Materials of Conferences

INFLUENCE OF DIMETHYLSULFOXIDE ON THE ADHESIVE ACTIVITY STAPHYLOCOCCUS AUREUS ISOLATED FROM THE WOUNDS

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Introduction. Adhesion can be regarded as an adaptation to maintain the indigenous microflora colonization resistance and pathogenicity factors in the implementation of infection among representatives pathogens. One of the important areas of modern microbiology is the study of substances that block microbial adhesins. In the community Staphylococcus aureus was the most common causative agent of furunculosis, and infections of the skin and soft tissues. The drug «Dimexide» is used in the treatment of wound infections. In the available literature describes the anti-inflammatory, immunosuppressive and conductive properties dimetulsulfoxide. However, no data on the effect of the drug on the adhesion of microorganisms.

Aim. Study of the effect of dimethylsulfoxide on the adhesive activity of S. aureus, isolated from wounds.

Materials and methods. Studied 50 strains of staphylococci isolated from wounds. The identification of isolates was performed by defining cultural, morphological, tinctorial and biochemical properties. To study the effects on the adhesive properties of S. aureus used the drug «Dimexide», active ingredient – dimethylsulfoxide (DMSO). We applied the 25, 12, 6 and 3 % concentration of the drug. Study of adhesive activity of isolates was performed according to standard methods Brilisa. Study of adhesion were performed in 96 – well microplates for immunological studies. In control samples, the mixture of native human erythrocytes 0 (I) blood Rh + (4 McF) and the suspension of test culture (0,5 McF) were added into the wells microplate to 20 mkl. In experimental samples to the wells shall be added to an equal volume of DMSO solution of different concentrations. The plate was placed in an incubator and incubated at 37 ± 0,1 °C for 30 minutes, shaking the mixture regularly. At the end of the incubation process smears were prepared, fixed in the flame, Gram stained and studied under a light microscope with immersion. The adhesive properties were evaluated considering the average adhesion (AA) – the average number of bacteria adhered to the same red blood cells, adhesiveness index microorganism (AIM) – the average number of microbial cells in the one participating in the adhesive process of erythrocyte and participation rate of erythrocytes (PRE) – the percentage of red blood cells with on its surface adherent bacteria. Statistical processing of the results was performed using Excel 7,0.

Results. These studies of the effect of DMSO on the adhesive properties of staphylococci suggest that the drug in 100 % block adhesive activity of strains studied. The results showed that the treatment of strains studied in the above concentrations of DMSO resulted in significant declines in adhesion ($P < 0,05$) compared with control. It was found that reducing the concentration of the drug was accompanied by an increase in its antiadhesive activity. Thus, when the concentration of DMSO 25 %, the average spa was 0,37 ± 0,215, and at 3 % – 0,04 ± 0,04. Similar results were obtained in the study of the index of adhesiveness of the microorganism. The adhesive capacity of S. aureus (control values AIM 2,72 ± 0,75) was the lowest in the processing of 3 % concentration of the drug. In the study of such a measure as the participation rate of erythrocytes (PRE), similar results were obtained (mean AA in the control strain was 89 ± 11, and after treatment with 3 % DMSO – 4 ± 4). Correlation analysis revealed a positive relationship between drug concentration and performance AA, AIM and PRE ($r = 0,92$, $r = 0,42$ and ш = 0,93, respectively). This indicates a dose-response effect of DMSO on the adhesive activity of isolates of S. aureus. Moreover, the increase antiadhesive effect occurs at lower concentrations.

Conclusions. Experiments on the effects of the drug on adhesion show that DMSO in 100 % leveled adhesive activity. Revealed a dose-dependent effect – increased antiadhesive activity at lower concentrations. This is probably due to the greater mobility of the molecules of DMSO as the concentration increases with an increase in the viscosity of the solution and change the physical and chemical characteristics. This phenomenon requires further study. S. aureus adhesion process is done by using the hemagglutinin, which is a receptor for fibronectin. Anti-adhesive activity of the drug may be due to the interaction of DMSO molecules to the active site of fibronectin and its receptor blockade. In vitro experimental model demonstrates greater antiadhesive effect of low concentrations of the drug against strains of staphylococci. At the same time, the most pronounced bacteriostatic have higher concentrations of the drug.

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