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MICROBIOLOGIC EXAMINATIONS OF SOME NATURAL WATER SOURCES

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SYNOPSIS

The microorganisms of natural waters are extremely diverse. The numbers and types of bacteria present will depend on the amounts of organic matter present, the presence of toxic substances, its saline content, and environmental factors such as pH, temperature, and aeration. Open water in the center of large bodies of water, free of floating debris, will have small numbers of bacteria. Many species of atrophic types are present, however, that require only the dissolved inorganic salts and minerals that are present. The threat to human welfare by contamination of water supplies with sewage is a prime concern of everyone. The enteric diseases often result in epidemics when water supplies are not properly protected or treated.

Our bacteriological qualitative tests of water are based on the identification of sewage indicators such as *Escherichia coli* and *Streptococcus faecalis*. We have taken 20 samples from 4 natural water sources. This water uses for drinking or for bottle water. Using proper media and procedures we have detected the presence of microorganisms – index of sewage- on the 20% of these samples. From these samples, the microflora was up the reference value in 40% of the cases and the presence of total coli forms up the reference value was in 35%. We have detected and *Pseudomonas aeruginosa* in 2,5 % of the values. From this study the pollution indicators are in the high values.

INTRODUCTION

The water is one of the most important products in the people life. The water is important for people in order to release their activities and especially for drinking. Safe fresh water access is the most important problem in the protection of public health (12,13). The control of quality of drinking water in Albania is carried out by Ministry of Public Health and the different laboratories. For the evaluation of safe water, apart of improvements of information regarding to drinking water quality of IHP, it is necessary to add new elements of environmental health indicators, according to World Health Organization's recommendations and methodology.

Microorganisms are found everywhere in our environment. They are common in the air, soil, water and in the habitats of our daily lives. A number of bacteria occur naturally in freshwater source. Some are found living in water and sediments as photosynthetic autotrophy or a saprophytes living on dead matter. Other exist in or on other organisms as mutual symbioses (providing some benefit to the host organisms in exchange for a place to live), commensuals (neither helping nor harming the host), or parasites (utilizing the host in a way that causes harm).

The information gathered, must be enriched with such elements as are: the quantity of water used by the population (hygiene, domestic, etc.), the number of population who live around the source, etc. Using this data we may evaluate the environmental health indicators which will facilitate the evaluation of safe water access.

EXPERIMENTAL

All bacteriological qualitative testing of water is based on the identification of sewage indicators such as *Escherichia coli* and *Streptococcus faecalis*. The series of tests can used to demonstrate the presence of coli form sewage indicators in water supplies. A coliform is a facultative anaerobe that ferments lactose to produce gas and is a gram-negative, non-spore-forming rod. *Escherichia coli* and *Enterobacter aerogenes* fit this description. Note that three different tests are involved: presumptive, confirmed and completed. Each test exploits one or more of the characteristics of a coliform.

This study is performed from May to September, 2006. We have analyzed 20 samples from 4 natural water sources around Tirana district. Two of these natural water sources are used for bottle water.

We have identificated by the tests the bacterial indicators such as: *Total coliform* (TC), *Fecal streptococcus* (FS), *and Fecal coliform* (FC) and *Clostridium perfringens* microorganism (4,13).

Total coliform test: The coli form group includes a number of genera and species of bacteria which have common biochemical and morphological attributes that include gram-negative, non-spore forming rods that ferment lactose in 24 to 48 hours at 35^{o}C.

These attributes are found in *E. coli* which is the coli form of most sanitary significance as it is very common in the feces of warm blooded animals.

Fecal coli-form test: A subset of the coli form group of bacteria that are able to grow at 44.5^{o}C (thermo-tolerant coli-forms). Monitoring methods that employ elevated temperature incubation give a more specific estimate of the presence the number of *E. coli* and thus the presence of fecal contamination.

Fecal streptococci test: The feces of humans and animals contain large number of streptococcal bacteria that can be classified as belonging to the fecal streptococci group.

In addition to determining the presence or absence of coli-forms, we also have used the series of lactose broth tubes to determine the most probable number (MPN) to coli-forms present in 100 ml of water

Table 1: The tests for bacterial indicators

No.	Bacterial Indicators	Tests	Norms
1	*Total coliform* (TC)	MF	0/250 ml
2	*Fecal streptococcus* (FS)	MF	0/250 ml
3	*Fecal coliform* (FC)	MF	0/250 ml
4	*Cl. perfingens (Cl.P)*	MPN	0/100 ml
5	*Pseudomonas aeruginosa (P.A)*	MPN	0/100 ml

MF – Membrane filter

RESULTS AND DISCUSSION

The data from the four natural water sources are:

Table 2: The samples with bacterial indicators

No.	No. of samples	Micro-flora	TC	*E.coli*	*S. Fecal*	*P. aurigenosa*	*Cl. perfringens*
1	20	12	11	5	3	2	2
2	20	8	6	3	2	0	1
3	20	7	6	2	0	0	1
4	20	5	5	1	0	0	0

Chart 1: The percentage of bacterial indicators

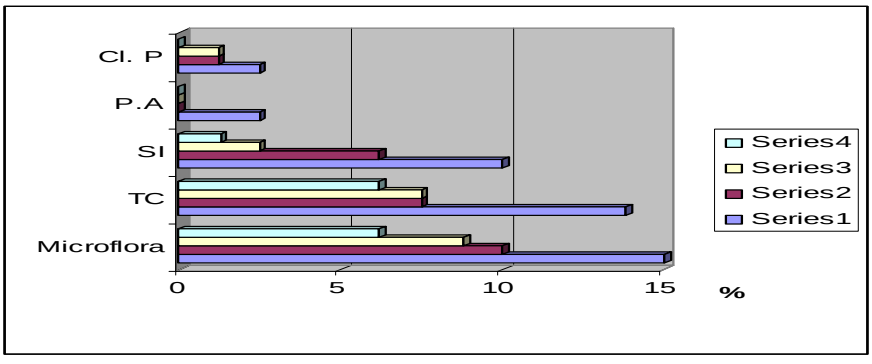
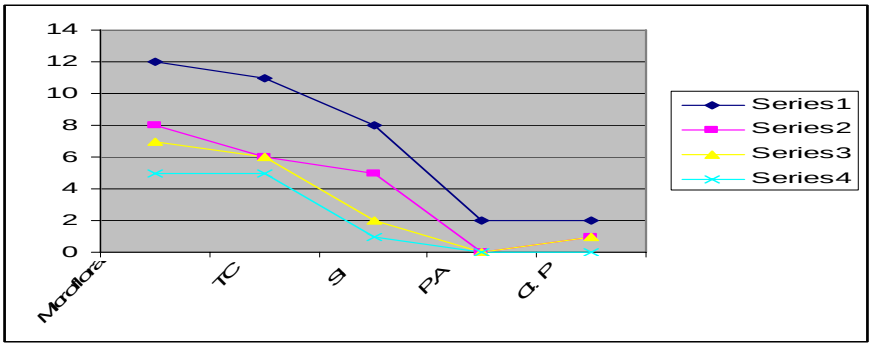


Chart 2: The cases with the bacterial indicators



The bacterial indicators such as: *Total coliform* (TC), *Fecal streptococcus* (FS), *and Fecal coliform* (FC) and *Clostridium perfringens* and *Pseudomonas aeruginosa* microorganisms are the potential risks of the different gastro-enteritis diseases. From the 80 samples which are analyzed by us in the 4 locations, 20% of them are up to reference value. We stress that two from these sources are used for bottle water and so the risk is so high. It's necessary to put the filters and to improve the sanitary conditions and to apply the auto-controls system through HACCP (Hazard Critical Control Point) as recommendations of World Health Organization and the standards of European Unit.

From our samples 40% of them had the general microflora up to the reference value and 35% of them were with *Total coliform* up to the allow norms. The fecal indicators are higher than the reference value. It's important to evaluate the indicators of sewage such as *E. coli* and *Str. fecal*, which in our study are in high value, 20%. Coli form bacteria are organisms that are present in environment and in the faces of the warm-blooded animals and humans. Coli form bacteria will not likely cause illness. However, their presence in drinking water indicates that disease-causing organisms (pathogens) could be in the water system. Most pathogens that can contaminate water sources and water supplies come from the feces of humans or animals.

After the microbiological examinations we can say that the indexes of sewage are up to the reference value, the level relatively high for the drinking water. A number of bacteria can enter water via either point or nonpoint sources of contamination (5,7,17). Some of them such as *Clostridium perfringens* is found living in water and sediments *Pseudomonas aeruginosa* is in the 2,5 % of the values and *Clostridium perfringens* are in the 5%. The bacterial index and the microorganisms are used to tell time after time that the water didn't fulfill the hygienic recommendation conditions.

Microbiological diseases are still transmitted in certain areas, in particular via drinking water and on recreational exposure to surface water. Apart from anthropogenic contamination of water, natural conditions may also make unsuitable for different uses without extensive and costly treatment.

Natural water sources are using for the furniture with drinking water of the population in Albania. So, it's necessary to evaluate the environmental health indicators which will facilitate the evaluation of safe water access and to evaluate and

other indicators such as: enterococci, enteric viruses, coliphage, total culturable bacteria etc.

For the evaluation of safe water, apart of improvements of information regarding to drinking water quality of IHP, it is necessary to add new elements of environmental health indicators, according to World Health Organization's recommendations and methodology. It would be better to combine the microbiological examination with physic-chemical examinations.

CONCLUSION

For the evaluation of safe water, apart of improvements of information regarding to drinking water quality of IHP, it is necessary to add new elements of environmental health indicators, according to World Health Organization's recommendations and methodology.

Our bacteriological qualitative tests of water are based on the identification of sewage indicators such as *Escherichia coli* and *Streptococcus faecalis*. Using proper media and procedures we have detected the presence of microorganisms – index of sewage- on the 20% of these samples. From these samples, the microflora was up the reference value in 40% of the cases and the presence of total coli forms up the reference value was in 35%. We have detected and *Pseudomonas aeruginosa* in 2,5 % of the values and *Clostridium perfringens* are in the 5%.

REFERENCES

A. SCHEIDLEDER, J. GRATH, G.WINKLER, U. STARK, C. KOREIMANN, G. GMEINER: Groundwater Quality and Quantity in Europe. European Environment Agency, Copenhagen, 1999.

APFA – Examination of Water and Waste Water, 1994.

AOAC International – FAO Bacteriological Analytical Manual, Gaithersburg – USA, 1995.

BALOW A., J. HAUSLER, K..L. HERRMANN, H.D.ISENBERG, H.J. SHADOMY: Manual of Clinical Microbiology, 5th ed. American Soc. Microbiology, Washington, D.C., 1991 Guidelines for drinking water quality

BISSON, J., V CABELLI: Environmental Microbiology, Membrane Filtration Enumeration Method for C. perfringens, 37: 55-66

BORDNER, R., J.A. WINTER, P.V. SCARPINO: Microbiological Methods for Monitoring the Environment, Water and Wastes. EPA-600/8-78-017, Environmental Monitoring and Support Lab., Environmental Protection Agency, Ohio, 1978

CABELLI, KENNEDY, LEVIN: Water Pollution Federation, P. aeruginosa and Fresh Recreational Waters, 1976, 48: 367

CHAMBERLAIN C., R. MITCHELL: Water Pollution Microbiology, A Decay Model for Enteric Bacteria in Natural Water. John Wiley & Sons, Inc, New York,1978

DAHLING D., B. WRIGHT: Processing and Transport of Environmental Virus Samples. Apply Environmental Microbiology, 1984. 47: 1272

DAVIES C., J. LONG, M. DONALD, N. ASHBOLT: Survival of Fecal Microorganisms in Freshwater Sediments. Apply Environmental Microbiology, 1995, 61: 1888-1896

EPA – Implementation Guidance for Ambient Water Quality Criteria For Bacteria, 1986

F. EUGENE, Mc JUNKIN: Water and Human Health: 1983

H. J. BENSON: Microbiological Applications, Microbiological of Water, Fifth Edition, 1990, 11:210-220

HOATHER R.: The Bacteriological Examination of Water. J. Inst. Water Eng., 1961, 61: 426

J.T. LISLE, J.J. SMITH, D.D. EDWARDS: Applied and Environmental Microbiology, Occurrence of Microbiological Indicators and C. perfringens in Wastewater, Water Column Samples, Sediments, Drinking Water Sources etc, 70 (12), 2004

L.S. CLESCERI, A.D. EATON: Standard Methods for the Examination of Water, 18th edition, 1992

McFETER, BARRY, HOWINGTON: Water Res., Distribution of Enteric Bacteria Surrounding a sewage outfall, 1993, 27: 645-650

W. KRINNER, C.LALLANA, T. ESTRELA: Sustainable Water Use in Europe. European Environmental Agency, Copenhagen, 1999.

WHO: Guidelines for Drinking Water Quality, Health Criteria and Other Support Information, Microbiological aspects, First Edition, Vol. II, 1984.

WHO: Guidelines for Drinking Water Quality, Second Edition, Vol.1, 1993.