Syphilis

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Transmission:

• Syphilis is primarily transferred through sexual contact. This can be from open sores around or inside the genitals or mouth and the mucous membrane (1).
• The disease can also be spread from the mother to the fetus via the placenta in utero, this normally occurs during the late stage of pregnancy (3).
• Human to human contact thus far is the only known way to acquire syphilis (7).

Reservoirs:

• The bacterium lives in the human genital tract of infected males and females (5).

Etiologic Agent:

• Treponema Pallidum (5).

Microorganism General Characteristics:

• T. pallidum is a spirochete, which is a type of bacteria that is helically shaped and the gram stains are usually negative. This pathogen is only found in humans and does not naturally occur in other species. This microorganism is transmitted through penetration of the spirochetes through mucous membranes or abrasions on the skin's surface. T. pallidum is easily broken down which causes it to lack the capability to survive of dry, disinfected surfaces (3).

• Silver imprinting methods can be used to view the bacterium by dark field microscopy. The flagella of the spirochete move in the periplasmic space along the flagella bundle, this causes the bacterium to move in a corkscrew structure. The bacterium promptly rotates along its longitudinal axis and then bends and snaps to its full length. The bacterium can range in cell size from 6 to 15 micrometers long and 0.1 to 0.2 micrometers wide. Due to the bacterium’s limited temperature and pH ranges, it is unable to be transmitted by public surfaces. The typical temperature range is between 30 to 37 degrees Celsius and the ideal pH is 7.2 to 7.4, a neutral environment (5).

Identification Key Tests:

• Serologic testing is the standard method of testing for syphilis because T. pallidum cannot be cultured in vitro and is much too small to be seen under a light microscope. There are three stages to syphilis which are: primary, secondary, and tertiary. In the early stage when antibodies are low in numbers microscopy tests are necessary (11).
• In a suspected syphilis patient the first step toward identification of the infectious disease is nontreponemal serology screening using the Venereal Disease Research Laboratory (VDRL), rapid plasma reagin (RPR), or the recently developed ICE Syphilis recombinant antigen test (11).

**Historical Information:**

• Syphilis was discovered in Europe before discovered in the Americas by Europeans around the end of the 15th century. It is possible that it was brought back to Europe from the Americans when Columbus and his men returned home (2).

• In 1905, Fritz Richard Schaudinn and Paul Erich Hoffmann identified the etiological agent. Around this time, Paul Ehrlich discovered an arsenic based medicine which was called salvarsan that was referred to the chemotherapeutic “magic bullet” against syphilis (9).

• From 1932 to 1972 an unethical study was conducted called The Tuskegee Study of Untreated Syphilis in the Negro Male which sought to record the natural process of the infection. The study was regard as unethical because the subjects were ill informed and did not receive proper treatment; even through penicillin was proven to be an effective treatment method (5).

**Signs and Symptoms of Disease:**

• Syphilis develops in three stages; primary, secondary, and tertiary. The first sign is a painless sore lesion, known as the chancre at the site of entry. Common sites of infection usually include the mouth, rectum, genitalia, rectum, and urethra. The chancre has a maximum six week lifespan and can wane without treatment. The second stage begins six weeks after infection as many of the most common symptoms manifest during this stage. Rash is the most common type of symptom seen with syphilis infections followed by fatigue, fever, sore throat, and headaches among others. Late syphilis leads chronic infection and is the most debilitating stage. At this stage, many areas of the body are at risk, these areas may include internal organs, bones, joints, liver, and skin. Signs may include a difficulty in coordinating muscle movements, paralysis, and gradual blindness. Small bumps or tumors called gummas can also be found in the body but can disappear with proper treatment (10).

• Having treatment early on can reduce the severity of the last stage. There is no natural immunity that develops for formerly affected individuals of syphilis. There is a dormant state of 2 to 30 or more years after infection; during this state there are no signs or symptoms of syphilis but antibodies can still be detected through a blood test. During dormancy, and primarily in the first two years, a relapse of secondary syphilis can occur (6).

• Health care professionals can diagnose syphilis using a blood test called the rapid plasma reagin. Antibodies can be precisely detected shortly after the initial infection. Another technique is detection by using a microscope of a sore; A dark field microscope is normally used to remove the clear bacterium in a dark background. A third test, the Cerebrospinal
Fluid Test, can be utilized if there is damage to the central nervous system. A skin test can be applied to identify previous exposure to syphilis, just as the TB skin test the individual with hypersensitivity will have a reaction when injected with piece of the bacterium (4).

Virulence Factors:

- *T. pallidum* has the capability to rapidly penetrate between tight endothelial cell junctions permitting it to invade at the dissemination sites. The bacterium can also invade the central nervous system early on in the infection. Perivascular inflammation is the most prominent histopathologic characteristic of a syphilitic infection. This typically consists of a propagation of adventitial cells, perivascular cuffing with lymphocytes, monocytes and plasma cells, and swelling and an abundance of endothelial cells. Some pathogens have developed an ability to avoid phagocytosis (5).

Control/Treatment:

- Syphilis is currently treated with the bactericidal antibiotic penicillin by intramuscular injection. Ten consecutive days of injection of procaine penicillin is a standard, but for most patients a single injection of benzathine penicillin is more practical (1).

- Individuals who have syphilis for less than a year and are in the primary or secondary stage of syphilis, a single injection can normally alleviate the disease. This is the preferred treatment, especially for pregnant women. Tetracycline can be used for patients allergic to penicillin because the bacterium has yet to develop resistance towards the drug (1).

- An effective vaccine for syphilis has not yet been made available. The problem lies in the cellular structure. The outer membrane of the bacterium lacks enough surface proteins for an antibody to be effective (8).

Prevention/Vaccine:

- There is no known medical vaccine currently available for syphilis. Many carriers are unaware of the infection, which increases the spread of disease. Some individuals may not develop symptoms for years and others simply fail to recognize the presence of a chancre (8).

- Utilizing contraception such as condoms can help reduce the risk of becoming infected with syphilis. However, it is much safer to keep the majority of sexual contact to a monogamous partner that is known to be uninfected with syphilis. If there is an infection, sexual contact should cease until treatment has begun and chancre sores have disappeared (7).

Local and Global Current Outbreaks/Cases:

- The Centers for Disease Control reports that Texas had 1,169 cases of primary and secondary syphilis in 2011 and Texas ranks 16 out of 51 areas with an average rate of
infection of 4.6 cases for every 100,000. The United States averages, 4.5 cases per 100,000 individuals. Cases of congenital syphilis were significantly lower both at the state and national level. Texas had 107 cases in 2011 and ranked 4 out of 25 areas, these average out to 26.4 cases per 100,000 live births in comparison to the national rate which is 8 cases per 100,000 live births. The African Americans population has the highest number of cases amongst races both in Texas and in the United States with the state at 18.2 per 100,000 people (12).

- The World Health Organization reports worldwide cases including the following: 10,000 cases in Australia & New Zealand, 100,000 cases each in North America and Eastern Europe & Central Asia, 140,000 cases in Western Europe, 240,000 cases in East Asia & Pacific, 370,000 cases in North Africa & the Middle East, 3 million cases in Latin America & the Caribbean, and 4 million cases in sub-Saharan Africa (13).

References


