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Enzyme secretion in *Staphylococcus aureus* strains

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Abstract

Staphylococcus aureus manifests many enzymes, which are correlated with the virulence of bacteria. The aim of the study was to determine enzymes secretion in *Staphylococcus aureus* strains. The results of the study showed that some enzymes which involve in virulence (plasma coagulase, catalase, urease, protease, and lecithinase, hemolysins) were secreted frequently in multidrug resistant and methicillin resistant *S. aureus* strains.

Keywords: *Staphylococcus aureus*; Virulence; Enzymes; Multidrug resistance

1. Introduction

Infectious diseases remain one of the leading causes of death worldwide. Natural genetic variations, recombinations, and adaptations allow new strains of known pathogens to appear [1]. Bacterial multidrug-resistance causes a substantial health burden [2].

Although *Staphylococcus aureus* is primarily a commensal microbe, it has the potential to cause a wide range of diseases that can vary considerably in severity [3]. *S. aureus* is the most isolated human bacterial pathogen and an important cause of infections of endovascular infections, skin and soft tissues, septic arthritis, sepsis, pneumonia, osteomyelitis, foreign body infections and endocarditis [4]. S. *aureus* is a common cause of infections in patients in intensive care units, and in many countries, it is often resistant to methicillin (MRSA strains)

S. aureus is one of the most common causes of clinical infections worldwide and has attracted significant public attention due to the increased mortality associated with multidrug resistance [5,6]. Currently, *S. aureus* is the main common cause of nosocomial infections, and as an increasing number of patients receive treatment outside the hospital, this is an increasing public concern [7].

In addition to the toxins, *S. aureus* produces a large number of virulence factors that have enzymatic properties - enzymes for degradation of tissue components. Secreted enzymes (exoenzymes) function to break down bacterial and host molecules for nutrient acquisition, bacterial survival, and dissemination [8].

Based on the foregoing, the aim of the present study was to identify the pathogenicity factors of *S. aureus* - enzymes and carbohydrates and to check their activity in multiresistant (MDRSA) and MRSA strains.

The study included clinical isolates identified by appropriate methods [9,10]. Media and reagents provided by these methods were used. In particular, the study was carried out taking into account morphological, tincture, cultural and biochemical features. Two methods were used to study antibiotic resistance: disk diffuse [11] and a Vomek2 analyzer (Biomerieux). *S. aureus* strains were divided into 2 groups: resistant to MDRSA (group I) and MRSA (group II). We studied the presence of some enzymes which are involved in the pathogenicity of bacterium.

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The test results are given in the table N1.

Table 1 Enzymes of *S. aureus*

Identity markers	Group I n = 50		group II n = 50	
	abs	%	abs	%
Urease-positive	39	78,0±5,85	48	96,0±2,77
Hemolytic activity (positive)	50	100	50	100
Proteolytic activity	43	86,0±4,90	47	94,0±3,35
Plasmocoagulase-positive	43	86,0±4,90	50	100
Catalase-positive	50	100	50	100
Lecitinase activity	41	82,0±5,43	48	96,0±2,77

As can be seen from the table, catalase and hemolytic activity is the same for all groups and is equal is 100%. Lecithinase activity and proteolytic production were detected in 82 ± 5.43% and 86,0±4,90% (group I) and 96 ± 2.77% and 94,0±3,35% (group II), respectively. Urease activity is less in group I (78,0±5,85%) than in group II (96,0±2,77%), Strains from both groups revealed high enzyme activity which was the highest in MRSA strains.

2. Conclusion

MDRSA and MRSA strains are characterized with high enzyme secretion frequency. Enzymes which determine virulence in these strains - catalase, urease, plasma coagulase, protease, lecithinase and hemolysins were highly active. These enzymes are involved in the pathogenesis of *S. aureus* infections.

Compliance with ethical standards

Disclosure of conflict of interest

Authors of the manuscript have no conflict of interests to disclose.

References

[1] Kaszanyitsky EJ, Janosi S, Egyed Z, Agost G and Semjen G. (2003). Antibiotic resistance of staphylococci from humans, food and different animal species according to data of the Hungarian resistance monitoring system in 2001. Acxta Vet. Hung, 51(4), 451-64.

[2] Jernigan JA, Hatfield KM, et al. (2020). Multidrug-Resistant Bacterial Infections in U.S. Hospitalized Patients, 2012-2017. N Engl J Med., 382(14), 1309-1319.

[3] Jenul C and Horswill AR. (2018). Regulation of *Staphylococcus aureus* virulence. Microbiol Spectr. 6(1).

[4] Mc callumn N, Berger-Bachi B and Senn M. (2010). Regulation of antibiotic resistance in *Staphyloccus aureus*. Int. J. of Med. Microb, 300(2-3), 118- 129.

[5] Mc Murray LW, Kernodle DS and Barg NL. (1990). Characterisation of widespread strains of methicillin susceptible *Staphylococcus aureus* associated with nosocomial infections J. Infect. Dis, 162, 759-762.

[6] Barua S, Joshi A Sh and Swaminathan R. (2017). Prevalence of Multidrug Resistant *Staphylococcus aureus* and its Antimicrobial Susceptibility Pattern in a Tertiary Care Hospital in Navi Mumbai, India. Int. J. Curr. Microbiol. App. Sci, 6(3), 370-375.

[7] Lowy FD. (1998). *Staphylococcus aureus* infections. N. Engl. J. Med., 339, 520-532.

[8] Tam K and Torres VJ. (2019). *Staphylococcus aureus* Secreted Toxins & Extracellular Enzymes Microbiol Spectr. 7(2).

[9] Baron EJ, Peterson LR and Finegold SM. (1999). Diagnostic Microbiology 9th edition Mosby, 320-345.

[10] Bergey's Manual of Determinative Bacteriology John G. Holt Lippincott Williams & Wilkins, 1994 -787.

[11] Clinical and Laboratory Standards Institute. (2006). Performance standards for antimicrobial disk susceptibility tests. Approved standard. 9th ed. (M2-A9). Wayne, PA: Clinical and Laboratory Standards Institute.

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