

Anbar University

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Pseudomonas aeruginosa

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Textbook of Diagnostic Microbiology (Mahon, Textbook of Diagnostic Microbiology), Connie R. Mahon MS, Donald C. Lehman EdD
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Jawetz Melnick & Adelbergs Medical Microbiology, Stefan Riedel (Author), Stephen Morse (Author), Timothy Mietzner (Author), Steve Miller.

Mims' Medical Microbiology and Immunology, International Edition, Goering.

Pseudomonas aeruginosa

The pseudomonads are Gram-negative, motile, aerobic rods, some of which produce water-soluble pigments. The pseudomonads occur widely in soil, water, plants, and animals. *P. aeruginosa* is frequently present in small numbers in the normal intestinal flora and on the skin of humans, and is the major pathogen of the group. Other pseudomonads infrequently cause disease. The classification of pseudomonads is based on rRNA/DNA homology and common culture characteristics.

Antigenic Structure and Toxins Pili (fimbriae) extend from the cell surface and promote attachment to host epithelial cells. An exopolysaccharide, alginate, is responsible for the mucoid colonies seen in cultures from patients with CF. Lipopolysaccharide, which exists in multiple immunotypes, is responsible for many of the endotoxic properties of the organism. Most *P. aeruginosa* from clinical infections produce extracellular enzymes, including elastases, proteases, and two hemolysins (a heat-labile phospholipase C and a heat-stable glycolipid).

Many strains of *P. aeruginosa* produce exotoxin A, which causes tissue necrosis. The toxin blocks protein synthesis by a mechanism of action identical to that of diphtheria toxin, although the structures of the two toxins are not identical.

Pseudomonas aeruginosa :

Some strains hemolyze blood, & many strains also give a greenish color to the agar because of the ability to produce fluorescent pigment *pyoverdine*,

but other strains give black pigment *pyomelanin*. It grows well at 37-42 °C, oxidase positive. It does not ferment carbohydrate but oxidize glucose.

The growth at 42 °C, with presence of characteristic pigments is important in differentiation.

Antigenic structure & enzyme, toxin (Virulence factor)

- * Pili
- * Capsules (responsible for the mucoid colonies)
- * LPS
- * Elastases, proteases (play key role in corneal ulceration) & two hemolysins:

Heat labile phospholipase C

Heat stable glycolipid

- * Exotoxin (A) blocks protein synthesis by mechanism similar to Diphtheria toxin.
- * Phospholipases, proteases & alginate associated with chronic pulmonary colonization.
- * Fluorecein or pyoverdin pigments act as bacterial siderophores.

Pathogenesis

***P. aeruginosa* is pathogen when introduced into:**

- ◆ Areas devoid of normal defense **ex:** mucous membrane & skin are disrupted
- ◆ When intravenous or urinary catheters are used

The pathogen process

The bacteria attaches to colonizes the mucous membranes or skin, invade locally & produces systemic disease, these processes are promoted by the pili, enzymes & toxins but LPS plays direct role in causing fever, shock, Oliguria, leukocytosis & leukopenia & adult respiratory distress syndrome.