Proteus & Pseudomonas

Ahmad Ausama Al-Kazzaz
Anas Huthaifa AL-Dewachi
Ameer Saadallah Zacko Al-Ta’i

Supervised by: Dr. Khalid
Ahmad Ausama Al-Kazzaz
Proteus

Proteus is a genus of Gram-negative *Proteobacteria* of family *Enterobacteriaceae* (Gram-negative stains, Oxidase negative, facultative anaerobes, Glucose fermenters, reduce nitrate to nitrite).

This genus include many species:

- *P. vulgaris*
- *P. mirabilis*
- *P. hauseri*
- *P. myxofaciens*
- *P. penneri*
Morphology

- Gram negative bacilli
- Very pleomorphic
- Highly motile
- Non spore forming
Cultural characteristics

- Facultative anaerobes, Growth temperature is 37°C
- Grow on all ordinary media producing fishy odor
- Hemolytic on blood agar
- Swarming phenomena due to their high motility with peritrichous flagella
  “noticed on non-inhibitory media like blood agar and nutrient agar; increasing the agar content can inhibit swarming”
They grow on Macconkeys agar as non-lactose fermenters **without swarming**
Biochemical reactions

- Phenylalanine deaminase +ve
  (similar to Morganella & Providencia)

Phenylalanine → Deaminase → Phenylpyruvate → Ferric Chloride → Green

- -ve
- +ve
Urase +ve

Urea $\xrightarrow{\text{Urease}}$ NH₃ (increase pH) + CO₂

Pink

+ve   -ve
Oxidase -ve
O-nitrophenyl-β-D-galactoside (ONPG) –ve

+ve
Yellow

-ve
Colorless
TSI (Tri Sugar Iron agar):
TSI K/A H2S +ve
Gelatin Hydrolysis Test: +ve
## IMViC profile

<table>
<thead>
<tr>
<th>Species</th>
<th>Indol</th>
<th>Methyl Red</th>
<th>Vogas Proskauer</th>
<th>Citrate utilization</th>
<th>Ornithine decarboxylase</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>P. vulgaris</em></td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>P. mirabilis</em></td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
Anas Huthaifa AL-Dewachi
Non-fermenters

Gram – Ve Bacilli
Non-fermenters Gram –Ve Bacilli (NFGN)

Opportunistic Pathogens of Human, Plants and Animals.

They are:

- Oxidase positive
- Lack of evidence of fermentation of glucose
- No evidence of growth on MacConkey’s agar
These include:

- *Pseudomonas*
- *Acinetobacter*
- *Bordetella*
- *Burkholderia*
- *Legionella*
- *Moraxella*
- *Stenotrophomonas*
Pseudomonas

*Pseudomonas* is a genus of Gram-negative aerobic bacilli belonging to the family *Pseudomonaceae*, containing 191 species.

Most important species are:

- *P. aeruginosa*
- *P. fluorescens*
- *P. putida*
- *P. stutzeri*
Morphology

- Gram-negative
- Motile with a single or multiple polar flagella
- Non-spore forming
Cultural Characteristics

- Obligate aerobe.
- Grow at optimum temperature of 37°C, but can tolerate 42°C.
- It can tolerate alkaline pH (8.5).
- Grow on ordinary media producing large opaque irregular colonies with sweetish aromatic “Grape-like” odor.
- Iridescent patches with metallic sheen are seen in cultures on nutrient agar.
It produces pigments:

- As part of pathogenicity
- Seen on Nutrient agar (not on blood agar)

Pyocyanin - bluish pigment

Pyoverdin - greenish pigment
*There is also Pyorubin - Red

Pyomelanin- black or brown
Biochemical Tests

- Oxidase +ve
Catalase +ve
Citrate utilization +ve
TSI (Tri Sugar Iron agar): K/K H2S -ve

Oxidative decarbocylaion = ammonia
Alkaline reaction = red slant

H2S production = black color

Fermentation of the sugar = acid formation
Acidic reaction = yellow butt

Gas = air bubble or crack in the medium

Photo by Karen M. Kiser
**Oxidative / Fermentative (O/F):** Oxidative & non fermentative

Glucose → **Aerobically** Oxidation → Acid

Or

Glucose → **Anaerobically** Fermentation → Acid

Bromothymol Blue → Yellow

- Fermentative & Oxidative
- Non fermentative & Oxidative
- Non fermentative & non oxidative (Asaccharolytic)
Motility can be detected as “Inverted Tree”
Note: Identification of *P. aeruginosa* is usually based on oxidase test and its colonial morphology: b-hemolysis, the presence of characteristic pigments and sweet odor, and tolerance of growth up to 42 °C.
Thank You