Listeriae

Oto Melter

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Taxonomy

- Genus – 19 species
- Only *L. monocytogenes* is significant human pathogen

Biological properties

- Gram-positive rods, non–spore-forming
- broad temperature range (1-45C)
- tumbinng motility (room temperature)

Pathogenesis

- facultative **intracellular pathogen** (macrophages, enterocytes, epithelial cells, hepatocytes)
- **virulence factors:**

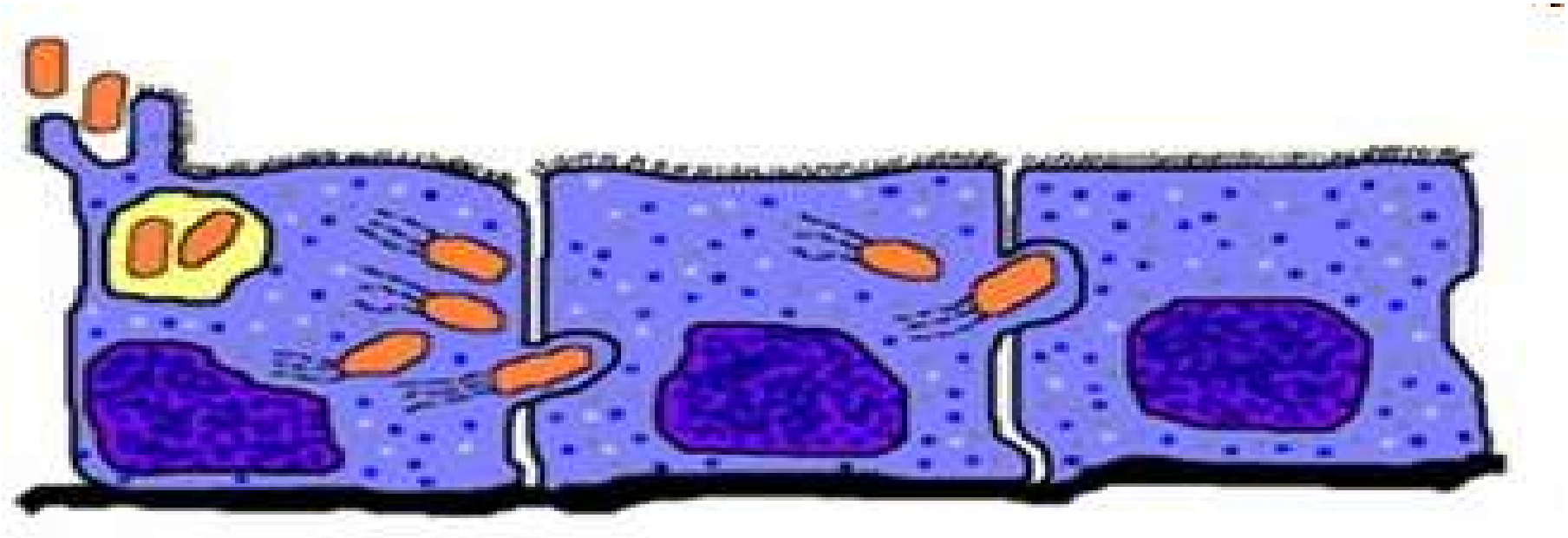
Internalins – interact with receptors on host cells, penetration into host cells

Listeriolysin (exotoxin), phospholipase C (enzymes) – releasing the bacteria into host cell, then bacterial replication

ActA protein – assembly of actin tail – pushing the bacterium into the adjacent cell

Cellular immunity is essential

Listerial cycle



Listeriae (shown as brown rods) are engulfed by a cell (blue). Listeriae multiply and move because actin proteins (dashed lines) which shoots them ahead. Actin is synthetised by the affected host cells (adapted from Wilson, Bacterial pathogenesis, 2011)

Epidemiology of listeriosis

- **Sapro-zoonoses**

(**Greek "sapros" = decaying; "sapron" means in ecology a decaying organic substrate**) are human diseases transmissible from abiotic environment (soil, water, decaying plants, or animal corpses, excreta, and other substrata). The ability of the agent to grow saprophytically and replicate in these substrata (i.e., not only to survive or contaminate them secondarily) are the most important characteristics of a sapronotic microbe.

Zoonoses (Greek "zoon" = animal) are diseases transmissible from living animals to humans (and vice versa)

Clinical diseases

Pregnant women (or patient with cell mediate immune defect) – bacteremia, meningitis

Neonatal disease

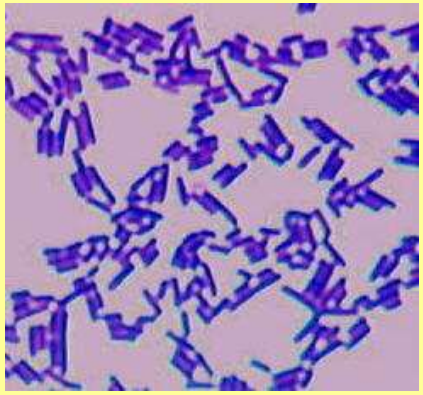
Early-onset disease – granulomatosis infantiseptica - acquired transplacentally in utero, disseminated abscesses and granulomas in multiple organs

Late-onset disease – acquired at or shortly after birth, meningitis, meningoencephalitis with septicemia

„Healthy“ adults – influenza-like illness with or without gastroenteritis

Laboratory diagnosis

- **Material – pus (abscess), CSF, blood, lochia, other**
- **Microscopy**



- **Culture – blood agar, hemolysis, CAMP test**
- **Identification – biochemical identification or mass spectrometry**

Treatment, prevention and control

- **Treatment** – penicillin or **ampicilin** (either alone or with gentamicin)
- **Erythromycin** – in case of allergy to penicillin
- **Naturally resistant to cephalosporins** (meningitis can not be treated by cephalosporin like meningitis caused by other agents)
- **High risk people should avoid eating raw or partially cooked foods of animal origin**
- A vaccine is not available

Corynebacteriae

Taxonomy

- Genus – 116 species
- ***Corynebacterium diphteriae****, C. ulcerans, Arcanobacterium (previously Corynebacterium) haemolyticum* are significant human pathogens and other e.g. *C. jeikeium*, *C. urealyticum* are part of normal human flora and potential pathogens

Biological properties

- **Gram-positive club shaped rods**, non–spore-forming

Virulence factors and pathogenesis

Virulence factors are genetic, biochemical, or structural features that enable an organism to produce disease. **Diphteria toxin** in the corynebacterium is a **bicomponent (A-B) exotoxin**. Fragment B transports the toxic fragment A into the affected cell where it abruptly **stops elongation of proteosynthesis**. Structural genes of the exotoxin are **located on lysogenic β phage so some strains of *C. diphteriae*** that do not own the phage therefore do not produce the diphteria toxin (and the disease)

Virulence factors and pathogenesis

Corenybacterium diphteriae. The infections are spread by droplets or by contact from a patient or a healthy carrier to a susceptible host. **Locally,** sore throat, exudative and pseudomembranous pharyngitis with regional lymphadenitis or cutaneous diphteria (non-healing ulcers) occur. **Systemic disease** procedes as the respiratory tract infection progress with generalized symptoms caused by absorbtion of the diphterial exotoxin (necrosis and parenchymal degeneration in muscles, heart, kidney, neurons).

C. ulcerans (pets can be carriers) – can receive also the **β phage and cause an infection simillar to diphteria**

Clinical diagnosis

- The clinical **outcome in diphtheria is improved by the prompt initiation of treatment**.
- **Presumptive diagnosis**, based on several clinical clues: **(1) mildly painful tonsillitis or pharyngitis with associated membrane**, especially if the membrane extends to the uvula and soft palate; **(2) adenopathy and cervical swelling**, especially if associated with **membranous pharyngitis and signs of systemic toxicity**; **(3) hoarseness and stridor**; **(4) palatal paralysis**; **(5) serosanguineous nasal discharge** with associated mucosal membrane; (6) temperature elevation rarely in excess of 102.5° F; and **(7) history of recent travel to a country where diphtheria is endemic.**

Laboratory diagnosis

- **Initial treatment** of a patient with dipheria should be started **on the basis of the clinical diagnosis!**
- **Culture – small hemolytic colonies (**Four subspecies are recognized: ***C. d. mitis*****,** ***C. d. intermedius*****,** ***C. d. gravis*****, and** ***C. d. belfanti***. The four subspecies **differ slightly in their colonial morphology**)

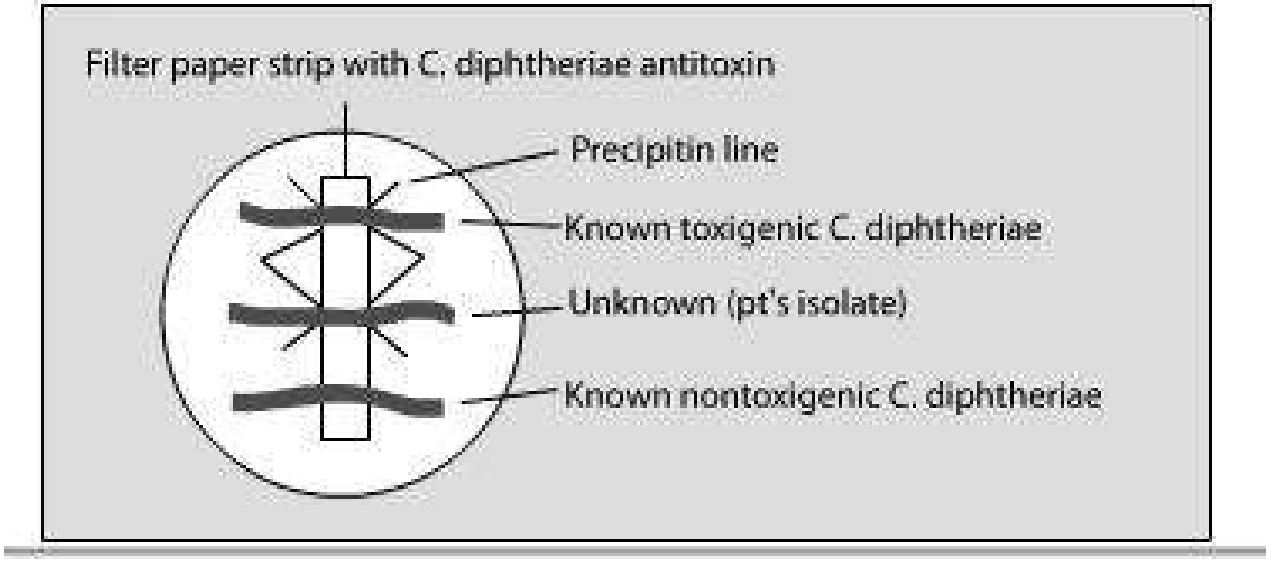
- Diagnostic medium – black colonies

- Gram-positive club shaped rods

- **Metachromatic granules** (Albert staining)
- **Detection of diphteria toxin** using **immunodifusion test** (**Elek test)**

Laboratory diagnosis – Elek test

ELEK test:



Treatment, prevention and control

- **Treatment** – **combined therapy** both eliminating the infectious process by **antibiotics** (e.g. penicillin, erythromycin) and **neutralization of the circulating exotoxin by antitoxin** is applied. An important note is that once the toxin is bound to a cell surface receptor it could not be eliminated by the antitoxin.
- **Prevention-** Immunization with **toxoid**, usually administered in **DTP triple vaccine** (tetanus toxoid and pertussis antigen is also included).

Other Corynebacteria

- ***C. jeikeium*** – *lipophilic corynebacteria,* **part of normal human flora**, naturally resistant to penicillins, cephalosporins, aminoglycosides and often to macrolides and fluorochinolones
- **Serious nosocomial infections** – treatment **vankomycin**

Arcanobacterium (Corynebacterium) haemolyticum

- **Acute tonsilitis** in young adults
- **Treatment** – macrolides and linkosamides