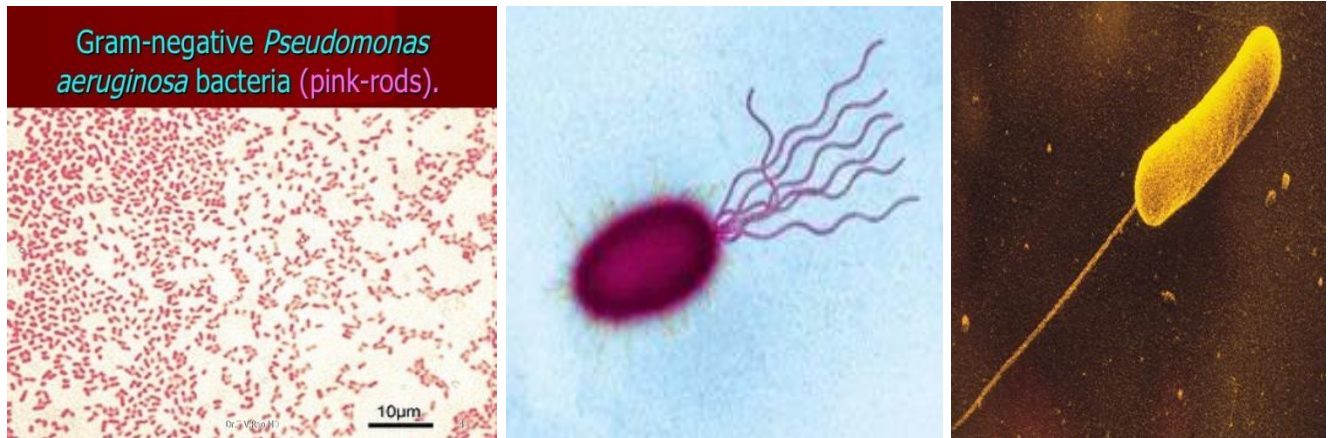


## *Pseudomonas aeruginosa*

It is a gram-negative rod, aerobic or facultative anaerobic, non-spore forming and motile by one or more polar flagellum.



Ubiquitous or free living bacteria, found in soil, decaying organic matter, water, plants, animals. Found throughout the hospital environments on moist reservoirs such as food, cut flowers, sinks, toilets, floor mops, taps, showers, respiratory therapy equipment and even disinfectant solutions. *Pseudomonas aeruginosa* is frequently present in small numbers in the normal intestinal flora and on the skin of humans.

Resistant to most commonly used antibiotics, weak antiseptics, highly concentrations of salts, soap, drying and dyes.

Transmission occurs from patient to patient by the hands of healthcare workers, by patient contact with contaminated reservoirs, and by the ingestion of contaminated materials.

*Pseudomonas* can grow on blood agar (beta hemolytic) and Mac Conkey agar.



On Nutrient agar *P. aeruginosa* can be recognized by the pigments, it produces a blue-green pigment (pyocyanin).

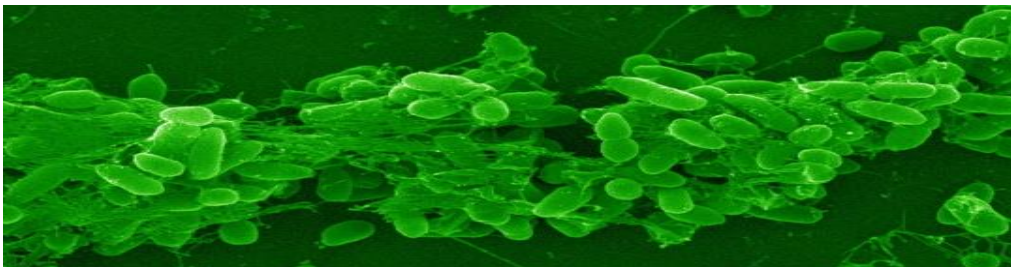
## Virulence factors

*Pseudomonas aeruginosa* has a number of virulence factors including:

- 1-Pili or fimbriae which mediate adherence to respiratory epithelium.
- 2-Polysaccharide capsule which covered the bacterial surface to protect it from phagocytosis.
- 3-Lipopolysaccharide endotoxin as a major cell antigen mediates the various biological effects such as fever, shock, oliguria and leucopenia.
- 4- Exotoxin A and exotoxin S which blocks or inhibition protein synthesis.
- 5-Elastase enzyme which destruction of the elastic fiber in blood vessel walls, resulting in hemorrhagic lesions
- 6-Protease enzyme that mediate tissue destruction, inactivation of antibiotics and inhibition of neutrophils function.
- 7-Phospholipids C that break down lipids and tissue destruction.

*Pseudomonas aeruginosa* is notorious for its resistance to antibiotics and is, therefore, a particularly dangerous and dreaded pathogen. The bacterium is naturally resistant to many antibiotics due to the:

- 1- Its tendency to colonize surfaces in a biofilm form makes the cells impervious to therapeutic concentrations antibiotics.



- 2-Since its natural habitat is the soil, living in association with the bacilli, actinomycetes and molds, it has developed resistance to a variety of their naturally occurring antibiotics.
- 3-Moreover, *Pseudomonas* maintains antibiotic resistance plasmids and it is able to transfer these genes by transduction and conjugation
- 4-Permeability barrier afforded by its gram-negative outer membrane.

## Pathogenicity

It is pathogenic only when introduced into areas devoid of normal defenses, such as when mucous membranes and skin are disrupted by direct tissue damage as in the case of burn wounds; when intravenous or urinary catheters are used; or when neutropenia is present, as in cancer chemotherapy. The bacterium attaches to and colonizes the mucous membranes or skin, invades locally, and produces systemic disease. The case fatality rate in these patients is near 50 percent such as:

- 1- Bacteremia and septicemia.
- 2- Respiratory infections.
- 3- Ear infections
- 4- Burn infections
- 5- Central nervous system infections.
- 6- Eye infections.
- 7- Bone and joint infections.
- 8- Urinary tract infections.
- 9- Gastrointestinal infections.
- 10- Skin and soft tissue infections.
- 11- Endocarditis.

## Treatment

Only a few antibiotics are effective against *Pseudomonas aeruginosa*, including gentamicin, amikacin, tobramycin, ciprofloxacin, levofloxacin, cephalosporins, piperacillin, imipenem, polymyxin B, colistin. These antibiotics are not effective against all strains and resistant forms have developed.

Topical therapy (by using creams) of burn wounds with antibacterial agents such as silver sulfadiazine, coupled with surgical debridement, dramatically reduces the incidence of *P. aeruginosa* sepsis in burn patients. The combination of gentamicin and carbenicillin is frequently used to treat severe infections.

**Prevention and control**

Effective infection control practices should concentrate on prevention of contamination of sterile equipment's such as respiratory therapy machines and cross - contamination of patients by medical personnel. The inappropriate use of broad spectrum antibiotics should be avoided because this can suppress the normal flora and permit the over growth of resistant *Pseudomonas*. Several types of vaccines are being tested, but none is currently available for general use.