

Proteus

Is motile, lactose non-fermenting, hydrolyze urea rapidly, swarming phenomena seen in *Proteus mirabilis*, *P.penneri* and *P.vulgaris* only and are opportunistic human pathogens.

Proteus is Gram negative, facultative anaerobic, rod shaped bacteria . Since it belongs to the family of *Enterobacteriaceae*, general behaviors are applied on this genus: It is actively motile, non-spore forming, non-capsulated oxidase-negative, but catalase and nitrate positive. To identify *Proteus*, specific tests including **positive urease and phenylalanine deaminase tests** were used. *Proteus* is widely distributed in the natural environment. It can be found in polluted water and in soil and manure, where it plays an important role in decomposing organic matter of animal origin .

Infections caused by *Proteus* spp.

1. Urinary Tract Infection (UTI) is the commonest disease caused by *Proteus*. (*Proteus mirabilis*) Urease hydrolyzes the urea in urine to form ammonia, which raises the pH & encourages the formation of stones.
2. wound infection
3. Bacteremia

PROTEUS EXHIBITS CHARACTERISTIC OF "SWARMING" ON BLOOD AGAR

- Cultures give fishy smell

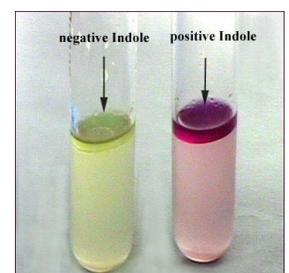


INDOLE TEST

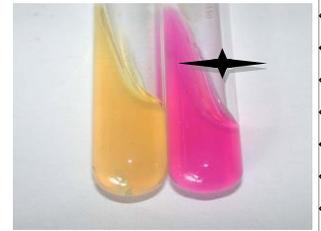
P. mirabilis can be differentiated from *P. vulgaris* by indole test.

P. mirabilis → (- ve)

P. vulgaris → (+ve)



Urea hydrolysis determine the ability of an organism to produce the urease enzyme .



Klebsiella

CHARACTERISTICS: *Klebsiella* spp. are Gram-negative, nonmotile, usually encapsulated rod-shaped bacteria, belonging to the family Enterobacteriaceae. These bacteria produce lysine decarboxylase but not ornithine decarboxylase and are generally positive in the Voges-Proskauer test. Members of the Enterobacteriaceae family are generally facultative anaerobic, and Lactose fermenter. *Klebsiella* spp. often occur in mucoid colonies.

PATHOGENICITY/TOXICITY: *Klebsiella* spp. have been identified as important common pathogens for **nosocomial pneumonia, septicaemia , urinary tract infection, wound infections.** *Klebsiella* spp. can also cause **bacteremias** and **hepatic infections**, and have been isolated from a number of unusual infections. They are also important opportunistic pathogens.

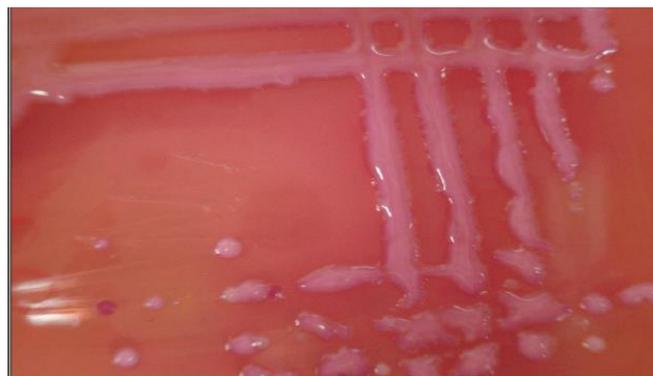


Figure (2): MacConkey s agar plate shows *Klebsiella* spp. colonies growing that isolated from a UTI . Notice the sticky colonies.

Pseudomonas

Microbiological Characteristics:

Pseudomonas aeruginosa is a Gram-negative, rod-shaped, asporogenous, and monoflagellated bacterium. It has a pearlescent appearance and grape-like or tortilla-like odour. *P.*

aeruginosa grows well at 25°C to 37°C, and its ability to grow at 42°C helps distinguish it from many other *Pseudomonas* species.



Figure(1): Gram staining of *Pseudomonas*

Culture Characteristics:

Pseudomonas aeruginosa non lactose fermenter, inert carbohydrate fermentation, take glucose by oxidation, strict aerobic; Oxidase positive and Catalase positive, grow on simple media, growth on blood agar may produce diffuse haemolysis, the colonies are large, low convex, circular and have an irregular spreading edge rough in appearance or small, smooth, produce soluble pigment especially at room temperature, the yellow/green pigment **pyoverdine (fluorescein)** is also produced by some strains, giving the characteristic blue-green appearance of infected pus or cultures, other species produce other type of pigments like **pyocyanin** and **pyomelanin**.

Pathogenesis

Pseudomonas can infect any tissue, any organ system in an immune-compromised host. *Pseudomonas* usually cannot infect normal host. So, you see as compromised hosts are found in hospitals, *Pseudomonas* has emerged as a common cause of health care associated or nosocomial or hospital associated infections. In addition *Pseudomonas* produces many different organ system infections in the humans.

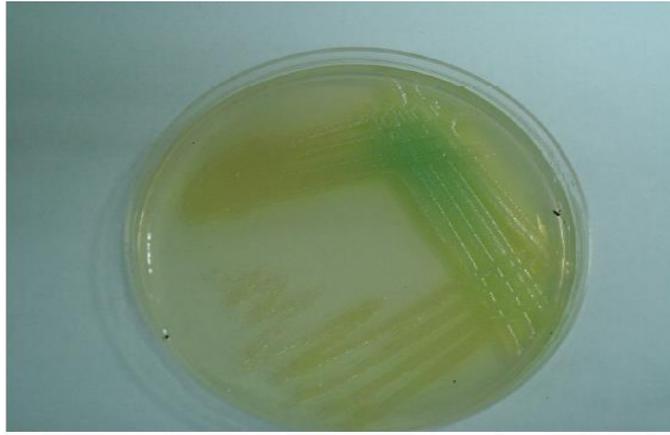


Figure (1): Shape the growth of *Pseudomonas aeruginosa* onto a nutrient agar plate; notice the yellowish-greenish pigment (pyoverdinin; fluorescein) produced via the microbe isolated from a burn case.