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STUDY OF MICROBIOLOGICAL QUALITY OF DRINKING WATER USED IN MILK INDUSTRY

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Abstract

The protection of public health is of paramount importance. Access to safe water and adequate water is recognised as one of the most fundamental of human needs. The development of sustainable capacities to meet these needs in developing countries is one of the key challenges for the water sector as a whole.

Maintaining a high standard of hygiene is one of today's most important milk production objectives. The hygiene level directly influences the production's economical result and dairies are enforcing this by steadily raising their quality requirements for raw milk. More importantly though, consumers are concerned about the safety of dairy products and the conditions under which these are produced. It is therefore critically important to ensure high quality raw milk can be produced from healthy animals under good hygienic conditions and that control measures are applied to protect human health

The goal of the paper is increasing food safety through the improvement of the drinking water quality used in processing and distribution of food products. Provide water that is safe and adequate from the perspectives of technological requirements in every stage of food processing/distribution.

The results of microbiologycal analysis suggest a faecal contamination of water derived from hall of cheese processing tap, packing hall tap and laboratory tap.

Key words: water, quality, hygiene, microorganism.

INTRODUCTION

The provision of safe drinking water is one of the most important steps that can be taken to improve the health of a community by preventing the spread of water-borne disease. The maintenance of a sufficient supply of wholesome drinking water is a complex undertaking in which individuals from many disciplines have a role.

Contamination is often intermittent and may not be revealed by the examination of a single sample. Information gained over time through monitoring will provide a comprehensive picture of the range of quality of any particular source of water, any deterioration from which should at once arouse suspicion. A microbiological report based on a single sample can only indicate that, at the time of examination, certain bacteria (either indicative of faecal contamination or general water quality) did or did not grow under laboratory conditions from the sample of water submitted.

The use of indicator organisms, in particular the coliform group, as a means of assessing the potential presence of water-borne pathogens has been paramount to protecting public health.

The use of indicator bacteria, in particular *Escherichia coli* (*E. coli*) and the coliform bacteria, as a means of assessing the potential presence of water-borne pathogens has been paramount to protecting public health. The analysis of large volumes of sample for faecal indicator bacteria using membrane filtration procedures can be very useful in assessing water treatment efficiency at various points in the treatment process.

Many pathogens are present only under specific conditions and, when present, occur in low numbers compared with other micro-organisms. Whilst the presence of coliform bacteria does not always indicate a public health threat, their detection is a useful indication that treatment operations should be investigated.

For water quality monitoring and assessment, reliance has been placed on relatively simple and more rapid tests for the detection of faecal indicator bacteria and other coliform bacteria.

The bacteriological examination of water is particularly important as it remains the most sensitive method for detecting faecal and, therefore, potentially dangerous contamination. Other bacteria, which possess some of the properties of indicator organisms, include the enterococci and spores of sulphite-reducing clostridia, typified by *Clostridium perfringens*. Enterococci do not multiply in the environment and can occur normally in faeces.

Numbers of enterococci in humans are greatly outnumbered by *E. coli* bacteria. When coliform bacteria are present in the absence of *E. coli*, but in the presence of enterococci, this can be indicative of the faecal origin of the coliform bacteria.

Clostridium perfringens are present in faeces in much smaller numbers than *E. coli* or enterococci. Spores of *Clostridium perfringens* are capable of surviving for significantly longer periods than vegetative bacteria, such as coliform bacteria or enterococci. These spores are also more resistant to chlorination. At present, there is conflicting evidence regarding the correlation of the presence of spores or vegetative cells of *Clostridium perfringens* with that of pathogens.

Tests for colony count bacteria growing at 37 °C and 22 °C enable a count to be determined of the heterotrophic bacterial population of the water.

It has been suggested that testing for enterococci can be a useful additional indicator of water treatment efficiency. As these bacteria are resistant to drying, they can be of value for routine assessment after new mains have been laid or when repairs in distribution systems have been carried out, or for assessing pollution by surface run-off to ground or surface waters.

MATERIAL AND METHODS

The water samples were collected from a milk processing factory placed in Bihor County.

Microbiologycal analysis of water was accomplished corresponding with the methodology approved by the Laboratory of Microbiology within the framework of Public Health Department of Bihor county.

Table 1

Standard normative utilised for the microbiologycal analysis of drinking water

Nr. crt.	Romanian Indicative Standard	Title	Method
1	SR EN ISO 6222:2004	Water quality. Total number of microorganisms.	Water quality - Enumeration of culturable micro-organisms - Colony count by inoculation in a nutrient agar culture medium and incubation at 22-36^{0}C.
2	SR EN ISO 9308-1:2004	Water quality - Detection and enumeration of Escherichia coli and coliform bacteria - Part 1: Membrane filtration method	Membrane filtration method CMN Endo, incubation at 37^{0}C, 24 h.
3	SR EN ISO 7899-2:2002	Water quality - Detection and enumeration of intestinal enterococci - Part 2: Membrane filtration method	Membrane filtration method, CMN Azid, incubation 24-48 h, at 37^{0}C.
4	SR EN ISO 12780:2003	Water quality. Detection and enumeration of *Pseudomonas aeruginosa*.	Membrane filtration method, CMN Cetrimid, incubation 48 h, at 37^{0}C
5	SR EN ISO 6461-2/A-99:2002	Water quality. Detection and enumeration of sulphite-reducing clostridia and *Clostridium prefringens*	Membrane filtration method, CMN agar with sulfit, 48 h, at 37^{0}C

RESULTS AND DISCUSSION

Table 2

The results of microbiologycal analysys of drinking water

Nr. crt.	Microbiologycal determination Days of determination	Results of analysis					Normal values
		Unchlorinated water 12.03.09 I	Cold water Hall of cheese processing tap 26.06. 09 II	Warm water Hall of cheese processing tap 26.06.09 III	Cold water Packing hall tap 26.06.09 IV	Cold water Laboratory tap 26.06.09 V	
1	colony count bacteria growing at 37 °C	-	-	-	-	-	-
2	colony count bacteria growing at 22 °C	-	-	-	-	-	-
3	Total number of coliforms/100 cm^3	0	0	700	2300	3200	0
4	Total number of thermal-tolerant coliforms/100 cm^3	0	0	0	0	0	0
5	Probable number of faecal streptococci/100 cm^3	0	0	-	-	-	0
6	Probable number of sulphite-reducing clostridia/100 cm^3 and *Clostridium prefringens*	-	-	-	-	-	-
7	Probable number of *Pseudomonas aeruginosa*/100 cm^3	-	-	-	-	-	-

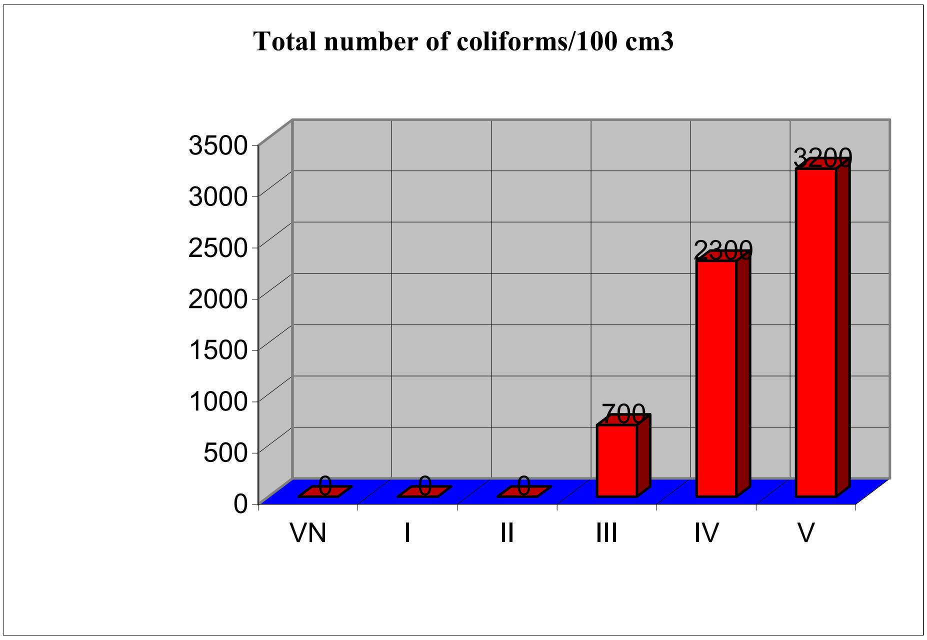

Fig. 1. Determination of total number of coliforms/100cm^3

The results of microbiologycal analysis showed in this graphic suggest a faecal contamination of water derived from hall of cheese processing tap, packing hall tap and laboratory tap because the number of coliforms is highly comparative with the number specified in the romanian normative standard.

When coliform bacteria are isolated from drinking water supplies it is often useful to determine which species of coliform bacteria are present, particularly if problems recur, in order to determine the source and significance of the coliform bacteria being recovered. The potential source of coliform bacteria in water supplies result from sub-optimal operation of water treatment processes or ingress of contamination from breaches in the integrity of the distribution system. These include for example, leaking hatches on service reservoirs, contamination via air-valves and stop valves, infiltration into mains and service reservoirs, cross connections and back-flow effects. Coliform bacteria can be present in domestic plumbing systems with kitchen taps and sinks being recognised sources of these organisms.

The water company and health authority and local authority will need to consider the issue of advice and guidance.

CONCLUSIONS

The results of a laboratory examination of any single water sample are representative only of the water at the time at that particular point at which the sample is taken. Satisfactory results from single samples do not justify an assumption that the water is safe to drink at all times.

Today, water the most precious resource is generally contaminated with many kinds of impurities such as organic, inorganic contaminants and micro organisms.

If drinking water supplies become contaminated with microbial pathogens, or there is a risk of microbiological contamination, immediate action should be taken to protect public health.

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