**Water Quality Monitoring and Ecological Risk**

**Annotation.** Today there is an actual and top priority task of supplying the population with good-quality, safe in epidemiological terms and non-toxic on chemical composition, potable water, which is now becoming the major goal in sphere of providing sanitary-and-epidemiologic well-being of the population of the Russian Federation and its regions [1,3,8].

Provision of the population with good-quality water has aggravated so much that the resolution of the United Nations 2005-2015 was declared as the International decade of ‘Water for life’ actions. At present drinking water is regarded as a multidimensional problem: social, political, medical, geographical, engineering, and economic as well as ecological.

Of actual priority is not only provision of enough water , but also its conformity and securing ecological safety in the water-economic sphere, preservation of soft water sources which is conditioned by chemical and microbiological indicators. In recent years there have been considerable changes in the composition of not only ground, but also underground waters.

All of the aforementioned, in turn, is becoming a problem concerning health problems of citizens caused by the use of potable water of inadequate quality which already has a global character [1.9.8]. Thus, it is understandable that health losses will also lead to significant economic damages to the national economy [7]. However, countries and regions have different causes of unsatisfactory quality of potable water, ranging from natural factors to technical problems of water consumption and water removal systems [1].

It is essential to note that naturally water can never be free from impurities. It has concentrations of various dissolved gases and salts as well as fluidized firm particles. 1 liter of soft water may contain up to 1 gram of salts.

Because of the contaminations of water bodies and inability of the population to access the centralized water supply and sewage systems, 2.2 million worldwide population die of intestinal diseases annually. Over 50 % of hospitals in the world are occupied by the patient suffering from illnesses caused by the use of poor-quality potable water [10].

Critically poor quality of potable water is connected with a high level of contamination of the water objects used for supplying with drinking water; insufficiently effective technology of water preparation; the secondary contamination of water in the course of transportation to the end user.

In major countries of the world there are conforming rules, regulations and the administrative laws controlling the drinking water supply relationships and setting the state guarantees on the provision of the population with potable water.

**Keywords:** potable water, quality, contamination, monitoring, SanPiN, maximum permissible concentration (MPC).

**Introduction**

Water is the most essential natural resource in the biosphere without which the existence of organic life on the earth is impossible. Its major role in human and animal life is specified with the fact that on average its quantity reaches 60-70 % from their mass. From the point of view of biological chemistry, water provides exchange processes, the antitoxic function of internals and participates in the regulation of heat, not to mention its huge value to provide normal growth, development of physiological functions as well as health.

Natural water is unique. Its composition is not constant but changeable in different seasons of the year. Natural sources change constantly and are filled with various impurities of both natural and anthropogenic origins. Concentration of separately taken impurities in water defines its properties which is called the quality of water [1,10,9].

People’s health depends, in many respects, on the quality of the used water which does not always correspond to hygienic requirements of SanPiN of the Republic of Bashkortostan 10-124-99.

The principle of its safety in the epidemiological terms, harmlessness on chemical composition and usefulness on organoleptic properties lie at the heart of hygienic requirements to the quality of water for the drinking and household purposes. The problem of the quality of water in the water supply sources and actually potable waters in Makhachkala city [2,3,4,5,14,15,16].

According to ‘Dagvodokanal’, Makhachkala consumes more than 270 thousand cubic meters of water. Approximately 40 % of water arrives from the Miatlinsky water storage reservoir, Lake Vuzovsky and the Hushetsky reservoir supply with equally 30 % each. The population of Makhachkala uses water from two water reservoirs: Miatlinsky and Chirjurtovsky. All these are considered to be the water from Sulaksky, but they arrive in the city differently. Water goes from Miatli in two main passages in subsoil pipes. As for the water from Chirjurta, it flows through the October Revolution Canal from which it gets to Lake Vuzovsky and the Hushetsky reservoirs. Therefore water differs with a number of quality indicators in different districts of the city.

Focusing attention on the quality of water despite its purification on existing treatment facilities of Makhachkala, the situation with quality of the water arriving from Vuzovsky and Hushetsky reservoirs remains problematic. As a matter of fact, more than 60 percent of potable water samples from Makhachkala network and adjoining settlements do not correspond to specifications of organoleptic indexes.

Besides, city water supply systems are in an unsatisfactory condition. From 934 km of existing networks, 356 km have served standard term and are in need of full changing. Owing to deterioration of the inner city water supply system, more than 30 percent of delivering volume of potable water is lost.

**Material and methods of research**

Considering the aforementioned researches of quality of the ground water used for household drinking needs, the water used by the population of Makhachkala city of the Republic of Dagestan has served as a material for research. Performance of relative analysis of quality of natural, cleared and the water after its transportation through pipes to know in what state it reaches the consumer is of our interest.

The objects of our experimental researches are the samples of natural water transported through intakes of water supply system to the consumer in 4 points. As points for water samples were chosen the October Revolution Canal, Lake Vuzovsky running from treatment facilities and water which already arrives through pipes for the population of Makhachkala. Sample drawing was made according to the method of taking average sample to plastic containers of 0.5 liters on different depths and in different points in accordance with GOST 31861.

Researches and the analysis of the quality of water were carried out in two stages, namely before purification and after it. The analysis of the selected samples was made at the Institute of Geology of the Dagestan Centre of Science at the Russian Academy of Sciences, in laboratories of physical and chemical researches and in Test laboratory at the Certification center of Dagestan SAU.

Metals concentration analysis of water has been performed via atomic absorption spectrometry method on an atomic absorption spectrometer with electro thermal atomization model MGL-915 MD. The specified method allows determining even low concentrations of investigated elements in water thanks to its high sensitivity. So the range of arsenic measurement is from 0.0050 mg / dm3 to 1.00; lead – from 0.0020 to 1.0; cadmium- from 0.00020 – 0.02. Concentration of anions has been made by the capillary electrophoresis method on the device called ‘Kapel-105 M’ which uses electro kinetic phenomenon of ionic electromigration and electroosmosis for separation and identification of components.

The obtained results are presented in tables 1 and 2.

**Results of researches**

Analyses of the obtained results reveal that samples of water from all investigated fields on chemical composition do not cause concerns, but they correspond to the requirements on the quality of potable water not only on chemical composition, on rigidity and general mineralization, but also on the concentration of such ecotoxicants as arsenic, cadmium, lead and mercury.

According to the data supplied from the laboratory researches, concentration of the specified elements in some samples are ten times below permissible concentration, and the concentration of arsenic which has generally toxic and cancerogenic properties, samples #3 and #4 are at maximum permissible concentration – 0.012 against 0.01. The lead concentration in sample #2 of Lake Vuzovsky is 0.012 mg/dm3 against 0.01 MPC.