



Letter to the Editor

Factors affecting flowering of *Pseudomonas aeruginosa* in urine

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Dear editor,

Because of rising antimicrobial resistance in the healthcare system, one of the most significant difficulties for clinicians is providing sufficient therapy for infections caused by Gram-negative bacteria [1]. *Pseudomonas aeruginosa* (*P. aeruginosa*) is the most common Gram-negative rod infection, [2] especially in severely sick and vulnerable individuals [3]. Treatment options for *P. aeruginosa* infections have been severely limited due to antimicrobial resistance [4-6].

Pseudomonas aeruginosa has been reported to continuously sense and respond to various environmental stimuli. While establishing in the urinary tract, presence of urine, which is a complex medium, exposes invading organism to conditions like varied osmolarity, pH as well as variability of ions such as iron that act as potential virulence of *P. aeruginosa* and are thus critical for its pathogenicity. Extrapolation of available information may help in developing alternative preventive approach against urinary tract infections (UTIs) based on iron supplementation with far reaching consequences [7].

Osmolarity is another important factor which has been reported to affect growth and virulence of *P. aeruginosa*. In order to establish and cause UTI, *P. aeruginosa* has to adapt itself to variations in osmolarity of urine. There was significant increase in production of virulence factors with increase in osmolarity. However further increase in osmolarity led to significant decrease in production of virulence factors. In addition, organisms grown in medium having osmolarity 300 mOsm/L were resistant to phagocytosis and were more virulent in mouse model of ascending UTI as indicated by significantly higher neutrophil recruitment, bacterial load, malondialdehyde (MDA) production, a marker of tissue damage, and renal as well as bladder pathology [8-9].

In addition to environmental variables, the host plays a critical role in the initiation of an infectious process. As evidenced by the increased pathogenicity of microorganisms in immune-compromised hosts and the absence of pathogenicity of pathogens in immune-competent hosts, microbial virulence is reliant on host characteristics. Innate immunity serves as a first line of defense in this regard, with macrophages and neutrophils playing a key role. Macrophages, which are mostly derived from the bloodstream, are one of the first lines of defense in the urinary tract and provide resistance to infection [7].

In conclusion: Although many factors can influence flowering the *P. aeruginosa* in urinary tract; environmental and host related factors, *P. aeruginosa* showed high adaptation to change in these factors by various mechanisms that enhance its pathogenicity and antibiotic resistance rate. The researchers in the field of antimicrobial agent may

give more attention by highlight *P. aeruginosa* as a major health threat and strongly urged the research and development of alternate and new antimicrobial therapies due to the high rates of antibiotic resistance.

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References

- 1-Pena C, Suarez C, Tubau F, Dominguez A, Sora M. Carbapenem-resistant *Pseudomonas aeruginosa*: factors influencing multidrug-resistant acquisition in non-critically ill patients. Eur J Clin Microbiol Infect Dis 2009;285:519–22.
- 2-AL-Khikani FH, Kadim BJ, Ayit AS, Abidalali MH. Evaluation cephalosporins resistance in pathogenic bacteria isolated clinically. World News of Natural Sciences 2020;31:255-259
- 3-AL-Khikani FH, Almosawey HS. Be conscious to be healthy: An initiative to prevent recurrent urinary tract infection in Iraqi women. Hamdan Med J 2020;12:44-6.
- 4-El Zowalaty ME, Al Thani AA, Webster TJ, El Zowalaty AE, Schweizer HP. *Pseudomonasaeruginosa*: arsenal of resistance mechanisms, decades of changing resistance profiles, and future antimicrobial therapies. Future Microbiol 2015;10:1683–706.
- 5-AL-Khikani FH. The forgotten role of methenamine to prevent recurrent urinary tract infection: urgency for reuse 100 years after discovery. Pharmaceutical and Biomedical Research 2020;5:24-32
- 6-AL-Khikani FH, Ayit AS. Correlation study between urinary tract bacterial infection and some acute inflammatory responses. Biomedical and Biotechnology Research Journal (BBRJ) 2019; 3:236.
- 7-Mittal R, Aggarwal S, Sharma S, Chhibber S, Harjai K. Urinary tract infections caused by *Pseudomonas aeruginosa*: a minireview. Journal of infection and public health 2009; 2:101-11.
- 8-AL-Khikani FH, Abadi RM, Ayit AS. Emerging carbapenemase Klebsiella oxytoca with multidrug resistance implicated in urinary tract infection. Biomedical and Biotechnology Research Journal (BBRJ) 2020 1;4(2):148.
- 9-Al-Khikani FH, Kadem BJ. Unusual false-negative serum human chorionic gonadotropin detected by qualitative immunoassay: a case report of two Iraqi women. Journal of Medicine in Scientific Research 2020;3:238.