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WATER POLLUTION INDICATORS - OBJECTS IN ECOLOGICAL JUDICIAL EXPERTISE

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Anthropogenic activities can generate certain forms of pollution and change of aquatic resources, flora and fauna. Water pollution is a risk factor for the lack of quality water.
Proper wastewater treatment is the basic condition for a healthy environment in urban and rural settlements. Uncontrolled discharge of raw wastewater poses a threat to public health and the environment. Waterborne diseases particularly affect children, vulnerable groups and adults, which can significantly impede a country's economic development.

Keywords: *ecological judicial examination, water pollution, water analysis, pollution indicators, public health.*

Nitrogen-containing substances (ammonium ions, nitrite ions and nitrates) are formed in water as a result of the breakdown of protein compounds that almost always enter it with domestic wastewater, residual coke-benzene, nitrogen fertilizer and other plants. Protein substances under the influence of microorganisms decompose, the final product of which is ammonia. The presence of the latter indicates water pollution with wastewater.

Among the pollutants that contain nitrogen from wastewater, ammonia is one of the most dangerous. It is the main source of food for nitrifying bacteria; by increasing the pH, it favors the latter's life. Biological oxidation of ammonia consumes the greatest amount of oxygen. Thus, according to the data, the oxygen consumption is 4.57 kg / kg ammonia, 1.14 kg / kg nitrites and 2.67 kg / kg hydrocarbons [4].

The decomposition of nitrogen-containing substances to the ammonia stage occurs quite quickly, so its presence in water indicates its fresh pollution. Recent water pollution is also indicated by the presence of nitric acid in it.

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The extent of pollution, its nature and the duration of the action of pollutants in the areas of operation of agro-industrial enterprises are different. It is characterized by both organic and biogenic compounds containing nitrogen (ammonium, nitrites, nitrates, etc.), pathogenic microorganisms and mineral fertilizers, pesticides and their metabolites. Contaminated soil and groundwater can be located in some cases in the area of the agro-industrial complex itself and adjacent areas (large livestock complexes, farms, etc.), in others, they occupy large areas, measured in thousands of square kilometers, (irrigated and dry land with intensive cultivation technology for agricultural products). The duration of the presence of contaminating ingredients is determined by the rate of decomposition of organic and mineral substances, the lifespan of microorganisms. As a result, during the elimination of the source of pollution, the lifespan of some pollutants is measured from a few days to 1-3 years, while others - it reaches tens and even hundreds of years.

Optimizing soil regimes, creating optimal C: N ratios promotes the mineralization of oil waste and reduces the time of soil cleaning of pollutants. With very intense, deep pollution of the soil with oil and petroleum products (especially in the southern regions), it is recommended to remove the saturated oil horizons and eliminate them, followed by the creation of fertile artificial horizons [5].

Due to the presence of nitrogen-containing substances in the water, its contamination with domestic wastewater can be assessed. If the contamination is recent, then all the nitrogen is usually in the form of ammonia. If there is nitrite in addition to ammonia, then it means that some time has passed since the infection. And if all the nitrogen is represented by nitrates, then a long time has passed since the infection, and the water in the tank at the sampling site has cleaned itself. It has been experimentally established that at room temperature 10 mg of ammonium salt nitrogen oxidizes to nitrite in 15 days, while nitrate oxidation to nitrates takes 40 days.

To determine the pollution from natural sources, the flow of a pollutant on a certain surface is recorded or the amount of settling substances is measured on special collectors (taking into account the products of their subsequent oxidation); in this case, the assessment will only be correct if the amount of natural emissions far exceeds the amount of anthropogenic pollution. This is how nitrogen oxides generated by lightning are determined in areas far from industrial areas. The amount of oxides is determined by the amount of precipitated nitrates. Emissions of alkaline materials from so-called "open" sources (unpaved roads, soil erosion, agrotechnical measures, etc.) are estimated by the deposition of alkaline solid particles. However, in some cases, emissions from natural sources are quite difficult to attribute to specific objects. Therefore, when fertilizers are applied in the field, they usually determine the total amount of ammonia emitted by both plants and as a result of the transformation of nitrogen-containing chemicals [3].

The presence of certain nitrogen-containing compounds is used to assess the time of sewage water pollution. Thus, the presence of NN in water and the absence of nitrites indicate a recent pollution of water. Their simultaneous presence indicates that a certain period of time has elapsed since the initial pollution. The absence of MN in the presence of nitrites and especially nitrates indicates that the pollution took place a long time ago and the water became clear during this time.

Among the indicators of chemical pollution of spring water or domestic drinking water from taps, the decomposition products of organic compounds in water from nitrogen-containing substances. The presence of NH^+ albuminous ammonia in water, even in the form of traces, signals its

fresh contamination; in the presence of at least traces of NO nitrite ion in the water, the water is usually considered to be sanitary suspicious; the presence of NO nitrates in water in the absence of ammonia and nitrites indicates existing pollution and completed mineralization. Ammonia salt and traces of nitrite ion may also be present in uncontaminated water as a result of the processes of reduction of nitric acid salts when they interact with humic substances. However, in the absence of ammonia and nitrite ion, with a high amount of nitrate ion, increased oxidability and the presence of a large amount of chlorides and sulfides, water is usually considered a sanitary suspect. Thus, the presence of nitrogen-containing substances in the absence of other indicators of pollution does not serve as evidence of poor water quality, especially if the water is artesian.

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The nitrification process is the final stage of mineralization of nitrogen-containing organic pollutants. The presence of nitrates in treated wastewater is one of the indicators of their degree of purification; therefore, it is necessary to use such treatment facilities that provide optimal conditions for the vital activity of nitrifying bacteria.

Chemical analysis allows us to detect in the ecological forensic examinations the components of water that are indicators of its pollution; However, these chemicals, which are harmless to the human body in those amounts in the water, indicate the connection of the tank with one or another source of its pollution. Among the indicators of chemical pollution of water, the degradation products of organic compounds in the form of substances containing nitrogen NH_4^+, NO_2^- and NO_3^- 'deserve attention (the sanitary significance of these substances has been clarified in detail during their research). However, in assessing the health value of nitrogen-containing substances, great care is needed, as they are, as mentioned, of mineral origin. The presence of nitrogen-containing substances in the absence of other pollution indicators does not serve as evidence of poor water quality, especially if deep groundwater (from artesian wells) is investigated.

The presence of only nitric acid in the water with the simultaneous absence of ammonia and nitric acid indicates past water pollution. In this case, a sufficient period of time has elapsed since the pollution of the water for the nitrogen-containing substances to fully mineralize; therefore, the death of pathogenic micro-organisms should also occur and the water can be considered epidemiologically satisfactory, which should be confirmed by bacteriological data.

The ability to wash chemicals from the soil by surface runoff has been demonstrated using many compounds as examples. Thus, the intensive use of nitrogen-containing mineral fertilizers has led to a sudden increase in nitrogen compounds in groundwater. An even greater danger is polluted water as a habitat for living organisms for human consumption. The tendency of exogenous chemicals to migrate and accumulate along food chains leads to the fact that fish, molluscs, crustaceans, which have concentrated significant amounts of harmful substances, can cause human poisoning. Thus, the cause of the well-known disease Minamata (Japan) is the pollution of water with organo-mercury substances and their concentration in algae used by the population as food [3].

The main danger factor is the unreliability and obsolescence of the equipment and structures of the engineering networks: water supply, sewerage; filtered from solid waste disposal facilities. Water treatment plants with extensive sludge maps, aerators and sedimentation tanks at treatment

plants, sewage sludge fields and linear sewage systems discharge dirty wastewater as losses in the first surface aquifer. In large cities, especially in Chisinau, the exploitation, conservation and liquidation of these shortcomings is an acute problem. Groundwater is heavily polluted with nitrogen-containing compounds.

Thus, eutrophication of water bodies can be prevented by removing at least one nutrient from the water. In practice, this is the elimination of phosphorus compounds from wastewater, as carbon is in the form of bicarbonates, and nitrogen, as a result of assimilation from the air by some types of aquatic vegetation, is almost always present in natural waters.

The main *sources of water pollution* are:

- industrial and domestic wastewater (domestic wastewater has high bacterial and organic pollution)
- draining water from irrigated lands
- residual water from zootechnical complexes (may contain pathogenic bacteria and helminth eggs)
- organized (stormwater runoff) and unorganized surface runoff from settlements, agricultural fields (use of various chemicals - mineral fertilizers, pesticides, etc.)
- water transport (wastewater of 3 types: faeces, household and water received in engine rooms).

In addition, additional sources of water contamination by the causative agents of intestinal infections may be: hospital wastewater; mass bath; washing clothes in a small tank.

Pollution entering water bodies:

- violates the normal living conditions of the tank biocenosis;
- contributes to the modification of the organoleptic characteristics of the water (color, taste, smell, transparency);
- increase bacterial pollution of water bodies;
- human consumption of water that has not undergone purification and disinfection methods leads to the development of: infectious diseases, namely bacterial, dysentery, cholera, viral (viral hepatitis), zoonoses (leptospirosis, tularemia), helminthiasis, and human infection with protozoa. (amoeba, ciliated shoe);
- increase the amount of chemicals, excess MPC in drinking water contributes to the development of chronic diseases (for example, the accumulation of lead, beryllium in the body) [2].

In the ecological forensic expertise we use various analytical laboratories in our country, specialists perform at least 100 million water quality analyzes annually, and 23% of the determinations consist in assessing their organoleptic properties, 21% - turbidity and solids concentration in suspension, 21% is the determination of the general indicators. - hardness, salt content, CCO, CBO_5, 29% - determination of inorganic substances, 4% - determination of individual organic substances. A significant number of tests are performed by health and epidemiological services [4].

The test results show that every fourth sample is chemically hazardous to health, and every fifth sample is bacterial.

Among the water quality standards, harmful limiting indicators are established - organoleptic, sanitary-toxicological or general sanitary. The limiting hazard indicator is a feature characterized by the lowest harmless concentration of a substance in water.

Organoleptic limiting indicators include standards for those substances that cause an unsatisfactory organoleptic assessment (taste, odor, color, foaminess) at concentrations that fall within acceptable values. Thus, the MPC for phenol, determined by the presence of odor, is 0.001 mg / l under water chlorination and 0.1 mg / l - in the absence of chlorination. Organoleptic limiting indicators also include MPC for chromium (VI) and chromium (III) color compounds; having a characteristic odor and taste of kerosene and chlorophyll; foaming sulfolane and the like [2].

Limiting general health indicators are set in the form of standards for relatively low toxic and non-toxic compounds - for example, acetic acid, acetone, dibutyl phthalate, etc.
Restrictive health and toxicological indicators have been established for the rest (most) of the harmful substances.

Temperature is an important hydrological feature of a tank, an indicator of possible heat pollution. Thermal pollution of a tank usually occurs as a result of using water to remove excess heat and discharging water with a high temperature into the tank. With thermal pollution, the temperature of the water in the tank increases compared to the natural values of temperatures at the same points during the corresponding periods of the season.

The main sources of industrial heat pollution are the hot water of power plants (mainly nuclear) and large industrial enterprises, which are formed as a result of the removal of heat from heated units and machines.
Power plants often discharge water into bodies of water, which have a temperature 8-12 ° C higher than the water taken from the same body of water.

Heat pollution is dangerous because it intensifies vital processes and accelerates the natural life cycles of aquatic organisms, a change in the rate of chemical and biochemical reactions that take place in the tank.

Under conditions of thermal pollution, the oxygen regime and the intensity of the self-cleaning processes of the tank change significantly, the intensity of photosynthesis changes, etc. As a result, the natural balance of the tank is disturbed, often irreversible, and environmental conditions are formed which adversely affect the animal and plant communities, in particular:

- heated water disorients aquatic organisms, creates conditions for depletion of food resources;
- the increase of temperature differences along the vertical layers, especially in the cold season, according to the "inverted" type, as opposed to the one that develops as a result of the natural distribution of water temperatures;
- with increasing water temperature, the dissolved oxygen concentration decreases, which aggravates the oxygen regime, especially in municipal wastewater disposal areas;
- at high temperatures, many aquatic organisms, especially fish, are subjected to stress, which reduces their natural immunity;
- there is a massive reproduction of blue-green algae;
- thermal barriers are formed on the migration routes of the fish;

- the diversity of species of the vegetal and animal "population" of water bodies is decreasing, etc [6].

Experts have determined: in order to prevent irreversible disturbances of the ecological balance, the temperature of the water in the tank in summer due to the release of polluted (hot) water should not increase by more than 3 ° C compared to the average. the monthly temperature of the warmest year in the last 10 years [2].

Organoleptic characteristics - any knowledge of the properties of water, whether we are aware of it or not, begins with the definition of organoleptic characteristics, ie. thus, for the determination of which we use our senses (sight, smell, taste), the organoleptic assessment brings a lot of direct and indirect information about the composition of water and can be performed quickly and without tools. Organoleptic characteristics include color, turbidity (transparency), odor, taste and aftertaste, foaminess.

Chromaticity - color is a natural property of natural water due to the presence of humic substances and complex iron compounds. The color of the water can be determined by the properties and structure of the bottom of the tank, the nature of the aquatic vegetation, the soils adjacent to the tank, the presence of swamps and peat bogs in the drainage basin, etc. from a mixture of potassium. K2Cr2O7 dichromate and CoSO4 cobalt sulphate. For surface water, this indicator is not allowed more than 20 degrees on the color scale.

The smell of water is due to the presence of volatile odors in it, which enter the water naturally or with wastewater. Almost all organic substances (especially liquids) have an odor and transfer it to the water. Usually, the smell is determined at normal temperatures (20 °C) and high temperatures (60 °C) of the water. The smell is divided into two groups of nature, describing it subjectively by sensation:

- *natural origin* (from living and dead organisms, from the influence of soils, aquatic vegetation, etc.);
- *artificial origin* these odors usually change significantly during water treatment.

Odor intensity -the nature of the odor manifestation;

-the smell is not felt;

Very faint - odor is not immediately noticeable, but is detected on close examination (when the water is heated);

The faint - odor is noticeable if you pay attention to it;

Visible - the smell is easy to notice and causes negative reviews about the water;

Distinct - the smell attracts attention and makes you refrain from drinking;

Very strong - the smell is so strong that it makes the water unusable.

Taste and taste - water taste assessment spends drinking natural water in the absence of suspicion of its contamination. There are 4 flavors: salty, sour, bitter, sweet ... The rest of the taste sensations are considered flavors (salty, bitter, metallic, chlorine, etc.).

Intensity of taste and flavor - the nature of the manifestation of taste and flavor

- the taste and the palm are not felt

Very weak - taste and aftertaste are not immediately felt by the consumer, but are detected after careful testing;

- taste and taste are noticed when you pay attention to them;

Visible - the taste and aftertaste are easy to notice and lead to water disapproval;

Distinct - taste and aftertaste attract attention and make you refrain from drinking;

Very strong - the taste and mouthfeel are so strong that they make the water unusable.

The turbidity of the water is due to the content of finely dispersed impurities suspended in water - insoluble or colloidal particles of different origins.

Water turbidity also determines other water characteristics, such as:

- *the presence of sediment*, which may be absent, insignificant, noticeable, large, very large, measured in millimeters;
- *suspended substances, or coarse impurities* - are determined gravimetrically after filtering the sample, according to the weight of the dry filter. This indicator is usually not very informative and is mainly important for wastewater.

Transparency, measured as the height of a column of water, visually distinguishing a standard font on paper. The transparency, or transmission of light, of water is due to its color and turbidity, ie. the content of various colored substances and minerals in it. Water clarity is often measured along with turbidity, especially when the water has a light color and turbidity that are difficult to detect.

Foam is the ability of water to retain artificially created foam. This indicator can be used for the qualitative assessment of the presence of substances such as detergents (surfactants) of natural and artificial origin, etc. The foam content is mainly determined in the analysis of natural wastewater and polluted water.

The hydrogen index (pH) is the negative logarithm of the concentration of hydrogen ions in a solution: pH = -lgH $^{+}$.

For all living things in the water (except acid-resistant bacteria), the minimum possible pH value is 5; pH rain <5,5, считается кислотным дождем.

pH 6.0-9.0 is allowed in drinking water; in the water of drinking water tanks and for cultural and domestic use - 6.5-8.5. The pH value of natural water is usually determined by the ratio of bicarbonate anion concentrations to free CO_2; a lower pH value is characteristic of swamp waters due to the high content of humic acids and other natural acids.

pH measurement during natural and drinking water quality control is performed almost everywhere.

Alkalinity and acidity. *Alkalinity* is due to the presence in the water of substances containing hydroxo-anion, as well as substances that react with strong acids (hydrochloric, sulfuric). *The acidity* of water is due to the water content of substances that react with hydroxoanions.

The mineral composition of water is interesting because it reflects the result of the interaction of water as a physical phase and the living environment with other phases (environments): solid, i.e. coastal and underlying, as well as minerals and rocks that form the soil; gaseous (with air) and the moisture and mineral components contained in it. In addition, the mineral composition of water is determined by a series of physico-chemical and physical processes that take place in different media - dissolution and crystallization, peptization and coagulation, sedimentation, evaporation and condensation, etc., in other media, chemical reactions involving nitrogen, carbon, oxygen, sulfur compounds, etc.

Sulphates - common components of natural waters ... Their presence in water is due to the dissolution of some minerals - natural sulfates (gypsum), as well as the transport of sulfates contained in the air with rain. The presence of sulphates in industrial wastewater is usually due to technological processes that use sulfuric acid (production of mineral fertilizers, production of chemicals). Sulfates in drinking water do not have a toxic effect on humans, but they worsen the taste of water: the taste of sulfates occurs at a concentration of 250-400 mg / l.

Chlorides are present in almost all fresh surface and groundwater, as well as in drinking water in the form of metal salts. If sodium chloride is present in water, it tastes salty even at concentrations above 250 mg / l; In the case of calcium and magnesium chlorides, the salinity of the water occurs at concentrations above 1000 mg / l.

Depending on the organoleptic - taste indicator, the MPC for drinking water for chlorides (350 mg / l) was established, the limiting danger indicator being organoleptic.

Large amounts of chlorides can be formed in industrial processes of concentrating solutions, ion exchange, salting, etc., forming wastewater with a high content of chloride anions.

High concentrations of chlorine in drinking water have no toxic effects on humans, although salt water is highly corrosive to metals, adversely affects plant growth and causes soil salinization.

The dry residue is characterized by the content of non-volatile dissolved substances (mainly minerals) and organic substances in water, whose boiling point exceeds 105-110 ° C.

The amount of dry residue can also be estimated by calculation. In this case, it is necessary to synthesize the concentrations of mineral salts dissolved in water, as well as the organic substances obtained from the analyzes (bicarbonate amounts to 50%).

For drinking and natural water, the value of the dry residue is practically equal to the sum of the mass concentrations of anions (carbonate, bicarbonate, chloride, sulfate) and cations (calcium and magnesium, as well as determined by the calculation method of sodium). and potassium).

The value of the dry residue for surface water bodies for domestic and drinking and cultural and domestic use must not exceed 1000 mg / l (in some cases up to 1500 mg / l is permitted).

Water hardness has a detrimental effect on pipes when water is used in heating networks, leading to the formation of deposits. For this reason, special "softening" chemicals must be added to the water, the hardness of the water being due to the presence of soluble and slightly soluble mineral salts, mainly calcium (Ca^{2+}) and magnesium (Mg^{2+}).

Water hardness is one of the most important properties of water use. If there are metal ions in the water that form insoluble salts of fatty acids with soap, then in such water it is difficult to form foam when washing clothes or washing hands, which results in a feeling of stiffness. The value of water hardness can vary greatly depending on the type of rocks and soil that make up the drainage basin, as well as the season of the year, the weather conditions [5].

A decrease in the concentration of RK indicates a change in the biological processes in the tank, the pollution of the tank with intensely oxidizing biochemicals (primarily organic). Oxygen consumption is also due to the chemical oxidation processes of impurities in water, as well as the respiration of aquatic organisms.

Oxygen enters the body of water by dissolving it on contact with air (absorption), as well as as a result of photosynthesis by aquatic plants ", ie as a result of physico-chemical and biochemical processes.

Oxygen also enters bodies of water with rainwater and snow. Therefore, there are many reasons for increasing or decreasing the concentration of dissolved oxygen in water.

Biochemical Oxygen Demand (BOD) Organic matter is always present in the natural water of the tanks. Their concentrations can sometimes be very low (for example, in spring and meltwater). The natural sources of organic matter are the decaying remains of organisms of plant and animal origin, both of which live in water and fall into the reservoir from foliage, air, shores, etc. In addition to natural sources, there are also artificial sources of organic substances: transport companies (petroleum products), pulp and paper and wood processing plants (lignins), meat processing plants (protein compounds), agricultural waste and faeces and so on. Organic pollutants enter the body of water in various ways, mainly by washing the surface with wastewater and rain from the soil.

Under natural conditions, organic matter in water is destroyed by bacteria, undergoing aerobic biochemical oxidation with the formation of carbon dioxide. In this case, the dissolved oxygen in the water is consumed for oxidation. In tanks with a high content of organic matter, most of the RK is consumed for biochemical oxidation, thus depriving other organisms of oxygen. At the same time, the number of organisms that are more resistant to a low RK content is increasing, oxygen-loving species are disappearing, and oxygen-tolerant species are appearing.

Thus, in the process of biochemical oxidation of organic substances in water, there is a decrease in the concentration of RK, and this decrease is indirectly a measure of the content of organic substances in water. The corresponding indicator of water quality, which characterizes the total content of organic matter in water, is called the Biochemical Oxygen Demand (BOD).

The determination of BOD is based on the measurement of the concentration of PK in a water sample immediately after sampling as well as after incubation of the sample. The sample is incubated without access to air in an oxygen bottle (ie, in the same vessel in which the RK value is determined) for the time necessary for the biochemical oxidation reaction to continue.

Ecological judicial examinations are often arranged to determine the chemical composition of the pollution of water basins, lakes and streams, to discover the nature of harmful substances entering this environment, the degree of pollution and the level of increase of permissible concentrations of substances and the negative action on humans, flowers and aquatic fauna [1].

Within this type of expertise, the objects in dispute play a key role in solving the objectives put forward by the authorizing officer. Exceeding the Water Quality Indicators described above plays a probative role in the trial and in identifying the degree of water pollution.

Conclusions

Traditionally, water quality indicators are divided into physical (temperature, color, taste, odor, turbidity, etc.), chemical (pH, alkalinity, hardness, oxidability, total salinity (dry residue), etc.) and sanitary, and bacteriological (general) bacterial contamination of water, coli-index, content of toxic and radioactive components in water, etc.).

In order to determine how the water meets the required standards, the numerical values of the water quality indicators with which the measured indicators are compared are documented.

The taste of the water is due to the presence of substances dissolved in it, which gives it a certain taste, which can be salty, bitter, sweet and sour. Natural waters usually have only a salty and bitter taste. In addition, in the water containing sodium chloride a salty taste appears, and an excess

of magnesium sulfate gives a bitter taste. Water with a high amount of dissolved carbon dioxide (so-called mineral water) has a sour taste. Ink-flavored or ferrous water is saturated with iron and manganese salts; its astringent taste is given by calcium sulphate, potassium permanganate; an alkaline taste is caused by the content of soda, potassium, alkalis in the water.

Water quality in lakes often varies greatly in depth due to thermal stratification caused by photosynthesis in the surface area, water heating, impact of bottom sediments, etc.

The quality of water in different aquifers can vary significantly, therefore, when taking a groundwater sample, the depth of the horizon from which the sample was taken, the possible gradients of groundwater flows, information about the composition of the ground.

Given the longevity of lakes, monitoring water quality over a long period of time (several years), including in places intended for human use, as well as establishing the consequences of anthropogenic water pollution (monitoring its composition and properties) comes to the fore.

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ՋՐԵՐԻ ԱՂՏՈՏՎԱԾՈՒԹՅԱՆ ՑՈՒՑԱԼԻՇՆԵՐԸ. ԷԿՈԼՈԳԻԱԿԱԼ ՕԲՅԵԿՏՆԵՐԻ ԴԱՍԱԿԱՐԳԱԼԻՆԵՐԸ

Կատարյան Օ.Ս., Տրիֆաուցան Վ.Ն., Կիշլյուեու Ա.Մ.Վ.

Դիդակտիկ նպատակ է մարդու/հասարակության մարդածին գործունեության, մասնավորապես՝ աղտոտման որոշակի ձևերի և քրային ռեսուրսների, բուսական և կենդանական աշխարհի փոփոխությունների հանպատրաստության ուսումնասիրությունը: Սույն աշխատանքն ունի միջառարկայական բնույթ, գրված է բնապահպանական, քրեաքիմիական և բժշկական առարկաների շրջման ներսում: Ձգալի ուշադրություն է դարձվում քրի աղտոտման հիմնական աղբյուրներին, որոնք որակյալ քրի ծավալը նվազեցնելու, ոչնչի գործոններ են համարվում: Առանձնացվում և նկարագրվում են բնական և արհեստական քրամբարներում՝ ագռոտի բիմիական միացություններ պարունակող կեղտաջրերի ներթափանցման հետևանքով տեղի ունեցող կենսաբանական գործընթացների բնութագրական

Аннотация: Эпидемии инфекционных заболеваний в разные исторические периоды являются одной из самых серьезных проблем, с которыми сталкивается человечество. Они уносят больше жизней, чем любая война. Вспышки инфекционных заболеваний, которые возникают в результате загрязнения воды,