GROUNDWATER USE IN IRRIGATION: SOURCE OF RISK TO HUMAN HEALTH

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Resumo

A água subterrânea constitui uma fonte relevante de água doce necessária à vida, ao meio ambiente e ao desenvolvimento dos povos. A demanda global por água doce tem crescido em correlação direta com a população mundial e com o setor agrícola, fato que aumentou significativamente a exploração de águas subterrâneas. Neste sentido, este trabalho teve por objetivo avaliar a qualidade da água subterrânea em propriedades rurais por meio da avaliação de indicadores microbiológicos. Foram colhidas 20 amostras de água utilizadas para irrigação, situadas na região Sul do estado do Espírito Santo. Determinou-se o Número Mais Provável (NMP) de coliformes totais e coliformes termotolerantes. Os resultados evidenciaram que 100% das amostras de água dos poços utilizados na irrigação e para consumo humano, estavam fora dos padrões microbiológicos de potabilidade e para uso na agricultura. A água utilizada nas propriedades rurais, portanto, foi considerado um importante fator de risco à saúde dos seres humanos que a utilizam e consomem.

Abstract

Groundwater constitutes a significant source of fresh water needed for life, for the environment and the development of people. Global demand for freshwater has grown in direct correlation with the world population, with the agricultural sector, which significantly increased the exploitation of groundwater. The objective of this study was to verify the quality on farms through counts of microbiological indicators. We collected 20 samples of water used for irrigation, located in the southern state of Espírito Santo. It was determined the most probable number of total and thermotolerant coliforms. The results showed that 100% of water samples from wells used for irrigation and human consumption were out of the microbiological standards for drinking water and for use in agriculture. The water used on farms was considered an important risk factor to the health of humans who use it.

Keywords: Groundwater, contamination, coliform,

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1 – INTRODUCTION

The primary need in agriculture is water because its rational use and quality in irrigation promotes the increase in productivity, which is the essential starting point towards progress in the agricultural sector. The misuse of water and disqualified, in turn, may cause extensive damage, including transmitting diseases to the farmer irrigating, who maintains direct contact with the water and also through users who consume irrigated products [1].

The risk of outbreaks of waterborne diseases in rural areas is high, mainly due to the possibility of contamination by microorganisms in water, which are often captured in old wells that are poorly sealed and near sources of contamination such as septic tanks and grazing areas occupied by animals [2].

A wide variety of microorganisms may be present in water including bacteria, protozoa or viruses, many of which are pathogenic to humans. Water quality can be assessed by analysis of indicator organisms such as coliform bacteria, which are simple and easy to detect.

Subgroups coliforms are mainly Escherichia coli, and their detection indicates with certainty that there was fecal pollution from human feces or homeothermic animals' feces. If there is fecal contamination can be the presence of pathogenic bacteria [3].

As a result of growing demand in the use of groundwater in rural areas, the objective of this study was to evaluate the presence of coliform (thermotolerant and total) in underground sources of water used for irrigation in Alegre, Espírito Santo.

2 - MATERIALS AND METHODS

This study was conducted in the deep-wells of twenty rural properties located in the Southern part of Espírito Santo (Figure 1). The groundwater samples were collected in supply wells in March 2011 to analysis the total and fecal coliform. The collections were stored in 250 mL sterilized glass jars and packed in a insulated box and transported to a laboratory and analyzed on the same day using a technique known as "most probable number (MPN) per 100 mL[4]" which determines the total and thermotolerant coliforms. In the region there is no type of study on risk to human health, hence the need for research.

3 - RESULTS AND DISCUSSIONS

The results of the samples collected in wells were positive for total and thermotolerant coliform, as shown in Table 1. The regulation MS No. 518, March 25, 2004, The Health Directive [5] believes that the positive results for total coliforms must be analyzed in thermotolerant coliform and/or *Escherichia coli*.

Table 1 - Most Probable Number (MPN) of coliform and thermotolerant coliforms found in the supply wells of in Alegre, ES.

WELL	TOTAL COLIFORM	THERMOTOLERANT COLIFORM
1.	75	43
2.	1100	120
3.	1100	75
4.	9	9
5.	11	4
6.	43	4
7.	21	11
8.	4	1
9.	240	28
10.	75	3

WELL	TOTAL COLIFORM	THERMOTOLERANT COLIFORM
11.	240	240
12.	1100	210
13.	11	11
14.	11	4
15.	15	9
16.	93	23
17.	23	15
18.	9	9
19.	93	23
20.	93	21

The absence of protective factors in a large number of sources studied together with the fact that most of them had depths of up to 30 meters is worrisome, therefore limiting the power of soil filter; the sources are exposed to contamination, mainly by water and the runoff that infiltrates the soil [6]. Kravitz et al [7] argue that the protection of supply sources can preserve water quality in rural areas where disinfection is not performed, each protective factor has its importance, and the absence of them is a reason for concern.

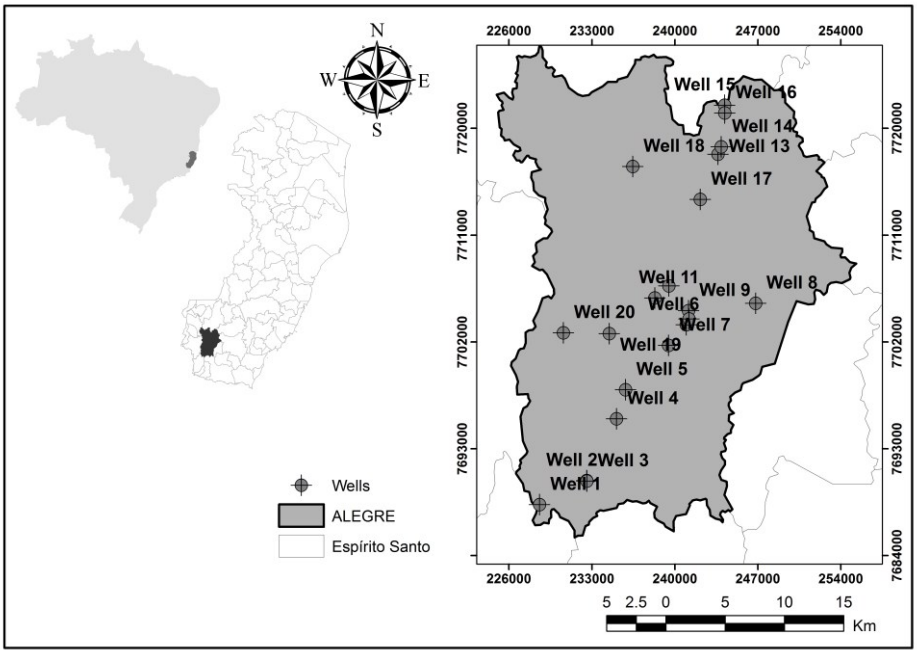

Figura 1 Study are showing location of wells samples for groundwater analysis

The results show that the samples are outside of the microbiological standards for drinking water in human consumption, expressed in the Brazilian National Health Surveillance Agency's ports ANVISA[5] establishes the absence of fecal coliform in 100 mL of water, but also didn't show quality standard for use in irrigation according to Brazilian National Council legislation (CONAMA) Resolution 396 of April 7, 2008. Therefore, it is observed that the water contamination in the farms is worrisome, since there is considerable risk in the occurrence of waterborne diseases. Galbraith et al[8] reported that

in the UK in the period of 1986 to 1937, 43% of outbreaks of waterborne diseases have occurred by ingestion of contaminated water from private sources.

The results obtained in this work lead to consider that the water used in rural properties is a risk factor for human health that use it. Therefore, it is believed that the development of a health education for the rural population, the adoption of preventive measures aiming at the preservation of water sources and water treatment already compromised, are the tools needed to maximally reduce the risk of waterborne diseases.

4 – CONCLUSION

All wells studied were contaminated by bacteria of the coliform group, are outside the limits established by the regulation MS No. 518, March 25, 2004 [5], and by CONAMA Resolution 396 of April 7th, 2008 [8]. The contamination of water wells may have originated in the lack of protection and poor location of the wells.

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