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Electron Microscopic Evaluation of the Impact on Microorganisms of Quaternary Ammonium Compounds.

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ABSTRACT

The most optimal solution to the problem of mycotoxicosis are preventive measures that inhibit the growth of fungi and mycotoxin formation. It has been shown that the quaternary ammonium compound cause marked ultrastructural changes, showing bactericidal, fungistatic and fungicidal properties with regard to the test microbes and fungi *Aspergillus niger*

Keywords: quaternary ammonium compounds, ultrastructural changes, the test microorganisms, microscopic fungi, bactericidal, fungistatic and fungicidal properties

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INTRODUCTION

Now there is a large number of the publications devoted to distribution and harmful effects of natural exotoxins – the mycotoxins having negative effect on plants and animals, and on a food chain do harm and to the person that, eventually, bears potential threat of its safety [1,2,3].

More than 10000 strains relating to 350 species of microscopic mushrooms produce about 300 toxic connections which are the reason of alimentary microtoxicosis of the person and animals. Among them one of the most dangerous and widespread are aflatoxins [4,5,6].

The aflatoxins produced by *Aspergillus niger* represent group of the low-molecular secondary metabolites possessing mutagen, teratogen, immunosuppressive and strong hepatotoxic action on an organism of animals and the person [7,8].

In this regard search of the effective remedies of prevention interfering growth of mushrooms and formation of mycotoxins is actual. Therefore the purpose of our researches was studying of bactericidal, fungicide, fungistatic properties quarternary the ammonium connections, and also the mechanism of their action on test microbes and microscopic mushrooms of the sort *Aspergillus*.

Important stage of studying of the mechanism of action of this or that preparation on microorganisms is electronic and microscopic studying of their ultrastructure [9].

METHODOLOGY

Studying of bactericidal, fungicide, fungistatic properties quarternary the ammonium connections received by the staff of Institute of organic and physical chemistry (IOFH) of A.E.Arbutova KNTsRAN was carried out by the standard techniques [10].

For electronic microscopy washouts of microorganisms of *E.coli*, *St.aureus* with a density of 2 billion microbic bodies, a suspension mixed dispute of *A.niger* with concentration of 200 thousand microbic bodies in 1 ml of physiological solution with the studied solution in the ratio 1:1. The preparation exposition with microbes proceeded from 15 seconds to 10 minutes, disputes of *Asp. niger* - from 5 to 120 minutes. After the termination of term of an exposition carried out neutralization of a preparation by the standard methods, materials were exposed to centrifugation at 6000 rpm within 30 minutes. Then supernatant liquid was merged, the deposit was washed out physiological solution with the subsequent repetition of centrifugation for removal of residual quantity of a preparation.

The received bacterial weight was subjected electronic microscopically to research. As control used cultures of the microorganisms processed by physiological solution.

For negative contrasting of microorganisms used 2% solution of phosphorus-tungsten acid. The received preparations estimated with use of an electronic microscope of the translucent type with PEM-100 minilenses at tool increase 15-45 thousand.

MAIN BODY

During experiment the death of experimental animals is noted. Within the first days 2 sheep, further during supervision one more animal fell. In the first and third groups of death of animals wasn't.

It is shown by the conducted researches that N-[karbonilmetit Alkoksipoli (etilenoks)] ammonium chlorides, N, N-Dimetil-N-benzil-N-[alkoksipol (etilenoks) were karbonilmetit] by ammonium chlorides and a pent [weed (etilenoks) I karbonilmetit] ammonium derivatives of three-nuclear trifenol possess the expressed bactericidal, fungicide and fungistatic properties. So, concerning the representative of group the gram-positive bacterium of *St. R-209* piece aureus for the offered connections the minimum bactericidal concentration made 0,02-0,3% at an exposition 0,5 hours, concerning the representative the gram-positive bacterium of *E. coli* of piece 7904 – 0,03-0,06%, fungistatic activity concerning *Aspergillus niger* – 0,00125-0,0025%, fungicide – 0,1%.

When studying the submicroscopic organization of control bacterial cages found a rhabdoid or spherical structure typical for the sake of appearances. Distinctly the superficial structures of bacteria presented by a cellular wall and cytoplasm came to light. The cellular wall had evenly distributed electron-optical density. Cytoplasm represented the structure which is more or less filled with a granular component where the system of intra cytoplasmic membranes was developed poorly. The cytoplasmic membrane came to light in the form of an electronic and transparent uniform contour which accurately differentiated a cellular wall from cytoplasm. Nuclear material was looked through in the form of the fibrillar material located in the center or is closer to the periphery.

Ultrastructural changes of bacteria after influence of a preparation were characterized by final fracture of a cage which was shown in the form of a lysis of a cellular wall, a cytoplasmic membrane, presence of the brightened-up sites on the periphery of cages and localization of a protoplast in the form of conglomerates of high electronic density.

Konidiya of control samples of *Aspergillus niger* were a spherical form with a warty surface, the size 2,5-4mm. The superficial structure of a konidiya presented by a multilayered sporous cover was distinctly looked through. Under a sporous cover well I came to light in the form of a massive layer коптекс, having the granular structure which is unevenly absorbing electronic beams. I occupied the main part of a konidialny cage споропласт which is formed by homogeneous electronic and dense material. Kernels were looked through in the form of small optical dark stains.

Studying of ultrastructure of konidiya of *Aspergillus niger* subjected to influence of these preparations showed peeling of a sporous cover, places partial or final fracture of the last. Its structure is indistinct that testified to destructive changes of a granular component.

CONCLUSION

Results of researches testify that quarternary ammonium connections possess the expressed fungicide and fungistatic properties therefore they can be used for disinfecting of warehouses of storage of forages and food, and also automobiles, etc.

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