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BIOLOGICAL SCIENCES

IMPACT OF THE CONSEQUENCES OF THE WAR IN UKRAINE ON THE ENVIRONMENTAL CONDITION OF DRINKING WATER

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ABSTRACT

Military operations significantly affect the quality of Ukraine's water resources, a large amount of pollutants enter them due to the explosion of oil storage facilities, fuel and lubricant warehouses, and the destruction of the infrastructure of enterprises and treatment facilities. The article provides an assessment of the state of drinking water in the regions of Ukraine.

Keywords: drinking water, quality, ecology, food industry.

Formulation of the problem.

War always brings with it countless tragedies. One of the most invisible but devastating consequences is its impact on the environment, in particular on the state of water supply systems and the quality of drinking water. According to the World Bank report "Rapid Assessment of Damage and Needs in Ukraine", as of February 24, 2023, direct losses from damage to water supply and drainage facilities amounted to 2.2 billion dollars. USA. The hostilities led to the destruction of water supply systems in the eastern and southern regions of Ukraine, as a result of which many settlements are deprived of access to drinking water. According to the audit of the Accounting Chamber, only 65% of the population of Ukraine has access to centralized water supply.

The impact of war on water quality is primarily caused by the pollution of water resources, especially in areas where hostilities are taking place. This pollution can have long-term consequences for human health and ecosystem health. In such conditions, the lack of timely control and appropriate response can lead to serious problems with public health and environmental crises. That is why informing the population and relevant services about the current situation with the quality of drinking water is one of the most important tasks today.

Analysis of recent research and publications.

The war in Ukraine has serious consequences for the state of drinking water. Some of the more common effects include [1-5]:

1. Pollution of water sources. Conflict can cause water sources to be polluted by fighting, infrastructure destruction, and the illegal release of toxic substances.

2. Damage to the water supply infrastructure. Shelling and bombing can damage water systems, leading to leakage and water pollution.

3. Limited access to drinking water. War can disrupt the supply of drinking water to populated areas due to the destruction of infrastructure or disruption of supplies due to hostilities.

4. Changes in water quality due to groundwater pollution. Military operations can lead to groundwater pollution as a result of emissions of fuel, chemicals and other toxins.

5. Threat to public health. Contaminated water can lead to the spread of drinking water, infectious diseases and other diseases that pose a threat to the health of the population.

In the conflict zone, measures should be taken to monitor water quality and provide assistance where necessary to ensure safe access to drinking water for the local population.

Contamination of Ukraine's water sources as a result of fighting is a serious problem that arises due to the destruction of infrastructure and the release of toxic substances during hostilities. Here are some of the consequences of this pollution [6-10]:

1. Contamination of water sources. Bomb explosions and artillery shelling can contaminate water sources, including rivers, lakes, and groundwater sources, with petroleum products, chemicals, and other toxins.

2. Damage to water supply systems. Damage to the infrastructure of water systems can lead to leaks from water supply systems, which can cause contamination of drinking water.

3. Insufficient water treatment. The conditions of a military conflict can lead to interruptions in the operation of waterworks and reduced volumes of water treatment, which can lead to the leakage of contaminated water into the water supply system.

4. Destruction of the infrastructure for collecting and cleaning water. Fighting can destroy water collection and treatment infrastructure, making it difficult to continue providing access to clean drinking water for local populations.

These implications highlight the importance of international cooperation and humanitarian efforts to ensure safe access to drinking water for populations affected by military conflict.

The quality of drinking water for food enterprises after the war in Ukraine can be a serious problem due to possible contamination of water supply systems and sources of drinking water as a result of hostilities. Here are some possible consequences for food businesses [11-15]:

1. Impossibility of using local water. If local sources of drinking water are contaminated, food businesses may be forced to seek alternative sources of water for use in their operations.

2. Increase in water supply costs. If you need to purchase water from other sources or use additional water treatment methods, this can lead to increased water costs for food businesses.

3. Threat to consumers' health. If the water is not treated properly, it can pose a threat to the health of consumers, as water contamination can lead to diseases and other health problems.

4. The need to observe strict safety and hygiene standards. Due to the potential threat of water contamination, food businesses must adhere to strict safety and hygiene standards to prevent the spread of infectious diseases among consumers.

5. Damage to reputation. If food products are prepared using contaminated water and consumers become ill, this can lead to damage to the company's reputation and loss of consumer trust.

In such situations, it is important to take all possible measures to ensure the quality of drinking water, including the use of additional water treatment methods and regular testing of water quality for contaminants. Consultation with food safety and hygiene experts may also be helpful.

The purpose of the work carrying out an assessment and analysis of the results of the ecological state of drinking water in the regions of Ukraine under the influence of the consequences of the war.

Results. According to the monitoring results, the main pollutants of tap water in the western region are iron, turbidity and hardness salts, especially in the Volyn and Ternopil regions. It is also worth noting the high level of manganese pollution in Zakarpattia Oblast — an average of 0.4 mg/dm³. A comparison of water quality for the first two quarters of 2023 shows the deterioration of the situation in Ternopil and Lviv regions.

However, the exceedance of the norms valid during the martial law is noted only in the Transcarpathian region for the indicators of turbidity and iron. Studying the quality of tap water in the central region, we see a heterogeneous picture. The Vinnytsia region has better indicators, with slight excesses of the standard for manganese content, and increased hardness and turbidity in the first quarter.

In other central regions, significant excesses of the standard for iron content and turbidity are observed - in some places up to 2.7 mg/dm³.

In the Kirovohrad region and the city of Kyiv, significant exceeding of norms, even of wartime, in terms of color and oxidizability were also recorded, which indicates a high level of pollution by organic substances.

In the Kyiv region, unlike the capital, these indicators are within the norm.

Comparing the quality of tap water in the first and second quarters of 2023, we do not observe any significant changes.

During the war, communal enterprises of the southern regions solved complex tasks related to providing the population with drinking water. This required a change of water intake sources, drilling of new wells and emergency repair of water infrastructure facilities. Looking at the monitoring results, we see a different picture in each region.

In the Odesa region, the situation with the quality of tap water is the best. The only deviation from the norm was recorded in the first quarter according to the turbidity indicator.

In the Zaporizhzhia region, in addition to increased turbidity, a high level of pollution by organic substances is observed, as evidenced by the values of Permanganate oxidizability and Color, which significantly exceed even the normative requirements of wartime.

In the Mykolaiv region, the source of water intake for a long time was water from the Southern Bug River, due to the destruction of the water intake from the Dnipro. After the de-occupation of the right-bank part of the Kherson region, it became possible to restore the former water intake, but it took some time. Because of this, in the first quarter of 2023, we observe significant exceedances of drinking water standards for dry matter, hardness, iron and manganese content. In the second quarter, the situation is already much better, but the increased content of iron and hardness salts is still observed.

When analyzing the results of water quality monitoring in the eastern region, the Poltava region stands out - the largest exceedances of the standards for drinking water in terms of fluoride content. This is a feature of the groundwater of this region, which is the main source of water intake in the region. In all other regions of the region, we see excessive iron content and turbidity. In the Dnipropetrovsk region, there are also very significant exceedances of standards for oxidizability and color.

In Kyiv, Kropyvnytskyi, and Dnipro, there is a significant increase in the values of such water quality indicators as color, oxidizability, iron content, and turbidity.

As we have already noted, in Mykolaiv after the restoration of the water intake from the Dnipro River, the quality of tap water improved significantly, although problems with excessive turbidity and iron content still remain.

Thus, the war in Ukraine led to the deterioration of the quality of drinking water in various regions of the country, especially in the cities that use water from the Dnieper River and its river basin and in the Mykolaiv Oblast. However, it is worth noting that, in the vast majority, the quality of tap water meets the requirements, which requires a lot of effort from the employees of communal services and city water utilities.

It is also important to remember that the situation with drinking water supply in the temporarily occupied territories of Ukraine is almost unknown to us, where the population often does not have access to any source of drinking water.

Conclusions. According to the monitoring results, the main pollutants of tap water in the western region are iron, turbidity and hardness salts, especially in the Volyn and Ternopil regions. It is also worth noting the high level of manganese pollution in Zakarpattia Oblast — an average of 0.4 mg/dm³. A comparison of water quality for the first two quarters of 2023 shows the deterioration of the situation in Ternopil and Lviv regions.

However, the exceedance of the norms valid during the martial law is noted only in the Transcarpathian region for the indicators of turbidity and iron.

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