

**ROLE OF FATTY ACIDS AS ENVIRONMENTAL  
REGULATOR ON PROTEUS MIRABILIS SWARMING  
AND BIOFILM FORMATION IN CATHETER-  
ASSOCIATED URINARY TRACT INFECTION**

**THESIS**

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# ABSTRACT

*P. mirabilis* is a common cause of C-UTI. This study evaluates the effect of stearic, palmitic and myristic acids to LB culture medium, on swarming, biofilm formation and EPS production of 30 *P. mirabilis* strains isolated from 300 urine samples collected from 300 catheterized patients. Myristic and palmitic acids could inhibit swarming and EPS of *P. mirabilis*. Only myristic acid could inhibit biofilm formation, while stearic acid enhanced swarming and EPS production of *P. mirabilis*.

## Key Words:

- . C-UTI. Catheter - associated urinary tract infection
- . EPS: exopolysaccharides
- . hrs: hours
- . LB: Lauri Bertani
- . *P. mirabilis*: *Proteus mirabilis*

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## LIST OF ABBREVIATIONS

|                    |  |
|--------------------|--|
| $\alpha$ :         | Alpha.                                       |
| <i>aad</i> :       | Amino acid deaminase.                        |
| Adon:              | Adonitol.                                    |
| AI-2:              | Autoinducer 2.                               |
| AmpC:              | Ambler's molecular class C.                  |
| ATF:               | Ambient temperature fimbriae.                |
| bp:                | Base pair.                                   |
| $\beta$ :          | Beta.  |
| C:                 | Complement.                                  |
| $\text{Ca}^{2+}$ : | Calcium.                                     |
| CFU/ml:            | Colony forming unit per milliliter.          |
| CFU:               | Colony forming unit.                         |
| CLED:              | Cystine lactose electrolyte deficiency.      |
| <i>Ccm</i> :       | Cell-cell migration.                         |
| <i>cmfA</i> :      | Colony migration factor.                     |
| CPG:               | Casamino- peptone-glucose.                   |
| C-terminus:        | Carboxy terminus.                            |
| CTX:               | Cefotaxime.                                  |
| C-UTI:             | Catheter-associated urinary tract infection. |
| C $\beta$ L:       | AmpC $\beta$ -lactamases.                    |
| DKPs:              | Diketopiperazines.                           |
| DNA                | Deoxyribonucleic acid.                       |

|                        |  |
|------------------------|--|
| DPPC:                  | Dipalmitoylphosphatidylcholine.            |
| <i>E. coli</i> :       | <i>Escherichia coli</i> .                  |
| EDTA:                  | Ethylene diamine tetra-acetic acid.        |
| EPS:                   | Exo/Extracellular polysaccharides.         |
| ESBLs:                 | Extended spectrum $\beta$ -lactamases.     |
| FAS:                   | Fatty acid synthetase.                     |
| Fig.:                  | Figure.                                    |
| <i>fla</i> :           | Flagellin gene.                            |
| <i>flh</i> :           | Flagellar hyperexpression gene.            |
| Fur:                   | Ferroxamine upregulator.                   |
| $\gamma$ :             | Gamma.                                     |
| <i>gidA</i> :          | Growth and initiation of differentiation.  |
| GIT:                   | Gastrointestinal tract.                    |
| h $\beta$ D1:          | Human $\beta$ -defensin 1.                 |
| HAUTI:                 | Hospital-acquired urinary tract infection. |
| HLA:                   | Human leucocytic antigen.                  |
| Hly:                   | Hemolysin.                                 |
| HPF:                   | High power field.                          |
| hrs.:                  | Hours.                                     |
| ID <sub>50</sub> :     | Infective dose 50.                         |
| Ig:                    | Immunoglobulin.                            |
| <i>K. aerogenes</i> :  | <i>Klebsiella aerogenes</i> .              |
| <i>K. pneumoniae</i> : | <i>Klebsiella pneumoniae</i> .             |
| KCN:                   | Potassium cyanide.                         |

|                      |   |
|----------------------|---|
| kD <sub>a</sub> :    | Kilo dalton.                                  |
| <i>L. Lactis</i> :   | <i>Lactococcus lactis</i> .                   |
| LB:                  | Luria – Bertani.                              |
| LD <sub>50</sub> :   | Lethal dose 50.                               |
| LD <sub>50</sub> S:  | Lethal dose 50 strain.                        |
| Log:                 | Logarithmic.                                  |
| LPS:                 | Lipopolysaccharides.                          |
| <i>Lrp</i> :         | Leucine-responsive regulator protein.         |
| <i>M. morganii</i> : | <i>Morganella morganii</i> .                  |
| mg/l:                | Milligram per liter.                          |
| mg/ml:               | Milligram per milliliter.                     |
| Mg <sup>2+</sup> :   | Magnesium.                                    |
| MIC:                 | Minimal inhibitory concentration.             |
| min.:                | Minute.                                       |
| mM:                  | Millimole.                                    |
| mm:                  | Millimeter.                                   |
| mol :                | Mole.   |
| MPC:                 | Methacryloyloxyethyl phosphoryl choline.      |
| MR/K:                | Mannose - resistant/ <i>Klebsiella</i> -like. |
| MR/P:                | Mannose - resistant/ <i>Proteus</i> -like.    |
| mRNA:                | Messenger ribonucleic acid.                   |
| <i>mrp</i> :         | Mannose resistant pilin.                      |
| μg/ml:               | Microgram per milliliter.                     |
| μL:                  | Microliter.                                   |
| μm:                  | Micrometer.                                   |