

9. ANTIBIOTIC RESISTANCE OF MICROORGANISMS: CURRENT ISSUES OF DIAGNOSIS AND WAYS TO OVERCOME

9.1

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THE EFFECT OF SUB-BACTERICIDAL DOSES OF ANTISEPTICS ON DNA AND PHENOTYPIC MARKERS OF VIRULENCE OF MICROORGANISMS

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Local antiseptics in sub-bactericidal concentrations are active against antibiotic-resistant microorganisms, including Gram-negative bacteria. The studies were performed *in vitro* and *in vivo*, on the culture of fibroblast cells of human embryonic skin. Our study shows anti-adhesive activity of QATs against *S. aureus*, their ability to suppress hyaluronidase and staphylococcal plasminogen activator. Poviargol (silver nanoclusters) is able to suppress protein A of staphylococcus, prevents the formation of microbial biofilms on biotic and abiotic surfaces. Polyhexanide shows antiadhesive properties against Gram-positive and Gram-negative bacteria, enhances the effect of antibiotics against resistant microbes due to increased permeability of the cell wall, affects plasminogen activator, collagenase. The effect of sodium hypochlorite on microbial DNA was assessed by UV spectroscopy and electrophoresis. For the first time, a dose-dependent effect of sodium hypochlorite on individual nucleotides and polynucleotides was obtained, and complete destruction of the plasmid DNA of *Escherichia coli* DH5-Alpha strain was demonstrated. It has been established that the interaction with sodium hypochlorite involves the destruction of the secondary structure of DNA (denaturation) and the chemical modification of nitrogenous bases, presumably chlorination. The presence of a secondary structure slows down the chemical reaction of sodium hypochlorite with nitrogenous DNA bases. The ability of sodium hypochlorite to destroy formed (48 h) microbial biofilms of *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* has been studied. Various antiseptics in non-bactericidal concentrations complexly affect the antibiotic-resistant microbial cell: increase the permeability of the cell membrane, inhibit the enzyme-inactivators of antibiotics, suppress the epidemic factors of the transfer of antibiotic resistance markers by transduction and conjugation.

9.2

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METABOLIC ACTIVITY OF PLANKTON IN COMPARISON WITH BIOFILM PHENOTYPE SOME MICROORGANISMS OF HUMAN MICROBIOTA

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An important interest for the detection of serious metabolic disorders of macroorganism, and its microbiota, are tricarboxylic acids common to bacteria and mitochondria

of eukaryotic cells, and phenylcarboxylic acids. They are called “sepsis-associated metabolites”, since the imbalance of the profile of phenylcarboxylic acids in the blood is most noticeable in septic states.

The purpose of our study is to carry out a comparative assessment of production sepsis-associated exometabolites by clinically-significant bacteria in biofilms and planktonic form.

Strains were used: *S. aureus* ATCC 25923, *S. epidermidis* ATCC 14990, *E. coli* ATCC 25922, *K. pneumoniae* ATCC 700603, and clinical isolates of these species, isolated from the blood of ICU patients. Biofilms of these microorganisms were grown according to the method developed by us. The determination of exometabolites was carried out using gas chromatography-mass spectrometry (GC-MS).

S. aureus and *S. epidermidis*. Lactate was produced by the planktonic form in a substantially greater concentration than by biofilms. As for the biodegradation products of aromatic amino acids (phenyllactic and p-hydroxyphenyllactic acid), a more intense production by the *S. aureus* biofilm was demonstrated as compared to plankton.

K. pneumoniae and *E. coli*. The metabolism of the investigated *Klebsiella* strains to a large extent coincides with the metabolism of *E. coli*. The *K. pneumoniae* biofilm produced phenyllactic and para-hydroxyphenyllactic acids significantly more actively than the planktonic form.

Conclusions: 1. processes associated with the hydrolysis of carbohydrates in biofilms are less intense than in the planktonic form of the same microorganisms. This is indicated by a significant difference in the concentrations of lactate between plankton and biofilm; 2. the processes associated with hydrolysis of proteins take place in biofilms much more intensively.

9.3

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STUDY OF ANTIMICROBIAL RESISTANCE IN MEDICAL INSTITUTIONS IN CONAKRY (REPUBLIC OF GUINEA)

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Extensive apparition of resistance of pathogenic microbes to many antibiotics causes a serious preoccupation of public health agencies in developing countries. WHO considers the surveillance on this resistance development as one of the important task of public health system of every country.

The aim was to study of problem of antibiotics resistance in Republic of Guinea.

We studied 875 bacterial strains having medical importance, from some medical institutions of Conakry city. The identification was accomplished on commercial mediums or on nutritive mediums prepared in IRBAG. For each strain one made an antibiogram with agar-agar precipitation method on Muller–Hinton medium. The antibiotic discs of more than 20 antibiotics were test-