



Fund “Nauka” Project № 19019 Resume – Competition-Based Session 2019:

“Invasive bacterial infections in patients after autologous and allogeneic hematopoietic stem-cell transplantation: etiological spectrum and resistance to strategic beta-lactam and glycopeptide antibiotics”

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Stem cell transplantation is a life-saving therapeutic approach for many patients with hematological malignancies. Despite the remarkable results, stem cell transplantation has its negative consequences, leading to high mortality – infectious complications.

The aim of this project is to investigate the etiologic spectrum of invasive bacterial infections in patients after autologous and allogeneic bone-marrow transplantation and their resistance mechanisms to strategic antibiotics (beta-lactams and glycopeptides).

For the purpose of the project several tasks were set: studying of the etiological spectrum of microbial causative agents of infections of the blood and the central nervous system; determination of the sensitivity of bacterial isolates to antimicrobial agents; identification of mechanisms of resistance to cephalosporins (3rd generation), carbapenems and glycopeptides; studying of fecal carriage of multiple-resistant bacteria and determination of the epidemiological link between invasive isolates and those of fecal samples.

The study will include isolates recovered from January 2020 to June 2022 from blood and cerebrospinal fluid of patients after bone marrow transplantation as well as bacterial isolates recovered from fecal samples. Susceptibility to strategic antibiotics will be tested by a classical method (disc-diffusion test) and the automated Phoenix BD system. The genetic mechanisms of resistance will be studied by using the PCR method.

The expected results are related to the dominance of Gram – negative bacteria exhibiting multiple resistance, detection of genes encoding enzymes responsible for this multiple resistance and detection of genetic relation between invasive isolates and those of fecal samples. The study will help establish the

fecal colonization of this population and study the potential link between intestinal colonization and invasive infections caused by multi-drug resistant bacterial isolates.

Achieved results:

- ❖ The etiological spectrum of invasive bacterial infections in patients with bone marrow transplantation, dominated by Gram-positive bacteria of the *Staphylococcus* family, was established.
- ❖ The susceptibility of bacterial isolates, associated with invasive infections in the study group of patients was determined.
- ❖ The main mechanisms of resistance to beta-lactams (third-generation cephalosporins and carbapenems) and glycopeptide antibiotics (vancomycin, teicoplanin) in the collected isolates were identified and the group and type of enzymes were determined.
- ❖ The level of fecal colonization (carrage) of multiple-resistant bacteria (resistant to third generation cephalosporins, carbapenems and glycopeptides) was established.
- ❖ The genetic relation between the collected blood isolates and those from fecal samples in patients with invasive bacterial infection was established, which identifies the fecal colonization of multiple resistant bacteria as a risk factor for the occurrence of invasive infections in these patients.
- ❖ Clonal spread among some species of bacteria has been demonstrated.