FOR STANDARDIZATION ISSUE
QUALITY OF WATER SUPPLY SOURCES IN UZBEKISTAN

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К ВОПРОСУ СТАНДАРТИЗАЦИИ КАЧЕСТВА ВОДЫ ИСТОЧНИКОВ ВОДОСНАБЖЕНИЯ В УЗБЕКИСТАНЕ

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Abstract: *the article analyzes the quality of water sources centralized drinking water supply in Uzbekistan, which is governed by a standard 951: 2011 "Sources of centralized drinking water supply. Hygienic, technical requirements and rules of choice". As standardized indicators used indicator organisms: Enterococcus (Str.Faecalis) and staphylococci (St. Aureus). Completed experimental studies give reason to assume that the studied indicator microorganisms have different resistance to disinfectant chemicals used in water supply practice. There is a direct relationship of dying off microorganisms in the water in dependence of time and concentration of chemical substances disinfecting water.*

Аннотация: *в статье анализируется качество воды источников централизованного хозяйственно-питьевого водоснабжения в Узбекистане, которые регламентируются стандартом 951:2011 «Источники централизованного хозяйственно-питьевого водоснабжения. Гигиенические, технические требования и правила выбора». В качестве нормируемых показателей использовали индикаторные микроорганизмы: энтерококки (Str.Faecalis) и стафилококки (St. Aureus). Выполненные экспериментальные исследования дают основание считать, что изученные индикаторные микроорганизмы обладают различной устойчивостью к действию дезинфицирующих химических веществ, используемых в водопроводной практике. Отмечается прямая взаимосвязь отмирания микроорганизмов в воде в зависимости от времени и концентрации химических дезинфицирующих воду веществ.*

Keywords: *drinking water, water sources, indicator organisms, water quality.*
Ключевые слова: *вода питьевая, источники водоснабжения, индикаторные микроорганизмы, качество воды.*

In a number of the CIS countries to date, the main indicator normalized in reservoirs of drinking purposes, it is to define glucose positive coliform bacteria and E.Coli, which are considered as indicators of fresh fecal contamination of water. The quality of water sources of centralized drinking water supply in Uzbekistan is governed by the standard of O'zDST 951: 2011 "Sources of centralized drinking water supply. Hygienic, technical requirements and selection rules "[1]. The quality of water for microbiological parameters is normalized by the set value of indirect indicators and includes the index definition of coliform bacteria (coliform) and total count (TBC) in the water.

The increasing importance of recreational water use, especially in regions with hot climate, puts the problem not only to prevent intestinal infections, and diseases of the upper respiratory tract and skin integuments. It is known that in humans after contact with contaminated water there are arised adenoviral diseases, conjunctivitis, staphylococcal infections. Such situation makes it necessary to regulate the water in the water objects of causative agents of the upper respiratory tract and skin. As quality of a sanitary-indicative microorganisms can be recommended representatives of coccal flora (staphylococci), constantly living on the skin and upper respiratory tract [2, 3, 4].

The foregoing witnesses that the working in the current water quality standard in the Republic of Uzbekistan is not effective, does not meet the requirements of ISO and does not guarantee the epidemic safety of reservoirs used for economic-drinking purposes and recreation.

The aim of research was to conduct complex of experiments to substantiate the content of standards in the water of new microbiological criteria. For this purpose experiments were conducted including the assessment of the significance of the indicator of sanitary-indicative microorganisms: E. Coli, E. coli lactose (LEC), enterococci (Str Faecalis.), Staphylococci (St. Aureus) and their hygienic regulation in the water of reservoirs of economic-drinking and recreational water use. It is established, that irrespective of the degree of bacterial

contamination of the water, its origin, the concentration of the model strains and exposure time duration of microorganisms dying off speed is about the same.

Survival of lactose positive intestinal bacilli (LIB) and E. Coli in water is approximately the same as that of enterococci and staphylococci. The dynamics of dying off in the water of model reservoirs of common sanitary and bacteriological parameters of LIB and E. Coli and re-studied microorganisms - enterococci and staphylococci about the same, and has a tendency to a slight decline to the end of the experiment. Stability of test microorganisms to the influence of disinfectants is studied in the conditions of models of reservoirs under the action of chlorine and phenol to them. As you know, drinking water is disinfected with different chlorine compounds depending on the initial water quality and brought up to standard requirements 951: 2011 "Drinking water".

The antibacterial effect was studied in the chlorine concentrations of 0.5; 15; and 3.0 mg/dm^3. At the same time we took into account that the chlorination of drinking water in the urban water-supply, the concentration of residual chlorine in the water should be at a level of 1.5 mg/dm^3. In rural water supply systems it is often conducted hyperchlorination. In such conditions, the concentration of chlorine in water is much greater than its permissible level. The action of phenol on the death of microorganisms was studied in concentrations of 0.02; 0.1 and 0.5 mg / dm^3. It was recognized that the MPC phenol in water objects is set at 0.1 mg / dm^3. The results were evaluated by comparing the speed of the withering away of microorganisms in model reservoirs on relation to the control.

It has been established by research that the chlorine in a concentration of 3 mg/dm^3 renders a high bactericidal effect. By the first day of monitoring the number of LEC decreased by 4 times, E. Coli - 2.72 times, enterococci - in 2.35 times and staphylococci - 2.31 times. The dynamics of the withering away of microorganisms when exposed to chlorine at a concentration of 1.5 mg / dm^3 was similar, but less expressed. More less expressed dynamics of the withering away of microorganisms on models of reservoirs is observed when exposed to chlorine at a concentration of 0.5 mg/dm^3. It was found that the most resistant was enterococci (Str. Faecalis) and staphylococci (St. Aureus). The least stable are the LEC. The received results were confirmed in the following series of experiments in which it was investigated the antibacterial effect of phenol. Phenol in a concentration of 0.1 mg / dm^3 (at MPC) has provided a high bactericidal effect. The number of LEC decreased by the end of the experiment 2.8 times; E.Coli - 3 times; enterococci - 1.69 times and staphylococci - 1.76 times. In these series of experiments it was also established that the less stable to the effect of phenol were microorganisms LEC.

Completed experimental studies give reason to assume that the studied indicator microorganisms have different resistance to disinfectant chemicals used in water supply practice. There is a direct relationship of dying off microorganisms in the water in dependence of time and concentration of chemical substances disinfecting water [4, 5].

Among the studied test microrganisms the most resistant to the bactericidal action of chemicals is Str. Faecalis. The indicator significance of studied microorganism compared with LEC and E. Coli is more expressed. The least resistant microorganisms with respect to the chlorine and phenol, regardless of the time of exposure and concentration of chemical substances are lactose E. coli. In the next series of experiments it was carried out the valuation of microbial contamination of water of economic-drinking and recreational water use. As standardized indicators there were used indicator microorganisms: Enterococci (Str.Faecalis) and staphylococci (St. Aureus).

Methodology of regulation of enterococci and staphylococci in water reservoirs included two series of experiments. In the first series of experiments it was observed for the vital activity of microorganisms and the withering away within 30 days (1, 5, 10, 20, 30) under conditions of reservoirs models. As a test of microorganisms there were studied: LEC, E. Coli, Str.Faecalis, S.Typhi, Sh.Flexneri. In the second series of experiments the test microorganisms were: LEC, E. Coli, St. Aureus, S. Typhi, Sh.Flexneri. The concentrations of microorganisms in the water of model reservoirs was created on the basis of results of field research on quantitative spread of indicator pathogene microorganisms in the water of surface reservoirs. The experimental results showed that in the I series of experiments on models of reservoirs mounted speaker it was established expressed withering away of the studied strains of microorganisms, which depends on the infective concentration of agents and the duration of the experiment. By 30 days the number of lactose-positive E. coli are reduced to a dozen at the initial concentration (1 day of the experiment) in water lg KOE 7,6. Reduction of the initial concentration of the LPC in the water for about 1-2 leads to its reduction to 20 hours within the lg KOE 1,8-2,3. And to 30 days it was marked negative growth of microorganisms in nutrient media.

More stable in comparison with LEC are E. coli. So if on one day of the experiment its values were lg KOE 6,1; by the end of the experiment - lg KOE 1,7. By reducing the concentration of infectivity in the order of magnitude of lg KOE to 30 days was 0.8. Even more resistant to adverse environmental factors are the enterococci. By the end of the experiment it was mentioned their presence of water within the lg KOE 0,7-2,2. Salmonella, Shigella, and especially, the least stable die to 20th and 10th days of the experiment respectively depending on the initial concentration in water. Similar results were obtained in the second series of

experiments. These studies found that staphylococci are less stable compared to E.coli, but more viable than lactose E. coli. By 30 days of observation quantities of staphylococci in the water were several dozen in 1 dm^3.

On the basis of the executed experimental studies it was established that indicators of Salmonella and Shigella pathogens can be not only lactose-coli and E. Coli, and enterococci, which, moreover, are more resistant to physical, chemical and biological factors. Standard of enterococci (Str. Faecalis) in water reservoirs of potable water set at 100 microbial bodies in 1 dm^3 of water.

Indicator index of the water quality of recreational water reservoirs are staphylococci (St. Aureus). Standard staphylococci (St. Aureus) is set at 500 microbial bodies in 1 dm^3 of water. Thus, when assessing the epidemic safety of water, along with the required conducting microbiological testing for the presence of LEC and E. Coli, also recommend determination of enterococci (Str. Faecalis) and staphylococci (St. Aureus) in the water supply source.

The results of these studies will be included in the new edition of the State Standard of the Republic of Uzbekistan to the sources of centralized economic-drinking water supply of the population.

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