Innovation and Integrative Research Center Journal
ISSN: 2584-1491 | www.iircj.org
Volume-2 | Issue-6 | June-2024 | Page 85-90

Bacteriological Analysis of Drinking Water and Water pollution

Shreya Singh

Department of Microbiology,Kalinga University,Naya Raipur,C.G,India-492101

Abstract

The public's health depends on the safety of drinking water, since bacterial pollution increases the danger of contracting diseases that are transmitted through the water. The bacteriological study of drinking water is reviewed in this review paper along with future directions. (Gunjan, 1536)It talks on how important it is to follow water quality guidelines established by agencies like the Environmental Protection Agency (EPA) and the World Health Organization (WHO). The article describes several approaches to bacteriological testing, such as cutting-edge molecular procedures like polymerase chain reaction (PCR), novel technologies like next-generation sequencing, and biosensors. (Hannan, bacteriological analysis of drinking water, 2010) The quality of the source water, the integrity of the distribution system, the methods used in water treatment, and the storage conditions all have an impact on the bacteriological quality. Case studies illustrate how rural and urban water systems differ and what may be learned from epidemics of waterborne illness. Contaminated water's effects on health are examined, including short-term effects on susceptible groups and long-term effects on gastrointestinal ailments. (Malhotra, 2015)

Introduction

It is essential for human health and wellbeing to have access to clean, safe drinking water. There are several harmful bacteria that can be found in contaminated water, which increases the chance of developing serious illnesses like cholera, dysentery, and gastrointestinal infections. (KiranKumar, 2015)Waterborne infections are estimated by the World Health Organization (WHO) to be responsible for a significant portion of cases of morbidity and mortality globally, especially impacting vulnerable populations including the elderly and children.Respecting international and national regulatory agencies' rules and directives is essential to ensuring the purity of the water. (Sitotaw, 2021) Bacterial pathogens are among the contaminants for which these standards—established by agencies such as the Environmental Protection Agency (EPA) and the World Health Organization (WHO)—specify permissible

Innovation and Integrative Research Center Journal
ISSN: 2584-1491 | www.iircj.org
Volume-2 | Issue-6 | June-2024 | Page 85-90

limits. (Solomon, 2011) To meet these requirements and safeguard the public's health, drinking water must be regularly tested and monitored.

Scope of Bacteriological Analysis

The goal of a bacterial analysis of drinking water is to identify and measure any bacterial pollutants that could be harmful to human health. Salmonella, Escherichia coli, Vibrio cholerae, and other coliform bacteria are common sources of bacterial contamination. (Augustyn, 2016) These microorganisms act as markers for both possible hazardous pathogen presence and fecal contamination.To make sure that the water that is delivered to customers is free of dangerous germs is the main objective of bacteriological testing. (Ghimire, 2013) This entails doing regular testing and monitoring, quickly identifying instances of contamination, and putting remedial action into action as needed. (Bhuiyan, 2013) In order to increase precision and efficiency, bacteriological analysis methodologies have developed over time, combining both conventional culture-based procedures and cutting-edge molecular techniques.

Importance of Water Quality

Ecosystems, human populations, and economic activity all depend on the quality of the water. (Phyo, 2019) For drinking, farming, industry, and enjoyment, clean water is essential. Water contamination, however, poses a serious risk to these applications and can result in ecological degradation, health issues, and financial losses.

Scope of Bacteriological Analysis and Water Pollution

The goal of a bacterial analysis of drinking water is to identify and measure any bacterial pollutants that could be harmful to human health. Salmonella, Escherichia coli, and Vibrio cholerae are common bacteria that can signal fecal contamination and the possible presence of dangerous pathogens. (Sami, 1988)The term "water pollution" refers to a wider variety of contaminants that have an impact on the general quality of water bodies, such as chemicals, heavy metals, nutrients, and newly developing pollutants including microplastics and pharmaceuticals.The goal of this review paper is to present a thorough analysis of drinking water bacteriological analysis in the broader context of water contamination. (Dwivedi, 2017)

Human Health

Waterborne Diseases: Giardiasis, cholera, and other disorders caused by bacteria, viruses, and

Innovation and Integrative Research Center Journal
ISSN: 2584-1491 | www.iircj.org
Volume-2 | Issue-6 | June-2024 | Page 85-90

protozoa.Chemical exposure : Can include exposure to pesticides, heavy metals, endocrine disruptors that cause cancer, neurological diseases, and other disorders. (Cabral, 2010)

Public Awareness and Policy

Education and Outreach: Using media campaigns, school curriculum, and community activities, increasing public knowledge of the causes and effects of water contamination. (Nabeela, 2014)Policy initiatives: Include financial support for research and infrastructure upgrades, sanctions for noncompliance, and incentives for pollution control.

Sources and Types of Water Pollutants

Water contamination is mostly caused by point sources, such as municipal wastewater and industrial discharge. Diffuse pollution concerns are posed by non-point sources, such as urban stormwater and agricultural runoff. Novel pollutants such as microplastics and medications present fresh hazards that necessitate additional investigation and surveillance.

Water Quality Standards

Standards for several water categories have been established by various health organizations (Lester, 1969). The World Health Organization (1992), the Indian Council of Medical Research (ICMR) (1962), and the U.S. Public Health Service Drinking Water Standards (USPHS) (1962) are a few examples of these associations. (Amin, 2019) Because the quality of water directly affects human health, standards are crucial (Umar, 2000).

Emerging Waterborne Bacterial Pathogens

The developing pathogenic bacteria of concern listed below have the ability to spread through drinking water, they do not correlate with other widely used indicators of drinking water quality, including coliform bacteria, or the presence of E. coli. Most of the time, there are insufficient microbiological markers to confirm their existence. (Azizullah, 2011)To fully comprehend the magnitude and importance of the illnesses brought on by water tainted with these bacteria, as well as the ecology of these pathogens, more research is required.

1. Mycobacterium Avium Complex (Mac)

Mycobacterium avium and Mycobacterium intracellulare are the two separate species that make up the 28 serovars that make up the Mycobacterium avium complex (Mac). When widespread infection in immunocompromised individuals—particularly those with HIV and

Innovation and Integrative Research Center Journal
ISSN: 2584-1491 | www.iircj.org
Volume-2 | Issue-6 | June-2024 | Page 85-90

AIDS—was discovered, the significance of Mac organisms became apparent. MAC members are regarded as opportunistic human pathogens.

2. Helicobacter Pylori

Helicobacter pylori has been identified as a prominent gastritis etiologic agent and has been linked to the pathophysiology of gastric cancer, peptic ulcer disease, and duodenal ulcer disease. Nonetheless, the majority of those infected with this infection do not exhibit any symptoms. (Ashbolt, 2004)

3. Aeromonas Hydrophyla

A. hydrophila has been identified as an opportunistic pathogen in public health in the past several years. Wound infections, meningitis, septicemia, and gastroenteritis have all been linked to it as possible agents. (Pal, 2014)For young children, the elderly, and those with compromised immune systems, it can be particularly important when it comes to digestive diseases. (Morin-Crini, 2022)

Conclusion

Maintaining the sustainability of the ecosystem and public health depend on ensuring the safety and purity of drinking water in the face of larger problems with water pollution. This review has examined the complex problems of bacterial contamination in drinking water as well as a broader range of water pollutants, emphasizing important approaches, consequences, and mitigation techniques. (Fida, 2023)

Acknowledgement

I express my sincere gratitude to many people who have helped me and supported during project work. Without them I could have helped me and supported during project work. I am thankful to my guide , Dr. Sadhna Jaiswal for valuable guidance, encouragement and patience.I would like to thank Dr. Priya Sutaoney (Head of Department) and Dr.Priyambada Singh(Assistant Professor) who contributed directly or indirectly in shaping and achieving the desired outcome.I thank all my colleagues and friends for their cooperation while completing this project work . I want to thank my family members, without whose emotional and moral support nothing was possible.

References

1. Gunjan, S., Kumar, R., & Rajpal, K. (2022). BACTERIOLOGICAL ANALYSIS OF DRINKING WATER FROM AN AREA OF WESTERN PATNA. NeuroQuantology, 20(4), 1536.
2. Hannan, A. B. D. U. L., Shan, S. I. D. R. A., & Arshad, U. M. (2010). Bacteriological analysis of drinking water from 100 families of Lahore by membrane filtration technique and chromagar. Biomedica, 26(Jul.- Dec.), 152-156.
3. Malhotra, S., Sidhu, S. K., & Devi, P. (2015). Assessment of bacteriological quality of drinking water from various sources in Amritsar district of northern India. The Journal of Infection in Developing Countries, 9(08), 844-848.
4. KIRANKUMAR, Y., UPADHYAYA, G., & BHATIA, V. (2019). Bacteriological Analysis of Water Samples from Different Points in a Tertiary Care Hospital. Journal of Clinical & Diagnostic Research, 13(11).
5. Sitotaw, B., & Geremew, M. (2021). Bacteriological and physicochemical quality of drinking water in Adis Kidame town, Northwest Ethiopia. International Journal of Microbiology, 2021.
6. Solomon, A., Ahmed, Z., Biruktawit, K., Amare, D., Solomon, A., & Endalew, Z. (2011). Bacteriological analysis of drinking water sources. African Journal of Microbiology Research, 5(18), 2638-2641.
7. Augustyn, Ł., Babula, A. M., Joniec, J., Stanek-Tarkowska, J., Hajduk, E., & Kaniuczak, J. (2016). Microbiological indicators of the quality of river water, used for drinking water supply. Polish Journal of Environmental Studies, 25(2), 511-519.
8. Ghimire, G., Adhikari, B., & Pradhan, M. (2013). Bacteriological analysis of water of Kathmandu Valley. Medical Journal of Shree Birendra Hospital, 12(2), 19-22.
9. Phyo, S. S. M., Yu, S. S., & Saing, K. M. (2019). Bacteriological examination of bottled drinking water by MPN method. Haya: The Saudi Journal of Life Sciences, 4(7), 227-232.
10. Sami, Z., Khan, M. A., & Ghafoor, A. (1988). Bacteriological analysis of drinking water. Journal of the Pakistan Medical Association, 38(4), 92-96.
11. Dwivedi, A. K. (2017). Researches in water pollution: A review. International Research Journal of Natural and Applied Sciences, 4(1), 118-142.
12. WHO (World Health Organization). Guidelines for Drinking-water Quality, Incorporating 1st and 2nd Addenda, Volume 1, Recommendations, 3rd ed; WHO:

ISSN: 2584-1491 | www.iircj.org
Volume-2 | Issue-6 | June-2024 | Page 85-90

Geneva, Switzerland, 2008.

13. Cabral, J. P. (2010). Water microbiology. Bacterial pathogens and water. International journal of environmental research and public health, 7(10), 3657-3703.
14. Nabeela, F., Azizullah, A., Bibi, R., Uzma, S., Murad, W., Shakir, S. K., ... & Häder, D. P. (2014). Microbial contamination of drinking water in Pakistan—a review. Environmental Science and Pollution Research, 21, 13929-13942.
15. Amin, R., Zaidi, M. B., Bashir, S., Khanani, R., Nawaz, R., Ali, S., & Khan, S. (2019). Microbial contamination levels in the drinking water and associated health risks in Karachi, Pakistan. Journal of Water, Sanitation and Hygiene for Development, 9(2), 319-328.
16. Azizullah, A., Khattak, M. N. K., Richter, P., & Häder, D. P. (2011). Water pollution in Pakistan and its impact on public health—a review. Environment international, 37(2), 479-497.
17. Fida, M., Li, P., Wang, Y., Alam, S. K., & Nsabimana, A. (2023). Water contamination and human health risks in Pakistan: a review. Exposure and Health, 15(3), 619-639.
18. Pal, P. (2014). Detection of coliforms in drinking water and its effect on human health-A review. International Letters of Natural Sciences, 12(2).
19. Ashbolt, N. J. (2004). Microbial contamination of drinking water and disease outcomes in developing regions. Toxicology, 198(1-3), 229-238.
20. Bhuiyan, A. B., Mokhtar, M. B., Toriman, M. E., Gasim, M. B., Ta, G. C., Elfithri, R., & Razman, M. R. (2013). The environmental risk and water pollution: A review from the river basins around the world. American-Eurasian Journal of Sustainable Agriculture, 7(2), 126-136.
21. Morin-Crini, N., Lichtfouse, E., Liu, G., Balaram, V., Ribeiro, A. R. L., Lu, Z., ... & Crini, G. (2022). Worldwide cases of water pollution by emerging contaminants: a review. Environmental Chemistry Letters, 20(4), 2311-2338