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Exploring the Progress of Research on Urban Drinking Water Quality and Safety

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Abstract: In recent years, people are more and more concerned about the safety of drinking water, with the improvement of the quality of life, urban drinking water is facing multiple pressures of demand and environmental protection, how to ensure the safety of urban drinking water quality under the development of the new era is an important task of urban development. This paper firstly elaborates on the safety of urban drinking water, then analyzes in detail some practical problems faced by urban drinking water quality safety, and finally puts forward some specific measures to ensure the safety of urban drinking water quality.

Keywords:urban drinking water; water quality safety; biotechnology; disinfection

1. Introduction

The construction of towns and cities in China is often dependent on water sources, which also reflects the wisdom of the ancient people. In recent years there are many industrial enterprises in order to facilitate the extraction of water, chosen to be located in rivers and lakes and other water sources near, but the extraction of water at the same time will produce industrial wastewater, which also led to urban drinking water safety problems gradually prominent. And in the process of industrialisation, from time to time there are explosive leaks that cause water pollution emergencies, which are threatening the safety of drinking water in towns. With China's vigorous promotion of urbanisation in recent years, the supply of drinking water to cities and towns has gradually increased, so the safety of the water supply must be guaranteed. The safety of urban drinking water is a matter of urban residents' practical personal and property safety, to ensure the safety of water sources in line with the new guidelines of the new era.

2. Overview of urban drinking water safety issues

2.1 Safety of drinking water quality in towns and cities

For drinking water safety, in fact, there has not been a clear definition of domestic, but foreign requirements for water quality safety is to meet the relevant standards, but also to meet the various aspects of the process of compliance, so as to protect residents drinking water safety issues. In the latest revision of the drinking water hygiene standards GB5749-2023, water quality testing indicators for 97, but also added the radioactive elements radium-226 and uranium detection. GB5749 combined the world's quality standards and combined with China's own water quality situation specified and become, China's drinking water safety has played a role in the protection of (Wang, 2018).

In the treatment process of drinking water first of all to remove pathogens, because once the pathogens enter the human body will cause great harm to the health of residents, and even some infectious diseases are more harmful to society. Some of the main diseases are hepatitis A, diarrhoea and other diseases. In addition to pathogens, there are often a variety of bacteria, viruses and other

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micro-organisms in drinking water, such as the most well-known "two worms", Jardine's flagellate and Cryptosporidium. Secondly, urban drinking water contains a number of harmful chemicals that need to be removed (Qian, 2018). Industrial development has made a huge contribution to the economy, but the pollution problem is also very serious, especially the part of the unscrupulous enterprises ignoring the environmental requirements, for the interests of a large number of waste, causing serious chemical pollution of water bodies of. Heavy metals and chemicals entering the human body can easily cause chronic poisoning and other symptoms, but the chemical substances in drinking water are difficult to remove completely, so the national standard provides a limit value to ensure that the relevant chemical substances in drinking water are less than the specified limit value. Finally, drinking water is often ignored in the measurement of radioactive substances, especially in mining areas, and mountainous water sources, because radioactive substances in the human body are difficult to be metabolized, long-term drinking water containing radioactive substances will cause the body of radioactive elements extrusion, resulting in explosive injury, and difficult to treat (Chen, 2017).

2.2 Town drinking water safety status

Today's society is becoming more and more aware of the safety of the people, so the safety of drinking water needs to be greater and greater. Drinking water safety accidents have occurred in recent years, and in 2014 alone, there were nearly ten accidents of contamination of drinking water sources, which had a huge impact on the health of residents (Zuo et al., 2017). And the pollution of surface water in China is also widespread, especially in the era of industrial development speed since the reform and opening up, which will also have a certain impact on drinking water. In the past ten years or so, China's urban drinking water indicators situation has significantly improved, of course, in some watersheds, there is also poor water quality, but the overall water quality standards at more than 90%, the failure to meet the water quality problems mainly appear in the same Jieyang, ammonia nitrogen, high manganese and other indicators.

3. urban drinking water quality and safety issues

3.1 Pollution sources pollute water sources

The national monitoring data analysis can be found, in urban drinking water sources in the water intake near the often no obvious industrial pollution sources, but it is difficult to protect the appearance of no pollution sources in the upper reaches. Because China's urbanisation process is accelerating and the scale of agricultural production is gradually increasing, water sources face the threat of industrial pollution, agricultural pollution and other multiple sources of pollution, and if industrial enterprises and agriculture in the area near and upstream of water sources are not treated, it will be difficult to ensure that the quality of urban water conditions does not decline (Jiang, 2017). The main sources of pollution from industry are heavy metals and various organic pollutants, of which heavy metals are difficult to degrade and organic pollutants are toxic and harmful, both of which can cause significant pollution to water bodies. The main source of pollution from agriculture is the discharge of high levels of nutrients into the water, including some pesticide residues and hormones. Finally, there is an important source of pollution is the people's life pollution sources, mainly containing human life generated by rubbish, manure and other household waste, life pollution sources of his characteristics is relatively high phosphorus and nitrogen, but also more bacteria, the safety of drinking water sources caused a great impact (Fu, 2014).

3.2 Water supply and drainage pipeline pollution and secondary pollution

Most of the drinking water pipes used in China now use a long time, prone to rust, corrosion and other phenomena, and the environment is relatively humid and more likely to breed bacteria. Even if the water source of water standards, the water sent to the hands of residents may also be contaminated. In addition to the problem of contamination of water supply and drainage pipes, the secondary

contamination of drinking water still needs to be focused on, mainly in the following areas. First, disinfection by-products (Yao, 2011). Currently, we are dealing with organic pollutants in the water measures are used in the way of disinfectants, which leads to the elimination of organic pollutants at the same time the water will exceed the standard of chlorine, the excess of chlorine still has a huge harm to the human body. If the amount of drinking water disinfectant cannot be controlled, more types of disinfection by-products will be produced in the water and the safety of the water cannot be guaranteed. Secondly, microorganisms. Microorganisms are prone to regrow in the adapted environment, causing secondary pollution to the water, such as the pipe corrosion problem mentioned above, which if not effectively addressed can easily cause bacteria and other microorganisms to breed and regenerate, deteriorating water quality. Third, metal pollution. Metal pollution in the water not only from industrial sources of pollution but also may come from the metal pipes of water supply and drainage, once the corrosion protection materials of metal pipes will fail to produce a large number of metal elements, into the water body to cause pollution (Zheng, 2009).

3.3 Poor early warning mechanism

Urban water resources issues are related to the safety of many people's lives, and the pollution accident will bring irreparable losses to residents. At present, China does not have a set of very effective emergency drinking water security systems, facing the emergency situation is difficult to do in a timely manner, and can not minimize the harm(Fu & Li, 2003). In the past, many pollution accidents can be found in the relevant departments of malfeasance is a major factor in causing accidents, they tend to look ahead in terms of information dissemination, resulting in rescue work being difficult to carry out in a timely manner. For example, in 2012, a major aniline leak occurred in Changzhi City, causing pollution of water sources in many nearby areas and resulting in water difficulties for hundreds of thousands of residents. The local government was afraid of being disciplined after the accident and did not report it in time, leading to a delay in rescue work, which increased the development of the pollution situation and caused greater pollution in the surrounding cities and counties.

3.4 Drinking water treatment process to be optimised

At present, some urban water plants use the traditional process of "coagulation, sedimentation, filtration, disinfection", which is difficult to achieve the complete removal of pollutants. The conventional process for turbidity, chromaticity and bacteria-related indicators, so it is difficult to effectively remove dissolved pollutants such as ammonia and nitrogen, resulting in incomplete treatment of pollutants, affecting drinking water quality (Li & Fu, 2002). Therefore, the drinking water treatment process needs to be continuously upgraded and optimised according to the changes in water quality, to ensure the effective removal of pollutants in the water. Especially for the current old equipment replacement, because the old equipment often difficult to support the implementation of new processes, limiting the efficiency of the new process.

4. urban drinking water quality security measures

4.1 Strictly control the source of pollution near the water source

Pollution sources near water sources should be controlled from industrial pollution sources, agricultural pollution sources and living pollution sources, which are three important sources of pollution to start with. First, industrial pollution sources can not be produced without the choice of the geographic location of the industrial park, so the more serious pollution of industrial enterprises should be encouraged to move to areas far from the water source, the pollution of the standard enterprises should also be clean and upgrade, and constantly reduce the total emissions of pollutants to ensure the safety of water quality in this important location. Secondly, agricultural pollution sources should be controlled to prevent livestock and poultry manure from entering the water source and to prohibit

large-scale stocking practices near the water source. The frequency and total amount of pesticides used on surrounding farmland should be reduced, especially some highly toxic pesticides, and organic fertilisers should be used in controlled amounts where possible. Researchers can continue to upgrade and optimise organic fertilisers to achieve the application of important techniques for the return of crop straw to the fields and balanced fertilisation. Thirdly, the construction of ecological civilisation in the countryside should be strengthened with regard to domestic sources of pollution, closing all outfalls in the protected areas of water sources and centralising the disposal of residents' household waste to prevent it from entering the protected areas of water sources and polluting them. Straw, feed and other usable waste should be reused, such as the production of biogas can also provide energy for residents.

4.2 Water treatment process optimization and upgrading

Water treatment technology is very important to the security of water quality, so each town needs to develop a reasonable water treatment process according to their own situation, and actively promote the renewal of old equipment, the optimization and upgrading of the process. The ultimate goal is to improve water quality at a standard rate. The main measures are as follows: First, the conventional treatment process is optimised and upgraded. Two aspects of coagulation and sedimentation and filtration need to be further strengthened to enhance the removal efficiency of various organic pollutants, and gradually carry out in-depth treatment, preliminary treatment by adding potassium permanganate in the early stage of the treatment process, which can effectively remove the pollutants in the water. Second, the pretreatment process. At present, the pre-treatment method is gradually accepted, can be through physical, chemical, biological and other methods to remove pollutants in the water, first to reduce the pollutants to a certain value, can reduce the pressure of the back-end treatment, improve the overall water quality of the water body. Third, the main role of biological treatment technology is the treatment of organic matter, not simply physical removal, but through biological enzymes to decompose organic matter, which can effectively inhibit the re-growth of bacteria. Fourthly, the disinfection process is optimised. As the disinfection process itself adds unacceptable contaminants to the water, the amount of disinfectant in this process as well as the timing needs to be very precise, and disinfection is the last step of the drinking water out of the field, so it is exceptionally critical. The technology currently in common use is membrane filtration technology, which is an alternative to disinfectant for treatment to avoid the production of disinfection by-products and has many advantages in terms of ease of operation.

4.3 Managing secondary pollution problems

The water supply network is a huge network, so network management is an important work to solve the secondary pollution of drinking water. With the progress of society in the development of urban drinking water supply official materials and safety quality are certain to improve, such as priority to choose corrosion-resistant materials, in the construction to do standard construction, in strict accordance with the accepted standards for acceptance, all parties acceptance after the acceptance of the water. In addition to the newly installed pipe network to do the upgrade, for the old pipe network problems exist for rectification, such as the overall renovation of the old pipe network, line optimization and transformation.

4.4 Establish a sound drinking water safety risk mechanism

At present, most of China's water quality online monitoring system is a collection of various testing projects, to get a variety of pollutants' numerical concentration information, although it can achieve the effect of rapid analysis of the content and type of pollutants, there is no link between the information of various pollutants, the application of data or monotonous. Biomonitoring is a technique that uses biological methods to provide a comprehensive analysis of a water body. The main use is to determine the type of pollutant by indicating the

different responses that organisms will produce in response to various pollutants. Water quality monitoring techniques using aquatic organisms can not only effectively monitor single chemicals, but can also determine the combined toxicity of water, providing information for subsequent research.

For the current drinking water contaminants are difficult to eradicate and a wide range of links in the middle of the problem of secondary pollution, the establishment of a drinking water safety risk assessment system is an effective solution, this system can effectively analyse the potential risks that may exist in drinking water, for the management department to provide the corresponding analysis report, help to make a timely response to the plan, better to protect drinking water safety.

5. Conclusion

Water pollution accidents have occurred in recent years so people's concern about water safety issues has reached an unprecedented level. Along with the continuous acceleration of China's urbanization process, the demand for urban drinking water is gradually increasing, so the safety of urban drinking water is an urgent need to solve an important research content, this paper analyzes the safety problems faced by urban drinking water, water source pollution sources are mainly agricultural pollution sources, industrial pollution sources and living pollution sources, so to achieve the protection of water sources must be on a variety of Pollution sources must be effectively controlled. This paper proposes measures to control pollution sources, reduce secondary pollution, optimise early warning mechanisms and optimise water treatment processes. The above measures can be implemented to effectively ensure the safety of drinking water in China's cities and towns, to protect the vital interests of the people and to contribute to the stable development of society.

Conflict of Interest

The authors declare that they have no conflicts of interest to this work.

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