

The spirochetes are a large heterogonous group of spiral, motile bacteria. The family *Treponemataceae* include 3 genera whose members are human pathogens; treponema, borrelia, and leptospira.

The genus treponema includes *T. pallidum* subspecies *pallidum*, which causes syphilis; *T. pallidum* subspecies *pertenue*, which causes yaws; *T. pallidum* subspecies *endemicum*, which causes endemic syphilis (also called bejel), & *T. carateum*, which causes pinta.

T. pallidum are long slender, helically coiled, spiral or corkscrew shaped, G- bacilli. It has an outer sheath or glycoaminoglycan coating. Endoflagellum (axial filament) are the flagella-like organelles in the periplasmic space encased by the outer membrane.

Culture:

Pathogenic *T. pallidum* has never been cultured continuously on artificial media, in fertile eggs or in tissue culture. *T. pallidum* is a microaerophilic, it survive best in 1-4% oxygen, *T. pallidum* may remain motile for 3-6 days at 25 °C. In blood or plasma stored at 4 °C, it remains viable for at least 24 hrs, which is potential importance in blood transfusion.

Spirochetes ***T. pallidum*** **Syphilis**



Pathogenesis, pathology & clinical findings:

Acquired syphilis:

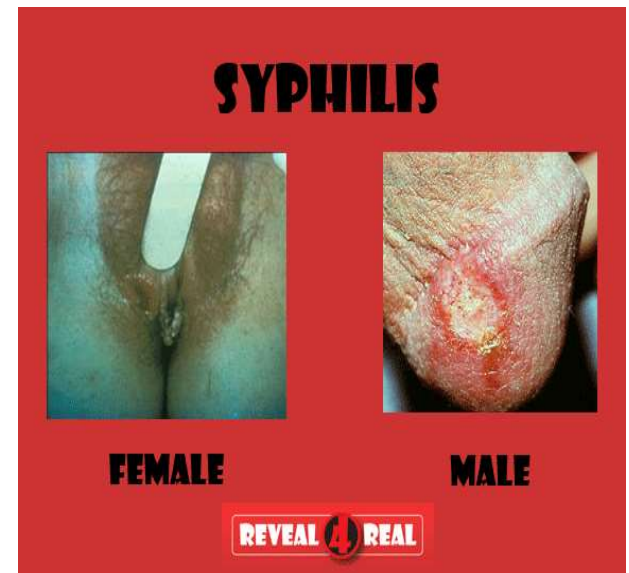
Natural infection with *T. pallidum* is limited to human host. Human infection is usually transmitted by sexual contact, & the infectious lesion is on the skin or mucous membranes of genitalia. In 10-20% of cases, the primary lesion is intrarectal, perianal, or oral. It may be anywhere in the body. *T. palladium* can penetrate the intact mucous membranes or it may enter through a break in the epidermis.

Spirochetes multiply locally at the site of entry, & spread to nearby LNs & then reach the bloodstream. In 2-10 wks after infection, a papule develops at the site of infection & breaks down to form an ulcer with a clean hard base (hard chancre). The primary lesion always heals spontaneously, but 2-10 wks later the secondary lesions appear. by predominance of lymphocytes & plasma cells. These consist of a red maculopapular rash anywhere on the body including hands, feet and moist pale papule (condulomas) in the anogenital region, axillas, and mouth. There may be syphilitic meningitis, chorioretinitis, hepatitis, nephritis (immune complex type) or periostitis.

T. pallidum

Syphilis

**Pathogenesis, pathology
& clinical findings**



The secondary lesion also subsides spontaneously. Both primary and secondary lesions are rich in spirochetes and highly infectious. Syphilitic infection may remain subclinical, and the patient may pass to the tertiary lesion. In 30% of cases, the syphilitic infection progress spontaneously to complete cure without treatment. In another 30% the untreated infection remains latent (evident by positive serological tests). In the remainder, the disease progress to the tertiary stage, characterized by development of granulomatous lesions (gumma) in skin, bone, liver & may involve the CNS & CVS. In tertiary syphilis, treponemas are very rare

: Congenital syphilis

Pregnant syphilitic women can transmit *T. pallidum* to the fetus through the placenta between the 10-15 wks of gestation. Some of the fetuses die & miscarriage, others are stillborn at term. Other may born live & develop signs of congenital syphilis in childhood. Adequate treatment of mothers during pregnancy may prevent congenital syphilis. In congenital syphilis the child develops anti-treponema IgM.

Syphilis *T. pallidum*



Lab. Diagnosis:

Specimen: tissue fluid from early surface lesion for demonstration of spirochetes, blood for serology.

Darkfield examination: a drop of tissue fluid or exudate is placed on slide & coverlip pressed over it, & examined under the oil immersion with darkfield illumination for typical motile spirochetes.

Immunofluorescence: tissue fluid or exudates spread on a slide, air dried, fixed & stained with fluorescent-labeled anti-treponemal Abs, & examined by immunofluorescent microscope.

Serological tests for syphilis:

Non-treponema Ag test (VDRL):

The Ags employed are lipid extract from normal mammalian tissues. The purified cardiolipin from beef heart is diphosphatidylglycerol that react with syphilitic reagin Abs. Reagin is a mixture of IgM & IgG Abs directed against the cardiolipin complex. The VDRL (Venereal Disease Research Laboratories) & PRP (rapid plasma reagin) tests are treponemal Ags are used commonly. The tests are based on the fact that the particle of the lipid Ag remain dispersed in normal serum, but flocculate when combined with reagin. The VDRL test required microscopic examination, while PRP have added colored particle & can be read without microscope. Results developed within few minutes. These tests are used for survey because of their low cost.

Syphilis T. pallidum



Positive VDRL or PRP tests develop after 2-3 wks of untreated syphilis & are positive in secondary syphilis in high titer. Positive VDRL or PRP revert to negative in 6-18 ms after effective treatment. The VDRL can be also performed on CSF, which becomes positive after 4-6 wks of infection. The flocculation tests can gives quantitative results by performing the test on twofold diluted serum, & the titer is the highest positive dilution. Non-treponemal tests are subjected to biological false positive results attributed to occurrence of reagin in variety of human disorders e.g. other infections (malaria, leprocy, measles, IMN), vaccinations, & collagen-vascular diseases (SLE, rheumatic disorders).

Treponema Ab test:

Fluorescent treponemal Ab test (FTA-Abs):

This test employs indirect fluorescent (killed *T. pallidum* + patient serum+ labeled antihuman gamma globulin). The test has good sensitivity & specificity, & it is the first to become positive in early syphilis, & routinely positive in secondary syphilis, & remains positive for many ys after treatment. The presence of IgM FTA in the blood of newborn is a good evidence of congenital syphilis.

Syphilis **T. pallidum**



Treponema pallidum particle agglutination test (TPHA): This test is *T. pallidum* hemagglutination. Particles are sensitized by *T. pallidum* Ag. The test is performed with diluted serum. Abs against *T. pallidum* reacts with sensitized particles. Formation of agglutination indicates positive results.

Epidemiology: With the exception of congenital & occupational syphilis, syphilis is acquired through sexual exposure. Reinfection in treated persons is common. An infected persons may remain contagious for 3-5 ys during early syphilis. Latent syphilis or more than 5 ys duration is usually non-contagious. Various immune responses fail to eradicate the infection.

Syphilis *T. pallidum*

