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### (( Microbiology II ))

### Stage 2

### Lecture 9

## **Spirochetes**

By

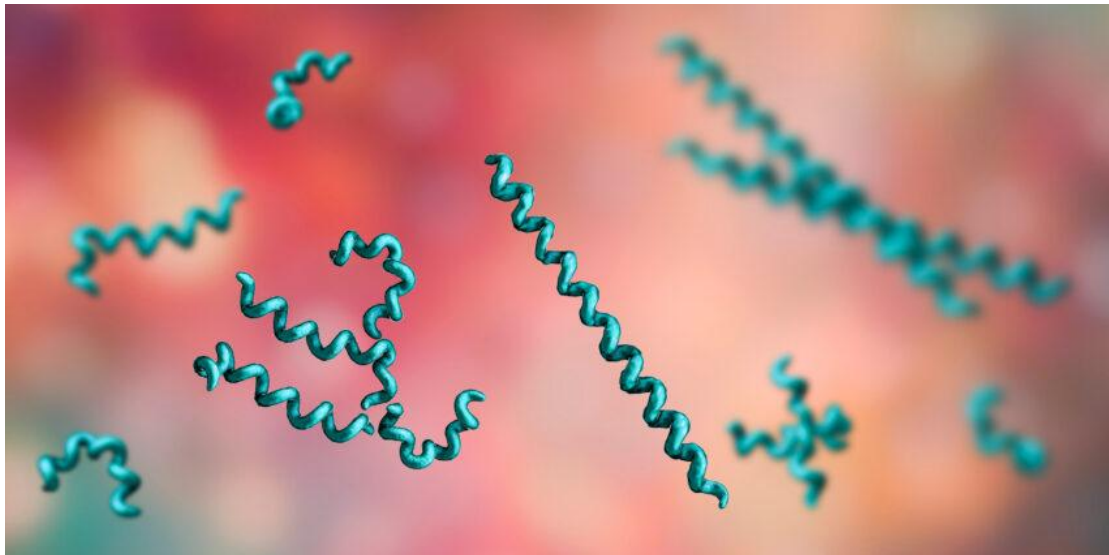
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## Spirochetes

### 1. Introduction

- **Spirochetes:** A unique group of **Gram-negative**, spiral-shaped bacteria.
- Notable for their **flexible, helical shape** and **endoflagella** (axial filaments).
- **Motility:** Corkscrew-like movement helps them penetrate viscous environments like mucus.



### 2. Morphology and Structure

- Thin, tightly coiled, helical organisms
- Not easily visible with Gram stain ( Use **dark-field microscopy** or **silver stain**)
- **Endoflagella** (periplasmic flagella): Between outer membrane and peptidoglycan layer
- Outer membrane: Lipid-rich, lacks classical LPS in some species



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### 3. Classification and Key Genera

#### A. Treponema

- *Treponema pallidum* – causes syphilis
- Anaerobic, not cultivable in artificial media

#### B. Borrelia

- *Borrelia burgdorferi* – Lyme disease
- *Borrelia recurrentis* – relapsing fever
- Larger, visible with Giemsa/Wright stain

#### C. Leptospira

- *Leptospira interrogans* – leptospirosis
- Hooked ends (“question mark” appearance)
- Aerobic, grows in special media

### 4. Treponema pallidum (Syphilis)

- Transmission: Sexual, vertical (congenital)
- Stages:
  1. **Primary:** Painless chancre
  2. **Secondary:** Rash (palms, soles), condyloma lata
  3. **Latent:** Asymptomatic
  4. **Tertiary:** Gummas, aortitis, neurosyphilis
- **Congenital syphilis:** Saddle nose, Hutchinson’s teeth, deafness
- **Diagnosis:**
  - Nontreponemal tests (VDRL, RPR)
  - Treponemal tests (FTA-ABS, TPPA)



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- **Treatment:** Penicillin G



### 5. *Borrelia burgdorferi* (Lyme Disease)

- Vector: Ixodes tick (deer tick)
- Reservoir: White-footed mouse (larvae), deer (adult tick)
- Stages:
  1. **Early localized:** Erythema migrans (bull's-eye rash)
  2. **Early disseminated:** Neurological signs, carditis
  3. **Late:** Arthritis (esp. knees), chronic neuro symptoms
- **Diagnosis:**
  - ELISA → Western blot confirmation
- **Treatment:** Doxycycline, amoxicillin (early); ceftriaxone (later/neurological)

### 6. *Borrelia recurrentis* (Relapsing Fever)

- Transmission: Lice (epidemic) or ticks (endemic)
- Antigenic variation → relapsing episodes of fever
- **Diagnosis:** Giemsa/Wright stain of blood smear
- **Treatment:** Tetracycline or doxycycline



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### 7. *Leptospira interrogans* (Leptospirosis)

- Transmission: Contact with water contaminated by animal urine
- Common in tropical areas, floods
- **Symptoms:**
  - Biphasic illness: flu-like → immune phase (Weil's disease)
  - **Weil's disease:** Jaundice, renal failure, hemorrhage
- **Diagnosis:**
  - Microscopy, serology (MAT test), PCR
- **Treatment:** Doxycycline or penicillin

### 9. Prevention and Control

- Safe sex practices (*Treponema*)
- Tick control and protective clothing (*Borrelia*)
- Rodent control, water sanitation (*Leptospira*)
- Vaccines in development (none widely used yet)

### 10. Bonus: Lab Techniques

- **Dark-field microscopy:** For *T. pallidum*
- **Serologic testing:** VDRL/RPR, ELISA, MAT
- **PCR:** Increasingly used for direct detection