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Photodynamic inactivation of microorganisms water treatment process

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Abstract

The kinetics of the destruction of standard museum strains of microorganisms as a result of photodynamic action of red light and a number of non-toxic photosensitizers in the process of water conditioning has been studied experimentally. Prokaryotic cells of *Escherichia coli* ATCC 35218, eukaryotic cells of *Candida albicans* ATCC 24433 were used as the objects of the study. Eosin H, sodium fluorescein, methylene blue and riboflavin (vitamin B2) in concentrations of 10 mg/l served as photosensitizers. A photodynamic effect was established with respect to microorganism cells, leading to their death in the presence of photosensitizers and red light. It has been shown that riboflavin and fluorescein are the most effective for eukaryotes (on the example of *Candida albicans* ATCC 24433), which help to reduce the number of colonies of cells in 2 hours of observations by more than 3.0 and 11.0 times, respectively. It was found that the death of prokaryotic cells in the case of Escherichia coli ATCC 35218 is most effective in causing methylene blue, riboflavin (vitamin B_2). For 2 hours of observations in their presence due to photodynamic action, microflora decreases in 36.0 and 90.0 times, respectively. The photodynamic effect of eosin against the microorganisms under study was the smallest, which is explained by the peculiarities of its chemical structure, including phenolic groups, which are known to exhibit an antioxidant effect. It is shown that fluorescein and methylene blue are most promising for effective lethal action against pathogenic microflora in pool water. Riboflavin is most effective for water treatment of drinking water used for cooking and drinking in public, including pre-school and school meals, which will allow not only to exclude the possibility of mass poisonings, but also to provide a daily intake of vitamin B_2 with a glass of water.

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