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Discovery of new antibacterial mechanisms and the influence of magnetite nanoparticles (MCS-B) on microorganisms

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The influence of basic physical factors caused by magnetite nanoparticles (constant magnetic field and sorption) on microorganisms by examining the reactions of the intensity of free radical lipid peroxidation (FRLP) and bacteriostatic action was studied in this work. It was well established that the magnetite nanoparticles caused unequal reaction in intensity of FRLP on different groups of microorganisms. It was determined that the most significant factor that influenced the ultimate indicator of the intensity of luminescence on *Candida albicans*, *Escherichia coli* and *Pseudomonas aeruginosa* was constant magnetic field which was induced by nanoparticles. On the contrary, sorption was the most significant factor on *Staphylococcus aureus*. It was found that the rate of consumption of free radicals in lipid reduced reliably in all microorganisms after their processing by magnetite nanoparticles. The results of microbiological studies of *Escherichia coli*, *Klebsiella pneumoniae* and *Staphylococcus aureus* showed that bacteriostatic effect was detected after exposure by magnetite nanoparticles. Visually, it was detected by decreasing the number of colonies in the nutritious medium in comparison with the control. An interesting fact revealed was that saline (NaCl), which had previously been processed by magnetite nanoparticles also significantly had a marked bacteriostatic effect on the studied microorganisms. This effect could be explained by mechanism of change the polarization structure water of microorganisms by magnetite nanoparticles. It was discovered that the degree of expression of bacteriostatic action induced by magnetite nanoparticles had correlation with marks of reactions intensity of FRLP. Maximum bacteriostatic effect on *Staphylococcus aureus* was expressed in second variant application of magnetite nanoparticles, where mechanism of sorption was more significant than action of the magnetic field. On the contrary, maximum bacteriostatic effect on *Escherichia coli* and *Klebsiella pneumoniae* was revealed in third variant, where time exposition of contact with microorganism nanoparticles and, consequently, action of a constant magnetic field was determinative.

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