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REVIEW ARTICLE

PHYSICAL-CHEMICAL EVALUATION OF THE WATER USED FOR HUMAN CONSUMPTION OF THE MATOVER POVOADO IN VICTORY OF THE CONQUEST – BA

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ABSTRACT

Water as drinking water is the essential and important element for health. For this reason, it is essential to evaluate its quality through physical-chemical analysis, especially in rural areas where this process is more difficult to perform. Therefore, the objective of this study was to evaluate the physical and chemical parameters of drinking water in the village of Matinha, rural area of the municipality of Vitoria da Conquista, and to compare them with the parameters established by the Consolidation Ordinance nº 5/2017. Three water collection points were evaluated (P1 = source 1, P2 = source 2 and P3 = community reservoir). The physical-chemical parameters evaluated were: Hydrogenionic potential, electrical conductivity, total solids dissolved, turbidity, alkalinity, edurity. The materials used were conductivity meter, conductivity meter with STD meter, pH meter, turbidimeter and glassware to analyze electrical conductivity and electrical resistivity, total dissolved solids, pH and temperature, turbidity and total hardness, respectively. The method used was based on the Manual of Procedure for Sampling and Physical-Chemical Analysis of Water of 2011. After analysis, the results presented acidic pH for the springs and neutral for the reservoir (P1 = 5.54, P2 = 5.66 (P1 = 108.7 µS / cm, P2 = 112.0 µS / cm and P3 = 151.3 µS / cm), the STD and the P3 = 6.20), the electrical conductivity presented above that preconized by the (P1 = 26mg / L, P2 = 23mg / L and P3 = 39mg / L), respectively (P1 = 55mg / L, P2 = 55.5mg / L and P3 = 77mg / L) . The turbidity was of P1 = 5.94 uT, P2 = 1.93 uT and P3 = 2.79 uT, and the hardness presented hard water to the spring and moderate hard to the reservoir (P1 = 220 mg / L, P2 = 148mg / L and P3 = 52mg / L). However, the water consumed through the spring and the community reservoir is suitable for human consumption in relation to the parameters evaluated.

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INTRODUCTION

It is a consensus that water is the essential and irreplaceable element for life, since its consumption and quality are extremely important to health. According to Ordinance No. 5/2017 of the norms on health actions and services, water for human consumption is drinking water, regardless of its origin, for ingestion, preparation and production of food and personal hygiene, in addition to its physical, chemical and biological parameters meet the recommended standards and offer no risk to health. Being a universal solvent, water has the capacity to contain elements harmful to health, from chemical elements, such as chlorine and sodium, radioactive elements in concentrations outside of the legislation, as well as pathogenic microbiological elements. Therefore a medium conducive to the spread of waterborne disease, such as parasitic, bacterial and viral, and toxicities by metals and other chemical elements. So what establishes that water is beneficial to health or is not its quality. The characteristics of water for human consumption may be different depending on their origin or treatment, so it is necessary to analyze the physico-chemical parameters and to evaluate the water quality. Second, the Health Surveillance Secretariat (BRASIL, 2006), almost a quarter of the urban population and approximately 70% of the rural population do not have adequate water supply conditions. Water supply and basic sanitation services in rural areas are largely neglected. The main sources of supply are wells, fountains, springs and cisterns without proper control and monitoring of water quality. A minimum percentage has a sewage network or septic tanks connected to the sewage network, most of them use rudimentary cesspits or discharge their waste in open air or in water courses, precarious sanitary situations that leads to the contamination of the same. This contamination can be of physical, chemical or biological origin (BRASIL, 2006; BORTOLI, 2016; SOUZA, 2017). Any source of water from collective or individual alternative supply solutions must be subject to control or be subject to water quality monitoring, respectively. The Health Secretariats are responsible for this surveillance (BRAZIL, 2017), but in rural areas this process is more difficult to carry out and there are few studies on the subject. However, the objective of this study was to evaluate the physical and chemical parameters of drinking water in the village of Matinha, rural area of the municipality of Vitoria da Conquista, and to compare the results with the parameters established by the legislation.

MATERIALS AND METHODS

The town of Matinha, being the study area is located 46 km from the city of Vitória da Conquista, has approximately 1059 inhabitants. Its main source of water for human consumption is a community reservoir, which has no control or monitoring of water portability by parts of the competent bodies. In order to evaluate the physical-chemical parameters water samples were collected in 3 water points. Being, P1 to spring 1; P2 for spring 2 and P3 for the community reservoir. The physical parameters evaluated were turbidity, electrical conductivity, electrical resistivity and total dissolved solids. For the chemical parameters the Hydrogenion potential (pH), alkalinity and hardness were evaluated. The three samples followed the methodology based on the Manual of Procedures of Sampling and Physical-chemical Analysis of water of 2011. To carry out the tests and to evaluate the physical-chemical parameters were used the conductivity meter to analyze the electrical conductivity and the electrical resistivity, the pH meter to analyze the pH and temperature, Turbidimeter to analyze the turbidity and the conductivity meter with STD meter to analyze the total dissolved solids content. The total hardness was analyzed through suitable glassware. All analyzes were carried out in the chemistry laboratory of the Faculdade Independente do Nordeste (FAINOR) in Vitória da Conquista. The results were compared to the parameters recommended by the Consolidation Ordinance nº 5/2017.

RESULTS AND DISCUSSION

Hydrogen potential (pH): The pH is the concentration of hydrogens ions (H +) in the liquid medium, which determines an acidic, neutral or alkaline solution with values above 7.0, below 7.0or 7.0, respectively, and its range varies from 0 to 14.0 (BRAZIL, 2013). The value of pH influences in the form of several physical, chemical and biological elements, either contributing to a greater or lesser solubility or defining toxicity potentials (BRAZIL, 2006; CETESB, 2017). As a drinking standard, it is recommended that in the distribution system the water pH be maintained in the range of 6.0 to 9.5 (BRAZIL, 2017). Based on the data in Table 1, it can be observed that the pH was acid (P1 = 5.54 and P2 = 5.66) in the two sources, but in the reservoir the pH was 6.20 as established in the legislation. The pH in natural waters may vary due to the dissolution of rocks, photosynthesis, domestic and industrial waste (BRASIL, 2006).

Electrical Conductivity Electrical: Conductivity is the ability of water to conduct electric current through the presence of ionic particles. The more ionic solids, the more concentrated the water is, the greater its electrolytic action and the greater ability to conduct electric current. This parameter represents an indirect way of measuring the concentration of pollutants, in which levels greater than 100μS / cm (units of resistance per unit length) represent affected environments. Since natural waters have values of 10 to 100μS / cm, waters considered polluted have representative values that can reach up to 1000μS / cm. High values thus can infer corrosive characteristics of the water, due to industrial and / or domestic waste (BRASIL, 2006; CETESB, 2017). Table 1 shows that the electrical conductivity was higher than 100μS / cm in both the springs and the reservoir. Based on this, this parameter can indicate a degree of pollution at the water points analyzed according to the literature, if evaluated in isolation. However, when analyzed together with the STD, the value of the electrical conductivity becomes adequate, since the increase of dissolved solids increases the electrical conductivity, this fact corroborates with a study carried out by Bortoli (2017) in Vale do Taquari.

Total Dissolved Solids: Filtration, drying or evaporation processes characterize the fractions of solids present in the water as total solids in suspension or dissolved. Dissolved solids are particles having a diameter of <10-3 μm which remain as a residue even after filtration. The average value of dissolved solids at the source obtained a low variation of 55 mg / L and 55.5 mg / L (Table 1) for P1 and P2 respectively. In P3, there was a small increase (P3 = 77mg / L). Since the results are within the parameters recommended by the legislation (Table 1).

Table 1. Physico-chemical parameters of collection points and recommended parameters

Physico-chemical	Water points			Recommended parameters
	P1	P2	P3	
pH	5.54	5.66	6.20	6.0 to 9.5 *
Electrical conductivity (μS / cm)	108.7	112.0	151.3	10 to 100 * *
STD (mg / L)	55	55.5	77	1000 *
Turbidity (uT)	5.94	1.93	2.79	5 *
Alkalinity (mg / L de$CaCO_3$)	26	23	39	30 and 500 **
Hardness)	220	148	52	500 *

* Ordinance of Consolida 5/2017; ** Monitoring and control of water quality for human consumption, MS, 2006; P1 Spring 1; P2 Spring 2; P3 Community reservoir. STD - Dissolved Total Solids

Turbidity: Turbidity is the degree of interference that light has when passing through water, that is, reducing its transparency caused by suspended particles. These particles can be organic as algae and plankton and / or inorganic as sand and clay, resulting from natural processes (eg erosions) and / or industrial and household waste. Its maximum permissible value for water potability is 5 uT (unit of tubing). In cases of water treatment by disinfection, rapid filtration and slow filtration the maximum permitted values are 1 uT, 0.5 uT and 1 uT, respectively, according to the standard established by the legislation. This difference can be explained by the fact that turbidity has a direct influence on the presence of pathogenic microorganisms (BRAZIL, 2006, 2013, 2017, CETESB, 2017). In Table 1, the turbidity value for P1 was 5.94uT, higher than that recommended by the legislation, while P2 and P3 are within the maximum allowed value with 1.93uT and 2.79uT, respectively. The study by Marmontel and Rodrigues (2015) evaluated the increase of turbidity in springs where the soil was more unprotected by riparian forest. This fact corroborates with the present study, because in the margin of the spring 1 there is an area of considerable deforestation.

Alkalinity: The alkalinity of water is defined by its ability to neutralize hydrogen ions, that is, acids and is measured by the amount of alkaline salts (calcium, sodium and magnesium). The bicarbonate ($HCO_{3)}$ carbonates ($CO_3^{2-),}$and hydroxide (OH^- $^)$are the three main components of alkalinity and distribution depends on the pH. The pH between 4.4 and 8.3 indicates the presence of bicarbonates that can be derived from the passage of water through the soil rich in limestone. The pH between 8.3 and 9.4 indicates alkalinity by bicarbonate and carbonate. And the pH> 9.4 indicates the presence of the carbonates and hydroxides that may be present in algae-containing waters, in which photosynthesis causes a rise in pH through the consumption of carbon dioxide in very hot periods. In addition, hydroxides can also be found in waters that receive discharges from industrial waste using caustic soda or hydrated lime (bases) for treatments (BRASIL, 2006; CETESB, 2017). Most of the natural waters have alkalinity values between 30 and 500 mg / L of calcium carbonate ($CaCO_3$) (BRAZIL, 2006).
The analyzed samples indicated the parameter of alkalinity within what is observed in the literature. The values were 26mg / L, 23mg / L and 39mg / L for P1, P2 and P3, respectively. However, the pH of the springs was more acidic.

Hardness: Hardness is the result of the sum of calcium and magnesium ions in the water, which can be classified as temporary by the presence of bicarbonate or permanent by the presence of sulfates (BRAZIL, 2013). Another type of classification is in relation to the amount of $CaCO_3$, which may be soft or soft with $CaCOcontent_3$<50 mg / L, moderate between 50 mg / L and 150 mg / L, lasting between 150 mg / L and 300 mg / L or very hard with $CaCOcontent_3$> 300 mg / L (BRAZIL, 2006). The main source of hardness is the passage of water through the soil, bearing the characteristic of the soil can determine the degree of hardness of the water (CETESB, 2017). The PRC 5 of 2017 establishes that the total hardness has the maximum value of 500 mg / L the $CaCOcontent_3$ for drinking water. For the hardness parameter, the analyzed samples are also within what is recommended by the legislation. The values were higher at the sources, P1 at 220 mg / L and P2 at 148 mg / L when compared to the value obtained in the sample of the community reservoir of 52 mg / L at P3 (Table 1). Therefore, the springs can be considered hard water and the reservoir of water of moderate hardness, according to data from the Surveillance and control of water quality for human consumption, Brazil (2006).

Conclusion

Based on the study of the physicochemical parameters evaluated and compared to the limits specified by Ordinance No. 5 of Consolidation No. 2017 and by the Surveillance and Control of Water Quality for Human Consumption of the Ministry of Health, 2006, water from two springs and of the community reservoir of the town of Matinha are in accordance with the recommended for the parameters of STD, alkalinity and hardness. The electrical conductivity was above the maximum limit established both in the springs and in the reservoir and the turbidity was greater only for the spring 1. In general terms the water consumed by these routes is adequate for the human consumption in relation to the evaluated parameters, but there are another parameter that should be associated to the degree of water potability as the microbiological water that was not the objective of this study.

REFERENCES

BRASIL. Portaria de Consolidação Nº 5. Consolidação das normas sobre as ações e os serviços de saúde do Sistema Único de Saúde. Ministério da Saúde, 2017.

______. Manual prático de análise de água. Fundação Nacional de Saúde. 4. ed. FUNASA, Brasília, 2013, p150.

______. Vigilância e controle da qualidade da água para consumo humano. Ministério da Saúde, Secretaria de Vigilância em Saúde. – Brasília, 2006.

BORTOLI, J. Qualidade físico-química e microbiológica da água utilizada para consumo humano e dessedentação animal em propriedades rurais produtoras de leite na região do Vale do Taquari/RS. 2016. 152f. Dissertação (Mestrado) - Programa de Pós-Graduação em Ambiente e Desenvolvimento, do Centro Universitário UNIVATES, Lajeado, 2016.

CETESB – Companhia Ambiental do Estado de São Paulo. Significado Ambiental e sanitário das variáveis de Qualidade das Águas: Apêndice E. 2017, p57.

EMBRAPA - Empresa Brasileira de Pesquisa Agropecuária. Manual de Procedimento de amostragem e análise físico-química de água. Lucilia Maria Parron; Daphne Heloisa de Freitas Muniz; Claudia Mara Pereira. Colombo: Embrapa Florestas, 2011.

MARMONTEL, C. V. F.; RODRIGUES, V. A. Parâmetros Indicativos para Qualidade da Água em Nascentes com Diferentes Coberturas de Terra e Conservação da Vegetação Ciliar. Floresta e Ambiente, 2015.

SOUZA, G. R. et al. Saneamento básico em comunidades rurais de Lavras, Minas Gerais. In CONGRESSO ABES – Associação Brasileira de Engenharia Sanitária e Ambiental, FENASAN, 2017, I-135.p7.

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