Medical Bacteriology- Lecture- 8

Clostridium

Manal M. Alkhluaifi

Clostridium

- Gram-positive rods
- **spore-forming rods** (terminal or sub-terminal spores)
- **Strict anaerobic**
- Found in anaerobic habitats (soil, human, animals)
- Most are saprophytes
- Fermentation metabolism; ferment variety organic compounds ⟶ (acids & alcohols)
- Ferment amino acids & fatty acids (foul smelling)
- Produce wide range of extracellular enzymes
- 120 species
- **Medical importance species:** ***Clostridium perfringens*** **– gas gangrene**
- ***Clostridium tetani*** **– Tetanus ("Lockjaw")**
- ***Clostridium botulinum*** **– Botulism**
- ***Clostridium difficile*** **– Diarrhea & colitis**

C. perfringens

- produces a huge array of **invasins & exotoxins**
- Capsulated
- causes **wound** and **surgical infections** that lead to **gas gangrene**

C. perfringens
Food poising

- *C. perfringens* produces an **enterotoxin** in **improperly sterilized (canned) foods** in which endospores have germinated.

- **Symptoms**; Diarrhea, usually without vomiting or fever

C. perfringens
Gas gangrene

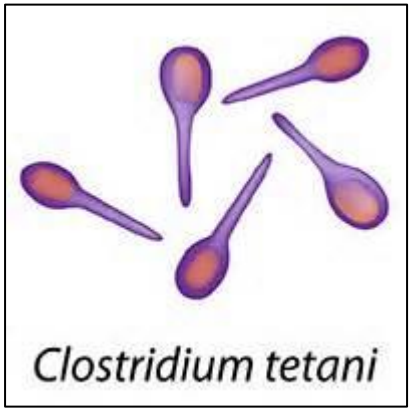
- Found in anaerobic soft damaged tissue and wound infections
- – **Alpha toxin (lecithinase) causes RBC rupture and tissue destruction**
- **– Gas formed in the tissues can destroy muscle tissue**
- **– Treatment with wound debridement, antibiotics, hyperbaric oxygen therapy**

- **Symptoms: high fever, brownish pus, gas bubbles under the skin, skin discoloration, and a foul odor.**

C. perfringens

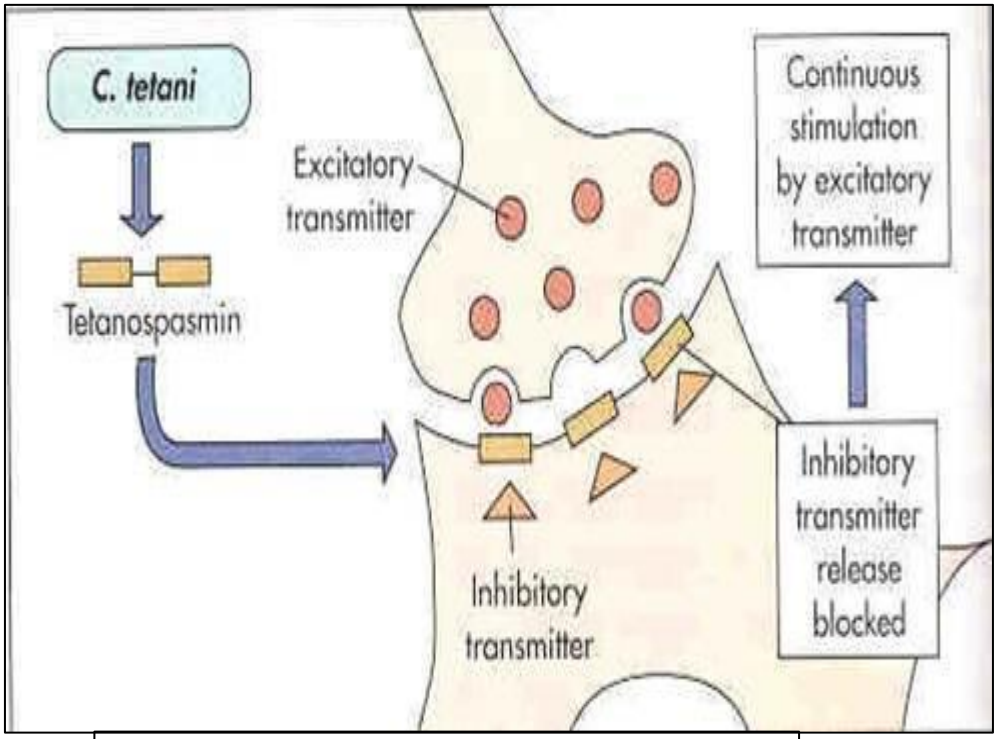
- **Virulence Factors:**
- **1- Toxins; Alpha toxin** (most important toxin)
- **Beta toxin**
- **Enterotoxin** (food poising)
- **2- Collagenase**
- **3- Hyaluronidase**
- **4- Dnase**
- **Treatment:**
- **Gas gangrenes (wound debridement, antibiotics, hyperbaric oxygen therapy)**

C. tetani

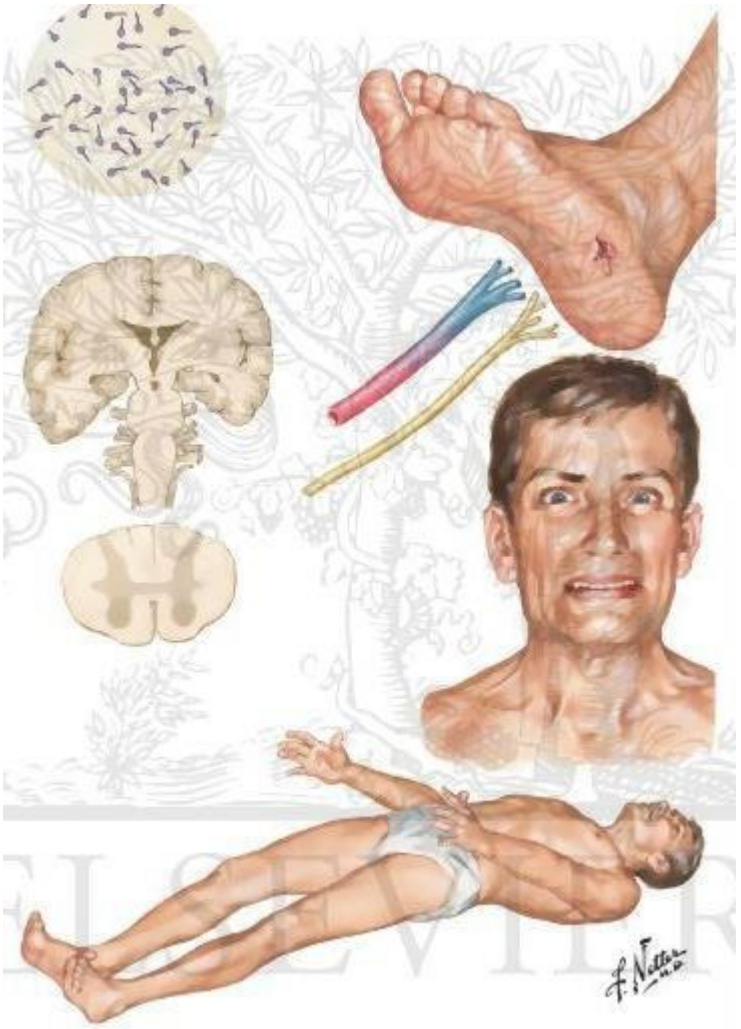


- Causative agent of **tetanus (Lockjaw)**
- The organism is found in soil, the intestinal tracts of animals.
- **Terminal spores (distinctive drumstick).**
- Tetanus result from small puncture wounds which become contaminated with Spores that germinate and produce toxin.
- (**Tetanus toxin** or **tetanospasmin**) is **neurotoxin**
- **Inhibit release neurotransmitters from neve ending**
- **Result: Spasm**
- **Tetanus toxoid (inactive toxin)** to make anti-tetanus antibody for prophylactic immunization.

C. tetani



Mode of action of tetanus toxin



C. botulinum

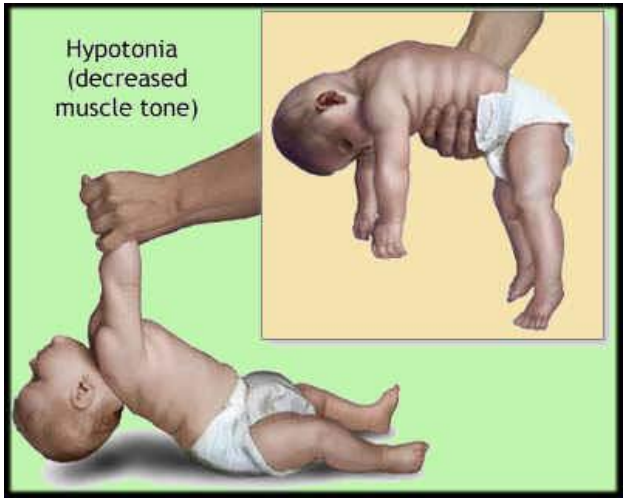
- **Subterminal endospores**
- soil, sediments of lakes, intestinal tracts of birds, mammals and fish.
- spores may found in honey, carried by bees
- **Causative agent in:**
- **– Botulism – food poisoning**
- **– Infant Botulism**
- **Produce most potent biological known**

Botulism- food poising in adults

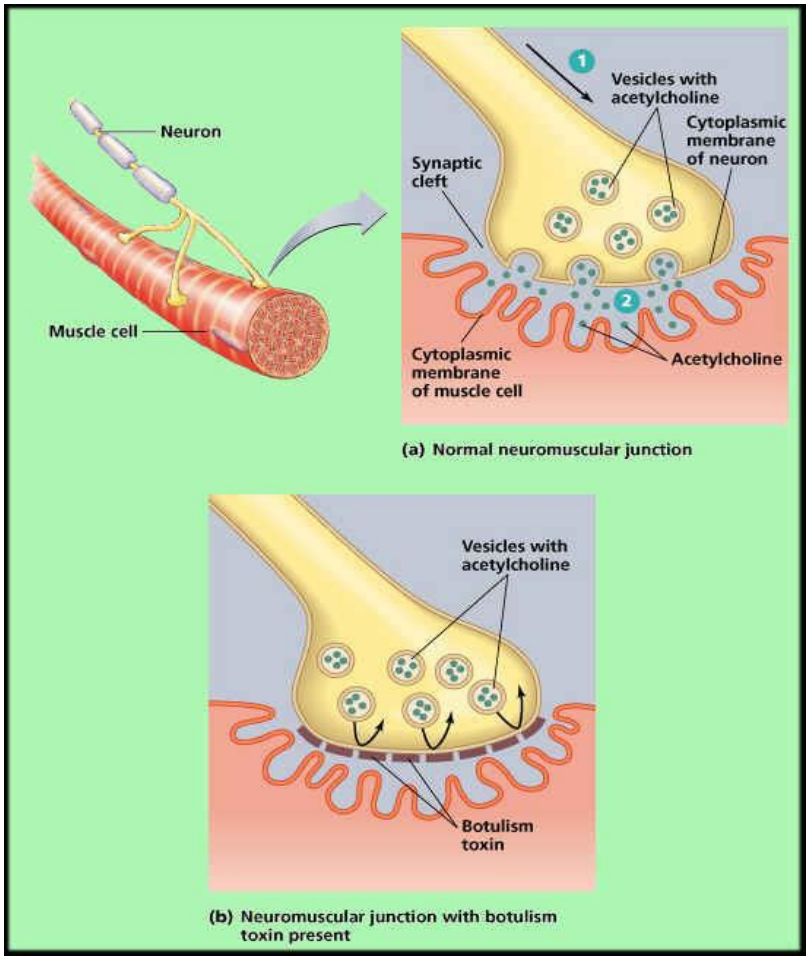
- **Botulinum toxin ingested with improperly canned food.**
- The toxin is absorbed by the upper part of the gastrointestinal tract (GI) tract and passes into blood stream by which it reaches the neuromuscular synapses.
- **Botulism blocks the release of the neurotransmitter acetylcholine; nerve impulses cannot be transmitted; muscles not stimulated**
- **Result:** generalized flaccid **paralysis**

Infant Botulism

- occurs in infants 5 - 20 weeks of age.
- **Infant botulism is caused by consuming the spores, which germinate and then grow in the intestines and release botulinum toxin within the infant's large intestine.**
- **It is characterized by paralysis**



Botulism Toxin



Clostridium botulinum

↓

neurotoxin botulin

↓

blocks neurotransmitter ACH

↓

no muscle contraction

↓

flaccid paralysis

C. difficile

- *C. difficile* causes **antibiotic-associated diarrhea (AAD)** and **pseudomembranous colitis** in humans.

- Individuals who have prolonged use of antibiotics, immunocompromised. gastrointestinal surgery.

- ***C. difficile* produces two toxins:**

- **Toxin A** (enterotoxin)

  Toxin B (lethal toxin).

- *C. difficile* infections can usually be treated with a 10-day course of antibiotics .