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Investigation of Coliform And *E. Coli* Bacteria And Nitrite And Nitrate Levels İn Drinking Waters of Van And Some Provinces

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Abstract: *In this study, coliform, Escherichia coli bacteria, nitrate and nitrite levels were investigated in drinking water of Van province and some districts. The study was conducted to ensure that the values were in line with drinking water standards. For this purpose, water samples were collected from 90 different drinking water network points from 9 different settlements. Membrane filtration technique was used to search for coliform bacteria and E. Coli. Spectrophotometric method was used to determine nitrate and nitrite levels. In drinking water samples collected from different sources, coliform and E. Coli bacteria were found frequently, while nitrite and nitrate were found in some samples.*
As a result; it was concluded that the presence of nitrite and nitrate as well as coliform and E. Coli in some regions of drinking water samples could constitute a potential health hazard in terms of public health.
Key Words: *Drinking water, Coliform, E. Coli, Nitrate, Nitrite.*

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I. Introduction

The delivery of healthy and reliable drinking water to the consumer is of utmost importance for community health. Microbiological pollution in drinking waters is one of the main causes of epidemic diseases. According to the World Health Organization (WHO), about 80% of the diseases that occur in developing countries are caused by drinking water. With non-hygienic water sources, many diseases (such as Salmonella typhimurium, Escherichia coli, Aeromonas hydrophyla, Shigella spp.) can infect people and cause important health problems. Coliform bacteria are the indicators to detect fecal contamination. Escherichia coli causes water and food-borne enteritis in children and elderly [1, 2].

In food microbiology, the most studied group of microorganisms is *E. Coli* and Salmonella spp., which are members of the Enterobactericeae family. Especially the most active live *E. Coli* bacteria is the main reason why many bacteria are searched for as a sign of fecal contamination due to the fact that the developmental stages of this bacterium are known and proliferate rapidly [3]. Coliform group bacteria are aerobic and facultative anaerobic, Gram (-), catalase (+), oxidase (-), non-spore bacteria. They are rod-shaped bacteria that ferment lactose in 48 hours at 35 ° C with this way form acid and gas. *E. Coli*; It is found in intestinal flora as well as in soil, water and plants. *E. Coli*; can be found in blood, cerebrospinal fluid, respiratory system, urinary system, soft tissues and immunosuppressed people [3].

Nitrate and nitrite can be formed, result of decomposition of animal-derived organic materials. Recently, as a result of the developments in the industry, the amount of these substances has increased considerably. Nitrogen containing industrial wastes, degradable organic materials, fertilizers are the most important sources for nitrate and nitrite. The excess nitrate is absorbed into the blood together with nitrite and ammonia. Nitrite convert oxyhemoglobin into meta-chemoglobin, which is in blood. Methemoglobin does not carry oxygen, and nitrite poisoning occurs in this vein. The nitrite nitrate is then oxidized and eliminated in the urine [2].

Turkey is rich in natural water sources. However, water pollution showed an increase in recent years in Turkey as well as all over the world remains a significant problem to date. In studies conducted in order to determine the quality of drinking water sources in Turkey [4-6], many of the samples were found to be in accordance with standard microbiological aspects [7].

In this study, coliform and *E. Coli*, nitrite and nitrite were investigated in drinking water used in Van province and some districts. The presence of E. *Coli* bacteria, a marker of coliform and fecal contamination, which posed a threat to public health, was investigated. At the same time, the rate of nitrate and nitrite was determined and it was examined whether the waters are a risk for public healthor not.

II. Methodology

In some districts of Van province, which located in easternTurkey, (Başkale, Bahçesaray, Çaldıran, Çatak, Edremit, Ercis, Gevaş, Gurpinar, İpekyolu, Muradiye, Özalp and Tusba) a total of 111 samples taken from drinking water sources, work was used as the material (Table 1). The water samples were collected during June 2016 and August 2016 and brought to the laboratory in the cold chain for analysis on the same day. The samples were stored at + 4 °C until analysis results.

From the water samples brought to the laboratory were filtered through cellulose nitrate filters with a pore size of 0.45 µm by vacuum in 100 ml membrane filtration apparatus (Sartorius, Göttingen, Germany). Membrane filters were then placed in sterile pens (Sartorius, Geottingen, Germany) with endo medium impregnated sterile pads so that no air was left. Colony counts were then performed by incubating for 48 hours at 36 ° C. Metallic (gold) shining colonies were evaluated as coliform. Lactose fermentation was carried out in lauryl tyrtriptose broth with inverted Durham tubes in the columns for 48 hours at 35 °C. The gassing tubes were incubated for 48 hours at 48.5oC with 48 hours of plating in the Brilliant Green Bile (Oxoid CM 0031) and in EC broth. The gas builders were incubated in alkaline peptone water at 44.5 °C for 24 hours, and the tube giving the pink color by dropping the covacic dispersant was evaluated as *E. Coli* [8]. In addition, the gas composers were placed in the EC-MUG feeder and incubated at 44.5 °C for 24 hours. The long-wave UV (366 nm) light was examined in the dark room and the blue fluorescent tube was evaluated as *E. Coli* [9, 10]. In the samples nitrate and nitrite levels were determined by spectrophotometric method [11].

III. Results

The water samples examined were analyzed for coliform and *E. Coli* bacteria, nitrite and nitrate values and the results are shown in Table 1. A total of 111 water samples collected, in 76 colonies of coliform bacteria, 46 colonies of *E. Coli* bacteria were detected. It was determined that the ratio of nitrite in 2 water samples and nitrate in 4 water samples were above the standards.

Table 1: Research results of coliform and *E. coli* contents of drinking water networks of some district of Van province

District that sample taken from	n	Nitrite	Nitrate	n (k)	n (e)	n (k-e)
başkale	10	Std.	1	10	7	7
bahçesaray	15	Std.	Std.	10	0	0
çaldıran	3	Std.	Std.	1	1	1
Çatak	3	Std.	1	1	0	0
edremit	5	Std.	Std.	4	3	3
erciş	10	1	Std.	1	0	0
gevaş	6	Std.	Std.	6	5	5
gürpınar	4	Std.	Std.	3	3	3
ipekyolu	20	Std.	1	18	10	10
muradiye	11	Std.	Std.	8	7	7
özalp	16	1	Std.	14	10	10
Tuşba	8	Std.	1	0	0	0

n: The number of samples studied, **n (k):** number of samples with coliform contamination, **n (e):** Number of specimens with *E. Coli* contamination, **n (k-e):** number of samples containing both coliform and *E. Coli*, **Std**: standarded.

IV. Discussion And Conclusion

In many countries physical, chemical and microbiological quality criteria for drinking and using water have been determined. Quality criteria related to waters are specified in Regulation on Natural Resources, Mineral and Drinking Water and Medical Waters Prepared by the Ministry of Health in our country and Turkish Standards Institute TS 266 Drinking and Consumption Waters Standard [7]. Microbiological parameters are very important in water resources in terms of public health. Because water resources play an important role in the transmission of enteric diseases. For this reason, the quality of the waters used should be checked frequently from the bacteriologic side. In routine controls, coliform group microorganisms, enterococci, *E. Coli* and sulphite-reducing anaerobes are sought as indicator microorganisms in faecal contamination, since it is impractical to look at the entire pathogens causing the epidemic diseases [2].

As can be seen in Table 1, it is shown that the contamination level is very high, especially if all the samples taken from the baskets of Başkale and Gevaş are contaminated and most of these samples contain both coliform and *E. Coli* bacteria.

This suggests fecal contamination in the mains water. The Turkish Standard states that coliform should not be present in drinking water at 100 ml. Most of the water samples examined do not meet the drinking and

drinking water standard. This confirms the results in some previous studies showing that the microbiological quality of the waters is poor.

For example, Alişarlı et al. (2007) have shown that water samples taken at different points in the survey conducted in Van provinces and Provinces are mostly contaminants. Ekici et al. (2010) found that 18.5% of the water samples were coliform and 10% were *E. Coli* in the study conducted in Van and its districts. In another study done, *E. Coli* bacteria were identified in 30% of the samples taken from the drinking waters of Kars province and Sarıkamış district [12].

In addition to being an indispensable element in human life, water is of great importance for the epidemic diseases caused by the many pathogenic factors that can result in contamination at different stages. Coliform and *E. Coli* agents cause contaminating diseases. For this reason, many countries are giving importance to research on the presence of these bacteria in water resources.

Studies on the health effects of nitrates and nitrites have shown the cause of Methemoglobinemia as an acute side effect and a number of limit values have been determined by international health organizations in order to prevent this effect; According to a report published by the US Environmental Protection Agency (EPA) in 2003, the limit value for nitrates in water is 10 mg / L and according to the World Health Organization (WHO) report published in 2004, it is 50 mg / L.

The most important part of the studies in terms of chronic side effects is concentrated on cancer, in which the effect of nitrate-nitrite ingestion on gastric cancer formation in the diet is investigated. Studies have shown that nitrate is not carcinogenic, whereas nitrite is only the result of carcinogenic at very high doses [13].

Studies have shown that nitrate in drinking water can increase the risk of colorectal cancer due to endogenous conversion to carcinogenic N - nitroso compounds. Increase in risk of colon and rectum cancer (CRC) has been noted as a result of the long-term use of nitrate in drinking water above saturations [14-16].

Turkey at different points made drinking water analysis of nitrite and nitrate were not detected [11], water samples containing Tekirdağ and Van nitrite and nitrate observations made in the province were identified [11, 17].

In this study, while nitrite and nitrate are not found in many samples of drinking water from many different points in the district of Van province, nitrite or nitrate from samples taken from Başkale, Çatak, Erciş, İpekyolu, Özalp and Tuşba districts show the importance of periodic water analyzes in these points.

Detailed and in-depth studies of the presence of coliform and *E. Coli* bacteria with nitrite and nitrate detected at several points in the analyzes performed should be performed. The relation of the water network and the fountains not connected to the network must be examined and examined for water samples, coliforms and pollution to be taken from various points.

As a result, it is necessary to prevent the potential public health risk that may arise from the consumed water before without proper purify in our country. For this purpose, it is very important to obtain drinking water in hygienic and technical conditions. Detailed, applicable standards should be introduced in water consumption and the use of trained personnel, instrument equipment and reliable rapid analysis methods should be made important in order to ensure compliance. In addition, the presence of coliform and *E. Coli* as well as nitrite and nitrate in drinking water samples were found to be a potential health hazard in terms of public health.

Disclosure

No author has any potential conflict of interest.

Resources

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