



Pseudomonas aeruginosa

Presented by

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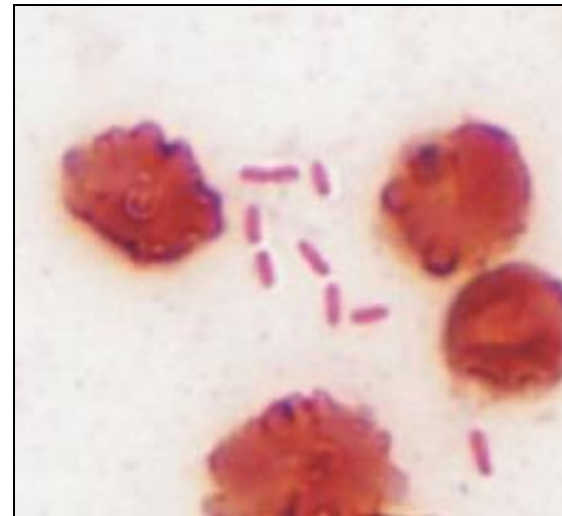
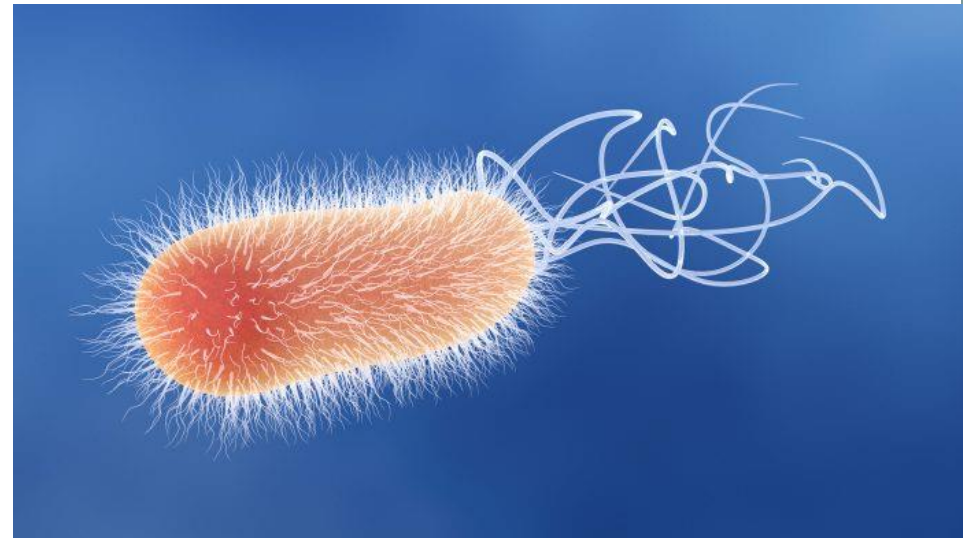


Pseudomonas aeruginosa



Morphology

- Gram-negative rods.
- Motile with polar flagellae.
- Some strains may be capsulated.
- Non-spore forming.



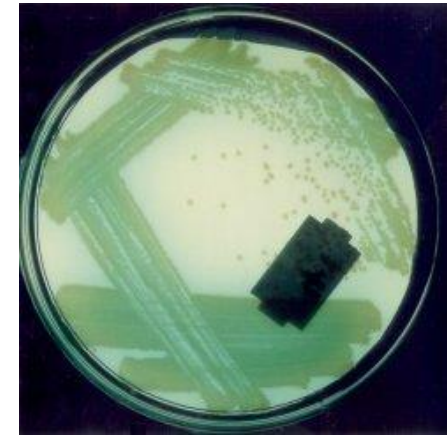


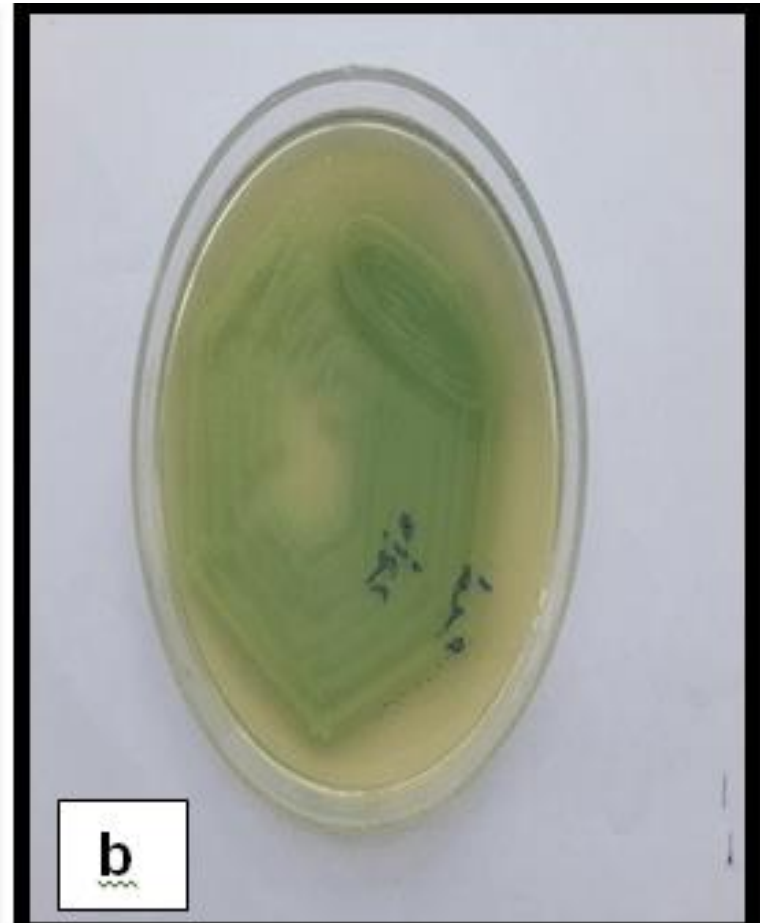
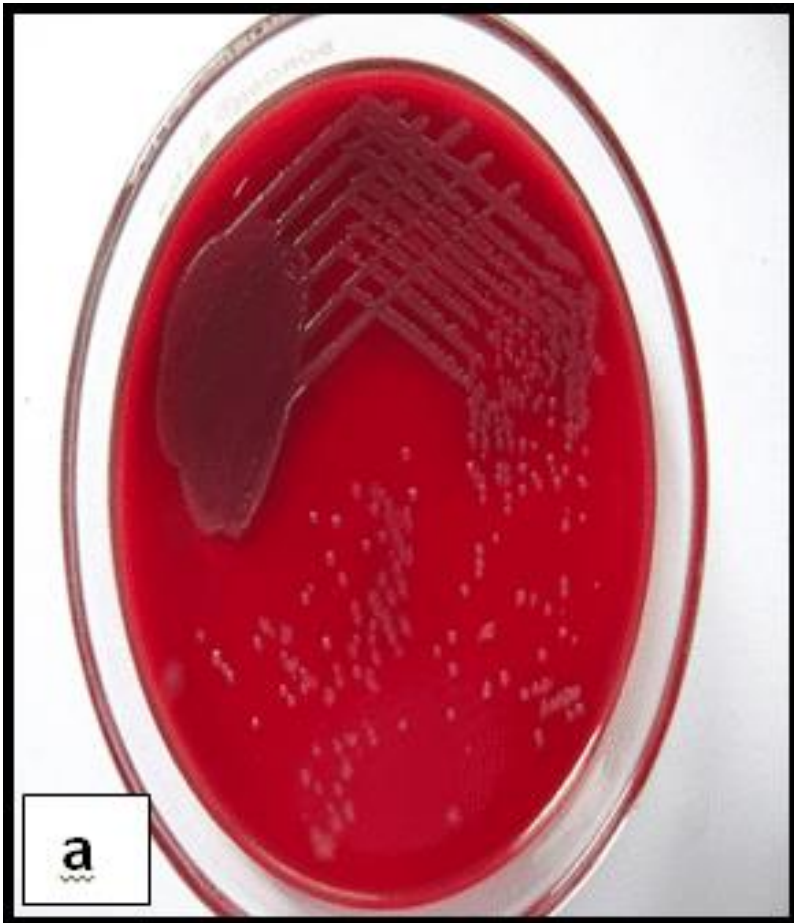
Culture characters

- Strict aerobic ****
- Grow on many types of media
- Gives greenish colour to nutrient agar with sweet grape-like fruity odor, and some strains may cause β -hemolysis.
- Grow at 37° to 42°
- It produces exopigments that consist of:

Pyocyanin- nonfluorescent bluish pigment

Pyoverdinin- fluorescent greenish pigment





β -hemolysis on blood agar

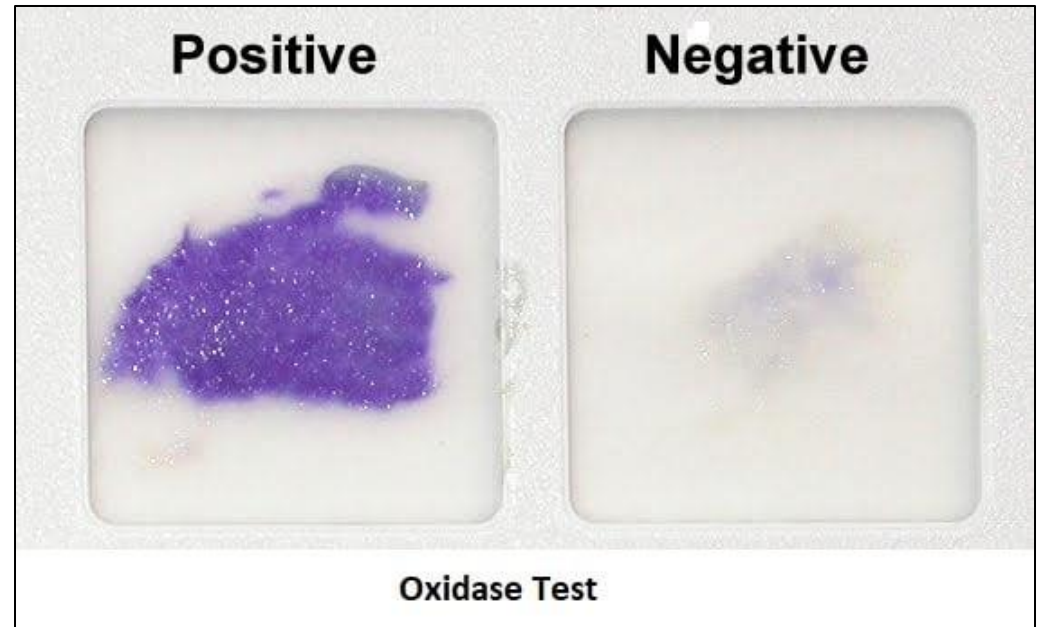
Greenish colour on nutrient agar



Biochemical reaction



- Do not ferment carbohydrates.
- Oxidase positive



Identification of *P. aeruginosa* is usually based on oxidase test and its colonial morphology: **β -hemolysis**, the presence of characteristic **pigments**, **sweet odor**, and **growth at 42 °C**.

Virulence Factors *P. aeruginosa*



- **Pili** for attachment to host cells
- **Capsule** seen in cultures from patients with cystic fibrosis.
- **LPS- endotoxin**, multiple immunotypes.
- **Pyocyanin**: catalyzes the production of toxic forms of oxygen that cause tissue damage.
- **Pyoverdinin**: a siderophore (iron-chelating compounds).

- **Proteases**
protease causes tissue damage and help bacteria spread.
- **Phospholipase C**: a hemolysin
- **Exotoxin A**: causes tissue necrosis, disrupts protein synthesis) and immunosuppressive.



P. aeruginosa: Pathogenesis



This organism is widely distributed in nature and is commonly present in **moist environments** in hospitals. It is pathogenic only when introduced into areas devoid of normal defenses, (opportunistic) e.g.,

1. Disruption of mucous membrane and skin.
2. Usage of intravenous or urinary catheters.
3. Neutropenia (as in cancer therapy).

It commonly complicates **burned and cystic fibrosis patients**.

P. aeruginosa is invasive and toxigenic. It attaches to and colonizes the mucous membrane or skin, invade locally, and produces systemic diseases and septicemia.

P. aeruginosa is **resistant to many antibiotics**. It becomes dominant when more susceptible bacteria of the normal flora are suppressed.



P. aeruginosa



Clinical Diseases

Infection of wounds and burns

(blue-green pus). Patients with severe burns may develop into bacteremia.

Skin and nail infections

Meningitis (when introduced by lumbar puncture).

Pulmonary infection

Tracheobronchitis

Necrotizing pneumonia in CF patients: diffuse, bilateral bronchopneumonia with microabscess and necrosis.

Eye infections

Ear infections

Otitis externa: mild in swimmers; malignant (invasive) in diabetic patients.

Chronic otitis media

Osteochondritis of the foot.

Urinary tract infection

Gastrointestinal infection

Sepsis



P. aeruginosa

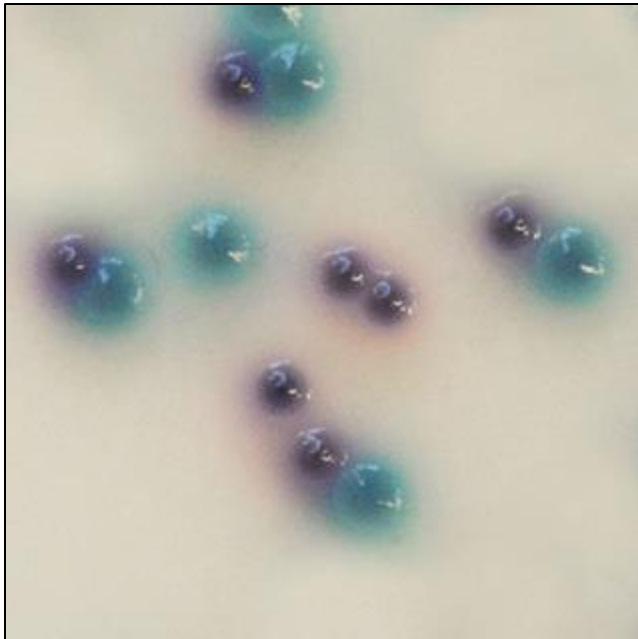
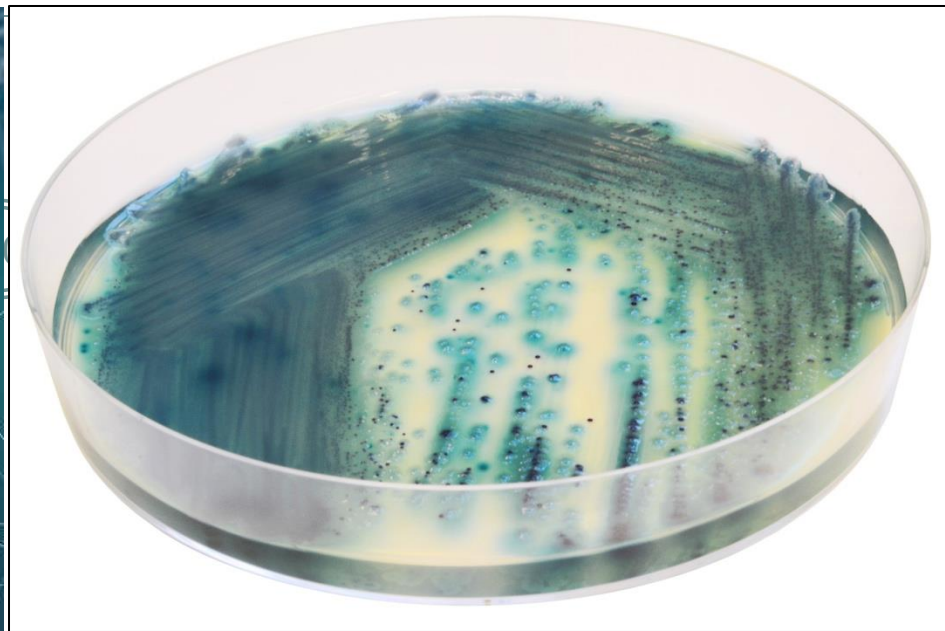
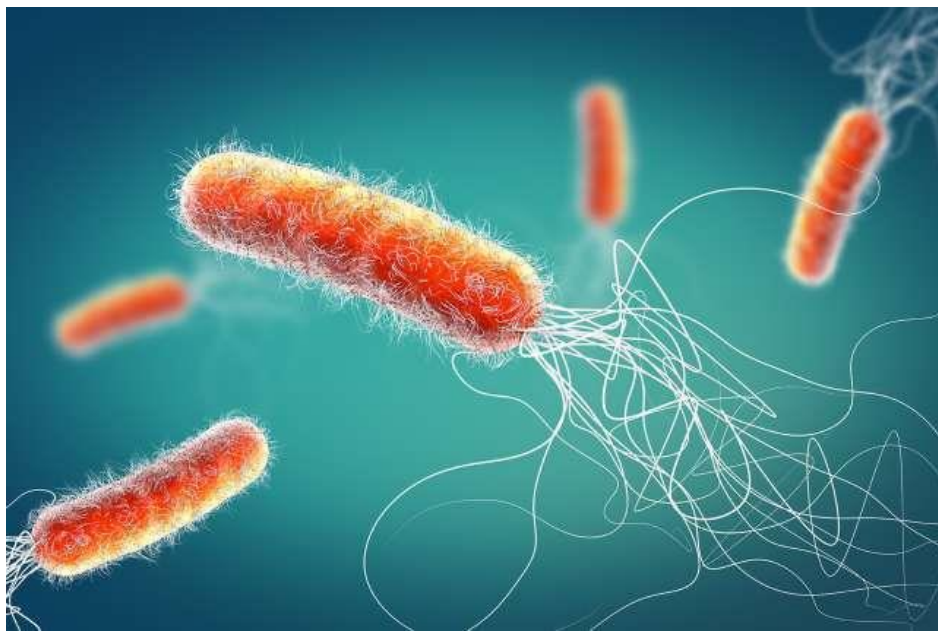


Laboratory Diagnosis

- **Specimen:** skin lesions, pus, urine, blood, spinal fluid, sputum.
- **Culture:** ???
- **Biochemical reaction:** ???

Treatment

Combined antibiotic therapy is generally required to avoid resistance that develops rapidly when single drugs are employed. It may be sensitive to Aminoglycosides or quinolones



Burn Unit



Weak Immunocompromised Individuals

Opportunistic Infection

Nosocomial Infection (Hospital Acquired)

Pseudomonas Aeruginosa

Gm -ve Rod

Cystic Fibrosis

Yahoo...now You will produce Green Sputum

Moist surfaces

Creative-Med-Doses ©2019 Priyanga Singh



Urine Receptacle



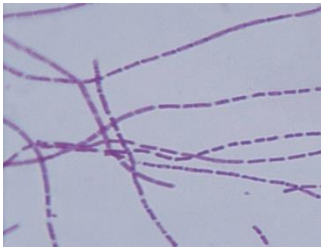
Ventilators

Humidifiers





Bacillus anthracis



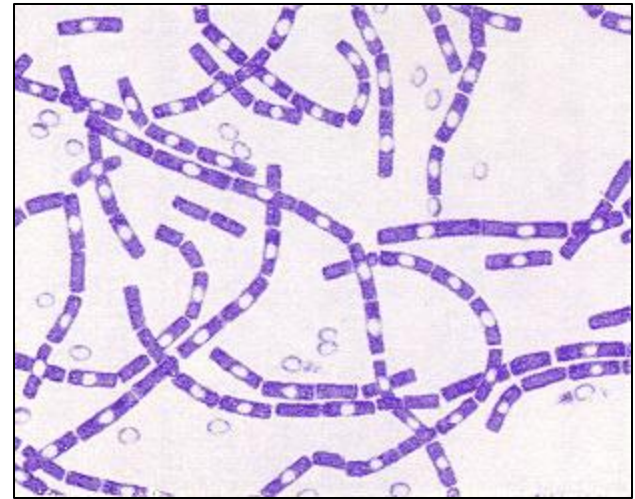
Bacillus

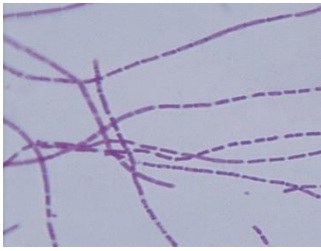


B. anthracis: anthrax of the animals and humans.

Morphology and Physiology

- Large gram-**positive** rods, have square ends, arranged in long chains.
- **Spore** is located in the center of the cell.
- Most are saprophytic (soil, water, air, and on vegetation.)
- Encapsulated and non-motile
- Capsule consists of polypeptide (poly-D-glutamic acid)



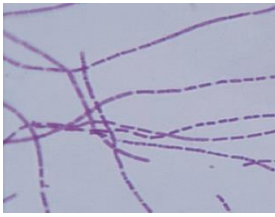


B. anthracis



Morphology and physiology

- The spores can withstand dry heat and certain disinfectants for moderate periods, and persist for years in dry earth.
- Aerobic or facultative anaerobe
- Culture: **nonhemolytic** gray-white colonies with dry surface (cut glass appearance and irregular margins) on blood agar plates and grow on nutrient agar.



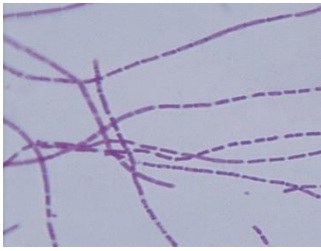
B. anthracis



Pathogenesis and Immunity

Virulence factors

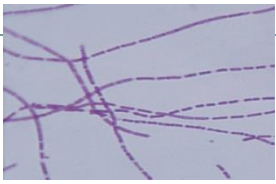
- **Capsule** (encoded from a plasmid)
- **Exotoxins (A-B toxins encoded from another plasmid)**
 - **Edema toxin** is composed of protective antigen (B-subunit) and edema factor (EF; an adenylate cyclase). This toxin complex increases vascular permeability which leads to shock.
 - **Lethal toxin** is composed of protective antigen and lethal factor (LF; a metalloprotease). This toxin causes cell death and stimulates macrophages to release proinflammatory cytokines.



B. anthracis

Pathogenesis and Immunity

- Primarily a **disease of herbivores** (sheep, cattle, horses); humans are rarely affected. (**Zoonotic**).
- In animals, portal of entry is mouth and GI tract. **In humans, scratches in the skin (95% of infection), ingestion or inhalation lead to infection.**
- The spores germinate in the tissue at the site of entry, and growth of the vegetative forms results in gelatinous edema and congestion. *Bacillus* spread via lymphatics to the blood and other tissues.



B. anthracis



Clinical Diseases

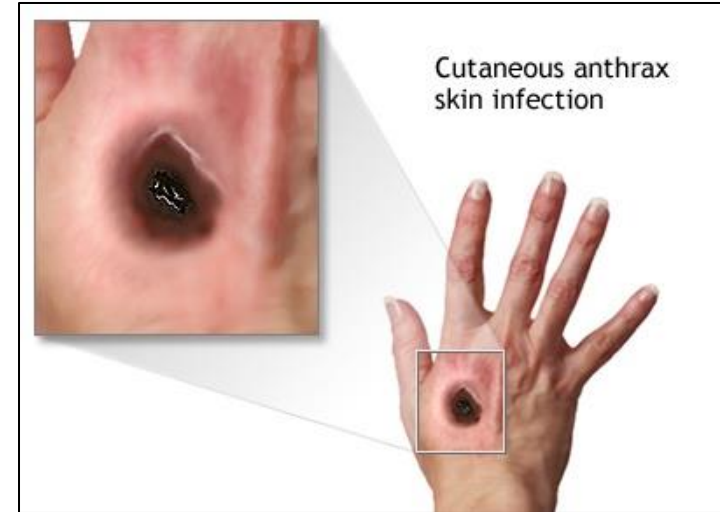
Inhalation anthrax (wool-sorters' disease): long incubation time (2 months or more).

Progressive hemorrhagic lymphadenitis /Mediastinitis (enlargement of mediastinal lymph nodes), bloody pleural effusion, sepsis, and meningitis (50% patients).

Fatal if untreated 100%

Cutaneous anthrax (malignant pustule) papule-pustule-ulcer with black eschar surrounded by marked oedema

Gastrointestinal anthrax (very rare) vomiting-pain and bloody diarrhea.





Human Cutaneous Anthrax Sampling (Suspected)



B. anthracis

Laboratory Diagnosis

- **Specimens:** fluid or pus from local lesion, blood, or sputum.
- **Smears:** long chains (a characteristic of *B. anthracis*) of large **gram-positive rods** with central spores can be seen.
- Immuno-fluorescence stain can be used.
- **Culture:** **nonhemolytic** gray colonies with dry surface on blood agar plates.
- **Identification:** made in a reference lab by direct fluorescent Ab test against capsular polypeptide or PCR test.
- **Serological tests:** detection of antibodies to lethal toxin and edema toxin.

B. anthracis

Treatment

Multi drug therapy, Ciprofloxacin, rifampin and vancomycin





Key words

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Pseudomonas aeruginosa

- ??????

Bacillus anthracis

- ??????



Thank
You