

Medical Bacteriology- Lecture 15

Gram Negative Rods

Pseudomonadaceae

Pseudomonas

Burkholderia

Vibrionaceae

Vibrio

Pseudomonas

- **Gram-negative rods**
- **Motile**
- **Aerobic (respiratory metabolism)**
- **Versatile**
- **Oxidase +**
- **Catalase +**
- **Found in water, soil, sewage, vegetable, human and animal intestine and skin.**



P. aeruginosa

- Part of normal flora in human and animal, water, soil and moist environment in hospitals.
- Nosocomial pathogen- Opportunistic pathogens
- very simple growth requirement.
- Its optimum temperature for growth is 37
- it is able to grow at temperatures at 42C.



- **Causes;** UTI (introduced by catheter)- Wound infection of burn sites, Otitis externa, Eye infection , bacteremia- meningitis- brain abscesses .
- **Identification based on** Bluish-green pigmented with “fruity” odor on media.
oxidase-positive
growth at 42C
Non lactose fermenter
- It is resistant to high concentrations of salts and dyes and many antibiotics
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P. aeruginosa Virulence Factors

- 1- **Pilli** (Adherence) .
- 2- **Exopolysaccharide capsule** (protected from phagocytosis)
- 3- **Biofilm** (less susceptible to antibiotics).
- 4- **Motility** (spread)
- 5- **Fluorescent pyocyanin** (impairs nasal cilia, disrupts respiratory epithelium).
- 6- **Enzymes:** • **Elastases:** Digests protein • **Alkaline protease** lyses fibrin.

7- **Toxins:** **Haemolysins** (beta haemolysis)

Phospholipase & lecithinase

Exdotoxin A (blocking protein)

Toxin S: interfere with membrane permeability

Lipd A (Endotoxin

Enterotoxins: food poisoning

Iron acquiring systems

Antibiotics resistance due to outer membrane changes

Burkholderia

- *Burkholderia mallei* (*pseudomonas mallei*)
 - Human & animal pathogen causing **Glanders**
- *Burkholderia pseudomallei*
 - Human & animal pathogen causing **Melioidosis**
- *Burkholderia cepacia*
 - (Onion bulb rot, **Foot rot of man**)
 - Septicemia, urinary tract infection, wounds, endocarditis pneumonia in immunocompromised individuals.

Curved Bacilli (Vibrio)

- Actively motile
- Vibrios are distinguished from **enteric** by being
- **oxidase-positive.**
- Vibrios are distinguished from **pseudomonads** by being
- **fermentative and oxidative in their metabolism**
- Vibrios are one of the most common organisms in surface waters of the world.
- Medical importance species: ***V. cholerae* and *V. parahaemolyticus***
- **Both are;** pathogens of humans
- **diarrhea, but in different ways.**
- ***V. parahaemolyticus* is an invasive the colon, causes food poisoning in Japan.**
- ***V. cholerae* is noninvasive (not reach the blood), only act locally, affecting the small intestine through secretion of an enterotoxin.**

Vibrio cholera

- Grow in asparagine as a sole source of carbon and nitrogen)
- Optimum pH growth range (8.5- 9.5)
- Cholera (epidemic cholera) is the most rapidly fatal diarrheal disease
- Large inoculum is required to cause disease - Sensitive to acidic pH
- Transmission to humans is by contaminated water or food- Route of infection is (fecal-oral)
- Watery diarrhea and vomiting (Rice– water stool is characteristic)
- Cholera fatality or death may results from severe fluids and electrolytes loss due to dehydration and death

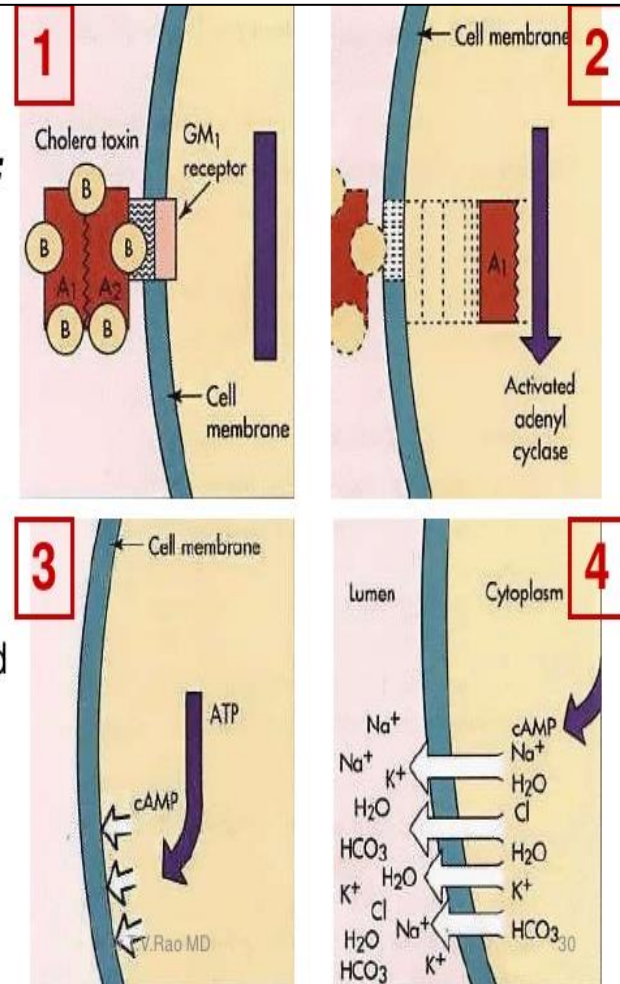
Virulence Factors: Cholera Toxin (major virulence factor)

neuraminidase

Cholera Toxin

Cholera toxin (heat labile enterotoxin)
action on the mucosal epithelium
responsible for the characteristic
diarrhea of cholera disease.

Mechanism of Action of Cholera Toxin

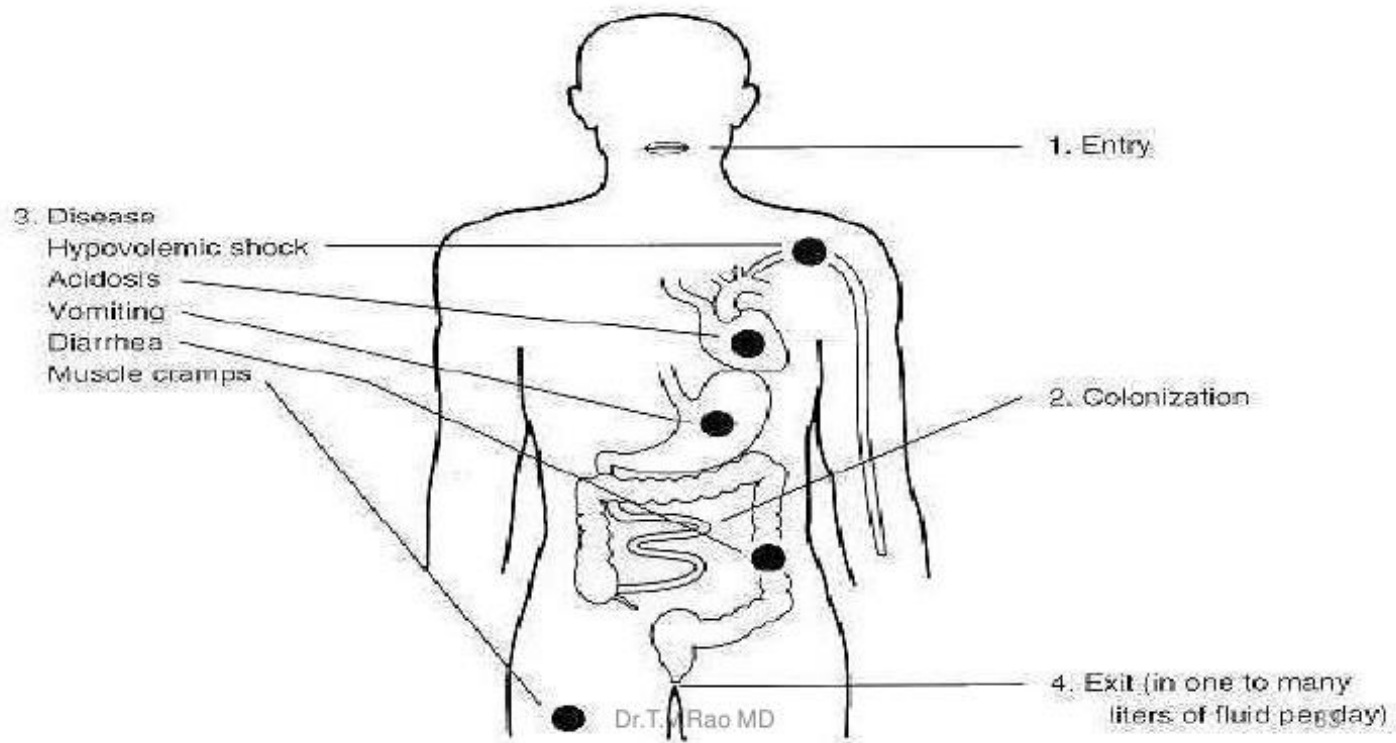


NOTE: In step #4, uptake of Na⁺ and Cl⁻ from the lumen is also blocked.

HCO₃⁻ = bicarbonate which provides buffering capacity.

Mode of action: Cholera toxin activates adenylate cyclase enzyme of the intestinal mucosa leading to increase secretion of H₂O, Na⁺, K⁺, Cl⁻, and HCO₃⁻ into the lumen of the small intestine.

Clinical events in Cholera



V. cholera

- **Cultures:**
 - 1- TCBS (thiosulphate citrate bile salt sucrose agar)
 - Selective media
 - 2- Alkaline peptone water
 - Enrichment media
- **Treatment:**
 - Give solution for fluids and electrolytes replacement
 - Tetracycline shorten the duration of diarrhea and reduce fluid loss.