

## Non-Spore-Forming Gram-Positive Bacilli

### *Corynebacterium, Listeria*

These are a diverse group of bacteria, many members of which are normal flora of the skin and mucous membranes.

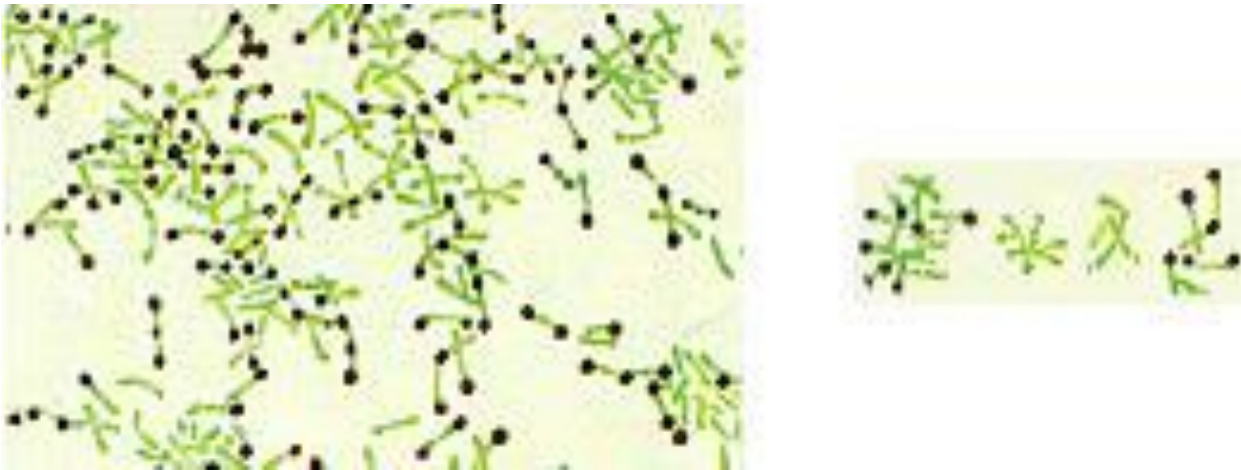
### *Corynebacterium diphtheriae*

#### Morphology and Identification

Corynebacteria are club-shape, gram positive, non spore forming bacteria, found in chines characters-like arrangement of cells. Aerobic and non motile.

#### Pathogenesis

The disease Diphtheria is caused by *C. diphtheria* (toxin producer). It is a droplet infection in which the organisms pass through the nasopharynx. Non toxic form of Corynebacteria found in the normal microbiota are called (Diphtheroids).



Stained *Corynebacterium* cells. The "barred" appearance is due to the presence of polyphosphate inclusions called metachromatic granules. Note also the characteristic "Chinese-letter" arrangement of cells.

### Pathology

Pseudomembrane over the tonsils, pharynx, larynx

Damage by toxins to heart muscle, liver, kidneys, and adrenals. Also nerve damage resulting in paralysis of the soft palate, eye muscles or extremities.

### Clinical Findings

Fever, sore throat, dyspnea because of the obstruction caused by the membrane. Later on difficulties with vision, speech, swallowing, or movement of the arms or legs. Symptoms tend to be subside spontaneously.

### Laboratory Diagnoses

Specimen: Throat swab

Gram stain: to demonstrate club-shape, gram positive, non spore forming, chains characters-like arrangement

Media for Culture: Blood agar, potassium tellurite, Loeffler slant.

**Treatment**: Antitoxin and antibiotics (penicillin).

**Prevention and control**: DPT Vaccine.

### Listeria

Gram positive coccobacilli, motile at 25 C by peritrichous flagella. The pathogenic species is *Listeria monocytogenes*.

Infections:

- 1- Neonatal sepsis
- 2- Neonatal meningitis
- 3- Abortion

**Treatment** : All strain are sensitive to ampicillin and this drug either alone or in combination with aminoglycosides.

## ACID-FAST BACILLI

### Tubercle Bacillus (*Mycobacterium tuberculosis*)

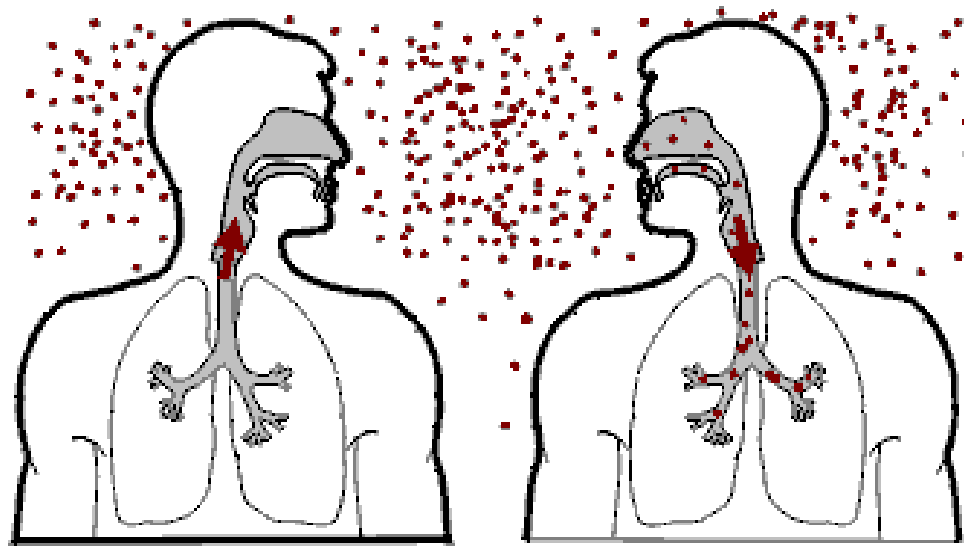
*Mycobacterium* means fungus-like bacterium, is a pathogenic bacterial species in the animal and the causative agent of most cases of tuberculosis (TB). First discovered by **Robert Koch** in 1882, *M. tuberculosis* has an unusual, waxy coating on its cell surface, which makes the cells impervious to Gram staining. Acid-fast detection techniques are used instead.

### Characteristics of *M. tuberculosis*

- Slightly curved, rod shaped bacilli, 0.2 - 0.5 microns in diameter; 2 - 4 microns in length
- Multiplies slowly (every 18 - 24 hrs), *Eight Week Growth of Mycobacterium tuberculosis on Lowenstein-Jensen Agar*
- Thick lipid cell wall, Aerobic , Non-motile
- Can remain dormant for decades

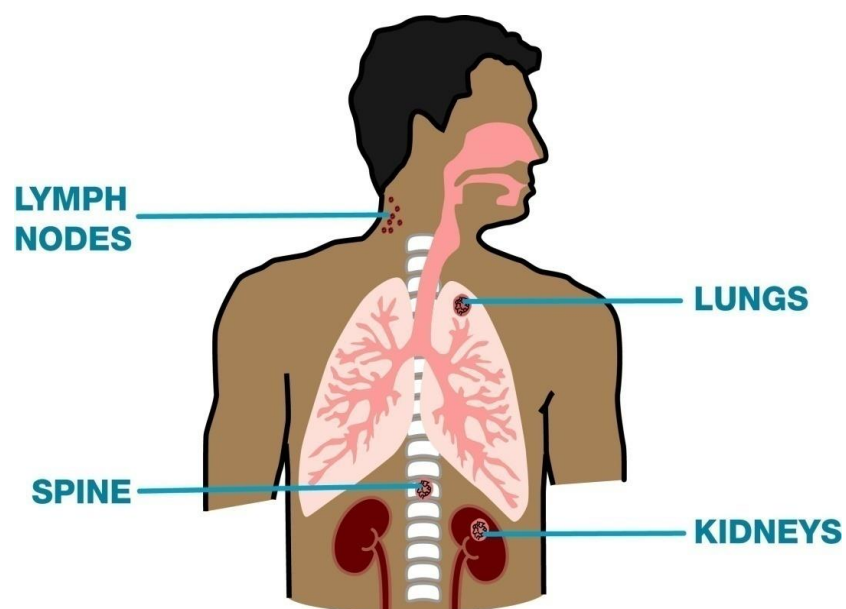
### Transmission and Pathogenesis of TB

- Caused by *Mycobacterium tuberculosis* (*M. tuberculosis*)
- Spread person to person through airborne particles that contain *M. tuberculosis*, called droplet nuclei
- Transmission occurs when an infectious person coughs, sneezes, laughs, or sings
- Prolonged contact needed for transmission



### Sites of TB Disease

- Pulmonary TB occurs in the lungs ,85% of all TB cases are pulmonary
- \* Extra pulmonary TB occurs in places other than the lungs, including the:
  - Larynx - Lymph nodes -Brain and spine -Kidneys -Bones and joints



**Not Everyone Exposed Becomes Infected**

- Probability of transmission depends on:
  - Infectiousness
  - Type of environment
  - Length of exposure

**Latent TB Infection (LTBI)**

- Occurs when person breathes in bacteria and it reaches the air sacs (alveoli) of lung
- Immune system keeps bacilli contained and under control
- Person is not infectious and has no symptoms

**TB Disease**

- Occurs when immune system cannot keep bacilli contained.
- Bacilli begin to multiply rapidly Person develops TB symptoms

**Evaluation for TB**

- \* Medical history
- \* Physical examination
- \* Mantoux tuberculin skin test (TST)
- \* Chest x-ray
- \* Bacteriologic exam (smear and culture)

**Symptoms of TB**

\*Productive prolonged cough \* Chest pain \*Hemoptysis \*Fever and chills \*Night sweats \*Fatigue \* Loss of appetite \*Weight loss (Commonly seen in cases of pulmonary TB)

**Chest x-Ray**

- Obtain chest x-ray for patients with positive TST results or with symptoms suggestive of TB
- Abnormal chest x-ray, by itself, cannot confirm the diagnosis of TB but can be used in conjunction with other diagnostic indicators

**Sputum Collection**

- Sputum specimens are essential to confirm TB
  - Specimens should be from lung secretions, not saliva
- Collect 3 specimens on 3 different days
- Spontaneous morning sputum more desirable than induced specimens
- Collect sputum before treatment is initiated

**Laboratory Diagnosis of Mycobacterial Disease****Smear Examination**

- Strongly consider TB in patients with smears containing acid-fast bacilli (AFB)
- Use subsequent smear examinations to assess patient's infectiousness and response to treatment

**Culture : Used to confirm diagnosis of TB**

- Culture all specimens, even if smear is negative
- Initial drug isolate should be used to determine drug susceptibility

**Treatment of Latent TB Infection**

- Daily Isoniazid therapy for 9 months
  - Monitor patients for signs and symptoms of hepatitis and peripheral neuropathy

- Alternate regimen – Rifampin for 4 months

### Treatment of TB Disease

- Include four 1<sup>st</sup>-line drugs in initial regimen
  - Isoniazid (INH), - Rifampin (RIF) -Pyrazinamide (PZA)
  - Ethambutol (EMB)
- Adjust regimen when drug susceptibility results become available or if patient has difficulty with any of the medications
- Never add a single drug to a failing regimen
- Promote adherence and ensure treatment completion

### Drug Resistance

- Primary - infection with a strain of *M. tuberculosis* that is already resistant to one or more drugs
- Acquired - infection with a strain of *M. tuberculosis* that becomes drug resistant due to inappropriate or inadequate treatment

### Prevention

- **A vaccine** against MTB is available. It is called **BCG** (Bacillus of Calmette and Guerin, named after the two Frenchmen that developed it). BCG consists of a live attenuated strain derived from *Mycobacterium bovis*. This strain of *Mycobacterium* has remained a virulent for over 60 years.
- The vaccine is not 100% effective. Studies suggest a 60-80% effective rate in children.