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**Ensuring water quality as the main goal of preserving human health**

**Annotation**

*The main problem:* The relevance of the issues raised is related to the value of water as a source of human life. The human body needs high-quality drinking water for its normal functioning. The number of deaths associated with the use of contaminated drinking water, according to WHO, tripled in 2021 and reached almost 19 thousand against 6 thousand in 2020. In addition, the number of neoplasms, diseases of the genitourinary system, digestive organs and skin increased by 2%, to 1.486 million. The reasons for the increase in the level of harmful chemicals and microbiological pollutants in the water are outdated sewage treatment plants, old pipes and disinfection with chlorine. The article analyzes water quality assurance as the main goal of preserving human health. A statistical analysis of the level of pollution of drinking water in Pavlodar was carried out. The study of chemical and microbiological parameters of wastewater and drinking water was carried out using generally accepted standards.

*Purpose:* study of the quality of wastewater and drinking water in Pavlodar, study of the quality of wastewater and drinking water in Pavlodar.

*Methods:* sampling of wastewater, chemical and bacteriological analysis of wastewater and drinking water, statistical method, correlation analysis of experimentally obtained results and calculated characteristics, etc.

*Results and their significance:* In the field of public health risk, pollution of reservoirs that are sources of household drinking water supply and recreational water use, the continuing high deterioration of water supply networks, their accident rate, as a result of low level of operation, failures in the operation of treatment facilities. Hygienic assessment of reservoirs according to complex indicators indicates the continuing high degree of water pollution in places of water use. The water quality indicators of the surface reservoirs of the region remain low in terms of sanitary and chemical (primarily organoleptic and general sanitary), as well as microbiological indicators. According to toxicological indicators, the level of water pollution in places of water use is estimated as moderate. The main pollutants of the Irtysh river in Pavlodar are industrial enterprises and housing and communal facilities that discharge untreated or insufficiently treated wastewater into reservoirs.

A complex of causes of drinking water pollution has been identified: high deterioration of water supply networks, their accident rate, because of a low level of operation, failures in the operation of treatment facilities, unfair treatment of industrial wastewater by industrial enterprises of Pavlodar, etc. Priority preventive directions for improving the quality of water as a source of life are the implementation of long-term targeted planning of measures for the modernization of water supply and sewerage networks and facilities in Pavlodar. The issues of providing the population with good-quality drinking water, the state of water supply and measures to improve it should be constantly monitored and considered at meetings of sanitary and anti-epidemic commissions.

*Keywords:* drinking water, water properties, public health risk, household drinking water supply.

**Introduction.** The normative legal acts in the field of sanitary and epidemiological welfare of the population include sanitary rules, hygienic standards, rules, technical regulations and uniform sanitary-epidemiological and hygienic requirements for goods of the Eurasian Economic Union. According to the Code of the Republic of Kazakhstan "On the health of the people and the health care system", activities in the field of sanitary and epidemiological welfare of the population are inextricably linked with measures to ensure compliance with sanitary rules regulating, among other things, requirements for water sources (places of water intake for economic and drinking purposes), economic and drinking water supply and places of cultural and domestic water use and the safety of water bodies.

Water pollution occurs when unwanted materials enter the water that change the quality of water [1] and harm the environment and human health. Water is an important natural resource used for drinking and other development purposes in human life. Safe drinking water is essential for human health all over the world. According to the World Health Organization (WHO), 80% of diseases are carried by water. Drinking water in various countries does not meet WHO standards, 3.1% of deaths occur due to high levels of chemical and microbiological contamination and poor water quality [1].

**The main part**

The condition of water sources and central water supply systems does not guarantee the required quality of drinking water. Most of the population of Kazakhstan, including the city of Pavlodar, uses water for drinking, which does not meet hygienic requirements for various indicators [2]. It should be noted that the developed traditional approaches for the protection of natural ecosystems are ineffective, since their use is reduced to the establishment of only individual sources of pollution.

Drinking water is a necessary element of the life support of the population, the state of people's health, the level of sanitary and epidemiological well-being, social stability of society depend on its quality [3].

The problem of providing the population of the Republic of Kazakhstan with drinking water of standard quality is getting worse every year, and today it is becoming one of the main socio-economic problems in the implementation of the state strategy for sustainable development of society.

Due to the increased pollution of water sources, the applied water treatment technologies have become in most cases insufficiently effective, and therefore water supply facilities do not always provide reliable water treatment and supply of drinking water of the required quality to the population. Due to the existing problems of financing, water purification methods are being introduced at an insufficiently high rate [4].

Our research was conducted from 2020 to 2022 on the territory of the city of Pavlodar. The material for the research was samples of the water of the Irtysh river both before purification and after its preparation at the station of the first pump using small-sized recirculates, as well as with reconstructed large-sized recirculates clarifiers.

In the course of the research work, a comprehensive assessment of own and statistical data was carried out.

Water intake was carried out from an open reservoir using a bathometer, and from the water supply network into sterile glass bottles (4 liters in volume) according to regulatory documentation in the field of water supply.

To determine the quality of the studied water, the following indicators were studied:

- physical: turbidity, color, taste (GOST R 51232-98).

- chemical: dry residue, stiffness General, the oxidation permanganate, nitrate, nitrite, oil, manganese, zinc, copper, iron, ammonia, chlorides, chlorine free chlorine residual (mg/l), pH (GOST R 51232-98).

bacteriology: thermotolerant coliform bacteria (TCB) [5]

– total coliform bacteria (TCB) – the number of bacteria in the 100 m, total microbial count (TMC) is the number of forming colonies of bacteria in 1 ml, coliphages, the number blagoobrazov units (COMBAT) 100 ml (GOST 18963-73, SanPiN 2.1.4.1074-01).

For the analysis, an average water sample was used, which was taken at 9 points of the Irtysh river. During the research, more than 5,000 water samples were selected and analyzed. Sampling was carried out with a frequency of twice a week; water analysis was carried out with a threefold repetition.

All the data obtained were processed mathematically with the calculation of reliability on an IBM PC personal computer using the program "Statistika 6.0" [6].

The calculation of the coefficient of complex pollution (CP) was carried out in accordance with the method of complex assessment of the degree of contamination of surface waters by hydrochemical indicators (RD 52.24.643-2002).

**Research results**

The first stage of our research was to study the assessment of the quality of the intake water of the Irtysh River in the city of Pavlodar.

As a source for household water supply in the studied region, mainly surface waters of the Irtysh River are used, which differ sharply from groundwater in chemical composition. The natural water of the Irtysh river has a very complex composition [6]. Not only heavy metal salts are present in the water, but also many other substances of technogenic origin. Our data are consistent with the research of the Center for National Expertise of Pavlodar.

During the period 2020 - 2022, more than 250 enterprises - users of natural resources were registered in the city. Wastewater from such enterprises as "MolKom" LLP, "BestMilk" LLP, "FoodMaster" LLP and "Zhana Rosa" LLP were evaluated.

Wastewater treatment in the city of Pavlodar is carried out at two complexes of treatment facilities. Taking into account the state of the soil, runoff, emissions of harmful substances into the environment by enterprises, which enter the Irtysh River with atmospheric precipitation, it is possible to obtain an assessment of its pollution.

Special attention was paid to the content of heavy metal ions in water. It is known that redox processes play an important role in the self-purification of water from heavy metal ions. Conditions in the water and bottom sediments contribute to the transition of oxidizing forms of metals to a more reduced state, which leads to an increase in the metal content in the water. The processes of destruction of complex compounds contribute to secondary pollution of reservoirs. The excessive content of iron and manganese in the water contributes to the fouling of pipes. To determine the degree of water pollution, calculations of the coefficient of complex pollution (CCP) of water in the city of Pavlodar were carried out. The CCP calculation makes it possible to evaluate analytical information about the chemical composition of water, and can also be used as an integral indicator that comprehensively assesses the degree of pollution and water quality of water bodies.

Chemical indicators such as nitrates, nitrites, sulfates, chlorides, phosphates, ammonium, cadmium, manganese, iron, copper, zinc, petroleum products were taken into account when calculating water pollution, according to which the coefficient of complex water pollution was determined.

Table 1 - Composition of wastewater from dairy enterprises

|  |  |  |
| --- | --- | --- |
| Composition, mg/dm3 | Company name | MPC standards |
| “MolKom” LLP | "BestMilk" LLP  | "FoodMaster" LLP |
| рН | 6,5-8,5 | 6,8-7,4 | 6,2-7,0 | 4-5,5 |
| Suspended substances | 350 | 350 | 600 | 180-240 |
| Common nitrogen | 60 | 50 | 90 | 10-15 |
| Phosphorus | 8 | 7 | 16 | 3-5 |
| Fats | До 100 | До 100 | До 100 | До 100 |
| Chlorides | 150 | 150 | 200 | До 100 |
| BOD full | 1200 | 1000 | 2400 | 150-600 |

The composition of wastewater significantly exceeds the MPC in all indicators according to GOST 31952-2012 and SanPiN 2.3.4.551-96.

Dairy industry enterprises should be provided with sewerage systems for separate collection and disposal of industrial and domestic wastewater. In the presence of its own treatment facilities, the conditions for the discharge of treated wastewater are determined by the "Rules for the Protection of Surface Waters from Wastewater pollution". The conditions for the discharge of wastewater from each specific enterprise must be agreed with the bodies and institutions of the State Sanitary and Epidemiological Supervision. Wastewater from dairy industry enterprises must be subjected to mechanical, chemical (if necessary) and complete biological treatment at the treatment facilities of the settlement or at their own treatment facilities before being released into reservoirs [7].

Fresh industrial effluents have a white or yellowish color. Their reaction is alkaline. Since wastewater contains protein substances, carbohydrates and fats, they are quickly subjected to rotting and souring. The fermentation of milk sugar into lactic acid occurs, which leads to the precipitation of casein and other protein substances. The rotting of the latter is accompanied by the release of a very unpleasant odor. The pH of wastewater is reduced to 4.5. The most dangerous for reservoirs are wastewater discharged during the production of casein, hard cheeses and cottage cheese.

Industrial wastewater from dairy plants, in addition to the above pollutants, contain chemical compounds used for washing containers, equipment and floors (detergents).

Wastewater of dairy industry enterprises in the case of their discharge into reservoirs without preliminary purification have a harmful effect on the water of the latter. Because of biochemical oxidation, organic compounds contained in wastewater absorb a large amount of oxygen from reservoirs, because of which the fauna and flora of reservoirs may die.

Organic substances entering reservoirs with sewage from the meat and dairy industry because rotting processes. As a result, the oxygen content in the water sharply decreases, which causes the so-called zamora - mass death of fish and other animals.

Table 2 - Composition of wastewater from breweries (“Zhana Rosa” LLP)

|  |  |  |  |
| --- | --- | --- | --- |
| Indicators | On average | Minimum | Maximum |
| рН | 7,3 | 5,1 | Выше 9,0 |
| BOD5 , mg/l | 611,3 | 1,0 | 8830 |
| Permanganate consumption, mg/l | 380 | 21,6 | 4480 |
| Suspended solids, mg/l | 303,6 | 0 | 5885 |
| Dry residue, mg/l | 913,7 | 280 | 13020 |

According to the data given in the table, we see an excess of the MPC according to regulatory documents: Water Code of the Republic of Kazakhstan dated July 9, 2003 No. 481-II, GOST 33045-2014, GOST 4979-49 and GOST 26449.1-85.

The temperature of the general wastewater of breweries is close to 20 °C. The reaction is almost neutral, the period of time during which they rot is very short and is 2-3 hours. In the case of particularly low concentrations, this period is somewhat longer. Wastewater contains a relatively large amount of biogenic elements: nitrogen, phosphorus and potassium. This is of great importance in the agricultural use of wastewater and in their biological treatment. Indicators characterizing wastewater pollution - oxidizability, BPK5 and suspended solids content - are on average twice as high as in typical urban wastewater, but at some enterprises they may be slightly smaller, and at others they may be several times larger.

The amount of water consumed, as well as wastewater at breweries, depends on a number of factors that have developed at this enterprise. Direct discharge of warm heat-exchange wastewater into the reservoir as conditionally clean bypassing treatment facilities is impossible only if there is no separate sewer network at the brewery for direct discharge of stormwater, in turn, this adversely affects the condition of the reservoir. Heat exchange waters, by increasing the average temperature of the waters with which they are mixed, make it difficult for oxygen to dissolve in water, and, consequently, the course of the self-purification process.

Table 3 - Indicators of the quality of domestic wastewater entering the Irtysh river

|  |  |  |
| --- | --- | --- |
| Indicator | Processing stage | MPC, standard (SanPiN 2.1.5.980-00) |
| After treatment | After cleaning |
| Transparency, cm | 5, 000±0, 320 | 9, 100±0, 130 | Not < 10 |
| Smell, score | 5 | 3 | Not > 2(detectable directly) |
| Colour | Gray (9 см) | Gray (10 см) | Should not be detected in a column of 10 cm |
| Temperature,˚С | 20, 250±1, 200 | 19, 300±1, 100 | 16, 000 – 23, 000 |
| рН | 7, 780±0, 100 | 6, 900±0, 300 | 6, 500 – 8, 500 |
| Suspended solids, mg/dm3 | 36, 80±1, 500 | 22, 080±1, 700 | 10, 450 |
| Settling substances, mg/dm3 | 25, 900±1, 900 | 15, 020±1, 800 | 6, 790 |
| Ammonium nitrogen, mg/dm3 | 0, 690±0, 010 | 0, 380±0, 010 | 0, 400 |
| Nitrites, mg/dm3 | 0, 280±0, 010 | 0, 180±0, 010 | 0, 080 |
| Nitrates, mg/dm3 | 16, 50±0, 800 | 10, 720±0, 500 | 40, 000 |
| Sulfates, mg/dm3 | 182, 200±5, 100 | 153, 000±7, 800 | 500, 000 |
| Chlorides, mg/dm3 | 138, 40±6, 300 | 103, 80±8, 100 | 300, 0 |
| Phosphates (by phosphorus), mg/dm3 | 2, 140±0, 100 | 1, 480±0, 100 | 0, 200 |
| BOD total mg O2/dm3 | 22, 90±0, 300 | 14, 00±0, 300 | 6, 000 |
| Total iron, mg/dm3 | 0, 230±0, 001 | 0, 20±0, 002 | 0, 100 |
| Nickel, mg/dm3 | 0, 017±0, 001 | 0, 015±0, 001 | 0, 010 |
| Chromium, mg/dm3 | 0, 085±0, 001 | 0, 076±0, 001 | 0, 070 |

In general, the efficiency of wastewater treatment should be considered unsatisfactory. This situation is largely explained by the physical deterioration of technological equipment. As a result, there is a significant discharge of untreated wastewater into the Irtysh river, which causes a deterioration in water quality.

Table 4 - Microbiological contamination of drinking water in Pavlodar (Irtysh river)

|  |  |  |
| --- | --- | --- |
| Indicator | Standard SanPiN 2.1.5.980-00 | Indicators |
| Common coliform bacteria | No more than 500 CFU in 100 ml | 550 CFU in 100 ml |
| Thermotolerant coliform bacteria | No more than 100 CFU in 100 ml | 200 CFU in 100 ml |
| Coliphages | No more than 100 BOE in 100 ml | 150 BOE in 100 ml |
| Pathogens of intestinal infections (analysis of bacteria from the family. Enterobacteriaceae of the genus Salmonella) | Water should not contain pathogens of intestinal infections (complete absence in 1000 ml) | 1-3 in 1000 ml |

Microbiological contamination of drinking water indicates its low quality and a threat to the health of the population of the city of Pavlodar. Non-compliance with the norms of the SanPiN can lead to an outbreak of various infectious diseases and exacerbation of chronic diseases.

The second stage of the work consisted in the study of drinking water prepared according to the old technology using small-sized recirculators, and water prepared after their reconstruction into large-sized recirculators.

The following conclusions are made:

1. The water quality of the sources of domestic drinking water supply in Pavlodar is characterized by increased: color and taste; concentrations of iron, hardness salts, total mineralization, nitrates, manganese, lead, arsenic; microbial contamination of TCB, CCB. TMC and coli-phages, due to the influence of the type of water sources, climatic and anthropotechnogenic factors, type of settlements.

2. A significant part of the centralized drinking water supply pipelines in Pavlodar does not meet the sanitary and epidemiological requirements of ST RK GOST R 51232-2003 due to the lack of sanitary protection zones, a complete set of facilities for cleaning and disinfection of drinking water.

3. Drinking water of centralized and decentralized household drinking water supply in a significant percentage of samples does not comply with hygienic standards due to: increased content of iron, manganese, nitrates, lead, hardness salts, total mineralization and volatile chlorinated hydrocarbons of the methane series; microbial contamination of CCB, TKB and coli-phages; excess of safe levels for total activity and total specific activity of natural radionuclides. In the drinking water of centralized domestic drinking water supply, the average concentrations of mercury, arsenic, cadmium, nickel, beryllium, boron are 0.2-0.55 MPC, benzene and its derivatives, benzene (a) pyrene, chromium+6, 6 organochlorine carcinogenic pesticides - 0.05-0.15 MPC.

**Conclusion.** A comparative analysis of regulatory requirements for the quality of wastewater and drinking water and the results of water sampling tests in Pavlodar was carried out, a complex of causes of drinking water pollution was identified: high deterioration of water supply networks, their accident rate, as a result of low level of operation, failures in the operation of treatment facilities, etc. Priority preventive directions for improving the quality of water as a source of life are: the implementation of long-term targeted planning of measures to modernize water and sewer networks and structures in the region, compliance with the requirements of regulatory documentation (GOST R 51232-98, GOST 18963-73, SanPiN 2.1.4.1074-01, ST RK GOST R 51232-2003). The issues of providing the population with good-quality drinking water, the state of water supply and measures to improve it should be constantly monitored and considered at meetings of sanitary and anti-epidemic commissions.

The drinking water supply system is complex in its structure and is associated with many risk factors that can have a negative impact on human health. Despite the measures applied by the state, it is necessary to raise the level of culture of water use of the population, so compliance with hygiene standards is impossible without the participation of citizens.

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**Адам денсаулығын сақтаудың басты мақсаты ретінде судың сапасын қамтамасыз ету**

**Аннотация**

*Негізгі проблема:* Көтерілген мәселелердің өзектілігі судың адам өмірінің қайнар көзі ретіндегі құндылығымен байланысты. Адам ағзасының қалыпты жұмыс істеуі үшін жоғары сапалы ауыз су қажет. Ластанған ауыз суды пайдаланумен байланысты өлім-жітім саны, ДДҰ деректері бойынша, 2021 жылы үш есе өсіп, 2020 жылы 6 мыңға қарағанда 19 мыңға жуықтады. Ал ісіктердің, несеп-жыныс жүйесі, ас қорыту мүшелері мен тері ауруларының саны 2-ге өсті. % , 1,486 млн.-ға дейін.Судағы зиянды химиялық және микробиологиялық ластаушы заттардың деңгейінің артуына ескірген тазарту құрылыстары, ескі құбырлар және хлормен залалсыздандыру себеп болды. Мақалада адам денсаулығын сақтаудың басты мақсаты ретінде судың сапасын қамтамасыз ету талданады. Павлодар қаласындағы ауыз судың ластану деңгейіне статистикалық талдау жасалды. Ағынды және ауыз судың химиялық және микробиологиялық көрсеткіштерін зерттеу жалпы қабылданған стандарттарды пайдалана отырып жүргізілді.

*Мақсаты:* Павлодар қаласындағы қалдық және ауыз судың сапасын зерттеу.

*Әдістері*: ағынды сулардан сынама алу, қалдық және ауыз суды химиялық және бактериологиялық талдау, статистикалық әдіс, тәжірибе нәтижелері мен есептік сипаттамалардың корреляциялық талдауы және т.б.

*Нәтижелері және олардың маңыздылығы*: Халық денсаулығына қатер төндіруі, шаруашылық-ауыз сумен жабдықтау және рекреациялық суды пайдалану көздері болып табылатын су объектілерінің ластануы, пайдалану деңгейінің төмендігі нәтижесінде сумен жабдықтау желілерінің жоғары тозуының жалғасуы, олардың авариялық жағдайлары саласында; және тазарту құрылыстарын пайдаланудағы ақаулар, жасау. Кешенді көрсеткіштер бойынша су объектілерін гигиеналық бағалау суды пайдалану орындарында судың ластануының жоғары дәрежесінің сақталып отырғанын көрсетеді. Облыстың жер үсті су объектілеріндегі су сапасының көрсеткіштері санитарлық-химиялық (бірінші кезекте органолептикалық және жалпы санитарлық), сондай-ақ микробиологиялық көрсеткіштер бойынша төмен болып қалуда. Токсикологиялық көрсеткіштер бойынша суды пайдалану орындарындағы судың ластану деңгейі орташа деңгейде деп бағаланады. Павлодар қаласындағы Ертіс өзенінің негізгі ластаушылары су объектілеріне тазартылмаған немесе жеткіліксіз тазартылған ағынды суларды ағызатын өнеркәсіптік кәсіпорындар мен тұрғын үй-коммуналдық шаруашылық нысандары болып табылады.

Ауыз суды ластау себептерінің жиынтығы анықталды: сумен жабдықтау желілерінің жоғары тозуы, олардың жұмыс деңгейінің төмендігі нәтижесінде олардың апаттылығы, тазарту құрылыстарының жұмысындағы ақаулар, өнеркәсіптік кәсіпорындардың өндірістік сарқынды суларды адал емес тазартуы. Павлодар және т.б. Өмір көзі ретінде судың сапасын жақсартудың басымды профилактикалық бағыттары: Павлодар қаласының сумен жабдықтау және су бұру желілері мен құрылыстарын жаңғырту жөніндегі іс-шараларды ұзақ мерзімді мақсатты жоспарлауды жүзеге асыру. Халықты сапалы ауыз сумен қамтамасыз ету, сумен қамтамасыз етудің жай-күйі және оны жақсарту шаралары тұрақты бақылауда болуы және санитарлық-эпидемияға қарсы комиссиялардың отырыстарында қаралуы тиіс.

*Түйінді сөздер*: ауыз су, судың қасиеттері, халықтың денсаулығына қауіп, шаруашылық-ауыз сумен жабдықтау.

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**Обеспечение качества воды как главная цель сохранения здоровья человека**

**Аннотация**

*Основная проблема:* Актуальность поднимаемых вопросов связана с ценностью воды как источника жизнедеятельности человека. Организму человека для его нормального функционирования необходима качественная питьевая вода. Количество смертей, связанных с употреблением загрязненной питьевой воды, по данным ВОЗ, в 2021 году выросло в три раза и достигло почти 19 тыс. против 6 тыс. в 2020. А число новообразований, заболеваний мочеполовой системы, органов пищеварения и кожи увеличилось на 2%, до 1,486 млн. Причины повышения уровня вредных химических веществ и микробиологических загрязнений в воде — устаревшие очистные сооружения, старые трубы и обеззараживание хлором. В статье анализируется обеспечение качества воды как главная цель сохранения здоровья человека. Произведен статистический анализ уровня загрязнения питьевой воды г.Павлодар. Исследование химических и микробиологических показателей сточной и питьевой воды проходило с применением общепринятых стандартов.

*Цель:* изучение качества сточной и питьевой воды г.Павлодар.

*Методы:* отбор проб сточных вод, проведение химического и бактериологического анализа сточной и питьевой воды, статистический метод, корреляционный анализ экспериментально полученных результатов и расчетных характеристик и др.

*Результаты и их значимость:* В области риска здоровью населения создают загрязнения водоемов, являющиеся источниками хозяйственно-питьевого водоснабжения и рекреационного водопользования, сохраняющаяся высокая изношенность водопроводных сетей, их аварийность, в результате низкого уровня эксплуатации, сбои в работе очистных сооружений. Гигиеническая оценка водоемов по комплексным показателям свидетельствует о сохраняющейся высокой степени загрязнения воды в местах водопользования. Остаются низкими показатели качества воды поверхностных водоемов области по санитарно-химическим (в первую очередь органолептическим и общесанитарным), а также микробиологическим показателям. По токсикологическим показателям уровень загрязнения воды в местах водопользования оценивается, как умеренный. Основными загрязнителями р.Иртыш в г.Павлодар являются промышленные предприятия и жилищно-коммунальные объекты, сбрасывающие в водоемы неочищенные, или недостаточно очищенные сточные воды

Выявлен комплекс причин загрязнения питьевой воды: высокая изношенность водопроводных сетей, их аварийность, в результате низкого уровня эксплуатации, сбои в работе очистных сооружений, недобросовестная очистка промышленных сточных вод промышленными предприятиями г.Павлодар и др. Приоритетными профилактическим направлениями улучшения качества воды как источника жизни являются: реализация долгосрочного целевого планирования мероприятий по модернизации водопроводных и канализационных сетей и сооружений в г.Павлодар. Вопросы обеспечения населения доброкачественной питьевой водой, о состоянии водоснабжения и о мерах по его улучшению должны постоянно находиться под контролем и рассматриваться на заседаниях санитарно-противоэпидемических комиссий.

*Ключевые слова:* питьевая вода, свойства воды, риск здоровью населения, хозяйственно-питьевое водоснабжение.

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