

Relationship between chloride and microbial contamination on water systems

Introduction

Water is an essential resource for the survival of all known life forms. Despite all the efforts to store and reduce its consumption, water is becoming increasingly scarce. In addition, the world faces the deficiency of water supply quality. The potable water shortage is responsible for causing numerous diseases to the world population. According to Brazilian legislation (MS 2.914/2011), water is considered potable when follows some parameters and in microbial point is absence of total and thermo tolerant coliforms, to being harmless to human health. In this way, it is notable that water quality contributes greatly to human health.¹ To ensure that water is free of pathogenic microorganisms, it must endure the disinfection aimed at the destruction or inactivation of pathogenic organisms capable of causing diseases. Chlorination is the most common method used for disinfection, as it is simple, low cost and reliable. The use of chloride in water treatment may have objectives such as disinfection, oxidation or both. In this fashion, the objective of this case was to analyze the relationship between chloride and microorganisms in the water systems of the municipality of Sobral-CE-Brazil.

Case presentation

To perform this research, we analyzed 17 water supply systems from districts belonging to the municipality of Sobral. These systems included water supply systems, alternative water solutions and individual water supply solutions. These systems were located in urban and rural areas. In a year, 566 samples of water were analyzed. In order to establish relationship between the concentration of chloride present in the water and the presence and absence of thermo tolerant coliforms, water samples were collected in sterile flasks with monthly frequency for quantification of microorganisms (thermo tolerant coliforms).² The quantification of chlorine was performed at the time of collection, considering that such chemical component may suffer losses due to volatility. Then, the residual chlorine analysis was performed using a digital meter of the brand Policontrol which measures the chlorine concentration through a colorimetric method. For this, about 10 mL of samples were placed in contact with DPD pellets (N, N-diethyl-p-phenylenediamine). The determinations were performed in duplicate.

Discussion

Brazilian legislation (MS 2.914/2011) requests a residual concentration of chlorine at minimal 0.20 mg/L in all extension of water system, including the pipelines, in order to guarantee the microbiological quality. For the 17 water systems supplies, a total of 566 samples were analyzed, and in this amount, 92 samples (16.3%) did not reach the residual chloride concentration; consequently these samples were out of water legislation. Based on the results and chemical properties of chloride, it was possible that in repairs operations or negative pressure on pipelines the compound quantification was influenced, making possible a microbial contamination. It was also observed that, the absence of free residual chlorine in the distribution systems occurred precisely on the days of the operational repairs, in

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which the system was stopped, returning to normal patterns in the others sampling.

In the microbial analyses, coliform group was also employed. These specific biological indicators refer to a type of microorganism whose presence in the water is evidence that it is polluted with fecal material of human origin or other warm-blooded animals. To coliforms, a total of 932 samples were analyzed and *Escherichia coli* indicator was performed. Samples (227) were found contaminated indicating non-proper water for human consumption. Seemingly, the low chloride concentration on water samples made it possible for the coliforms to grow on the pipelines and water system, showing that appropriate concentration was important to prevent microbial growth.³ Furthermore, chloride presence can eliminate microorganisms by membrane damage and microbial inactivation. Therefore, it is important to ensure adequate residual chloride concentration in treated water to reduce the probability of microbial growth. Nonetheless, the local government; it's an essential key to provide legal approach to force law enforcement toward secure human healthy.

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Conflicts of interest

Authors declare that there is no conflicts of interest.

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