

# G+VE RODS

## A) SPORE FORMING

1-Bacillus spp.

2-Clostridium spp.

# INTRODUCTION

- ◉ Spores are specialized cell structures that may allow survival in extreme environments.
- ◉ The gram-positive spore-forming bacilli are the *Bacillus* and *Clostridium* species.
- ◉ *Bacillus* species are **aerobes**, whereas clostridia are **anaerobes**.

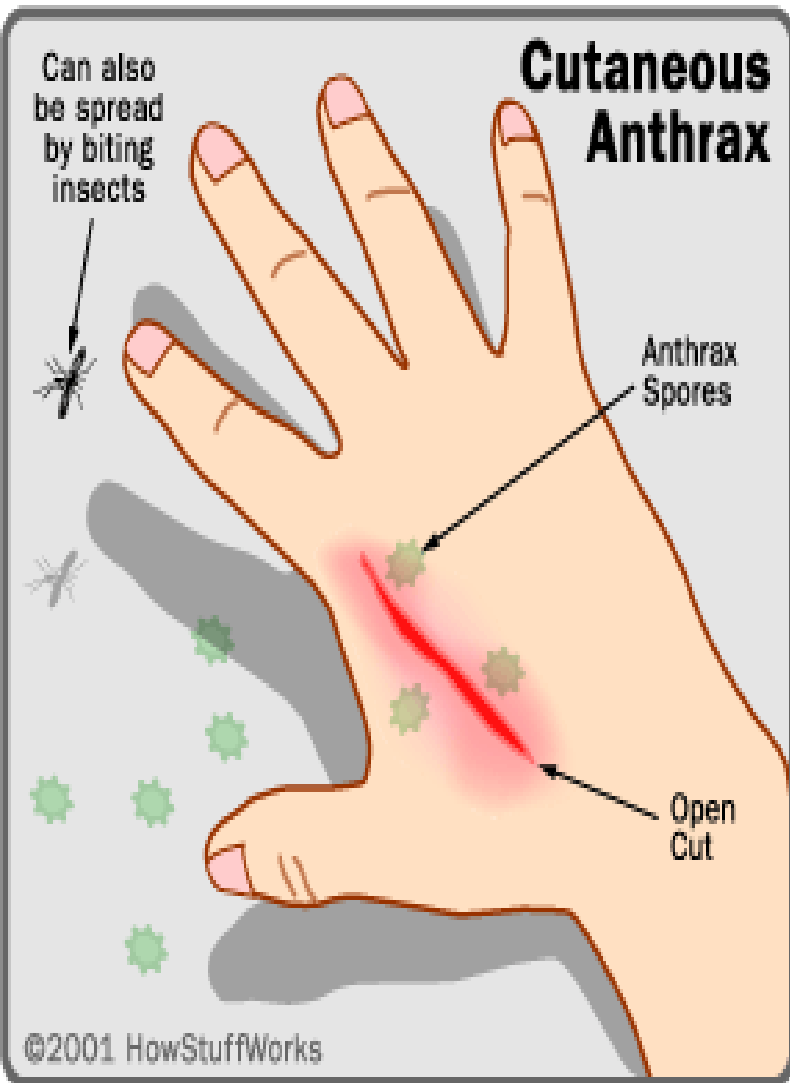
# BACILLUS

- ◉ Most members of this genus are saprophytic organisms prevalent in soil, water, and air.
- ◉ *B cereus* can grow in foods and produce an enterotoxin or an emetic toxin and cause **food poisoning**.
- ◉ *B anthracis*, which causes anthrax, is the principal pathogen of the genus.

# BACILLUS ANTHRACIS

- ◉ *B. anthracis* is spore-forming, Gram-positive rod causes the zoonosis **anthrax**, a disease of animals that is occasionally transmitted to humans.
- ◉ Entry of spores through:
  1. injured skin causes; **Cutaneous anthrax**
  2. inhalation of spores into the lung; **Inhalation anthrax.**
  3. rarely the mucous membranes causes **Gastrointestinal (GI) anthrax**

# CUTANEOUS ANTHRAX



- Most common form of anthrax
- After the spore germinates in skin tissues, toxin production initially results in itchy bump and then painless black ulcer(eschar).

# INHALATION ANTHRAX (WOOLSORTER'S DISEASE)

- ◉ Caused by inhalation of spores
- ◉ Characterized by progressive hemorrhagic lymphadenitis (inflammation of the lymph nodes),
- ◉ Hemorrhagic mediastinitis (inflammation of the mediastinum)
- ◉ Has a mortality rate approaching 100 percent if left untreated.

# GASTROINTESTINAL ANTHRAX

- ⦿ Gastrointestinal anthrax is extremely uncommon.
- ⦿ Abdominal pain, vomiting, and bloody diarrhea are clinical signs

***CLOSTRIDIUM***



# *CLOSTRIDIUM SPECIES*

- ◉ The clostridia are large anaerobic,
- ◉ Gram-positive,
- ◉ Motile rods.
- ◉ Their natural habitat is the soil or the intestinal tract of animals and humans, where they live as saprophytes.

# 1-CLOSTRIDIUM BOTULINUM

- ◉ C. botulinum causes **botulism**.
- ◉ Botulism is caused by the action of a **neurotoxin** that causes a **flaccid paralysis**.
- ◉ The disease can be solely due to ingestion of **toxin-contaminated canned food**.
- ◉ Botulinum toxins block the neuromuscular junction and inhibiting release of acetylcholine.

## *2-CLOSTRIDIUM TETANI*

- ◉ C. tetani spores is introduced into small wounds via contaminated soil.
- ◉ **Tetanus toxin (tetanospasmin)**, is an extremely potent toxin.
- ◉ Tetanus presents as a **spastic paralysis** blocks neurotransmitter release at inhibitory synapses.
- ◉ **Death** occurs due to paralysis of chest muscles leading to **respiratory failure**.

# 3- *CLOSTRIDIUM PERFRINGENS*

- ◉ **Clinically causes:**

- 1) Cellulitis/wound infection
- 2) Clostridial myonecrosis (gas gangrene)

- ◉ **Toxins:**

- ◉ **Alpha toxin:** is a lecithinase, it splits lecithin (cell membranes constituent).
- ◉ **Theta toxin:** is a hemolysin
- ◉ **Degradative enzymes:** DNase and hyaluronidase, are collagenase that digests collagen of subcutaneous tissue and muscle.

## 4- CLOSTRIDIUM DIFFICILE

- ◉ *Associated with* pseudomembranous colitis (diarrhea)
- ◉ Occurs after the use of broad spectrum antibiotics.
- ◉ This is called **superinfection**.
- ◉ It releases its exotoxins that causes diarrhea abdominal cramping, and fever.

# G +VE RODS

## B) NON SPORE FORMING

- 1- *Corynebacterium*,
- 2- *Listeria*

# CORYNEBACTERIUM

- ◉ *Corynebacterium diphtheriae* is the most important member of the group.
- ◉ It causes diphtheria in humans that is strictly localized infection of the **throat**.

# CORYNEBACTERIUM

- Generalized symptoms occur caused by production and absorption of **Diphtheria toxin** which **include:**
  - 1- necrosis in heart muscle, liver and kidneys.
  - 2-Nerve damage, resulting often in paralysis of the soft palate, eye muscles, or extremities.



# LISTERIA

- ◉ *Listeria monocytogenes* are primarily found in *animals* and occasionally cause severe disease in humans.
- ◉ It is an intracellular parasite
- ◉ *It may also be transmitted transplacentally to the fetus* and to newborns in the birth canal

# *LISTERIA MONOCYTOGENES*

- Once internalized, it escapes from the phagocytic vacuole by elaborating a membranedamaging toxin called **listeriolysin**  
**O**
- Mainly causes septicemia and meningitis  
**(LISTERIOSIS)**

**Thank you**