

Phenotypical and Genotypical Assessment of Resistance of *Klebsiella Pneumoniae* Strains Producing Carbapenemase

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Abstract

The global emergence and spread of antimicrobial resistance genes, such as extended spectrum beta-lactamase (ESBL) and carbapenemase genes in *Klebsiella pneumoniae* strains, pose a significant public health threat. This is because carbapenems are considered the latest therapeutic agent used to treat diseases caused by multidrug-resistant gram-negative bacteria. The detection of carbapenemases is epidemiologically important because they are plasmid-mediated and can be transmitted horizontally between different bacterial species. The purpose of the work is to assess the spectrum of antibiotic resistance of carbapenemase-producing strains of *K. pneumoniae* circulating in hospitals in St. Petersburg using phenotypic and genotypic methods. An assessment of the sensitivity of 182 *K. pneumoniae* strains isolated from samples of patients admitted to hospitals in St. Petersburg in to 18 antimicrobial drugs was carried out. Resistance to antibiotics was assessed by the disk diffusion method. Carbapenemase genes were detected by molecular genetic (PCR) and phenotypic (CIM) methods. Most of the strains were resistant to ticarcillin / clavulanate, as well as quinolones, third and fourth generation cephalosporins, netilmicin, and gentamicin. The investigated microorganisms showed a moderate percentage of resistance to amikacin, meropenem and imipenem. The main type of carbapenemases produced by *K. pneumoniae* strains were metallo-beta-lactamases of the NDM group (60.4%) and serine carbapenemases of the OXA-48 group (49.5%). In the course of the study, a serine carbapenemase of the GES type was found in one strain. Carbapenemases of the KPC group were found in only 1.1% of the tested strains. The results of the study demonstrate a high level of resistance of *K. pneumoniae* nosocomial isolates to various antimicrobial drugs. In this regard, the range of antibiotics for the treatment of *Klebsiella* spp. infections is significantly reduced, which can lead to a decrease in the effectiveness of clinical therapy.

Biography

Samoilova A. is a junior researcher of Department of New Technologies. Research interests are antibiotic resistance and virulence of *K. pneumoniae* strains, as well as the development of kits for determining the antibiotic susceptibility of bacteria. The results of scientific activities have been published in the form of articles in peer-reviewed journals.

Likhachev I. is a junior researcher of Department of New Technologies. I am engaged in the development of commercial reagent kits for the quantitative assessment of the susceptibility of microorganisms to antimicrobial drugs (by the method of serial dilution and gradient diffusion). At the moment, the preparation of scientific and technical documentation is

underway to obtain a registration certificate for these test systems. Rogacheva E. is a researcher-microbiologist with experience in scientific and medical institutions. The main area of research interests is the antibiotic resistance of microorganisms of the ESKAPE group, nosocomial infections and the development of new antibacterial drugs. The analysis of the data obtained over the years of work allowed me to publish research results in the form of scientific articles in peer-reviewed journals (23) and make presentations at Russian (7) and international conferences (3), as well as become a leader (1) and executor (3) in grant projects.