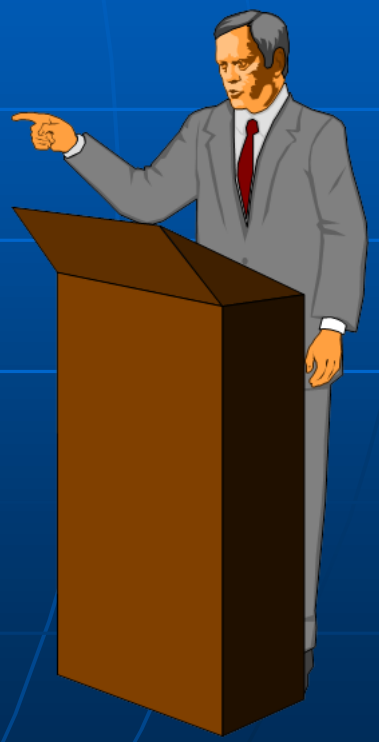
Medical microbiology
Lec. 9
Non-spore forming Gram-positive rods



By:
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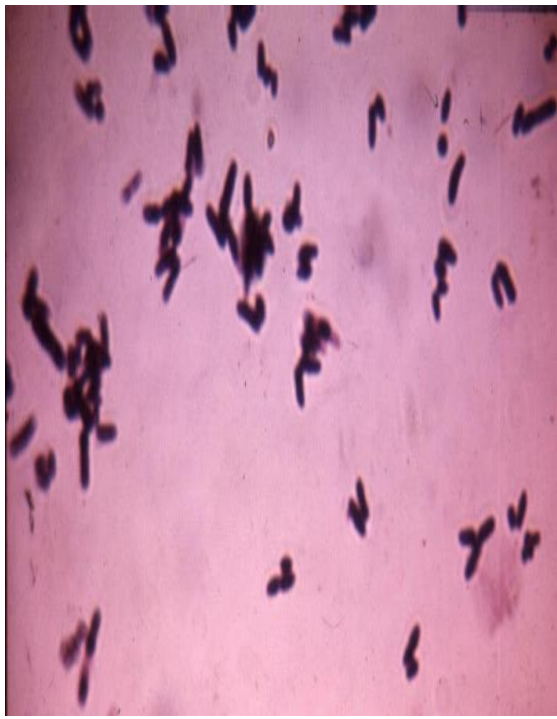
Non-spore forming Gram-positive bacilli

Corynebacterium

☯ *Corynebacterium:*

Many members of the genus corynebacterium are members of the normal flora of the skin and mucous membranes of the humans. *C. diphtheriae* is the most important member of the group, it can produce a powerful exotoxin that causes **diptheria** in human.



❖ Morphology & identification:

- G+ve rods, clupped-shaped, arranged in acute angles (V or L shape, pallisade, cueniform).
- Have beaded appearance (due to the metachromatic granules).
- Non-motile.

Corynebacterium

❖ **Cultural characteristics:**

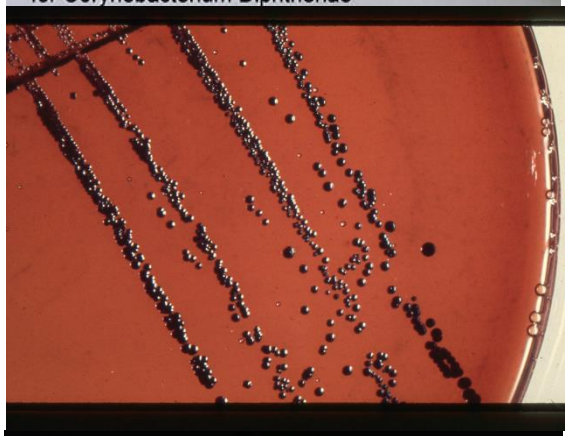
- Aerobic and facultative anaerobic bacteria.
- **Loaffler's serum slope:** the growth is very fast and produce in 6–8 hours, the colonies are small, circular, opaque, and white, at a temperature of 37°C.
- **potassium tellurite:** gray or black colored colonies after 48 hours of incubation. *C. diphtheriae* biotypes :

■ **Mitis** colonies are small, round, convex, and black.

■ **Intermedius** colonies are small, flat, and gray.

■ **Gravis** colonies are large, irregular, and gray.

- **Tinsdale media**: grayish black colonies surrounded by a dark brown halo due to H_2S production (**Diagnostic**).



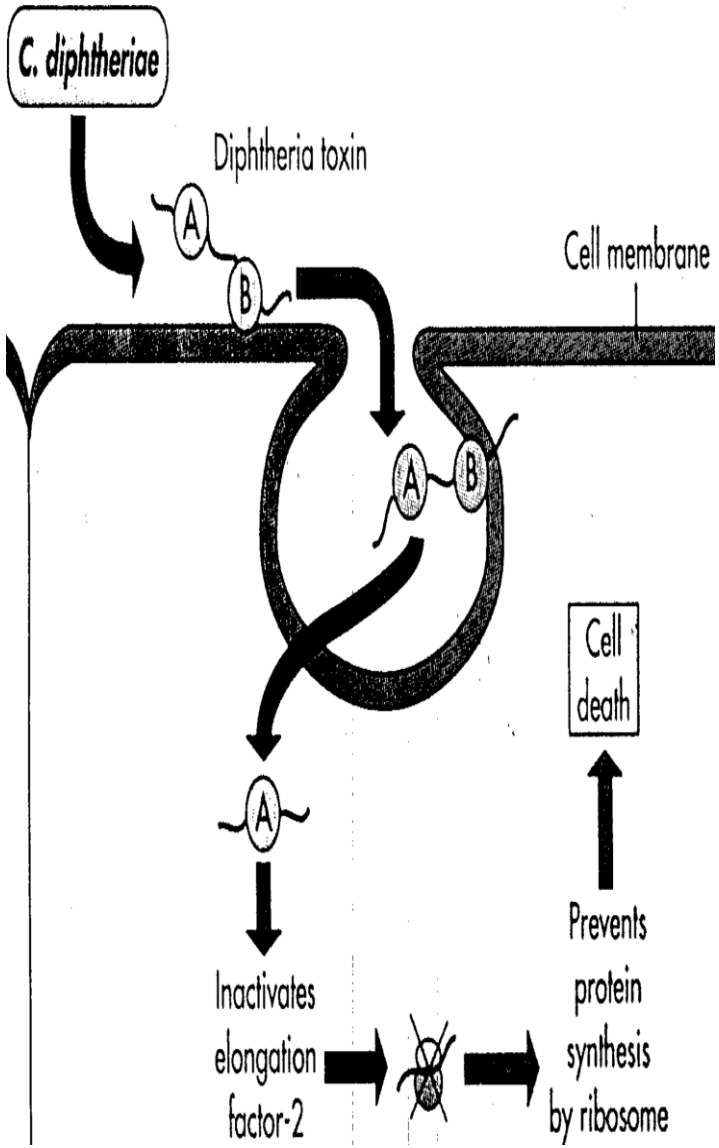
Mechanism of action

❖ virulence factor:

- **Diphtheria toxin:**

- Heat-labile toxin.
- Blocks protein synthesis
- Encoded by (Tox gene) introduced in lysogenized bacteria with lysogenic phage Beta-corynephage
- controlled by bacterial repressor protein.
- expressed if [iron] low.
- Composed of fragment A & B

- B for transport
- A inhibits protein synthesis.



C. diphtheria

❖ **Pathogenesis:**

- Site of entry is respiratory tract but may enter through skin or eye.
- Adherence and multiplication of the bacteria in the epithelial cells of infected region, forming a local lesion.
- Secrete exotoxins that cause necrosis of the cells in that area.
- Formation of the characteristic pseudomembrane.
- *C. diphtheriae* does not cause any invasion of the, but the toxin may absorbed into the blood stream and distributed, resulting in systemic complications of diphtheria including demyelinating peripheral neuritis and myocarditis.

❖ **Clinical findings:**

- The incubation period is 2-5 days.
- Sore throat, fever, dyspnea, marked edema of the tonsils, uvula, and anterior neck (bull neck).
- Untreated patients may continue shed the bacilli in the environment for weeks or months after recovery (Convalescent carriers).

C. diphtheria

Epidemiology:

Either clinical or subclinical infection at an early age yield **protective levels of antitoxin.** Thus most members of the population, except children are immune. By age 6-8 years about 75% of children in developing countries where skin infection with diphtheria are common have protective serum antitoxin. Absorption of small amount of *C. diphtheria* toxin does not produce a disease, but it can serve as antigenic stimulus for immune system to produce antitoxin.

Active immunization with *C. diphtheria* **toxoid** during childhood yield antitoxin levels that generally adequate until adulthood. Young adults in developed countries (Non **endemic** areas) should receive a booster dose because diphtheria bacilli are not sufficiently prevalent to provide a stimulus of subclinical infection. **DPT** is the combined of **diphtheria toxoid**, **tetanus toxoid** & **pertussis vaccine** used as a single injection for immunization of children. For booster dose in adults only **TD** is used.

Corynebacterium jeikeium

- Opportunistic infections (sepsis, endocarditis) in immunocompromised (e.g., patients with blood disorders, bone marrow transplants, intravenous catheters)
- Multiple antibiotic resistance common (MDR)
- Carriage on skin of up to 40% of hospitalized patients (e.g., marrow t-plants)

Corynebacterium urealyticum

- Urinary tract infections (UTI's); cause chronic or recurrent cystitis, bladder stones, and pyelonephritis rare but important
- Urease hydrolyzes urea; release of NH_4^+, increase in pH, alkaline urine, renal stones

REVIEW

Listeria monocytogenes

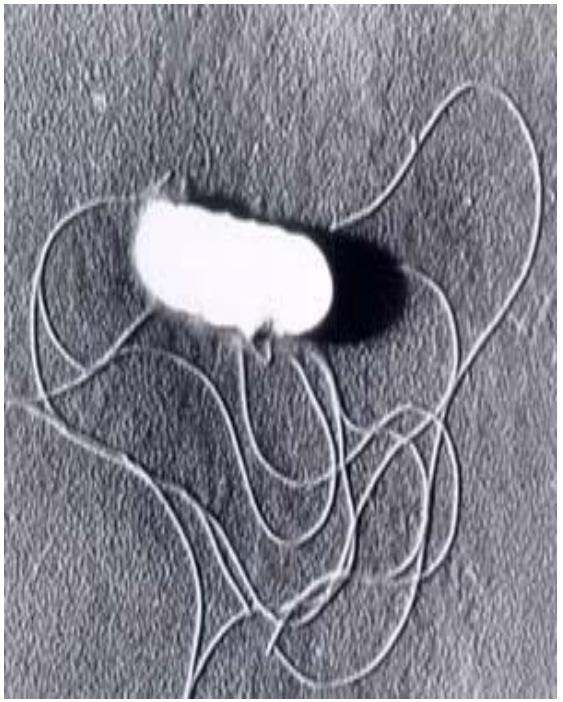
❖ **Morphology & identification:**

- short G+ rods (coccobacilli), frequently occurs in chains.
- Non-spore forming.
- Multiply at refrigerator temperatures (4°C)
- It has a tumbling end-over-end motility at room temp., but not at 37 C.
- It is facultative anaerobe, catalase positive, CAMP positive.

❖ **Culture & growth :**

- Muller-Hinton agar.
- On blood agar (sheep RBCs) small zone of hemolysis may be observed.

Listeria monocytogenes



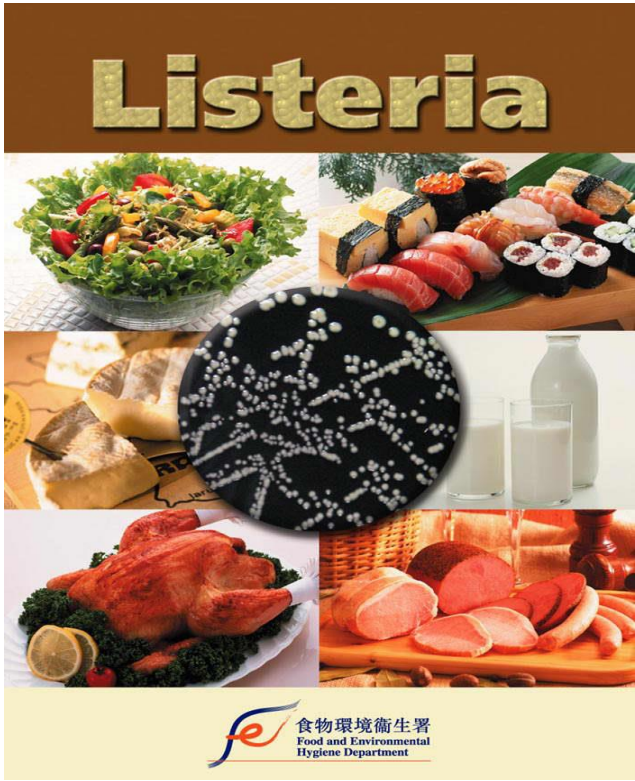
Listeria monocytogenes

❖ **Pathogenesis:**

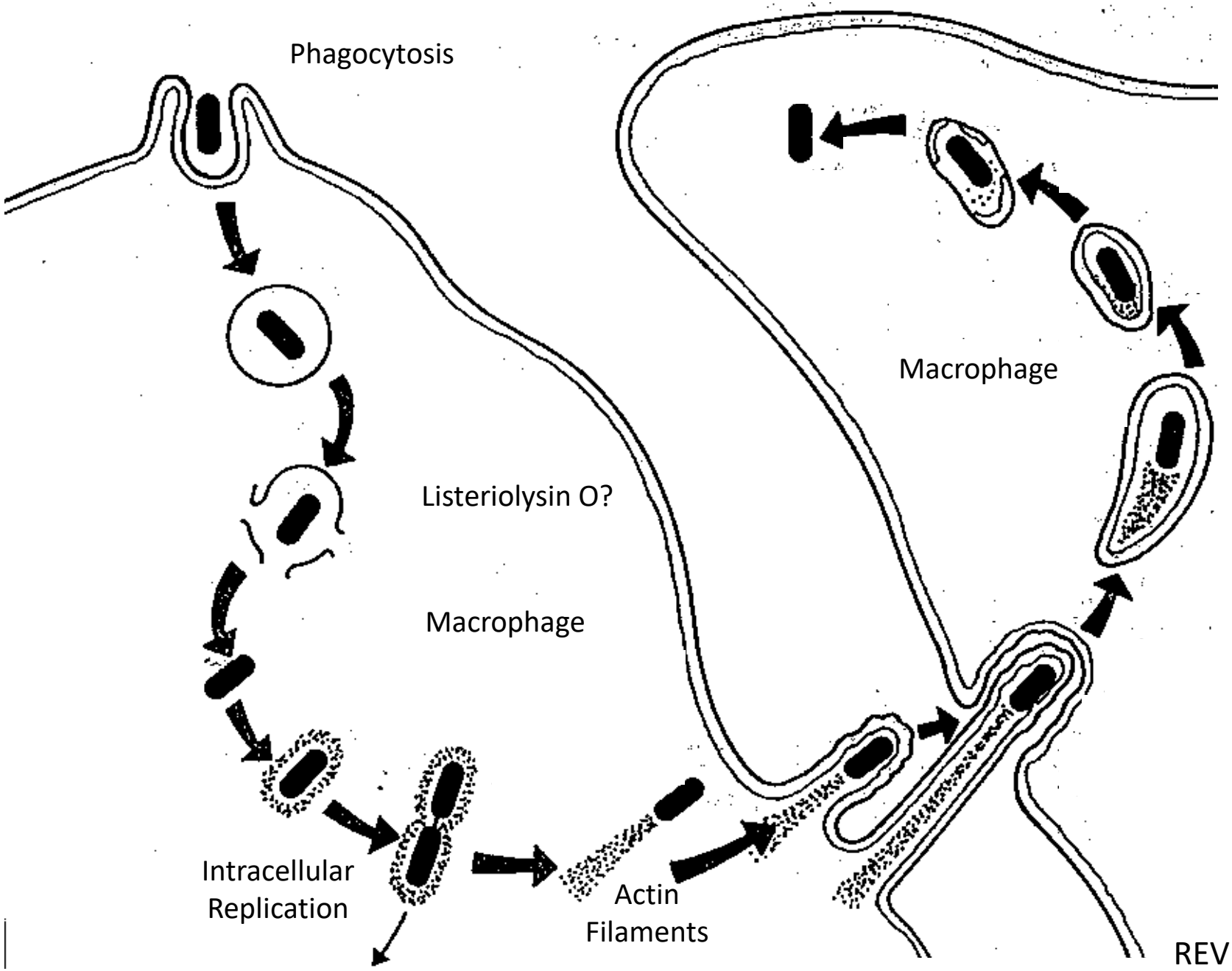
- route of transmission is eating food cntaminated with the bacteria.
- Group at risk are primarily pregnant women, newborns, & adults with weakened immune systems.
- *L. monocytogenes* enters the body through the GIT with the contaminated food e.g. Cheese or vegetables.
- Enters the epithelial cells by induced phagocytosis. and start to produce **listeriolysin O**.

❖ **Clinical findings:**

- Intrauterine infection results in **sepsis** and death before or after delivery.
- **Meningitis**: between the birth and the 3rd. week of life.
- Meningitis is often complicated by encephalitis, a pathology that is unusual for bacterial infections.

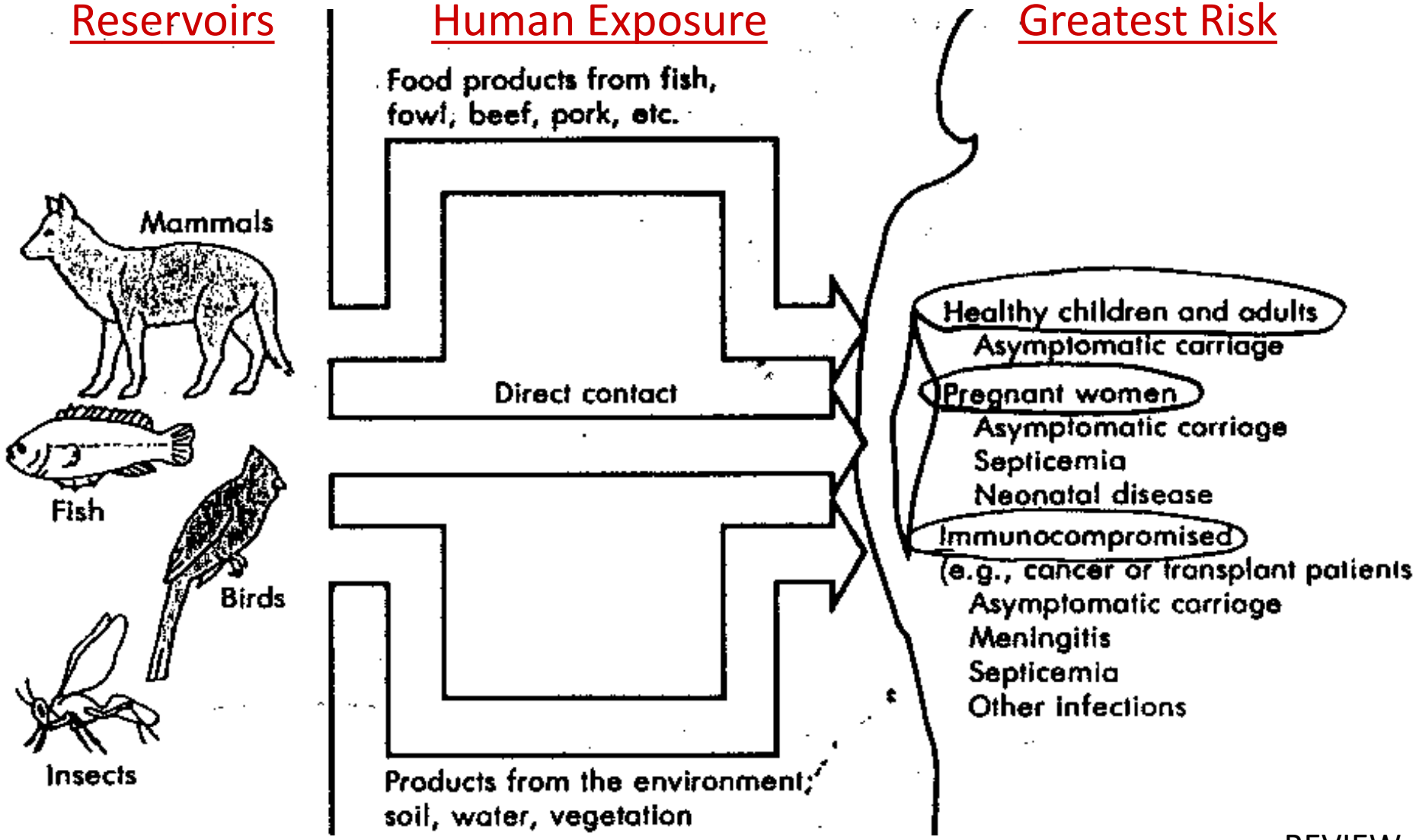


Intracellular Survival & Replication of Listeria



REVIEW

Epidemiology of Listeria Infections



REVIEW

Actinomycetes

Are a diverse group of G^+ bacilli with a tendency to form chains or filaments. Most are saprophytes that lives in soil, others are normal flora.

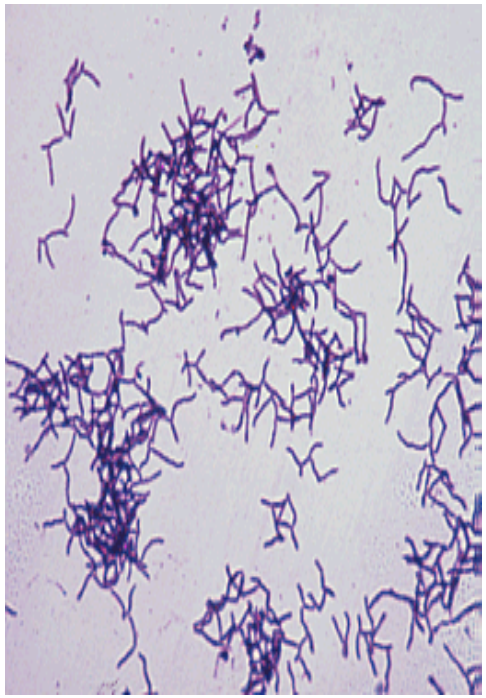
❑ ***Actinomyces israelii:***

- Non-acid fast, Branching rods.
- Normal flora of gingival crevices and female genital tract

❖ **Pathogenesis**:

- Causes actinomycosis: chronic suppurative & granulomatous, generally not painful but very invasive, penetrating all tissues, including bone.
- Tissue swelling → draining abscesses (sinus tracts) with "sulfur" granules(hard yellow microcolonies) in exudate that can be used for microscopy or culture and composed of macrophages, tissue cells, fibrin and bacteria.

Actinomyces israelii



Actinomyces :draining sinus & sulfur granules

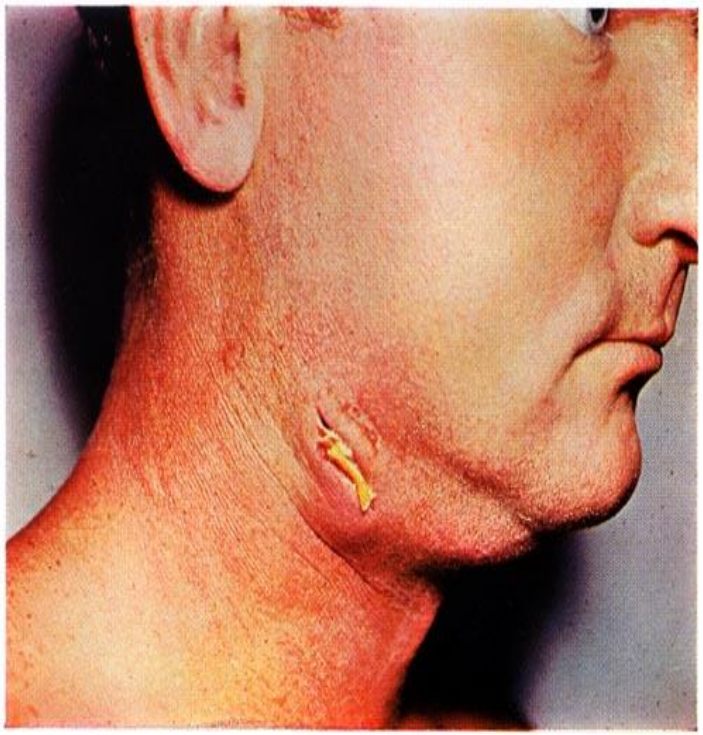


FIGURE 1.—Actinomycosis, jaw, observed at Letterman General Hospital, San Francisco, Calif., in a sergeant who had punctured the floor of his mouth with a weed stem while picking his teeth.

❖**laboratory diagnosis:**

- **Specimen:** Pus from draining sinuses, sputum, or specimens from tissue.
- **Microscopy:** examined for the presence of sulfur granules (**Diagnostic**).
- **culture**: Brain heart infusion agar and thioglycolate broth and incubated anaerobically or elevated CO2 conditions.

☯ Nocardia:

- *Nocardia asteroides, Nocardia brasiliensis*

❖ Morphology:

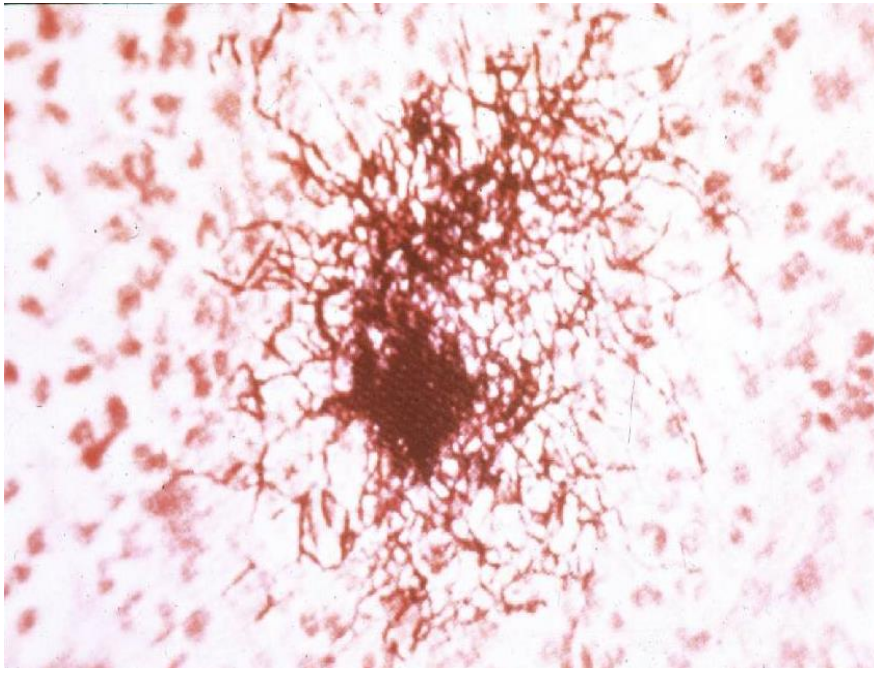
- Aerobic
- Gram-positive branching rods, partially acid fast.

❖ Pathogenesis

- No toxins or virulence factors known
- an opportunistic infection associated with several risk factors, most of which impair the cell-mediated immunity.
- Pulmonary nocardiosis may disseminate to other organs (brain or skin).
- The usual pathologic process is abscess formation (neutrophilic inflammation).
- Cutaneous/subcutaneous nocardiosis: cellulitis with swelling → draining subcutaneous abscesses with granules (mycetoma)

❖ laboratory diagnosis:

- Culture of Clinical specimen :Sputum, Pus, Biopsy tissue




THANK YOU

REVIEW