

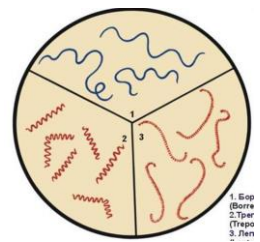
## Medical Bacteriology – Lecture 11

### *Spirochaetaceae*



### *Treponema*

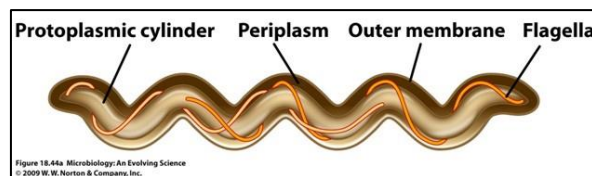
### *Borrelia*



## Spirochaetaceae

### Characteristics

- Gram negative rods
- **spiral single cells, or cork-screw-shaped, extremely thin and can be very long**
- aerobic to strict anaerobic, free or strict parasites.
- **motile**, move by bending and rotating body movements.
- Spirochete consist of protoplasmic cylinder bounded by a cell wall and outer membrane. There is an **axial filament or endoflagella (preiplasmic flagella)** between the cell wall and outer membrane.



### Spirochetes of medical importance:

#### 1- Treponema

*T. pallidum*----- cause Syphilis

*T. peritenuis*-----cause Yaws- 3 stages- (granulomatous disease)

*T. carateum*----- cause Pinta (primarily restricted to skin- tropical area)

#### 2- Borellia

*B. recurrentis*----- cause relapsing fever

*B. hermsii* ----- cause relapsing fever

#### 3- Leptospira

*L. interrogans*----- cause Leptospirosis

## *Treponima pallidum*

- **Cause syphilis (sexually disease)**
- **Too thin to be seen with light microscopy in specimens stained with Gram stain**
- Intracellular pathogen
- **Not cultured in artificial media**, cultured in fertilized eggs and tissue culture (Do not survive well outside of host)
- **Actively motile**, rotating steadily around their **endoflagella**
- Remain viable in the blood or plasma store at 4°C at least for 24 hrs (transmitted via blood transfusion)
- **Route of Transmission is sexually contact or by congenitally from mother to fetus**
- Incubation period is 3-4 weeks.
- Rash, fever, organ damage



## *Pathogenesis of T. pallidum*

### Primary Syphilis

- Following penetrating skin or mucus membranes, rapid multiplication.
- inflammatory response at the site of infection resulting in the hallmark painless hard lesion called; **chancre** (in genital area) at the site of entry within 3 weeks
- **Chancre is highly contagious** and filled with Treponemes. Chancre changes from hard to ulcerative with profuse shedding of spirochetes
- The organism enters the lymph (swelling lymph nodes) and becomes disseminated
- Chancre heals spontaneously (during two months) without treatment, but by that time the organism has already disseminated

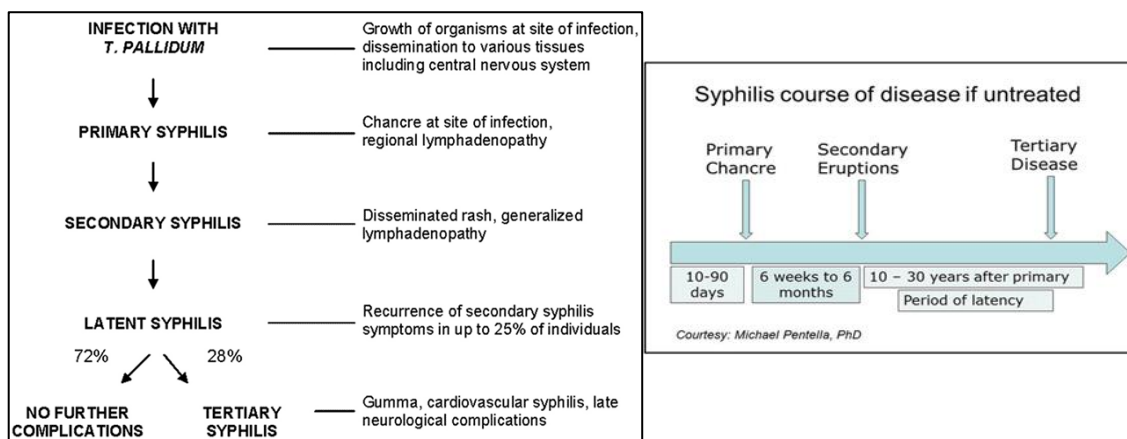
### Secondary Syphilis

- 4-8 weeks after primary stage, the secondary stage develops.
- **There are lesion (filled with organism) throughout the body including, skin, mucus membranes, organs, eyes, lips etc.** (widely disseminated mucocutaneous rash)
- **Skin rash, reddish- brown spots on hands and button of feet, mucous membranes lesions throughout body with ichiness**
- Secondary lesions of the skin and mucus membranes are **highly contagious**
- Mild fever, sore throat, headache, swollen glands, weight loss, muscle ache, fatigue.
- This lesions also heals without treatment

- **Latent Stage of Syphilis**
- **No symptoms**
- **Specific Anti- treponemal antibodies are found**
- May last 3-10 years
- About 40% of late latent patients progress to late tertiary syphilitic disease

### **Tertiary Syphilis**

- Characterized by localized granulomatous dermal lesions (**gummas**) of the **skin, internal organs, bones, eyes( blindness) and cardiovascular system.**
- Granulomas reflect containment by the immunologic reaction of the host to chronic infection
- Late neurosyphilis develops in untreated cases, usually more than 5 years after initial infection (Central nervous system and spinal cord, Dementia, wasting, paralysis. etc).
- Cardiovascular involvement appears 10-40 years after initial infection with resulting myocardial insufficiency and death.
- **This stage cannot be treated**



### **Congenital syphilis**

- occurs when Treponema cross the placenta during gestation to infect unborn fetus (occurs usually when mom is in the latent stage)

**This can result to**

**Damage mental development**  
**keratitis**  
**Deafness**  
**Generalized syphilis**

- If the pregnant woman who has a primary or secondary stages.

**This can result**

**Stillbirth**

## Virulence Factors of *T. pallidum*

- Outer membrane proteins promote adherence
- Hyaluronidase
- Molecular mimicry ( resistant host defenses)
- Tissue destruction and lesions are primarily result of host's immune response

## Syphilis Diagnosis

**Direct:** Motile spirochetes in dark field microscope

**Immunofluorescence stain** (anti-treponemal antibodies labeled with fluorescent dyes)

**Indirect:** Serological tests for syphilis (nonspecific and specific tests)

**A- Non-treponemal antigen test** (detect antibodies to nonspecific antigen) e.g:

1. Flocculation test –venereal disease research laboratory (VDRL), rapid plasma region (RPR)
2. Complement fixation test
- 3- Wasserman test
  - **Low sensitivity in early and late disease**
  - **Usually revert to negative after treatment**

**B- Treponemal antigen tests** (detect antibodies against specific *T. palladium* antigens).

e.g:

- 1- Indirect Fluorescent treponemal antibody-absorption test (FTA-abs)
- 2- *T. pallidum*- particle agglutination test (TP-PA)
- 3- *T. pallidum* immobilizing test (TPI)**

- **Remain positive for years despite treatment**

**Treatment:** Penicillin- Tetracycline- Erythromycin

## Borellia

- Highly flexible irregular spiral organism, and move by rotation and twisting
- **Arthropod transmitted spirochetes**
- Cultured in complex serum-rich artificial media and embryonated eggs.
- Famous in **antigenic variation ( virulence factor)**

**Causes relapsing fever (Borelliosis) - two types:**

	<i>Borellia recurrentis</i>	<i>Borellia hermsii</i>
<b>Transmitted</b>	<b>lice</b>	<b>ticks</b>
<b>Relapses</b>	<b>One time</b>	<b>Three times</b>
<b>Causes</b>	<b>Epidemic ( more severe)</b>	<b>Endemic (sporadic cases)</b>

- Both types of relapsing fever follow the same symptoms
- 12- 15 days after infection, there are abrupt onset of fever, headache, myalgia for 4-10 days.
- Antibodies are formed and number of organism are decreased
- This leads to an afebrile period for a few days to several weeks.
- The fever then relapse because the organism has undergone antigenic variation.
- The antibodies has no longer effective and the organism number increase.
- Several relapses may occur.

**Treatment:** Tetracyclin or erythromycin

### Review Question

- What is the major characteristics of Spirochetes?
- What is major characteristics of *T. pallidum*?
- What is the transmission ways of Syphilis disease?
- What do you know about Congenital syphilis
- Compare between *Borrelia recurrentis* and *B. hermsii*?
- What is the causative agent of Syphilis, relapsing fever?
- What do you know about immobilizing test?
- Give two examples of spiral bacteria?
- Syphilis disease progresses in a series of distinct stages (primary, secondary, latent, and tertiary), what is distinctive features of each stage?