

## Abstract

### MICROBIOLOGICAL AND CHEMICAL QUALITY OF DRINKING WATER IN BRAGANÇA DISTRICT

The microbiological and chemistry quality of water of human consumption of the District of *Bragança* was evaluated and the variation of the content of micro-organisms in the water was related with the chemical characteristics of that water.

The microbiological quality of waters of human consumption of the District of *Bragança* was evaluated between 1996 and 2005. The classification of analyzed waters in this period was based on the Decree 74/1990 (7 March), which was revoked by the Decree 236/1998 (1 August). No alterations were verified in the studied parameters. From 2004 on, the classification of waters followed the Decree 243/2001 (5 September). Of the microbiological analyses that were carried through (21630 analyses), 8225 (38.03%) had been classified as improper, 7169 (33.14%) as potable ones, 2056 (9.51%) as over the recommendable maximum value, 2770 (12.81%) as in agreement and 1410 (6.52%) as not in agreement ones. Of all the carried through microbiological analyses, 10490 (48.5%) had been the treated waters and 11140 (51.5%) the waters not treated. From all treated waters, 7782 (74.2%) had been classified as in agreement and 2708 (25.8%) as not in agreement. From all waters not treated, 4213 (37.8%) had been classified as in agreement and 6927 (62.2%) as not in agreement. Only in three of the twelve studied regions, *Mogadouro*, *Macedo de Cavaleiros* and *Alfândega da Fé*, a water percentage above 50% was verified in not conformity.

*Mogadouro* presented the waters of human consumption with worse microbiological quality (62.3% of the total of analyzed waters were considered improper for consumption). *Freixo de Espada à Cinta* presented the biggest number of water in conformity (73.5% of waters had been considered appropriate regarding the legal demands).

The chemical quality of consumption waters was evaluated between 2003 and 2005. The total of analyzed samples (2692), 2549 (about 95%) had been classified in accordance with Decree 243/2001 and only 143 according to Decree 236/1998.

Nineteen (0.7%) waters had been classified as improper, 1841 (68.4%) as potable, 518 (19.2%) as aggressive water for the plumbing and 314 (11.7%) as being over parametric value.

From the total of the analyses, 1832 (68.1%) were carried though treated waters and 860 (31.9%) to not treated waters.

The undesirable contaminants were also only detected between 2003 and 2005. In this period, 278 analyses had been carried through. The concentration of cadmium, lead, cyanide and trihalomethanes had never exceeded the parametric value. The aluminium and the arsenic had exceeded the parametric value in 58% and 23% of the analyzed samples, respectively.

From all the chemical variables studied the pH, the nitrates and the fluorine had been the ones that had been more correlated ( $p < 0,05$ ) with the microbiological parameters. It was not possible, however, to evaluate that percentage of variation of the microbiological parameters that was explained by these chemical variables, through the linear regression type stepwise.

Although the microbiological quality of potable water in Bragança District has improved throughout the period of study, in particular in the last two years, around 45% of the analyzed waters did not present good microbiological quality. It was verified that the treatment of these waters was not entirely efficient. Therefore the percentage of the improper consumption waters after the treatment was very high (25%).

All treated water should be potable otherwise the treatment was not made according to the right methods and to the adequate technical processes.

Keywords: water quality; fecal contamination indicator; chemical contaminants; drinking water; District of Bragança.