Microbiology

SHEET (18)
MADE BY: LINA ABDULLHA
CORRECTED BY: SHATHA KHTOUM
DATE: 17-11-2016

*slides are within a bold style
Clostridial Food Poisoning

- *Clostridium botulinum* – rare but severe intoxication usually from home canned food

- *C. botulinum* is distributed throughout the environment. The spores find their way into preserved or canned foods with low (more correctly without oxygen) oxygen levels and nutrients (this conditions enhance the growth or germination to its spores in food) that support growth.

- Seven antigenic varieties of toxin (A–G) are known. Types A, B, E, and F are the principal causes of human illness.

- Botulinum neurotoxins are the most potent toxins known. It is heat-labile, so properly heated food does not transmit botulism.

# very dangerous food poisoning, the toxin produced from clostridium botulinum the strongest and most dangerous toxin among the all toxins are produced by other microorganisms.

#it produced toxin and gases (methane, CO2, N2, H2) lead to swelling the can.

# There is a department in factories responsible to check the cans through put it in incubation from 10 to 14 days and check it every day to observe swelling the cans by producing gases from spores of bacteria.

#spores of bacteria in canned food resist all environmental conditions like high or low Ph OR high or low temp, etc.

# exotoxin: heat labile (>60) means the toxin become denatured when the temp above 60

# BUT endotoxin is stable (>100)

- Toxin is ingested and absorbed. It acts on the peripheral nervous system blocks the release of acetylcholine, necessary for muscle contraction to occur (flaccid paralysis)"means relaxation in muscles in all body systems"

- Once the toxin is bound, the process is irreversible. The symptoms include dysphagia (صعوبة في البلع), dry mouth, diplopia (تشوش), and weakness or inability to breath.

- Botulism should be treated with antitoxin.

- Infant botulism (another type of botulism, which is differ from botulism in canned food) follows the ingestion of spores. Honey is a common vehicle for spread of the spores in infants.

# Clostridium botulinum used in Botox operations, because it makes relaxation in muscles but it is used in very low concentration.
23 Gram-Positive Irregular Non-Spore-Forming Bacilli Medically important genera:

• **Corynebacterium**

• **Propionibacterium**: produce propionic acid from its metabolic

• **Mycobacterium**: responsible for tuberculosis

• **Actinomyces**

• **Nocardi a**: acid-fast bacteria

24

• Pleomorphic; stain unevenly (irregular stain)

• 20 genera; **Corynebacterium, Mycobacterium, and Nocardi a** greatest clinical significance

• Some possess mycolic acids (these acids exist in acid-fast bacteria like mycobacteria and no cardia)

25 **Corynebacterium diptheriae** (الخانوق)

• Gram-positive irregular bacilli (the arrangement like Chinese letters)

• Virulence factors assist in attachment and growth.
  – diphtherotoxin – exotoxin
  – 2-part toxin – part B binds and induces endocytosis; part A inhibit protein synthesis

# Corynbacterium diptheriae exist in vagina and oral cavity as normal flora "diphtheiroid" it also has the same appearance.

#2 part of toxin A and B.

# A: active part inhibits the elongation-part of transcription of DNA into mRNA of polypeptides.

# B: binding part.

- Aerobic or facultatively anaerobic Small, pleomorphic (club-shaped), gram-positive bacilli that appear in short chains (“V” or “Y” configurations) or in clumps resembling “Chinese letters”
- Cells contain metachromatic granules (visualize with methylene blue stain)
- Lysogenic bacteriophage (ينتقل عن طريق فيروس) encodes for potent exotoxin in virulent strains.

# Metachromatic granules: source of inorganic phosphate – synthesis ATP.
#metachromatic effect: change in the color of the stain. For example; it appears in red color instead of blue when it is stained by methylene.

# Two types of strains:
1- Virulent (toxin)
2- Avirulent

**Pathogenic Corynebacterial Species**
- *Corynebacterium diphtheriae*
- *Corynebacterium jeikeium*
- *Corynebacterium urealyticum*

*Corynebacterium urealyticum* **Urinary tract infections (UTI’s); rare but important** Urease hydrolyzes urea; release of NH₄⁺ (also release CO₂, amino acid), increase in pH, alkaline urine, renal stones.

Also proteus bacteria release urease so it cause renal stones.

*Corynebacterium diphtheriae* **Respiratory diphtheria** (release secretions like toxins or enzymes they form pseudomembrane on pharnx, which is alsyar prevent the oxygen to enter.) (pseudomembrane on pharynx) and cutaneous diphtheria **Prototype A-B exotoxin acts systemically** (transmitted through blood circulation so it maybe reach to heart and causes heart failure or dysfunction)

- **Toxoid in DPT** (D: diphtheria toxin, P: pertussis toxin-whooping cough-, T: tetanus toxin) and TD vaccines **Selective media:** cysteine-tellurite; serum tellurite; Loeffler’s media (tellurite media reduced to telluride)

'C. gravis, C. intermedius, and C. mitis differentiated by colonial morphology.'

# Exotoxin converts to toxoid in order to use as vaccines.

Vaccines can be kill bacteria but its antigen still alive to stimulate the immune system or weak it like in tuberculosis (by subculture of the bacteria for many years)

• **Reservoir of healthy carriers** (c. diphtheriae can act as normal flora, but if it changes its place, it will become pathogen); potential for diphtheria is always present

• Most cases occur in non-immunized children living in crowded, unsanitary conditions.
• Acquired via respiratory droplets from carriers or actively infected individuals.

2 stages of disease:
1. Local infection – upper respiratory tract inflammation
   – sore throat, nausea, vomiting, swollen lymph nodes;
   pseudomembrane formation can cause asphyxiation
2. Diptherotoxin production and toxemia
   – target organs primarily heart and nerves

Pseudomembrane and swelling
• Staining
• Elick test: used to determine sample that contain the toxins
• Serological assay

Treatment and Prevention
• Antitoxin to neutralize the toxin
• Penicillin or erythromycin
• Prevented by toxoid vaccine series and boosters (boosters: increase the titration of antibody)

Precipitation line: formed when low molecular weight toxin react with anti-toxic media mostly semi agar to facilitate the diffusion of toxin and antitoxin

Filter paper saturated with antitoxicity