Раздел 2. Естественные науки

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ANTIBIOTIC SUSCEPTIBILITY OF CLINICAL *ACINETOBACTER BAUMANNII* STRAINS

Balan Greta Georgievna
MD, PhD, Associate Professor
Nicolae Testemitanu State University of Medicine and Pharmacy
(Chisinau, Republic of Moldova)
Abu Arar Sabri Sami
6 year student
Nicolae Testemitanu State University of Medicine and Pharmacy
(Chisinau, Republic of Moldova)
Cojocari Daniela Simionovna
University Assistant
Nicolae Testemitanu State University of Medicine and Pharmacy
(Chisinau, Republic of Moldova)

Acinetobacter baumannii has emerged as a medically important pathogen because of the increasing number of infections produced by this organism over the preceding three decades and the global spread of strains with resistance to multiple antibiotic classes. There were examined 53strains of *A.baumannii*, isolated from patients with trophic ulcers. Strains of *A. baumannii* were highly resistant to all tested antibiotics, 38 (71.7%) showed multidrug-resistance. The study results proved that treatment of trophic ulcers is still a major problem, requiring rational monitoring and management strategies.

Key-words: *Acinetobacter baumannii*, antibiotic resistance, trophic ulcers.

ЧУВСТВИТЕЛЬНОСТЬ К АНТИБИОТИКАМ КЛИНИЧЕСКИХ ШТАММОВ *ACINETOBACTER BAUMANNII*

Бэлан Грета Георгиевна
Доктор медицинских наук, доцент
Николае Тестемицану Государственный Университет
Медицины и Фармации
(Кишинев, Республика Молдова)
Абу Арар Сабри Сани
студент 6 курса
Николае Тестемицану Государственный Университет
Медицины и Фармации
(Кишинев, Республика Молдова)
Кожокарь Даниела Симионовна
Ассистент кафедры
Николае Тестемицану Государственный Университет
Медицины и Фармации
(Кишинев, Республика Молдова)

Acinetobacter baumannii стал важным, с медицинской точки зрения, патогеном из-за увеличения количества инфекций, вызываемых этим микроорганизмом за последние три десятилетия и глобального распространения штаммов с устойчивостью к нескольким классам антибиотиков. Было исследовано 53 штамма *A. baumannii*, выделенных от больных с трофическими язвами. Штаммы *A. baumannii* обладали высокой устойчивостью ко всем протестированным антибиотикам, 38 (71,7%) показали множественную лекарственную устойчивость. Результаты исследования доказали, что лечение трофических язв, по-прежнему, является серьезной проблемой, требующей рационального мониторинга.

Ключевые слова: *Acinetobacter baumannii,* устойчивость к антибиотикам, трофические язвы.

Introduction

A. baumannii is recognized as disease-causing agent, involved in healthcare-associated infections, displaying high morbidity and mortality rates in critically ill patients. These patientsare more predispose to germ transmission due to invasive medical procedures, the widespread use of a variety of antimicrobial agents, particularly the broad-spectrum ones and inappropriate infection control [1].

The infections associated with different types of immunodeficiencies, high virulence and antibiotic resistance of the *Acinetobacter* strains, make up 28.3% - 84.3% of mortality cases among patients. Currently, of particular concern is the selection of some *A. baumannii* strains that can express serum bactericidal resistance to various factors and biofilm-forming capacity, thus often being involved in bacteremia associated with high mortality rate (up to 75%) [1, 2, 3].

The treatment of *Acinetobacter* spp. infections is often challenging, since the bacteria show an intrinsic resistance to many antimicrobial agents and due to a variety of mechanisms, as well as have an extraordinary ability to develop resistance to all classes of antimicrobials, used in the treatment of gram-negative bacillus infections [2, 4].

It is well recognized that *Acinetobacter* species have a natural resistance to cephalosporins generations 1-2 and aminopenicillins. The bacterial resistance to other classes of antibiotics is due to various mechanisms as, enzyme inactivation, changes in the target sites, impaired membrane permeability, and activating the pumps [5].

The worldwide spread of multidrug-resistant or pan-resistant *A. baumannii* strains has increased dramatically since 1990. The World Health Organization has included these bacteria in the group of highly infectious agents that would spiral out of the antibiotic control.

According to the 2011-2014 European surveillance network EARS-NET (European Antimicrobial Resistance Surveillance - Net-

work) data, the highest antibiotic resistance levels of gram-negative bacilli have been reported in southern and eastern Europe. The highest resistance level was recorded in species of the genus *Acinetobacter* [6].

Although trophic ulcers are a major health problem, the current methods of treatment are sometimes not enough and often lead to amputation due to mis understanding regarding microbiology of these infections or methods of their eradication.

The study was aimed to conduct and evaluate the antibiotic susceptibility of *A. baumannii* strains isolated from trophic ulcers.

Material and methods

The study group included 53 strains of *A. baumannii*, isolated from trophic ulcers. Solid Oxoid culture media were used to isolate *A. baumannii*: Columbia Blood Agar Base with 5% sheep blood, MacConkey agar.

The identification was assessed by classical biochemical tests and confirmed byVITEK 2 COMPACT automatic system.

The Kirby-Bauer disk diffusion method was used for antimicrobial susceptibility testing , whereas the *in vitro* antibiotic test results were interpreted according to EUCAST (European Committee on Antimicrobial Susceptibility Testing) [7].

The *A. baumannii* strains were tested to four classes of antimicrobial drugs: aminoglycosides (gentamicin, amikacin, tobramycin), carbapenems (meropenem, imipenem), fluoroquinolones (levofloxacin, ciprofloxacin) and sulfanylamides (trimethoprim-sulfamethoxazole). *A. baumannii* strains that showed resistance to three or more different classes of antimicrobials were classified as multidrug-resistant (MDR) *A.baumannii* [8].

The reference strains *A. baumannii* (BAA-747) were used for quality control.

Results and discussions

The present study assessed the antimicrobial susceptibility profiles of *A. baumannii* strains isolated from trophic ulcers (fig.1 - 4).

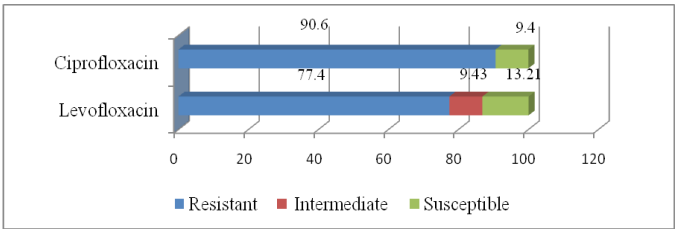

Figure 1. Antibiotic susceptibility testing of *A. baumannii* strains to fluoroquinolones

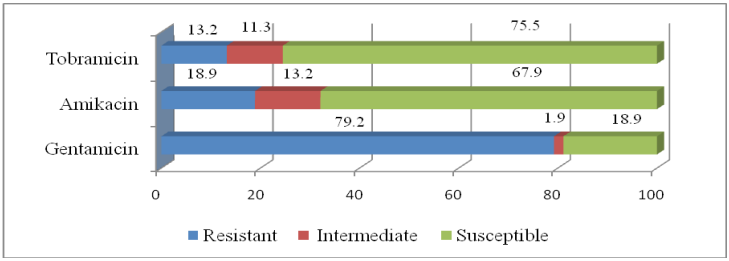

Figure 2. Antibiotic susceptibility testing of *A. baumannii* strains to aminoglycosides

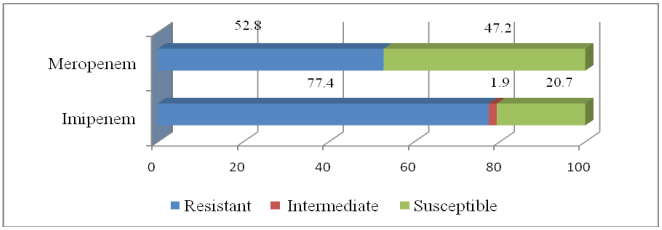

Figure 3. Antibiotic susceptibility testing of *A. baumannii* strains to carbapenems

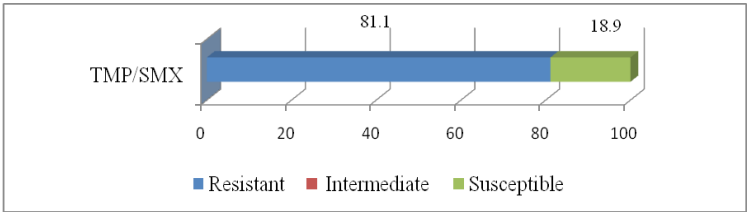

Figure 4. Antibiotic susceptibility testing of *A. baumannii* strains to sulfanylamides, TMP/SMX - trimethoprim/sulfamethoxazole

The data analysis of the previous figures revealed that *A. baumanii* strains, isolated from trophic ulcers are highly resistant to most antibiotics. Of 53 strains, 38 (71.7%) were multidrug-resistant. Higher antibiotic susceptibility was registered to tobramycin (75.5%) and amikacin (67.9%).

The resistance of *A. baumannii* strains to carbapenems (imipenem - 77.4% and meropenem - 52.8%) is of major concern. The World Health Organization stated that carbapenem-resistant *Acinetobacter baumannii* infections has become a major public health challenge and a serious health threat in future [9].

Conclusions

The research findings underline the importance of an effective surveillance of antimicrobial resistance of *A. baumannii* strains, thus suggesting the appropriate use of antimicrobials in order to prevent the emergence of bacterial resistance to these specific drugs.The assessment of resistence to antibiotics will help the practitioners to effectively manage these infections, providing a more effective control of appropriate antimicrobials and thus resulting in a reduced mortality and morbidity rates in patients.

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