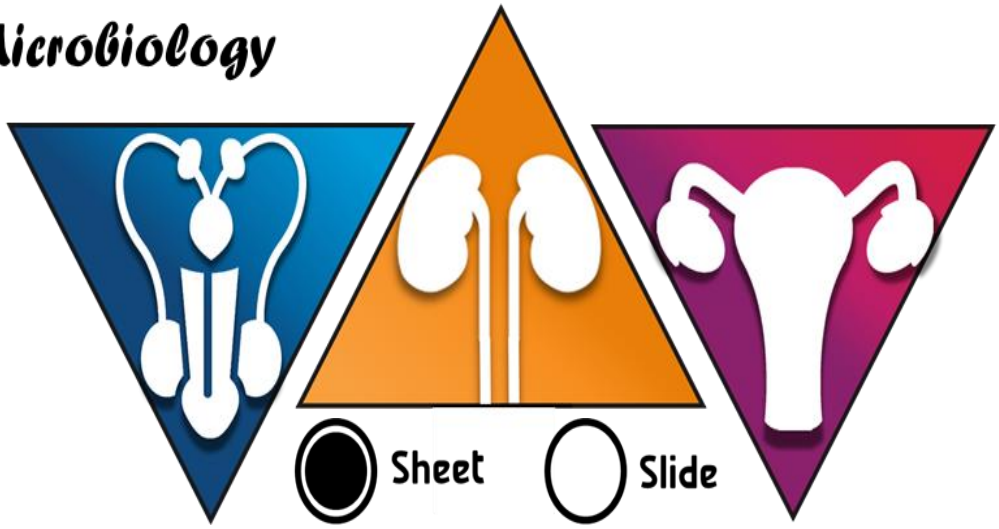
Urogenital system

Microbiology



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- -In this sheet, I used the video of the 3rd lecture.
- -This topic (STDs) will be covered in two lectures; lecture 3, 4.
- -I tried to include everything mentioned in the video and in the slides, but you can refer to the slides for further pictures (though the important ones are mentioned here).

- **In this sheet, we'll talk about:**

-An overview on the sexually transmitted diseases (STDs)
-Bacterial Vaginosis (BV)
-Trichomoniasis
-Syphilis

Genital infections cover a wide variety of pathogens, there are quite a lot of pathogens that cause specific diseases in the genital tracts (bacteria , viruses, protozoa, fungi) but most of the genital infections are transmitted through intercourse (sexually transmitted diseases). During intercourse there's an exchange of fluids and then the mucous layers of the urethra of the male and the vagina of the female can serve as the surface from which the pathogens can be transmitted from one person to the other.
We will focus on genital infections that are transmitted through intercourse (AKA: STDs or STI)

• Overview on the sexually transmitted diseases (STDs)

Symptoms and signs:

- **vaginal discharge, penile discharge**
- **ulcers on or around the genitals**
- **pelvic pain** (because the genital organs will refer their pain
- to the area in the pelvis)
- **Dysuria** (pain during urination due to the overlap between the genitals and urinary tract)
- **dyspareunia** (pain during sexual intercourse)
- Many STDs can be **asymptomatic.**
  if the person is asymptomatic, the risk of transmitting the disease increases, either because he doesn't know he has the disease, so they

will not be treated or because the partner will not stay away from the person with the infection because he is asymptomatic

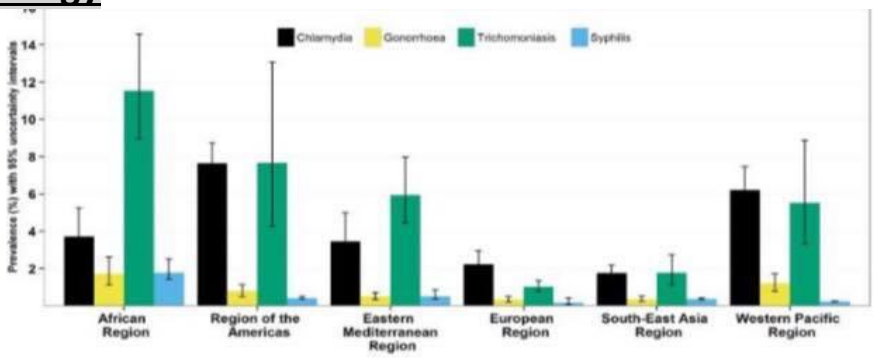
Note: Patients with one STI or STD (sexually transmitted infection or disease respectively) should be assessed for the presence of others, because of similar risk factors and vulnerability of an inflamed genital epithelium to other infections.

Risk factors:

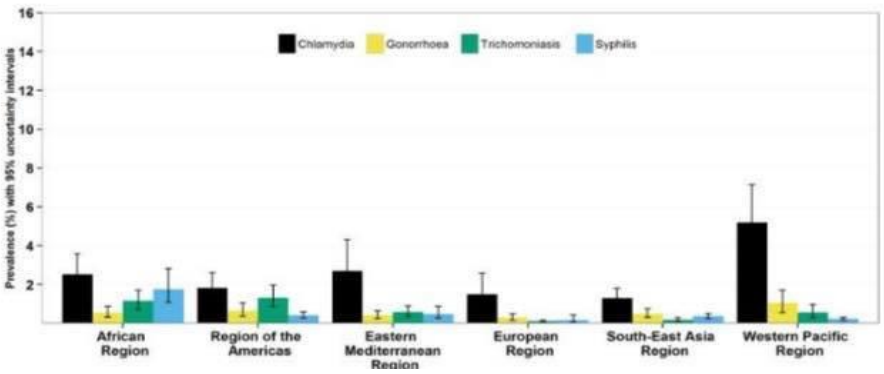
- **The number of sexual partners and frequency of partner change**
- **Failure to use barrier contraception** (e.g. condoms)
- **Lower socioeconomic status** because they either do not get enough education about the subject or they do not get proper health care.
- **Age <25 years**
- **Symptomatic partner**
- **Sexual orientation and sexual practices**
  for example, **MSM** (males having sex with males) increases the risk of having syphilis, gonorrhoea, HIV, and hepatitis B
  also, **orogenital and anogenital practices** would affect how and what diseases are more likely to be transmitted.

Epidemiology

Women



Men



-**Trichomoniasis, Chlamydia, Gonorrhoea and syphilis** are the most common pathogens to cause STDs.

- According to WHO estimates, there's around **one million** new infections with curable STI **each day.**

-The global prevalence of chlamydia was 4.2% (which is quite high)

- The prevalence and incidence estimates varied by **region and sex**.

-we can see that the **African** region has the **highest rates of STDs**

- among women, the **most common** disease in general is **trichomoniasis** followed by **chlamydia** (notice the columns in green which is for trichomonas and the one in black which is for chlamydia), while in men, chlamydia is more common than trichomoniasis.

-if you compare the Women in the **African** region to the women in the **European** region you can see that **there are several Folds decrease** in the prevalence between those two regions.
(although maybe the culture around sexual practices could be similar for some extent, but there is a lot of difference in the prevalence, probably due to as we said the socio-economic status which play an important role in the epidemiology of those diseases)

-We expect also **in our region** to have **lower incidence or prevalence of those cases**
(this is due to many reasons, one is because sexual practices are not as similar as to how they are in the African or in the European regions and another reason is because of maybe lack of reporting of such cases due to the stigma that surrounds STIs)

-**Men** in all areas have **much less prevalence** of those diseases than women "in most cases".
probably because of the susceptibility of the women's genital tract to infections.

-**in Jordan,**
-We are on the lower end of the spectrum of prevalence of STDs.
-based on this low prevalence they concluded that the need for screening for those diseases is not necessary

- the prevalence might be a bit different than we have expected because of the lack of reporting (due to stigma for example)

Now we'll start talking about STDs

1)Bacterial Vaginosis (11:53-22:00)

Etiology:

-**bacterial vaginosis is not considered really an STD** for certain reasons:
1) there is **no counterpart** of this disease in men, so it only happens in women with bacterial vaginosis.
2)there is no one pathogen that causes bacterial vaginosis it is rather a **change in the ecology of the vaginal flora.**
3)some say that women who have never had sexual intercourse can still get bacterial vaginosis.

-although BV isn't a sexually transmitted infection (STI), but it can **increase your risk of getting an STI** such as chlamydia

-the pattern of Bacterial Vaginosis:
1-the normal vaginal flora is usually dominated by one or two species of **lactobacillus** (in most healthy women it's lactobacillus some women have different flora but it's mostly lactobacilli) and those Lactobacilli **produce H2O2 which lowers the pH**.
2-In bacterial vaginosis there's a loss of lactobacilli by variety of species which permits an increase in pH and overgrowth of vaginal anaerobes species (such as Bacteroides, Mobiluncus) which will cause:
-degrading peptides within the vagina into an offensive-smelling products
-exfoliation of epithelial cell
-**a foul-smelling discharge** from the lumen due to exfoliation of those epithelial cells and degradation of those vaginal peptides
-sometimes there is **dysuria**, **dyspareunia**
-There're clinical trials and researches on **Probiotics** to see if they are beneficial or not in promoting vagina and urinary health.

Epidemiology, signs and symptoms:

-Worldwide prevalence ranges from **11%to 48% in women of childbearing age**.

-**Risk factors** are similar to other STDs (new or multiple sexual partners, vaginal douching, smoking)

NOTE: it can occur in women who have never had vaginal intercourse.

-50 to 75% of cases are **asymptomatic**.

-In **symptomatic cases**, there is **thin, white, fishy smelling discharge**, most noticeable after intercourse.

-Pregnant women with BV have a higher rate of **preterm delivery and pregnancy complications.**

-BV also **increases the risk of contracting other STDs (because of the vaginal discharge carrying different pathogens)** like HIV.

Diagnosis:

-The diagnosis of BV is usually based on **Amsel criteria**

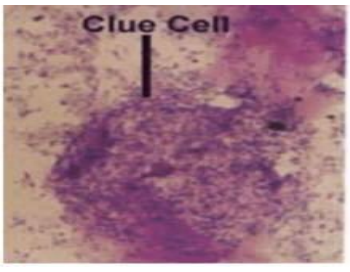
1)**homogeneous, watery, white- grey discharge** coating the vaginal walls. (normally there can be a vaginal discharge, it's not an abnormal condition but, if this discharge is white or grey and more profuse than normal then it might be an abnormal vaginal discharge)

2) vaginal **pH > 4.5**; due to the loss of lactobacilli which used to keep the pH below 4.5)

3)**positive amine test;** in which you add 10% KOH to a sample of discharge and if it **produces a fishy odour** then it's a positive amine test.

4)the presence of "**clue cells"** (epithelial cells studded with adherent coccobacilli)

-normally under the microscope on a saline wet mount for the discharge you will see **epithelial cells surrounded by gram positive rods (Lactobacilli).**



-in BV you will see a new species of bacteria that are mostly in the form of **coccobacilli that are stuck on the epithelial cell -→damaging the epithelium and causing the discharge** and this appearance is called **"clue cells"**

NOTES: -The first three findings are sometimes also present in patients with trichomoniasis.
-In all the above four **we examine a sample of the vaginal discharge**.
- **the best predictor of BV is the presence of clue cells.**

Treatment:

- in one- third of cases, Infection **resolves spontaneously.**

-You can use **Antibiotics e.g. Metronidazole** (due to the presence of Bacteroides) **or Clindamycin**

-tell the patient to **change his sexual behaviours** that increase the risk of BV (e.g. sexual intercourse with many partners, not using protection, etc)

-**30% of patients experience recurrence** within 3 months.
in such cases you can either use a prolonged course of the above-mentioned antibiotics (e.g. for 14 days) or to use alternative treatment course.

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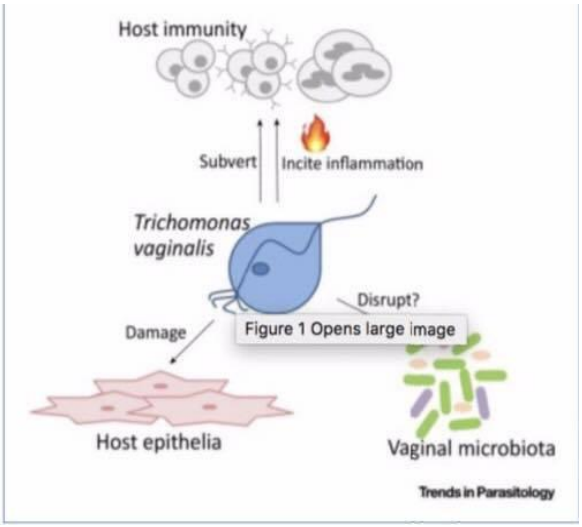
2)Trichomoniasis (22:00-29:30) "داء المشعرات"

Etiology:

-it's the most common non-bacterial causes of STDs because this one is not caused by a bacterium but is rather caused by protozoa.

-An STI caused by the flagellated protozoan T.vaginalis (TV).

-TV pathogenesis includes:
1) **damaging the host epithelium** and then the host epithelium can exfoliate and slope off in this discharge
2**) affect the immune system** first by subverting it (which means they escape the immune system) and also damage the immune cells and activate them.
3)**Disturb the normal vaginal microbiota**



because they change the environment of the vagina and takes place between the vaginal microbiota and also they compete for nutrients within the vagina so they will finally disturb the vagina and microbiota.

Epidemiology, signs and symptoms:

NOTE: regardless of the name "trichomonas vaginalis" it can also affect men

-**Transmission is by sexual contact**, and its incidence is highest in women with multiple sexual partners and those with other STIs.

-Infection is **asymptomatic** in 10– 50% of women and 15– 50% of men

-**Symptoms:**

In females: **frothy, yellow vaginal discharge** (may be itchy and smelly), **dyspareunia, dysuria**, and **lower abdominal pain.**
'strawberry cervix' in minority of cases (2% of patients) ; which are punctate haemorrhages (a small red dots on the cervix)

In males: Can lead to **urethritis** (involve a discharge from the urethral meatus), **dyspareunia** and **dysuria**

Diagnosis:

1)Microscopy; use phase-contrast or dark-ground microscopy of wet preparation of genital discharge specimen, you will see **the motile flagellated protozoans** (which are obvious and you can't misdiagnose them with bacteria or yeast due to their large size and the presence of flagella).

2)OSOMR; Which is a point of care test (simple, small kit with high specificity and selectivity) and it **looks for certain antigens** on the trichomonas

3)NAATs (Nucleic Acid Amplification Tests); e.g .PCR and **it looks for nucleic acid** (it's the one with the highest sensitivity)

****NAATs is the gold standard to diagnose Trichomonas Vaginalis**

NOTE: many of the pathogens causing STDs they are very fastidious and hard to be culture

Treatment:

-Antibiotics (Metronidazole)

****don't forget to treat the partner even if he's asymptomatic (to avoid recurrence),**

3)Syphilis: (29:30-45:05) "الزهري"

Etiology:

-The causative agent for Syphilis is **Treponema palladium**

-**Spirochetes are thin, helical gram-negative bacteria**

-they're less than 0.2 micrometre in diameter so you cannot see them with the light microscope, so you **use dark field microscopy** (you take a sample from the lesion like the chancre for example and put it on a slide and you look under the dark field microscope and then you can see those spirochetes)

-**those spirochetes are very dependent on the host cells**, so you cannot culture them on normal agar, they do not grow there, so you need to **culture them in the presence of mammalian cells** because they are dependent for much of their metabolic needs on those epithelial cells,
(that's why culture is not usually used for diagnosis of Tapinoma Palladium because it's quite difficult and expensive)

-also, they are extremely sensitive to oxygen, and that affects the transmission, (if a pathogen is sensitive to oxygen then you do not expect it to survive on clothes for example or toiletries so, if you share clothes or fluid or any inanimate object with someone with syphilis you will not expect to get the disease only from using those objects.)

Epidemiology:

-Between 2000 and 2012, the incidence of newly acquired disease has increased each year.

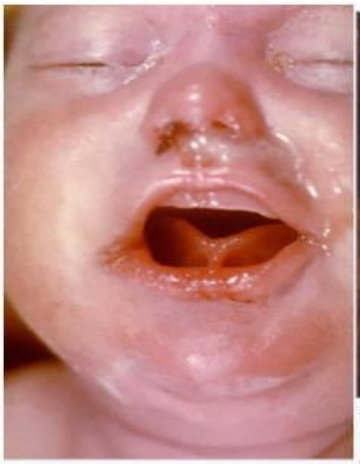
-Patients infected with syphilis are at **increased risk for transmitting and acquiring HIV** when genital lesions are present.

-the transmission of syphilis:

1) **Direct sexual contact** which is the most common route of spread.

2**)Blood transfusion**; T.palladium contaminated blood

3)**congenitally;** which will cause "congenital syphilis" ,this happens during delivery when baby pass through the vagina of infected mother.
**some of the characteristics of this congenital syphilis are:

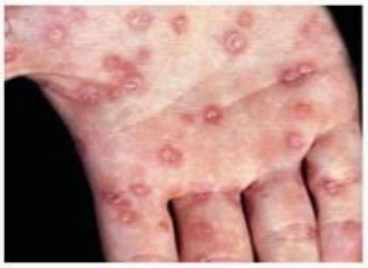


The face of a newborn infant displaying snuffles indicative of congenital syphilis

Portrait of Gerard de Lairesse by Rembrandt van Rijn, circa 1665–67, oil on canvas - De Lairesse, himself a painter and art theorist, had congenital syphilis that deformed his face and eventually blinded him.[54]

a) **The face of the new born infant displaying <u>snuffles</u>** (you see the baby profusely having rhinorrhoea which is filled with T.palladium)

b) when the patient with congenital syphilis grows up he might have deformities such as something called **<u>saddle nodes.</u>**

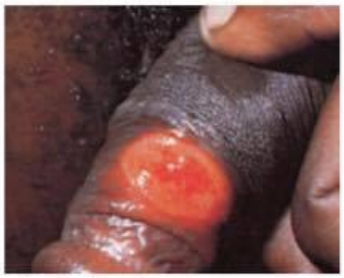


Secondary stage rash on the palms of the hands.

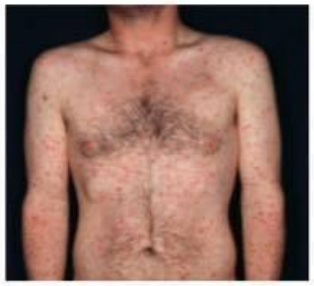
c)<u>characteristics similar to secondary stage of syphilis</u> which involves rash on the palms of the hand and on the soles of the feet (which is something that is not commonly seen with rashes, as usually we don't see rashes on palms and soles).

Signs and symptoms:

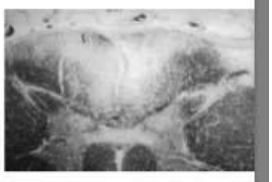
-The clinical course of syphilis evolves through three phases:



primary phase is characterized by skin lesions **(chancres)** at the site where the spirochete penetrated



In the **secondary phase,** the clinical signs of disseminated disease appear, (e.g. **skin lesions** over the entire body, fever, headache). Symptoms resolve within weeks.



- Late syphilis severely damages organs involved (e.g., **neurosyphilis**, tabis dorsalis, cardiovascular syphilis) leading to various symptoms (e.g. **dementia** or **blindness,**)

1) primary phase "Chancres"

-is characterized by skin lesions (chancres) that is found on the genitals of males or females at the site where the spirochete has penetrated.

-sometimes in the case of orogenital sex, you can have the chancre also on the mouth.

- we have similar chancer's with other STDs but, there are ways that we can tell them apart.

-this chancer is very contagious, because it's filled with Treponema palladium(can be used for diagnosis by swabbing the ulcer)

-After a few weeks (a couple two to eight weeks), the chancre can heal on its own, and the bacteria would have spread from the site of the infection into the blood.

2)Secondary phase "once the bacteria are in the blood"

-it's when the bacteria spread from the site of the infection into the blood (the infection is systemic now).

-you'll develop some systemic manifestations (e.g. skin lesions over the entire body, fever, headache)

- so, it can cause cranial nerve defects (neurosyphilis) or can cause uveitis and less commonly, secondary syphilis can cause hepatitis.

****NOTE:** - Neurosyphilis can occur even earlier in the stage (could occur in secondary phase and not only in tertiary phase as we'll see next)

-also, we have different types of rashes and most of them are caused by the pathogen found in the blood as it starts to clog or damage some of smaller blood vessels and this leads to inflammation and tissue destruction in the area around those small blood vessels and this appears as those legions all around the body.

-in this phase, the chancre could be still there or could have disappeared.

-Symptoms resolve within weeks even without treatment.

In our days, if someone gets this disease or this lesion, he will probably go to a doctor, takes an antibiotic and if they have access to good healthcare facilities the story ends at the primary phase but, without treatment the chancre can resolve secondary manifestations of syphilis appear or secondary phase and then the disease will go into a **latent stage (latent stage is previous to late/tertiary stage)** where the **pathogen is not apparent and not causing many symptoms but at the same time doing damage to whatever tissue it resides in** ,mostly in the central nervous system or in the heart and it's causing damage in both places.

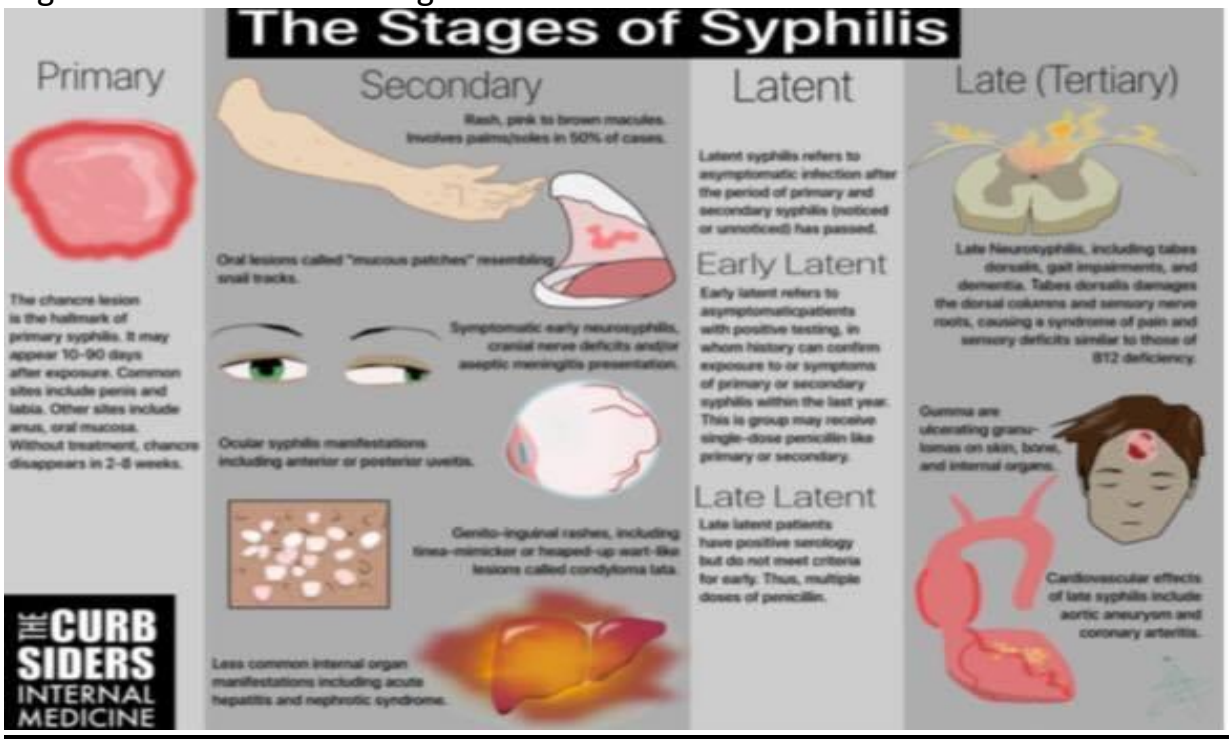
3) Late syphilis/ tertiary syphilis
Appears after a latent stage (asymptomatic stage)
-here the patient might have:

1)neurosyphilis were T.palladium has damaged parts of the CNS and the patient can **end up with dementia or blindness**

2)tabes dorsalis, in which the posterior horn in the spinal cord is damaged and will manifest in the form of **gait abnormalities and abnormal sensations.**

3)cardiovascular effects including **Aortic aneurysms and coronary arthritis**

4)Gumma which are granulomas that can ulcerate on skin, bone and internal organs and then cause disfigurement



Diagnosis:

1)Do a **dark field microscopy or immunofluorescent stains** looking for the pathogen or do **PCR** and look for the nucleic acids of the pathogen if we have access to the **chancre or one of the skin lesions** (that are filled with T.palladium)

2)Do **Serology**, and look for antibodies against the pathogen in the **blood** of the patients;

a- non- treponemal/ cardiolipin tests,

- e.g. venereal disease research laboratory test **(VDRL)**/ Rapid plasma regains test **(RPR).**
- **used to screen, stage the disease and monitor treatment**

(they are not very specific, and they cannot diagnose but they're quite sensitive; meaning that if you have those antibodies then they can detect the presence of anticardiolipin antibodies)

b- specific treponemal tests

-e.g. Treponema pallidum particle agglutination **(TP-PA)** test

- **used for diagnosis**

(you take a blood sample from the patient and you add it to the particles of T.Palladium, so if the particles start to aggregate, that indicate the presence of abs in the serum and it's a positive test ,and the patient is infected or has been infected with T.pallidium but, if they do not aggregate, that means it's a negative test and the antibodies aren't there)

Treatment:

-Syphilis be **controlled** only through the practice of **safe-sex techniques**.

- **treatment** with antibiotic; **Penicillin** is the **drug of choice**. (Benzathine benzylpenicillin / Penicillin G).

-NOTE: we do not see many cases of tertiary syphilis these days because penicillin is quite effective in eradicating syphilis.

وَاصْبِرْ لِحُكْمِ رَبِّكَ فَإِنَّكَ بِأَعْيُنِنَا

your colleague: Sarah Shawabkeh