Short Communication

Microbiological analysis of surface water in Indore, India

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Abstract

Water borne bacterial pathogens were isolated from surface waters in Indore, India. The bacterial pathogenic organisms can cause intestinal infections, dysentery, typhoid fever, cholera, and other illnesses. The paper discusses results of bacteriological analysis done on various water samples taken from different sources in Indore. The water samples collected from different regions of Indore were found to have significant impurities, considerable deterioration and remarkable variation. In the bacteriological analysis, colliform group of bacteria are differentiated by the presumptive test, confirmed test and completed test. After performing these tests Gram negative, were non spore forming and rod shaped bacteria having metallic shine or pink with dark centerd colonies on EMB agar indicated positive results. The isolates were characterized and identified as E.coli, Enterobacter, Klebsilla, salmonella and Shigella. The study therefore, stresses on the need to control the fecal pollution of water bodies.

Keywords: E.coli, enterobacter, salmonella and shigella, presumptive test, eosin methylene blue (EMB) agar.

Introduction

Water is one of the most essential needs for the continued existence of all living organisms on earth. The day-to-day activities of all living organisms require water in some form. It is effectively and efficiently put into use by plants, animals, microorganisms and man. In the microbial world, no single microorganism has been discovered to be active at the extreme lack of water for the singular reason that man cannot exist without water, it is of paramount importance to monitor domestic water supply[1].

Water plays an essential role in human life. Although statistics vary, as the World Health Organization (WHO) reports that approximately 36% of urban and 65% of rural Indian's were without access to safe drinking water[2]. Normally water is mainly used for domestic purposes especially for drinking. All living organisms require a wide variety of inorganic compounds for growth, repair, maintenance and reproduction[3]. Water is one of the most important, as well as one of the most abundant of those compounds and it is particularly, vital to living organisms[4].

In addition, water has been traced to be one of the ways by, which humans could be infected with various kinds of diseases. Some water borne diseases include typhoid fever, cholera, & bacillary dysentery. In waterborne infections, pathogens are usually spread by water contamination with untreated or poorly treated sewage[5].

In many developing countries, availability of water has become a critical and urgent problem and it is a matter of great concern to families and communities depending on non-public water supply system[6]. Increase in human population exerts an enormous pressure on the provision of safe drinking water especially in developing countries[7].

Water in nature is seldom totally pure. Rainfall is contaminated as it falls to earth, the combustion of fossil fuel put sulphur compound responsible for acid precipitation in the air. Water that moves below the ground's surface undergoes filtration that removes most organisms[8]. For this reason, water from springs and deep wells are generally of good quality.

The most dangerous form of water pollution occurs when fecal contaminant like Escherichia coli enter the water supply. Contaminants ingested into water supply cause many diseases. Examples of such pathogens are Salmonella spp, Shigella spp, Vibrio cholerae and E. coli[4].

The bacteriological quality of drinking water is of paramount importance and monitoring must be given highest priority[9]. This is so because studies have attributed several disease outbreaks to untreated or poorly treated water containing bacterial pathogens that have been isolated from surface water in around Indore.

Material and Methods

Collection of samples: Sampling was according to the procedure recommended by American Public Health Association[10]. Water samples were collected for Bacteriological analysis. Samples were collected in sterile container, which is immediately covered tightly after collection of water samples and transported to the laboratory.

Around Indore two lakes are present as sources of water supply in the city, Billawalli Pond (B) and Sirpur Talab(S). Two sampling sites (BR, BF and SR, SF) of each sampling station were selected. Samples were collected as raw water (Before Treatment) and after filtration and chlorination from all the sources. R- Raw water; F- Filtered water

Bacteriological analysis: The most probable number (MPN) technique was used to determine the fecal coliform counts of the water samples[10]. This involved the presumptive test using lactose broth and Nutrient agar, confirmatory test using lactose broth and completed test using eosin methylene blue (EMB) agar. Pure colonies of the isolates were subjected to motility-indole-urease test, methyl red-voges-proskauer (MRVP) test and citrate utilization agar tests. Enteric bacteria isolates were confirmed from the biochemical tests (IMViC test).

Results and Discussion

Gram negative enteric bacteria were isolated from all water samples. Rate of growth of isolates decreased as the temperature was increased. The temperatures were taken for studies as 40, 50, 60 and 70°C. The tube and plates were incubated at 44.5°C for 24 to 48 hrs. Gas and turbidity in the tubes were shown the metallic sheen or pink color of colonies with dark centre on EMB agar found positive. All isolates that produced gas at 44.5°C, were found Gram negative, non spore forming and rod-shaped belonging to fecal coliform group. The counts calculated according to standard probability table[9]. All water samples using the tryptone broth enrichment (TBe) and high temperature (37°C) incubation methods, followed by plating for isolation on EMB agar.

The isolates were initially differentiated on the basics of the cultural and morphological studies after which they were subjected to IMViC biochemical test (table 1 and 2). All the water samples were contaminated with E.coli, Enterobacter, Klebsilla, salmonella and Shigella. These bacteria cause water borne diseases like intestinal infections, dysentery, typhoid fever, cholera, and other illnesses[9]. Treatment of water by Municipal Corporation should be such that impurities as well as removal of pathogenic organisms done completely or minimize to such extent that it is should not be hazer done to humans and animals.

Biochemical results shown by the tables that in the samples of Billawali Pond (B) and Sirpur Talab (S) were not present in raw water samples but they found in filtrated water samples which high lights the contamination of water during the supply system. It shows mixing of sewage water into drinking water and concludes that the supply system of water in Indore city is not perfect and should be monitored time to time for reducing disease epidemics and other health hazards.

Conclusion

This study concluded that water quality distributed at Indore need more effort in limiting the numbers of microbial organisms released into distribution systems. The use of contaminated water can in drinking expose human body to various water borne diseases hence water treatment and improving quality of water before drinking is required. It is recommended that effective management and maintenance are required in order to minimize acute problem of water related diseases, which are endemic to the health of man. This research also demonstrated the importance of education for the consumers who use individual supplies for their drinking water. Much needs to be done to increase awareness of the hazard of drinking contaminated water and of ways to prevent contamination.

Acknowledgment

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