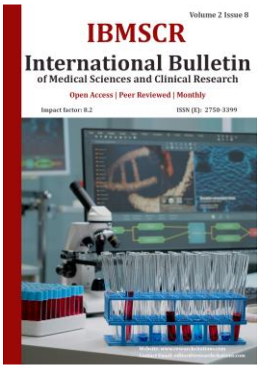

INFLUENCE OF THE CHEMICAL COMPOSITION OF WATER ON POPULATION HEALTH

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Annotation.

The question of the effect on the body of mineral substances, often found in the aquatic environment, is currently very relevant in connection with the use of artificially desalinated water for drinking purposes. The state of water supply to the population of Russia, according to the State Committee for Sanitary and Epidemiological Supervision, is unsatisfactory. The quality of drinking water supplied to the population does not meet hygienic requirements for sanitary and chemical indicators by approximately 22%. About 1/3 of the population uses water from decentralized sources for drinking, which in 31.6% of cases does not meet the requirements. In general, about 50% of the population of the Russian Federation uses water for drinking that does not meet hygienic requirements for various quality indicators.

Key words:

water, chemical composition, elements, iron

The consumption of highly mineralized waters by people who are not accustomed to them can cause relatively short-term general malaise and exacerbation of chronic diseases of the gastrointestinal tract. According to experts, WHO, the use of sea water for drinking leads to progressive dehydration of the body, a violation of its acid-base state, an increase in residual nitrogen in the blood, a weakening of cardiac activity, an increased feeling of thirst, a sharp loss of strength and, often, death.

The hygienic significance of the general mineralization of drinking water largely depends on the composition and quantitative ratio of individual ingredients in it, among which it is necessary, first of all, to point out chlorides. Their excessive intake can cause inhibition of gastric secretion, decreased diuresis, increased blood pressure and other disorders that are especially harmful for patients with heart and kidney diseases. However, all these manifestations can occur only when the concentration of chlorides in drinking water exceeds the threshold of their taste sensation. A similar conclusion can be reached when assessing sulfates, the high content of which manifests itself mainly in a laxative effect and disruption of the body's water-salt metabolism.

As for iron, its toxic effect on the body has not been established. At the same time, it gives the water turbidity, a yellow-brown color, a bitter metallic taste, causes rust stains to appear on laundry and the development of iron bacteria in water pipes. Thus, the iron content in drinking water should be limited by its effect on turbidity and color.

The daily human need for microelements such as manganese, copper and zinc is completely covered by the diet, and the concentrations that determine the toxicological hazard clearly exceed their organoleptic indicators. This allows us to consider the latter as a limiting feature when rationing the quality of drinking water.

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One of the most significant criteria for assessing the suitability of water for domestic and industrial purposes is its hardness. With significant hardness, insoluble flaky sediments of calcium and magnesium soap are formed in it, which settle on the fibers of washed fabrics and also clog skin pores, causing irritation and dryness. In addition, meat and vegetables are poorly cooked in such water, tea is poorly infused, and its taste properties noticeably deteriorate. Finally, it turns out to be unsuitable for many technical needs due to the formation of scale on the walls of boilers and pipes.

As for the impact on public health, of all the theories about the positive (for the prevention of rickets) or negative (the development of atherosclerosis) effects of hard water, not one has been confirmed.

When standardizing the organoleptic properties of water based on the concentration of chemicals, it is necessary to mention those that are added to it as reagents. One example is aluminum found in drinking water that has been clarified through the coagulation process. Aluminum paralyzes the central nervous and immune systems, especially in children. In certain concentrations, it causes the appearance of turbidity and an unpleasant aftertaste, which can be considered a limiting feature when rationing it.

The maximum doses of beryllium (0.02 mg/l) cause inhibition of erythropoiesis in the bone marrow, significant changes in conditioned reflex activity, and dystrophic changes in nerve cells.

Assessment of the degree of danger of small doses of molybdenum reveals sharp disturbances in the activity of sulfhydryl groups and pathomorphological changes in internal organs.

Chronic arsenic intoxication in most cases is associated with functional disorders of the central and especially peripheral nervous system, with the subsequent development of polyneuritis, and a concentration of 0.1 mg/l is ineffective.

Selenium has high biological activity, causing severe morphological damage to internal organs. In chronic experiments (0.1 mg/l), a specific effect on the thiol groups of enzymes, disturbances in the excretory function of the liver and kidneys, suppression of the immunological reactivity of the body and conditioned reflex activity are noted. At the same time, it has the ability to sharply increase the odor of water when solutions stand, which, however, is observed at concentrations greater than those that cause the initial toxicological effect.

With a relatively high content of strontium in water, it can cause inhibition of prothrombin synthesis, decreased cholinesterase activity and impaired liver function. The bitter-astringent taste caused by it is noted with more significant quantitative indicators than the manifestation of intoxication.

Changes in fluoride concentrations cause the emergence of two massive diseases of the world's population - endemic fluorosis and dental caries. The first of them is associated with the increased content of this microelement.

The consequence of a low fluoride content in drinking water is the incidence of dental caries, especially among children. At the same time, as a rule, there is a delay in the timing of bone ossification, and caries itself can contribute to odontogenic infection (rheumatism, tonsillitis, etc.).

Relatively recently, reports appeared in the literature about water-nitrate methemoglobinemia, which is a consequence of the increased content of nitrates and nitrites in drinking water, mainly well water. Symptoms of this disease most often appear in formula-fed infants when dry milk formulas are diluted with such water. The increased content of nitrogenous compounds in drinking water is of particular importance for the health of not only infants but also adults, especially those suffering from lung diseases, coronary insufficiency and anemia. It has also been established that these chemical compounds have an inhibitory effect on some digestive enzymes, primarily pancreatic lipase and alkaline phosphatase.

Note that the largest amount of nitrates is found in carbonate and brown chernozems, and the smallest in brown and gray forest soils, and the presence of calcium carbonate salts and a slightly alkaline environment contribute to the transition of nitrates into groundwater. According to the existing standard, the upper limit of their content in water, guaranteeing the safety of its use, is at the level of 10 mg/l (for nitrogen).

Today, the problem of water should be considered one of the most important problems of environmental protection, because water is not only the health of the population, but also the life of the animal and plant world.

Good quality drinking water should be clear, colorless, odorless and have a pleasant, refreshing taste. It is generally accepted that water containing a lot of salts (mineralization) is not the best in terms of its consumption. However, low mineralization is below hygienic standards and also does not ensure sufficient supply of necessary minerals to the body.

Of particular importance is the presence of potentially dangerous contaminants in water, such as heavy metals. Preliminary quantitative determination of toxicants such as zinc, lead, cadmium, chromium, mercury, molybdenum, manganese, nickel, and arsenic showed that their content in the studied sources is below the sensitivity threshold of the method.

To determine the components of interest, methods were used that complied with GOST, given in the experimental part.

The quality of drinking water was monitored at points of water intake from water supply sources before entering the water distribution network.

Method for determining total iron

This standard applies to drinking water and establishes a colorimetric method for determining the mass concentration of total iron with thiocyanate.

The volume of the water sample to determine the mass concentration of iron must be at least 200 cm3.

Water samples intended to determine the mass concentration of total iron are not preserved.

Essence of the method

The method is based on the interaction of iron oxide and thiocyanate in a strongly acidic environment with the formation of a red-colored complex compound of thiocyanate iron. The color intensity is proportional to the iron concentration. The sensitivity of the method is 0.05 mg/l Fe.

Carrying out analysis

10 ml of the test water is poured into a test tube, two drops of concentrated hydrochloric acid and several crystals of ammonium persulfate and 0.2 ml of ammonium or potassium thiocyanate are added. After adding each reagent, the contents of the test tube are mixed.

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