the aboce

** The answer is (A) . Green –Blue Pus is a characteristic of Psudomonas argueosa wound infection

5)Tinea versicolor produced by one of the following

A-Malassezia Furfur (Lipophilic Yeast) . B- Tricophyton C-Candida D-Non of the Above

** the answer is A.