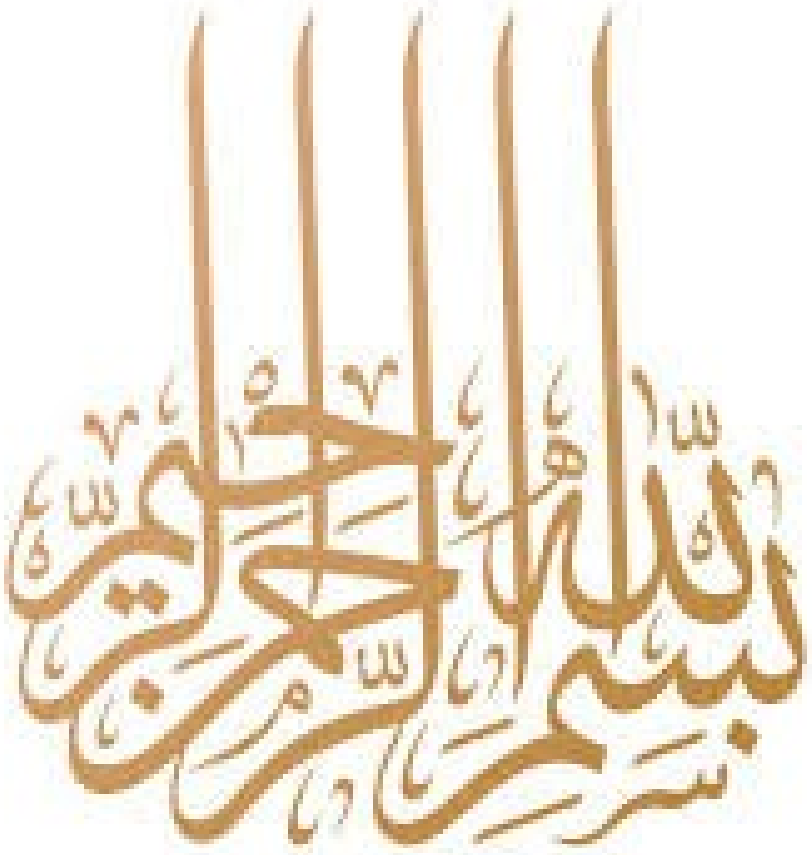
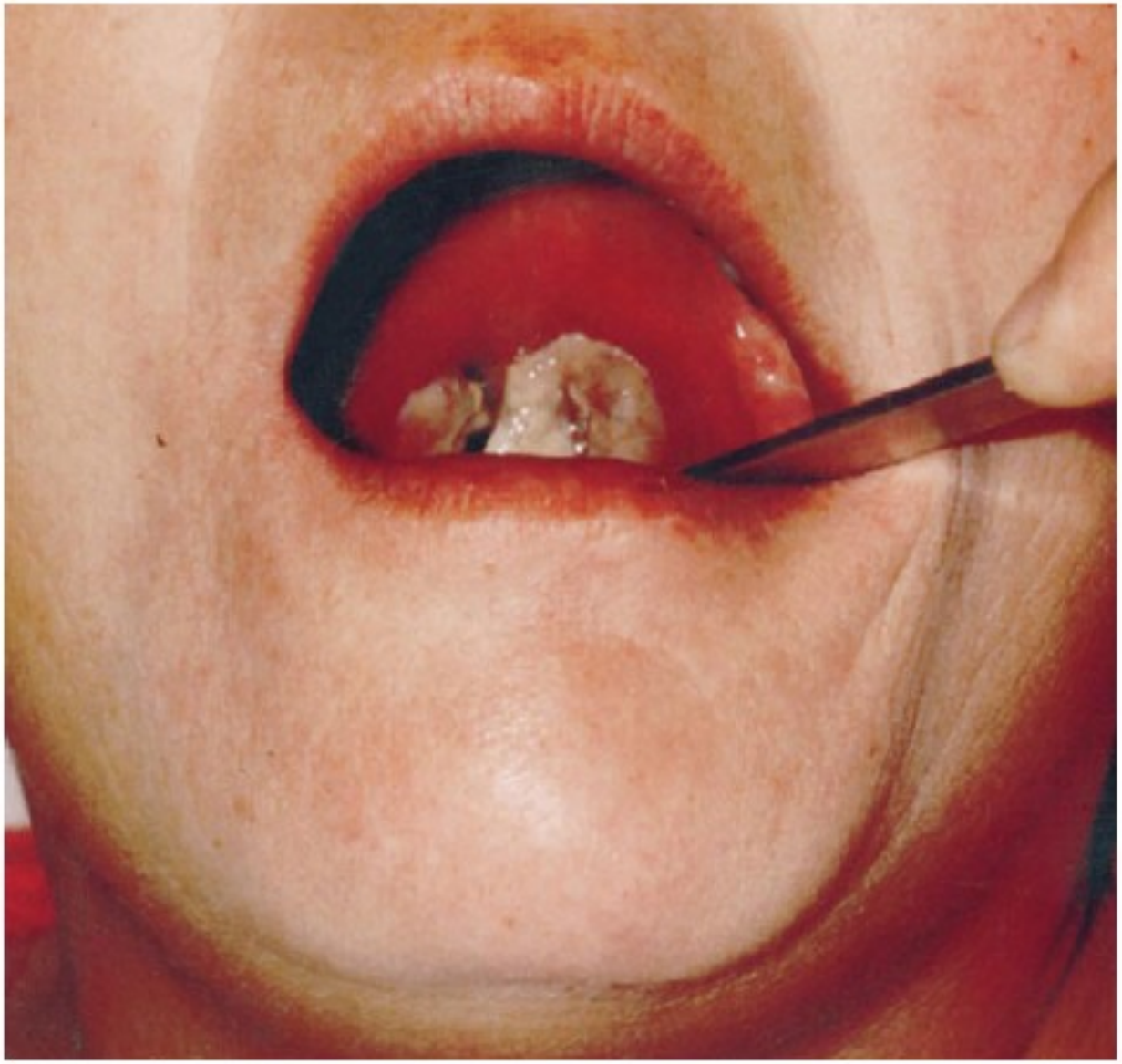

بسم الله الرحمن الرحيم

15.3.2023

Non sporing

Gram Positive Rods

(MBBS, M.Phil, Ph.D, CBact, CHPE)



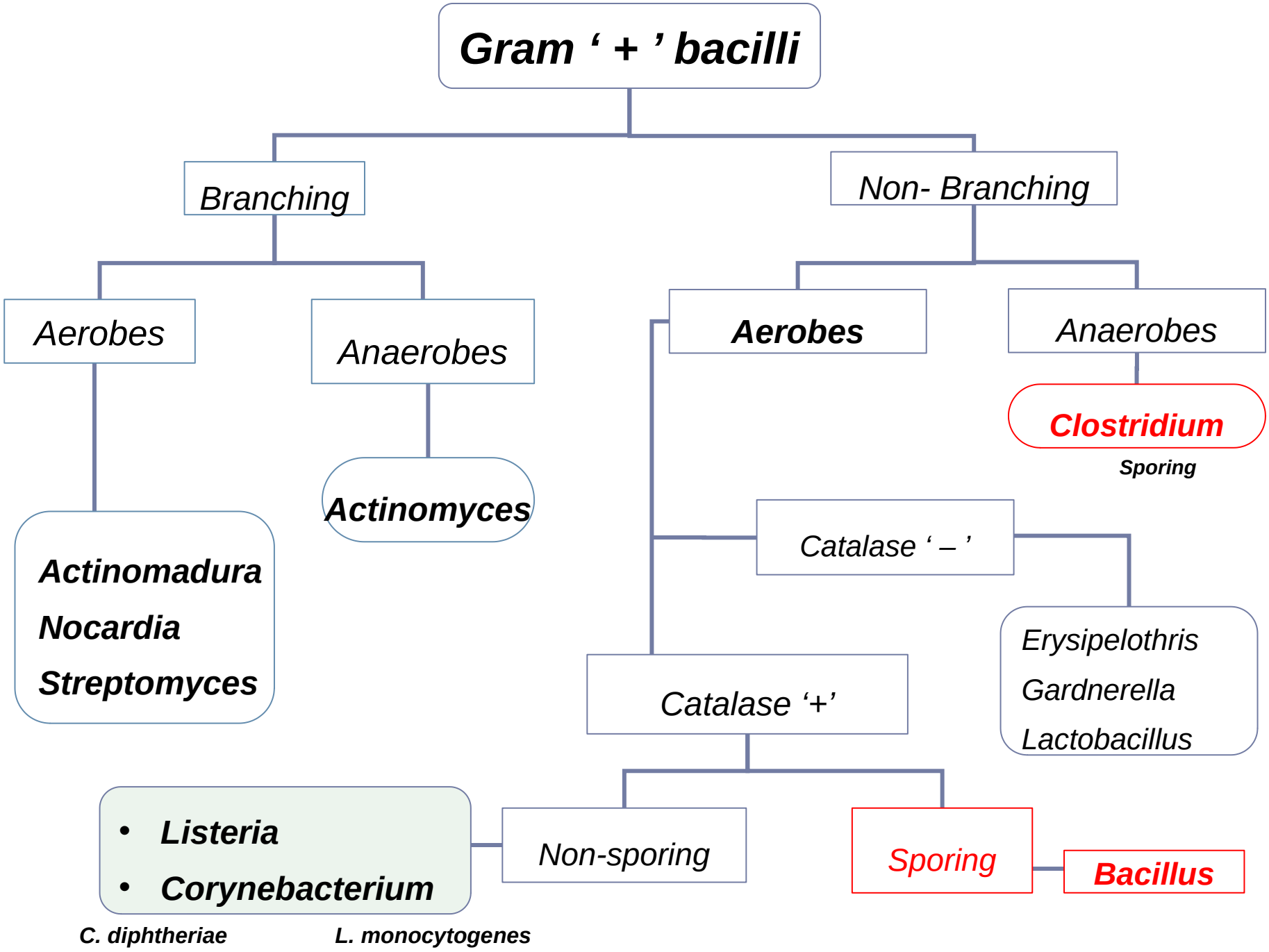
whitish-gray pseudomembrane
covering posterior pharynx and marked inflammation of palate and pharynx.

(Courtesy of Dr. Peter

Objectives

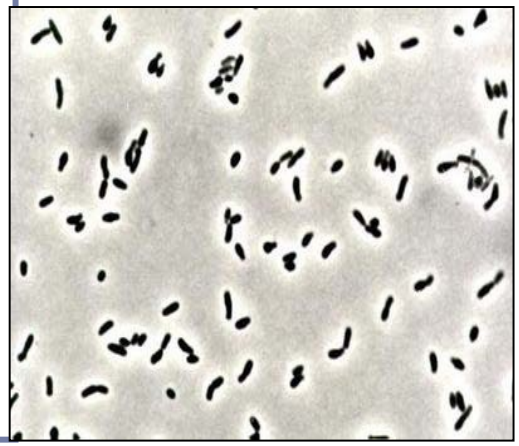
At the end of this session students of 3rd year should be able to

1. Enumerate non sporing gram positive rods
2. Describe the important properties, pathophysiology, clinical features and lab diagnosis of *Corynebacterium* and *Listeria*.


Gram ‘ + ’ bacilli
Branching
Non- Branching
Aerobes
Anaerobes
Aerobes
Anaerobes
Clostridium
Sporing
Actinomyces
Actinomadura
Nocardia
Streptomyces
Catalase ‘ – ’
Erysipelothris
Gardnerella
Lactobacillus
Catalase ‘+’
Listeria
Corynebacterium
C. diphtheriae
L. monocytogenes
Non-sporing
Sporing
Bacillus

Corynebacteria

- gram-positive rods
- Small, slender, **club shaped** or pleomorphic (arranged in L, V shaped formation), have beaded appearance
- Non-motile, and non-capsulated, non sporing



Corynebacteria

HABITAT

- Normal commensal flora of human skin, throat, urinary tract and margins of conjunctiva.
- Can be found in soil, plants and animals and food products.

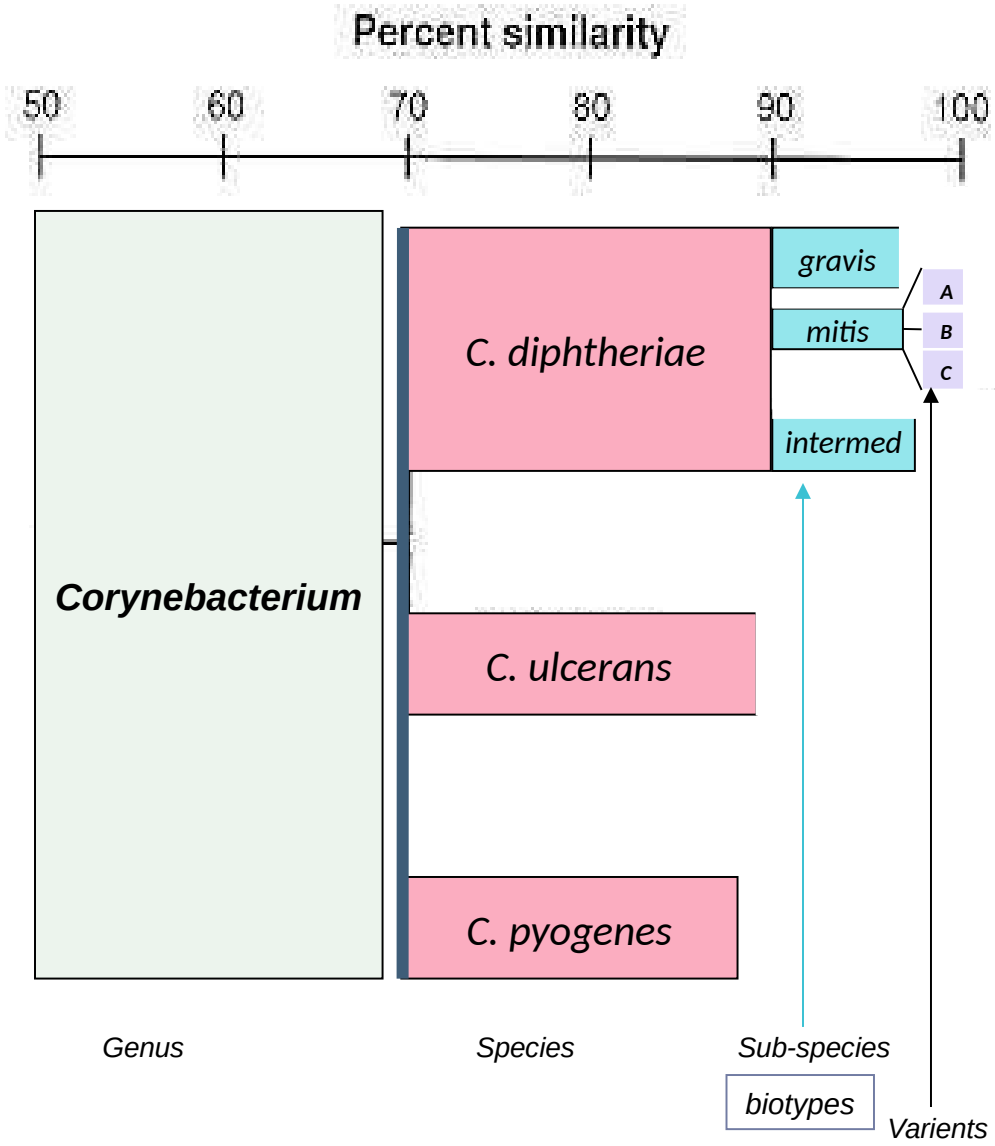
Role in disease

- The most notable human infection is **diphtheria**, caused by *C. diphtheriae*; It is an acute, contagious infection characterized by pseudo-membranes of dead epithelial cells, WBC, RBC, and fibrin that form around the tonsils and back of the throat.

- Corynebacterium species **(diphtheroids)** are opportunistic pathogens.

- **Toxigenic *C. diphtheriae*** Lysogenic bacteriophage (β-prophage) carries toxin gene *'tox'.*

  No phage = no toxin = no disease



C. diphtheriae gravis

C. diphtheriae mitis,

C. diphtheriae intermedius

C. Diphtheriae is humans pathogen

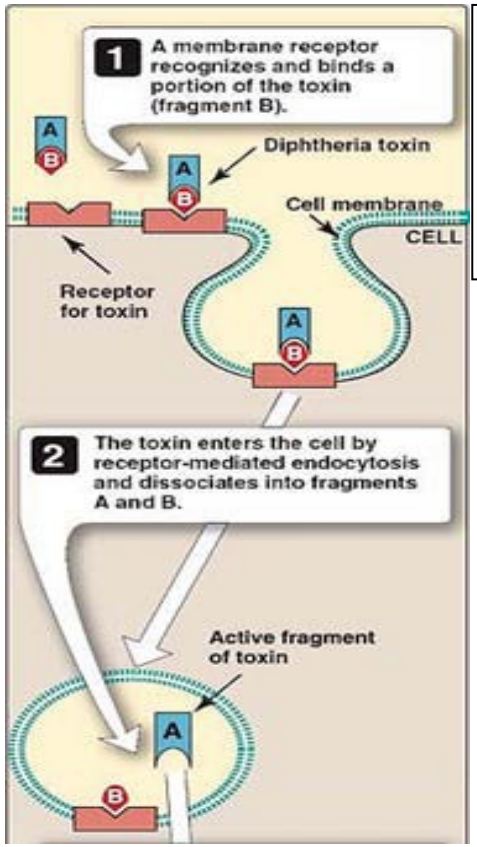
- found in the throat & nasopharynx of carriers & patients with diphtheria.
- Local infection, usually of the throat.

TRANSMISSION

- Spreads through respiratory droplets, or nasal secretions; usually by convalescent or asymptomatic carriers.
- Less frequent spread includes direct contact with infected individual or a contaminated fomite.

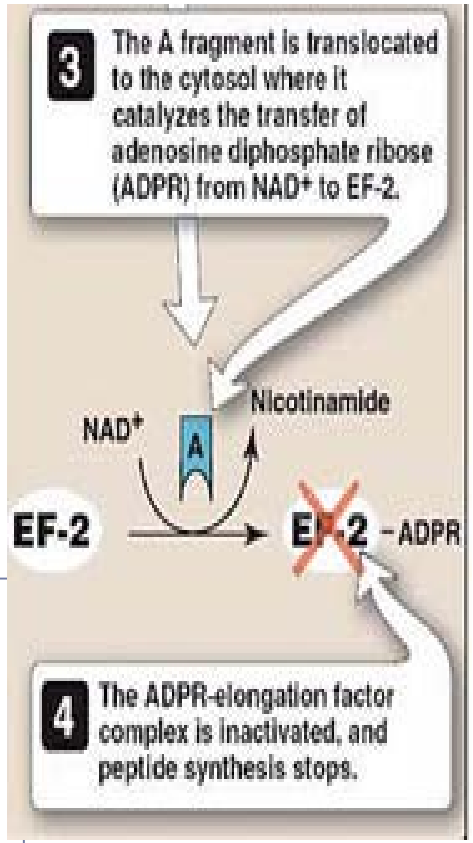
Pathogenesis

- *C. diphtheriae* causes only local throat infection, however,
- The exotoxin may have systemic effects. It inhibits cellular **protein synthesis** that results in cell death diseas manifestations



Fragment B binds to susceptible cell membranes and mediates delivery of fragment A to its target.

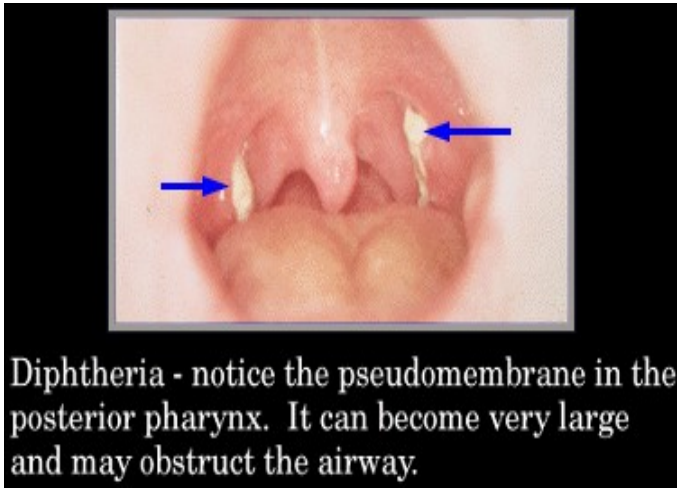
Invasion & Establishment



Fragment A separates & inactivates the elongation factor [EF-2]and inhibits protein synthesis.

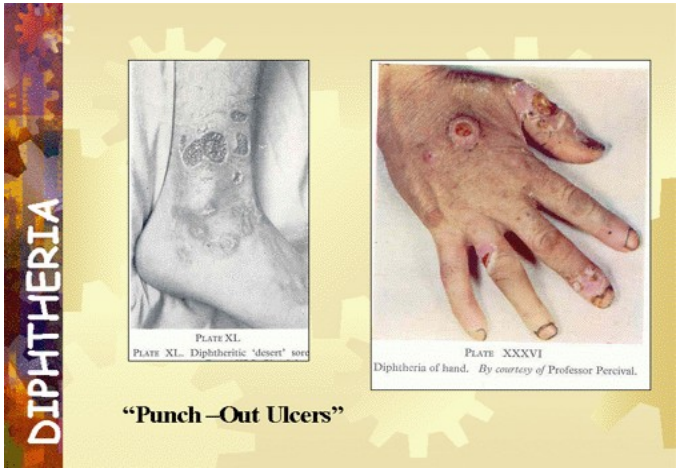
Diphtheria

- acute respiratory inflammation with fibrinous exudate (pseudomembrane) Life-threatening illness.
- Antibody block the binding site “B” of toxin
- Became rare disease due to vaccination & immunization (DPT) [in childhood]
- serious disease if population has not been immunized,



Pseudomembrane is composed of fibrin, bacteria, and inflammatory cells

- A milder form can be restricted to the skin (cutaneous lesion) covered by grey membrane. It don’t invade surroundings.



Clinical presentation

Most prominent sign is

Thick, greyish tough adherent exudate (**pseudo-membrane**) that coats the throat & tonsils, & may extend into larynx, trachea, nasal passages or respiratory tract (airway obstruction).

The exudate may obstruct the airways → (suffocation)

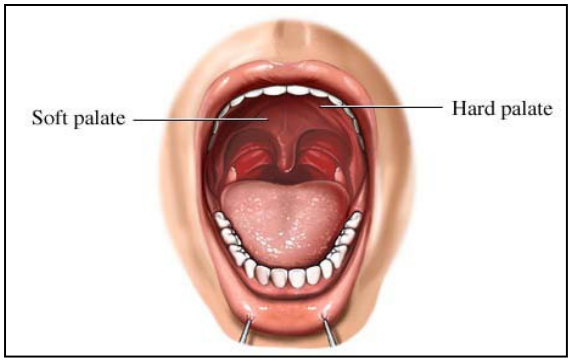


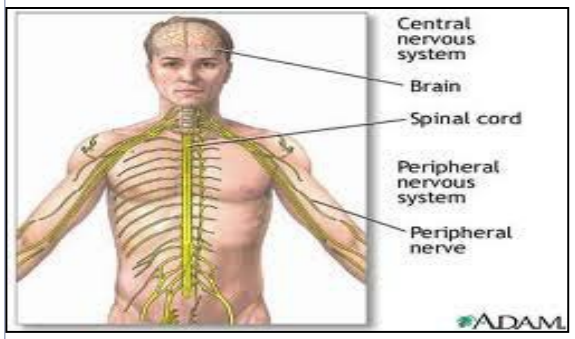
FIGURE 17–7 Diphtheria. Note whitish-gray pseudomembrane covering posterior pharynx and marked inflammation of palate and pharynx. Caused by diphtheria toxin, an exotoxin that inhibits protein synthesis by inhibiting elongation factor-2. (Courtesy of Dr. Peter Strebel.)

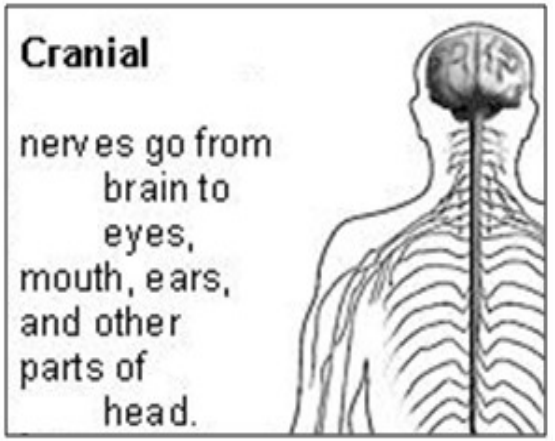
Clinical presentation

Generalized symptoms due to production & absorption of toxin (fever, sore throat, cervical lymphadenopathy).

Major clinical effects: on heart & peripheral nerves are.

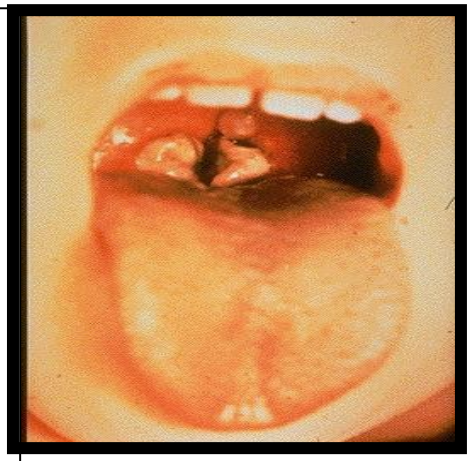
- **Cardiac conduction defects & myocarditis** may lead to arrhythmia, circulatory collapse or permanent heart damage,.
- **neuritis of cranial nerves & paralysis of muscle groups**, i.e. those controlling movement of palate or eyes loss of motor functions Later difficulty in swallowing and regurgitation of fluid through nose.



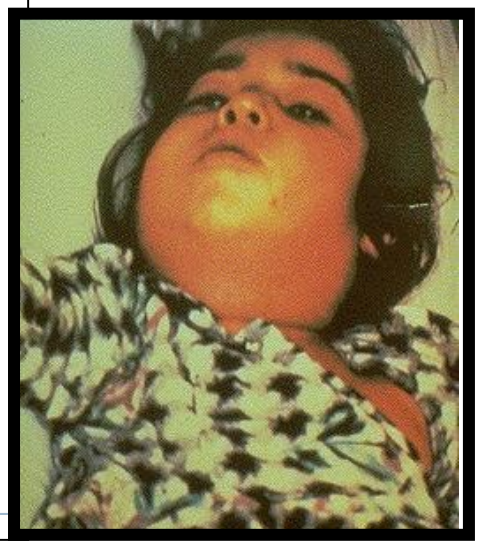


Diphtheria

- Symptoms of **pharyngeal diphtheria** vary from **mild pharyngitis to hypoxia to suffocation** due to airway obstruction.



- **The involvement of cervical lymph nodes** may cause profound swelling of the neck (bull neck diphtheria), and the patient may have a fever (103°F).



C. ulcerans

- Cutaneous infection with *C. diphtheriae* may lead to a **chronic, non-healing ulcer** with a gray pseudomembrane.
- Rarely cause death due to systemic effects of the **toxin.**

Immunity: **Diphtheria toxin is antigenic** and stimulates the production of **antibodies** that neutralize the toxin's activity.

- Toxoid (formalin treated toxin) → antigenic but not toxic immunization against the disease

Lab Diagnosis

- **Isolation of *C. diphtheria***

- *Culture on lab media*

On Loeffler's medium, a tellurite plate, and a blood agar plate

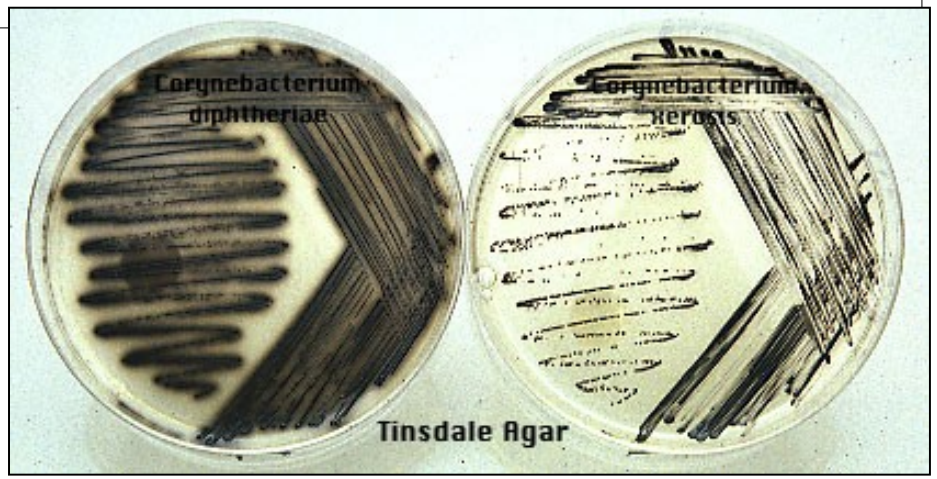
- **Demonstrate toxin production** ('tox' gene)

- PCR
- *Animal inoculation*
- *Gel diffusion precipitin test*

Definitive diagnosis

1. Isolation of *C. diphtheriae* from throat SWAB culture on a selective media & **must be** tested for virulence.
2. Gram & Methylene blue staining of swab smear for GPR & metachromatic granules.
3. PCR for the presence of toxin ‘tox’ gene.

C. Diphtheriae has distinctive morphology: (Chinese-letters)
*Small, slender, **club shaped** or pleomorphic*



Typical Gray-black colonies

Treatment

Prompt neutralization of toxin with antitoxin followed by eradication of the organism.

- A single dose of horse serum antitoxin inactivates any circulating toxin, although it does not affect toxin already bound to a cell-surface receptor.

- Immunize children with **diphtheria toxoid** (DTaP) vaccine three doses given at 2, 4, and 6 months of age.

- Antibiotic treatment slows spread of infection & prevents further toxin production by killing the organism.

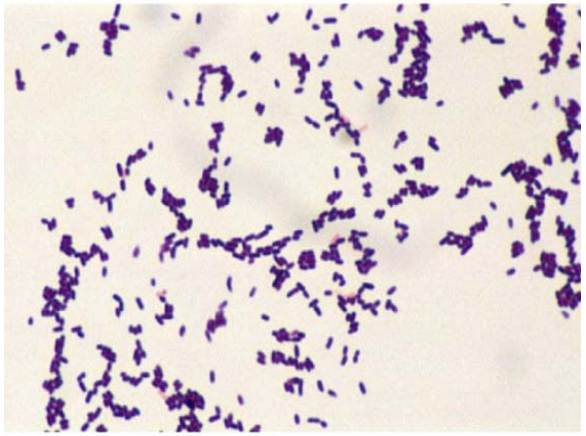
  Penicillin (Penicillin G), Macrolides, Erythromycin, Lincomycins

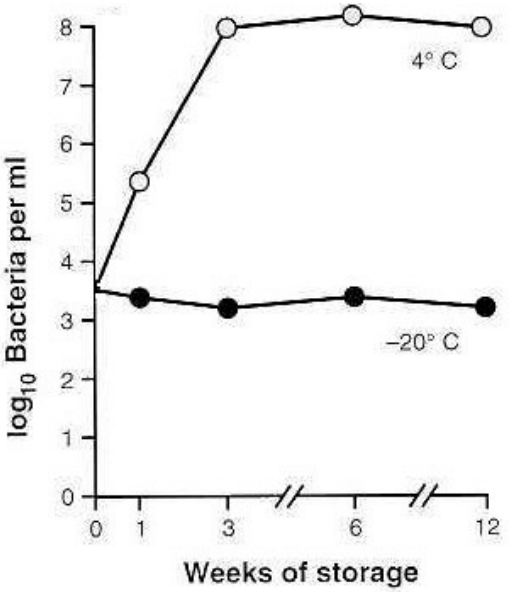
Listeria monocytogenes

Listeria

Morphology

- short, gram positive rods
- Motile,
- Grow at low temperatures at 4°C and accumulates in contaminated food, stored in a refrigerator.
- **Listeriosis** is highly fatal opportunistic food borne infection
- It is associated with ingestion of refrigerated milk, meat / vegetable.





Habitat:

- can be found in soil, sewage & dead vegetable matter, effluent and human feces
- infects wild domestic animals & birds.

- **It can infects** pregnant women, newborns infants, elderly and immunocompromised patients.

❑*Epidemiolog*

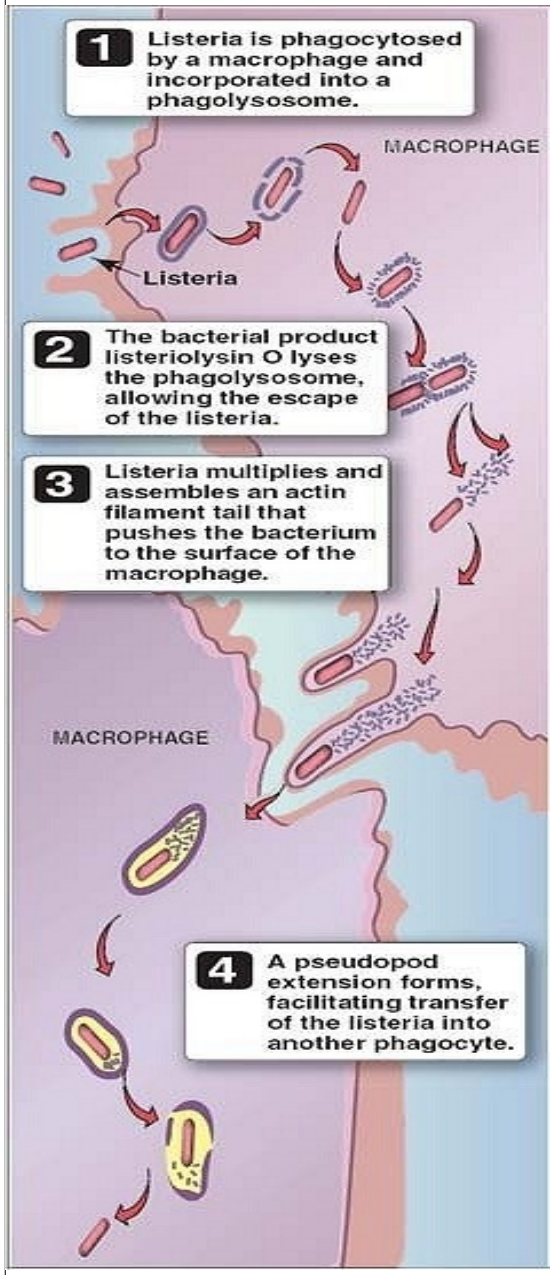
- not a common humans pathogen,
- Infections are opportunistic and may occur as sporadic cases or in small epidemics
- 1-15% of healthy humans are asymptomatic carriers (in their intestinal).
- *In USA: 2000 cases are reported each year, with 450 deaths and 100 stillbirths.*

Infections are usually food-borne

- 20-30% from ground meat
- 2 – 3 % from processed dairy products (including ice cream and cheese) &
- Remaining from retail poultry products

Pathogenesis

- Facultative, intracellular parasite
- Adheres and enters a variety of mammalian cells
- Virulent factors include hemolysin (listeriolysin O), phospholipases and several other
- listeriolysin destroys phagosome.
- Cell to cell spread lead to inflammation and cell death (enteritis in intestine) .



Spread and transmission

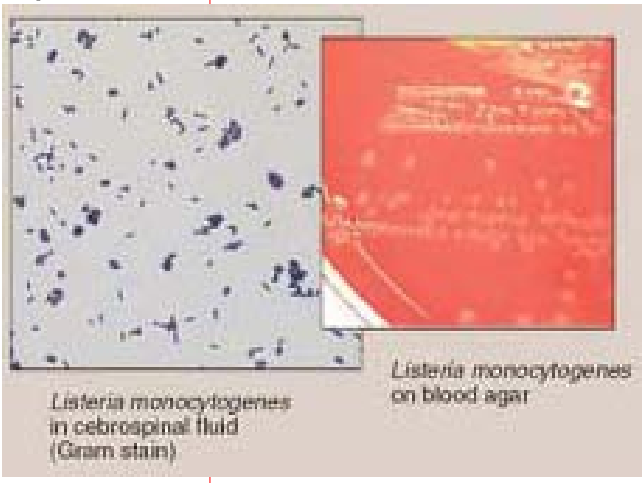
1. Transmission to new-born can occur in 3rd trimester of pregnancy in infected women, (who has milder flulike presentation)
2. Can also infect fetus and initiate abortion & still birth.
3. Immunocompromised with decreased cellular immunity are susceptible to serious generalized infections,

Clinical presentation

1. **Meningitis, meningoencephalitis & Septicemia** in infants & immunocompromised adults (i.e. renal transplant patients).
2. Occasionally it can cause bacteremia, endocarditis, abscesses in the brain and other parts.
3. Outbreaks of **febrile gastroenteritis**

Laboratory identification

- Clinical specimens include Blood, CSF, and other aspirates
- Gram stain and culture



- Blood cultures are indicated in pregnant febrile women when no alternate pathology is readily detected (for example, UTI).

Treatment:

- Many antibiotics are successfully used to treat listeriosis.
- Good response to ampicillin with or without gentamycin.
- Trimethoprim-sulphamethoxazole are also effective.
- Listeria gastroenteritis does not require treatment

- **Prevention:** by hygiene, proper food preparation and food handling.

Thank you