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MODERN METHODS OF SEWAGE SLUDGE DISPOSAL IN THE CONTEXT OF WATER RESOURCE PROTECTION

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Sustainable water resource management is a key element in ensuring access to safe drinking water and protecting the environment in an era of growing population and climate change. Improper wastewater treatment leads to the degradation of aquatic ecosystems and poses a threat to public health. Therefore, it is essential to implement modern and effective sewage sludge disposal methods that reduce pollution and recover water and raw materials. The aim of this paper is to review the latest research and technologies in the field of sewage sludge disposal, with particular emphasis on its role in protecting water resources. The analysis indicates that the development and dissemination of advanced treatment technologies, such as reverse osmosis, ultrafiltration, and ozonation, are crucial for increasing process efficiency and wastewater reuse. Combining biological methods with membrane technologies has yielded particularly promising results, enabling the near-complete removal of pathogens, heavy metals, and organic compounds.

The implementation of innovative technological solutions must be coupled with the strengthening of national and international water quality standards, including the effectiveness of treatment processes and the safety of wastewater reuse. Water recycling and creating sustainable sources of water are an important element of the strategy to reduce pressure on natural water resources and respond to the growing demand for water in the municipal, agricultural and industrial sectors.

DRINKING WATER DISINFECTION: A REVIEW OF MODERN METHODS

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This study critically reviews various methods of drinking water disinfection, analyzing their advantages and limitations to ensure the epidemiological safety of the population. The article discusses modern disinfection methods such as ozonation, ultraviolet irradiation, and the use of nanoparticles, as well as their effectiveness and associated challenges. The promising nature of combined disinfection methods, such as chlorination and UV irradiation, is emphasized for increasing effectiveness and reducing the formation of harmful byproducts. Although novel technologies have great potential for destroying pathogenic microflora, their high operational cost and maintenance remain a significant barrier to large-scale implementation. Modern disinfection strategies must be adapted to specific conditions, and ongoing scientific research is aimed at developing safer and more effective approaches.

Ensuring access to safe drinking water is one of the goals of sustainable development and a critical component of public health protection. Pollution of rivers and other water sources by industrial and domestic wastewater significantly increases the risk of infectious diseases. Effective and reliable disinfection of water is essential to minimize these epidemiological risks. However, the increasing resistance of microorganisms to traditional disinfectants necessitates the search for innovative and more effective water treatment solutions. Therefore, the aim of this study is to provide a critical review of various disinfection methods and to highlight some of their advantages and limitations associated with their use.

Providing access to safe drinking water is crucial for public health, regardless of whether water is used for drinking, domestic use, food production, or recreational purposes. Pollution of water bodies with wastewater leads to decreased water quality and increased health risks due to the spread of pathogens [2].

Bacteriological indicators of drinking water quality are among the most important criteria for assessing its safety for human health. Contamination of water with pathogenic microorganisms can lead to the occurrence of infectious diseases, including cholera, dysentery, hepatitis A, leptospirosis, and other waterborne illnesses. That is why regulatory documents, such as the State Sanitary Norms and Rules in Ukraine, as well as international recommendations, including EU Directive 98/83/EC and the standards of the World Health Organization (WHO), establish strict requirements for the microbiological composition of drinking water [1].

According to WHO guidelines and national standards of Ukraine, drinking water must be free of pathogenic microorganisms and harmful chemical or radiological substances in concentrations that pose risks to human health [3]. Among all potential contaminants, microbiological threats are considered the most dangerous [4].

Disinfection is a critical stage of water treatment aimed at eliminating pathogenic organisms responsible for diseases such as hepatitis, cholera, and other intestinal infections. The choice of disinfection method depends on raw water quality, pathogen types, regulatory standards, and