HEALTH RISKS FOR THE USE OF WATER FOR DENTAL HYGIENE

CASE STUDY FROM CACOAL-RO, BRAZIL

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Introduction

Water is an essential asset for life and must be observed and evaluated as such. It should be a concern both in consumption and in a sustainable way to evaluate their physicochemical characteristics, because this is directly related to the health of the population. Because of the need to evaluate the water consumed by the population were created laws and they determine the main characteristics of a water fit for consumption, in order to ensure its quality and prevent diseases associated with it, such as gastrointestinal disturbances, diarrhoea, hepatitis A and E, parasitic gastroenteritis and other diseases of hybrid origin (SANT’ANA et al.2003; CASTRO, OAK, VALE, 2010; ANDRADE, Souza, 2009; Faracha SON, DIAS, 2008).

Ordinance No. 518 (BRAZIL, 2004) establishes the procedures and responsibilities relating to control and surveillance of water quality for human consumption and its potability standards for public water supplies, as well as the responsibilities of those who produce it, assure quality control, monitoring, etc.

The main sources of contamination of the hybrids are untreated sewages from cities that are released into rivers and lakes, landfill affecting groundwater, agricultural products that flow with the rain and are washed into rivers and lakes, which cast mines chemicals such as mercury, and industries that use the rivers as corridors for their toxic waste (Bettega et al.2006).

Because of this possibility, there is growing public concern about the quality of public water supplies, which has contributed to the increased consumption of mineral water in Brazil, according to Cole et al (2010).

To provide guidelines in respect of mineral defaulting to its commercialization through bottling and other purposes, signed the Decree-Law No. 7841 (ANVISA, 1945) which provides, among others, trade, chemical classification as well of mineral water springs, which are surface waters that seep underground and can reach greater depths and therefore enriched in salts and acquiring physical and chemical characteristics that are considered beneficial to health (Silva, P. et al.2008).

Water contamination can occur in the mineral source, filling (due to reuse of packaging have not been cleaned properly), or transport and storage. (ANDRADE, SOUZA,2009). According to the Ministry of Health Decree 518 of 25 March 2004, the mineral water at source as much as in your marketing should not present a health risk for consumers and it is free from pathogenic microorganisms in addition to presenting quality, should be captured , industrial and packed in hygienic toilets strictest standards (Resende, 2008).

According to the Decree No. 5440 (BRAZIL, 2005), every citizen is entitled to receive information about the quality of water consumed, both by the services responsible for water supply as authorities responsible
for monitoring water quality. Therefore, before the existing legislation and aim to verify the quality of water consumed by the population of Cacoal-RO and region, this study aimed to evaluate some general aspects of quality by determining the presence of microbiological contamination indicators such as total coliforms, faecal coliforms, heterotrophic bacteria in these waters.

Materials and methods

We analyzed 45 samples from three brands of mineral water in bottles of 20 litters, 2-liters, and 500ml. 15 samples of each brand divided in their packaging in accordance with the quantity. Also analyzed 5 samples of drinking water of the Autonomous Service of Water and Wastewater - SAAE, collected at random taps neighbourhoods of the city of Cacoal - RO.

The samples of mineral water were purchased in many shops in the city and Cacoal - RO at random on different days, observing the period of its validity. They were taken directly from the original sealed packages, properly sanitized, without any possibility of contamination, with the help of sterile pipettes (Alves, ODORIZZI, Goulart, 2002). The samples of tap water, let the water drain for two or three minutes tolerate pipe ficasse then were placed into sterilized jars, being careful not to splattering out of the bottle, thus avoiding contamination and possible interference with the outcome. After collection, the samples were transported to the Laboratory’s Microbiological Analysis of the Autonomous Service of Water and Wastewater - SAAE.

Techniques

On the count of heterotrophic bacteria, we used the technique of Petrifilm, using only 1 ml withdrawn from the vial of 100ml of water collected and stored in sterilized glass jars. Each vial containing the sample was shaken 25 times to mix the contents, and it was near an open flame to be flame, thus avoiding changes in the outcome. With a sterile pipette withdrew 1 ml of the sample and placed on Petrifilm. Each sample had reference identification numbers corresponding labels using the packaging. The samples were taken to the greenhouse temperature of 35 ° C for 24 hours. We counted the number of colonies on the plate and the result was expressed in colony-forming units / ml (CFU / ml). Ordinance No. 518 of March 25 was adopted as the basis for the pattern of heterotrophic bacteria and sets a limit of 500 CFU / mL.

To check the microbiological quality and contamination of drinking water*, we adopted Resolution No. 275 of 22 September 2005, which determines the absence of total coliforms, faecal coliforms and / or Escherichia coli, sulphide reducing clostridia 46 ° C, enterococci, Pseudomonas aeruginosa and heterotrophic bacteria counts for water to be considered suitable for consumption.

To determine the MPN/100ml technique
was used for chromogenic substrates, using the product Colitag ® trademark. He was transferred to 100 ml of sample in a sterile flask aseptically adding the contents of a blister with the substrate and stirred until all the granules were dissolved. They were then taken to the greenhouse at a temperature of 35 °C for a period of 24 hours. After this time the readings were performed, samples of mineral waters that had yellow color indicated positive for coliforms, and so these were analyzed to check for possible contamination by faecal coliform.

For the evaluation of faecal coliform / E.coli, with yellow tubes were exposed to ultraviolet light to verify that blue fluorescence indicates positive contamination.

<table>
<thead>
<tr>
<th>DATE</th>
<th>from the sample</th>
<th>500ml P / A(1) CBH 500ml(2)</th>
<th>DATE</th>
<th>2L P / A CBH</th>
<th>2L P / A CBH</th>
<th>20L P / A CBH</th>
<th>20L P / A CBH</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/10/2011 A</td>
<td>*</td>
<td>1U.FC(3)</td>
<td>21/10/2011 *</td>
<td>UFC 38</td>
<td>Absence &gt; 500U.FC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20/10/2011 2</td>
<td>Absence</td>
<td>0U.FC</td>
<td>21/10/2011 Absence &gt; 500U.FC</td>
<td>Absence 389U.FC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20/10/2011 3</td>
<td>Absence</td>
<td>0U.FC</td>
<td>21/10/2011 Absence UFC 7</td>
<td>Absence 256U.FC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20/10/2011 4</td>
<td>Absence</td>
<td>0U.FC</td>
<td>21/10/2011 Absence UFC 79</td>
<td>Absence 289U.FC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20/10/2011 5</td>
<td>Absence</td>
<td>0U.FC</td>
<td>21/10/2011 * UFC 7</td>
<td>Absence &gt; 500U.FC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 1:** Results of the analysis of brand Lind’Água

(1) presence / absence of total coliforms and E. coli  
(2) Count of Heterotrophic Bacteria  
(3) Unity Formation of Colony

**Results**

Analyzing samples of 500 ml brand Lind’Água (Table 1 and Table 2) shows that for total coliforms, have a total of 20% of heterotrophic bacteria contamination and no contamination. For analysis of 2 litres had 40% of total coliform contamination and 20% for heterotrophic bacteria. Already in containers of 20 litres contamination occurred in 40% of the samples for heterotrophic bacteria did not show the presence of total coliforms.
**Table 2** - Number and percentage of samples of mineral water brand- Lind'Água in individual containers of 500ml, 2L and 20L in the first batch that met and not met the standards established by Brazilian law, marketed in the cities of Cacoal-RO and region.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>500 ml samples</th>
<th>2L samples</th>
<th>20L samples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Presence</td>
<td>Absence</td>
<td>Presence</td>
</tr>
<tr>
<td></td>
<td>n (%)</td>
<td>%</td>
<td>n (%)</td>
</tr>
<tr>
<td>P / A Coliform</td>
<td>A</td>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td>CBH</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

In the universe of all samples Lind'Água brand, there was some kind of contamination in 40% of the analysis (Figure 1).

**Chart 1**: Percentage of contamination of all samples of the brand Lind'Água contamination.

The samples collected Kaiary brand in bottles of 500ml, 20% showed contamination by the presence of total coliforms and no contamination by heterotrophic bacteria count (Table 3 and Table 4). Analyses of 2-liter crates showed no contamination. The 20-liter samples showed total coliforms, giving a quantity of 20% of samples.
Table 3: Results of the analysis of brand Kaiary

<table>
<thead>
<tr>
<th>DATE</th>
<th>from the sample</th>
<th>500ml P/A (1)</th>
<th>CBH 500ml (2)</th>
<th>DATE</th>
<th>2L P/A</th>
<th>2L CBH</th>
<th>20L P/A</th>
<th>CBH 20L</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/10/2011</td>
<td>A</td>
<td>* Presence</td>
<td>0U.FC. (3)</td>
<td>21/10/2011</td>
<td>Absence</td>
<td>12U.FC</td>
<td>Absence</td>
<td>0U.FC</td>
</tr>
<tr>
<td>20/10/2011</td>
<td>2</td>
<td>Absence</td>
<td>0U.FC</td>
<td>21/10/2011</td>
<td>Absence</td>
<td>UFC 1 * Presence</td>
<td>0U.FC</td>
<td></td>
</tr>
<tr>
<td>20/10/2011</td>
<td>3</td>
<td>Absence</td>
<td>4U.FC</td>
<td>21/10/2011</td>
<td>Absence</td>
<td>UFC 2</td>
<td>Absence</td>
<td>0U.FC</td>
</tr>
<tr>
<td>20/10/2011</td>
<td>4</td>
<td>Absence</td>
<td>2U.FC</td>
<td>21/10/2011</td>
<td>Absence</td>
<td>UFC 3</td>
<td>Absence</td>
<td>1U.FC</td>
</tr>
<tr>
<td>20/10/2011</td>
<td>5</td>
<td>Absence</td>
<td>0U.FC</td>
<td>21/10/2011</td>
<td>Absence</td>
<td>UFC 1</td>
<td>Absence</td>
<td>0U.FC</td>
</tr>
</tbody>
</table>

(1) presence / absence of total coliforms and *E. coli*
(2) Count of Heterotrophic Bacteria
(3) Unity Formation of Colony

Table 4: Number and percentage of samples of mineral water brand Kaiary in individual containers of 500ml, 2L and 20L in the first batch that met and not met the standards established by Brazilian law, marketed in the cities of Cacoal-RO and region.

<table>
<thead>
<tr>
<th>Samples - Kaiary</th>
<th>500 ml samples</th>
<th>2L samples</th>
<th>20 L samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>P / A Bacteria</td>
<td>Presence (n) %</td>
<td>Absence (n) %</td>
<td>Presence (n) %</td>
</tr>
<tr>
<td>CBH</td>
<td>0 0 5 100</td>
<td>0 0 5 100</td>
<td>0 0 5 100</td>
</tr>
</tbody>
</table>
In the universe of samples of brand Kaiary there was some kind of contamination in 13.33% of the samples (Figure 2).

**Kaiary – Total Analysis**

The collected samples of the brand Pur'Água in 500ml bottles and 2 litres did not have any kind of contamination, either total coliforms or E. coli and heterotrophic bacteria. It analyzes the 20-liter containers showed contamination in 40% of the samples by the presence of total coliforms and there were no samples contaminated by heterotrophic bacteria (Table 5 and Table 6).

**Table 5 - Results of the analysis of brand Pur'Água**

<table>
<thead>
<tr>
<th>DATE</th>
<th>from sample</th>
<th>the 500 ml P / A</th>
<th>CBH 500 ml</th>
<th>DATE</th>
<th>2 L</th>
<th>2 L</th>
<th>20 L</th>
<th>20L</th>
</tr>
</thead>
<tbody>
<tr>
<td>21/10/2011</td>
<td>A</td>
<td>Absence</td>
<td>56U.FC. (3)</td>
<td>21/10/2011</td>
<td>Absence</td>
<td>UFC 9</td>
<td>Absence</td>
<td>UFC 36</td>
</tr>
<tr>
<td>21/10/2011</td>
<td>2</td>
<td>Absence</td>
<td>0 CFU</td>
<td>21/10/2011</td>
<td>Absence</td>
<td>0 CFU</td>
<td>Absence</td>
<td>0 CFU</td>
</tr>
<tr>
<td>21/10/2011</td>
<td>3</td>
<td>Absence</td>
<td>UFC 4</td>
<td>21/10/2011</td>
<td>Absence</td>
<td>134U.FC</td>
<td>Absence</td>
<td>0 CFU</td>
</tr>
<tr>
<td>21/10/2011</td>
<td>4</td>
<td>Absence</td>
<td>8 UFC</td>
<td>21/10/2011</td>
<td>Absence</td>
<td>UFC 13</td>
<td>Presence</td>
<td>391U.FC</td>
</tr>
<tr>
<td>21/10/2011</td>
<td>5</td>
<td>Absence</td>
<td>UFC 10</td>
<td>21/10/2011</td>
<td>Absence</td>
<td>UFC 56</td>
<td>Presence</td>
<td>UFC 21</td>
</tr>
</tbody>
</table>
(1) presence / absence of total coliforms and *E. coli*

(2) Count of Heterotrophic Bacteria

(3) Unity Formation of Colony

**Table 6**- Number and percentage of samples of mineral water brand Pur'Água in individual containers of 500ml, 2L and 20L in the first batch that met and not met the standards established by Brazilian law, marketed in the cities of Cacoal-RO and region.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>500 ml samples</th>
<th>Samples 2 L</th>
<th>20 L samples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Presence</td>
<td>Absence</td>
<td>Presence</td>
</tr>
<tr>
<td>P / A Coliform</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>CBH</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

In total universe of brand Pur'Água samples, there was some kind of contamination in 13.33% of the samples (Figure 3).
Chart 3- Percentage of contamination of all samples of the brand Pur’Água contamination.

By comparing the analysis in bottles of 500 ml notes that there are total coliforms 13.33% of the samples (Figure 4). There was the 50% brand and 50% Lind'Água brand Kairi.

Pur’Água – Total Analysis

Chart 4- Percentage contribution of marks on the contamination of 500 ml bottles. Brand influence the overall result.

For containers of 2 litres contamination occurred in 13.33% of the samples for total coliforms and 6.67% above the level permitted by counting heterotrophic bacteria (Figure 5). Displaying result of contamination of 100% mineral water Lind'agua.
Chart 5- Percentage contribution of marks on the contamination of 2-liter bottles. Brand influence the overall result.

General Analysis- 2 litres

In containers of 20 litres contamination to the water and Pur'Água contamination occurred in 33.33%, and total coliforms represent 20% and 13.33% to the count of heterotrophic bacteria. Being distributed in 67% of coliform contamination by heterotrophic bacteria was 100% mineral water Lind 'the water. (Graph 7)

Chart 6- Percentage contribution of the brands in contaminated bottles of 20 litres. Influence of brands in general result from E. coli.
Chart 7- Percentage contribution of the brands in contaminated bottles of 20 litres. Brand influence on the overall outcome for heterotrophic bacteria.

![General Analysis - 20 Litres](chart.jpg)

According to Table 7, the analysis of water samples provided by the water utility and sewer location (SAAE) did not present any kind of contamination, either by total coliform, faecal coliform and E. coli and heterotrophic bacteria, superior to UFC 500 units in 1 ml of water.

**Table 7 - Analysis of samples of the water utility of Cacoal**

<table>
<thead>
<tr>
<th>DATE</th>
<th>from the sample</th>
<th>100 ml P / A(1)</th>
<th>CBH ml(2)</th>
<th>100 ml(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/10/2011 A</td>
<td>Absence</td>
<td>40 FC. (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20/10/2011 2</td>
<td>Absence</td>
<td>UFC 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20/10/2011 3</td>
<td>Absence</td>
<td>UFC 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20/10/2011 4</td>
<td>Absence</td>
<td>0 CFU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20/10/2011 5</td>
<td>Absence</td>
<td>UFC 6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) presence / absence of total coliforms and E. coli

(2) Count of Heterotrophic Bacteria

(3) Unity Formation of Colon
Discussion

The specific legislation for mineral waters (Resolution No. 275 of 22 September 2005) sets some parameters and their quality standards for these waters, including total coliform bacteria, faecal coliform \textit{E. Coli} and \textit{Pseudomonasaeruginosa}, among others. The presence of total coliforms in water is less representative as an indication of faecal contamination in relation to faecal coliform and \textit{E. coli}. The presence of coliform bacteria group denotes that occurred outside interference in mineral water, as this group of bacteria is not part of the natural composition of these waters.

Faecal coliform indicate the possible presence of pathogens, including \textit{E. coli} that has some serotypes responsible for gastroenteritis, with diarrhea as their main symptom. In Figure 4 we observe that the samples analyzed for 15 bottles of 500 ml 13.3\% were positive for total coliforms being distributed this contamination rate of 50\% marks and 50\% Lind'Água brand Kaiary. In 2-liter bottles 13.3\% of the samples showed contamination, 100\% brand Lind'Água. For containers of 20 litres, 20\% were contaminated by coliforms, 33\% being distributed this brand Kaiary and 67\% for the brand Pur'Água.

To Farache and Son Day (2008), the presence of coliforms in bottled water may indicate lack of health care, problems in funding operations, plumbing, filtration, bottling and other properties that may change the characteristics and composition of the same.

Although the legislation to determine the mineral waters of heterotrophic bacteria counts as quality parameter, taking as basis the recommendation of the Ordinance 518 establishing a limit of 500 CFU / mL for drinking water, we used this pattern as a variable the most in this study.

In respect to this research heterotrophic bacteria were found in bottling of 2 and 20 litres, for distribution in bottles of 500 ml, 6.67\% were in the 15 samples and 100\% of this contamination was due to the brand Lind'Água. In relation to the bottling of 20 litres of 15 samples were contaminated with 13.33\% 100\% brand Lind 'Water.

This study found that using the same standard for heterotrophic bacteria in water recommended for public water supply systems classify most of the analyzed samples as unfit for human consumption, prompting the need for detailed studies to establish standards for the presence of these bacteria bottled natural mineral waters, considering the risks that may offer health and water quality.

Even though most of the heterotrophic bacterial flora of the natural water is not considered pathogenic, it is important that its density is kept under control, for very high densities of these bacteria in water can cause health risks to
the consumer, like diarrhoea, stomach cramps, giardiasis, hepatitis, jaundice, typhoid and dysentery. Some of these bacteria can act as opportunistic pathogens, deteriorating water quality, causing unpleasant odours and flavours and limbo and producing films, and inhibitory influence of some microorganisms, because when present in high numbers can prevent the detection of coliforms.

The contaminating organisms reach the water for faecal contamination or other means, whether directly at source or during bottling. It is therefore important to protect sources of mineral water infiltration of surface water or soil drainage water in place of the source or perforation. These waters can lead large population of aquatic organisms and soil to the groundwater, changing their physical and chemical properties and providing nutrients for the bacteria.

The equipment that is used to carry water to the local bottling, such as those used during the bottling process and storage tanks can also harbour populations of contaminating organisms, which can also come from the environment and packaging and seals. The returnable gallons are possible sources of contamination of the product when your inspection, cleaning and disinfection are neglected. There are some methods to avoid possible contamination of gallons of water as returnable packaging evaluate and reject them if they have defects that compromise water quality, disinfection of containers and lids and care in transport and storage of packaging.(SANT’ANA et al.2003).

In relation to water throughout the city of Cacoal, there was no contamination. Some forms of contamination from the storage tanks are inadequate or poorly sanitized, household habits in the management of drinking water can affect the health of their users, as well as lack of user awareness about the proper maintenance of the reservoir and filter household water. (SILVA R. et al. 2009)

**Conclusion**

In the present study we observed that three brands of mineral water most commercialized in the city of Cacoal-RO and region, with the packaging of 500ml, 2L and 20 litres were presented with problems of contamination, therefore the dentist must restrict the use these waters in the tanks of dental.

Showing in decreasing order of quality, Lind’Agua, Kaiary, Pur’Agua, while the water supply provided by SAAE, did not show any type of contamination, so Preferably it should be borne by the public water supply or Cacoalenvases of 500 ml.
Bibliographic reference


microbiológico da água mineral comercializada no Distrito Federal. 


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