

GROUP A

**Foundation
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رقم المذكرة

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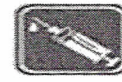
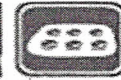
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عدد الصفحات

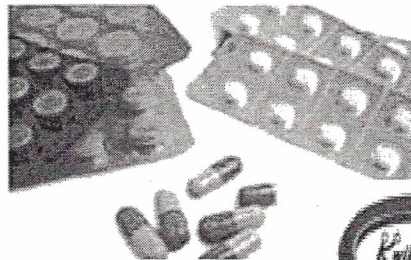
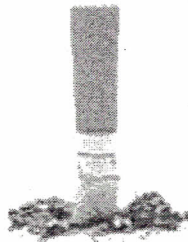
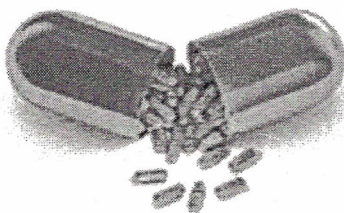
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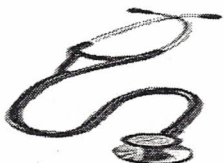


Microbiology

Hand out
Dr. Ali Somily



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Clinical and lab aspect of anaerobic infection

Dr Ali M Somily

CLASSIFICATION

1. Anaerobic spore forming bacilli (Clostridia)
2. Gram negative bacilli non-sporing forming (Bacteroides)
3. Anaerobic streptococci (*Peptostreptococcus*)
4. Anaerobic staphylococcus (Peptococcus)
5. Gram negative diplococci (Veillonella)
6. Gram positive bacilli (Actinomyces)

ANAEROBIOSIS

- Lack cytochrome—cannot use oxygen as hydrogen acceptor
 - Most Lack Catalase & Peroxidase
- Contain flavoprotein so in the presence of oxygen produce H_2O_2 which is toxic
- Some lack enzyme superoxide dismutase so many killed , peroxide and toxic radicals enzyme like fumarate reductase must be in reduced form to work

HABITAT I :

- These organism are normal flora in:
 - A. Oropharynx eg. 1. *Prevotella melaninogenica* 2. *Fusobacteria* 3. *Veillonella*
 - B. Gastrointestinal tract
 - Found mainly in the large colon in large numbers
 - Total number of anaerobes = 10^{11}
 - While all aerobes (including *E. coli*) = 10^4
 - examples are (1) *Bacteroides fragilis* (2) *Bifidobacterium species*

- C. Female genital tract (mainly in the vagina)

FEATURES OF ANAEROBIC INFECTIONS

1. Infections are always near to the site of the body which are habitat.
2. Infection from animal bites.
3. Deep abscesses
4. The infections are also polymicrobial
5. Gas formation, foul smell
6. Detection of "Sulphur granules" due to actinomycosis
7. Failure to grow organism from pus if not culture anaerobically.
8. Failure to respond to usual antibiotics.

INFECTIONS BEGIN

- DISRUPTION OF BARRIERS
 - TRAUMA
 - OPERATIONS
 - CANCEROUS INVASION OF TISSUES
- DISRUPTION OF BLOOD SUPPLY
 - DROPS OXYGEN CONTENT OF TISSUE
 - DECREASE IN Eh POTENTIAL
 - TISSUE NECROSIS

WHAT ARE THE INFECTION CAUSED BY THESE ANAEROBIC ORGANISMS I

1. Post operative wound infection
2. Brain abscess

3. Dental abscesses
4. Lung abscess
5. Intra abdominal abscess, appendicitis, diverticulitis
6. All these infection can cause bacteraemia
7. Infection of the female genital tract
8. Septic abortion
9. Puerperal infection or sepsis
10. Endometritis
11. Pelvic abscess
12. 12. Other infections
13. a) Breast abscess in puerperal sepsis
14. b) Infection of diabetic patients (diabetic foot infections).
15. c) Infection of pilonidal sinus

LABORATORY DIAGNOSIS:

- When anaerobic infection is suspected;
 - a) Specimens have to be collected from the site containing necrotic tissue.
 - b) Pus is better than swabs.
 - c) Specimens has to be send to the laboratory within 1/2 hour why?
 - d) Fluid media like cooked meat broth are the best culture media.
 - e) Specimens have to incubated anaerobically for 48 hours.

TREATMENT:

- *Bacteroides fragilis* is always resistant to penicillin.
- But penicillin can be used for other anaerobes

- Flagyl (metronidazole) is the drug of choice.
- Clindamycin can also be used.

ORGANISM GROUPS

- GRAM NEGATIVE RODS
 - BACTEROIDES
 - PREVOTELLA
 - PORPHYROMONAS
 - FUSOBACTERIUM
 - BUTYRIVIBRIO
 - SUCCINOMONAS

BACTEROIDES

- STRICT ANAEROBE
- PLEOMORPHIC
- GRAM NEGATIVE BACILLI (COCCO BACILLI)
- NORMAL FLORA IN
 - OROPHARYNX
 - GASTROINTESTINAL TRACT
 - VAGINA
- GROUP = *B. FRAGILIS*, *B. VULGARIS*, *B. THETA IOTAMICRON*, *B. UNIFORMIS*

- ACCOUNT FOR 1/3 OF ALL ISOLATES
- RESISTANT TO 20% BILE
- RESISTANT TO MANY ANTIBIOTICS
 - PENICILLIN, KANAMYCIN, VANCOMYCIN, COLISTIN — AND MANY MORE
- NO PIGMENTATION OF COLONIES OR FLUORESCENCE

BACTEROIDES OTHER SP

- BACTEROIDES SPECIES OTHER THAN B. FRAGILIS GROUP
 - BILE SENSITIVE
 - RESISTANT TO KANAMYCIN ONLY
 - SOME PIGMENTED

FUSOBACTERIUM NECROPHORUM

GRAM NEGATIVE BACILLI

PERITONISILLAR → INTRNAL JUGULAR VEIN THROMBOSIS → EMBOLI TO THE LUNG

PEPTOCOCCUS

- GRAM POSITIVE COCCI IN CLUSTERS

PEPTOSTREPTOCOCCUS

- GRAM POSITIVE COCCI IN CHAINS
- BRAIN ABSCESS

VEILLONELLA PARVULA

- GRAM NEGATIVE COCCI

CLOSTRIDIUM SPECIES

- LARGE GRAM POSITIVE RODS
- SPORE FORMATION
- Causative Agents For
 - 1. Gas gangrene : *Cl. perfringens* and other e.g. *septicum*
 - 2. Tetanus : *Cl. tetani*
 - 3. Botulism : *Cl. botulinum*
 - 4. Toxic enterocolitis : *Cl. difficile* (Pseudomembranous colitis)

Clostridium perfringens (*Cl. welchii*)

- Morphology large rods gram +ve with bulging endospores
- Laboratory diagnosis
- Smear Gram stain Large Gram positive bacilli with few or no WBCs
- Culture
 - Blood agar with haemolytic colonies (double zone of haemolysis)
 - Cooked meat medium
- Gives the NAGLAR'S Reaction & toxin neutralization on Egg yolk medium & toxin is a phospholipase
- Can lead to the following diseases
 - 1) Wound Contamination
 - 2) Wound infection
 - 3) Gas Gangrene – most important disease

- 4) Gas Gangrene of the uterus in criminal abortion
- 5) Food Poisoning : Spores are swallowed → Germinate in gut after 18 hours (Toxin production) → abdominal pain and diarrhoea
- Pathogenesis: Traumatic open wounds or compound fractures lead to muscle damages and contamination with dirt etc,
- Mainly in war wounds, old age, low blood supply and amputation of thigh (required prophylaxis with penicillin)
- Prevention and Treatment
- Remove dead tissue , debris and foreign bodies .Penicillin and hyperbaric oxygen in some cases
- *Cl.tetani* (TETANUS)
- Morphology gram +ve anaerobic with terminal spore Drum Stick appearance
- Lives in soil and animal faeces. e,g horse and any wound can infected if contaminated by spores
- Face & neck wounds are more dangerous
- Clinical Features
- Incubation period 1-2 weeks (time from infection to the appearance of symptoms)
- Symptoms: Painful muscle spasm around infected wound and Contraction of muscles in the face called **Trismus** (Lockjaw) , **Risus Sardonius** - strychnine or back called arching of Back
- Opisthotonus in children. **Opistho** meaning "behind" and **tonos** meaning "tension", due to **extrapyramidal effect and is caused by spasm of the axial along the spinal column** .
- Pathogenesis
- Mainly due to **tetanospasmin** which is powerful exotoxin (protein) .This organism does not lead to invasion or Bacteraemia . Its function to inhibits transmission of normal inhibitory messages from central nervous system at anterior horn cells of cord.

- Diagnosis
- Mainly by clinical and it is strict anaerobe very motile , spread on agar.
- Prevention
- by vaccination
- Treatment
- Cleaning of wound and removal of Foreign body
- Specific by antitoxin from horse serum but it can lead to anaphylaxis & shock must be tested first or human immunoglobulin. Antibiotics .like penicillin. Supportive treatment by keeping the patient in dark place, fluids and sedative valium

CLOSTRIDIUM BOTULINUM

- Found in soil ponds and lakes
- Toxin is exotoxin (protein) heat labile at 100 °C and resist gastrointestinal enzymes
- .It is the most powerful toxin known Lethal dose 1 µg human and 3 kg kill all population of the world .It dictated for by lysogenic phage

Botulism

- From canned food., sea food e.g. salmon when it is not well cooked (Spores resist heat at 100 °C) → then multiply and produce toxin

Symptoms

- Abnormal eye movement as if cranial nerve affected when bulbar area of the brain affected. Finally the patient might develop respiratory and circulatory collapse

Infantile Botulism

- Ingestion of *Spores* → germination in the *gut* → *Botulism* .Child present with weak child, cranial nerve and constipation

Botulism Pathogenesis

- Attacks neuromuscular junctions and prevents release of acetylcholine that can lead to paralysis

Laboratory diagnosis

Suspected food from the patient faeces culture or serum toxin detection by mice inoculation after weeks → paralysis and death

- Treatment
- Mainly supportive and horse antitoxin in severe cases
- Prevention
- Adequate pressure cooking autoclaving and heating of food for 10 minutes at 100 °C

Clostridium Difficile

- Normal flora in gastrointestinal tract after exposure to antibiotics and killing of other normal flora, this organism will multiply and then produce toxin that has two components
 - A-Subunit enterotoxin (cause diarrhea)
 - B-Subunit Cytotoxic (kill the cells i.e. necrosis)
- PSEUDOMEMBRANE is the clinical manifestation of this disease which is composed of bacteria, fibrin, WBCs and dead tissue cells
- Severe dehydration, intestinal obstruction and perforation are some of the complications of this syndrome
- Laboratory diagnosis: this organism is hard to grow in the laboratory; special media and growth of the organism in solid media required cell line culture to illustrate cytotoxicity of the organism. The simplest method for diagnosis is by detection of the toxin in the stool by immunological testing (ELISA)
- Treatment : Metronidazole or oral vancomycin in severe cases
- Prevention: This organism forms spores and is hard to control in the hospital because they are resistant to alcohol decontamination (use Na hypochloride instead). Patient needs to be isolated and contact needs to be screened to find out if they are carrying the toxic strain of the bacteria.