

S63. Determination of contaminants in drinking water

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Drinking and tap water supplies in many geographic areas contain chromium. Certain contaminants, such as hexavalent chromium(chromium-6), steel and pulp mills, a metal used in metal processing, and the tanning industry, aren't removed by standard tap filters. Acidic environments with high organic content lend wings to the reduction of chromium-6 to nontoxic trivalent chromium(chromium-3). Public health worries are centered on the presence of chromium-6 that is classified as "likely to be carcinogenic to humans" by the U.S. Environmental Protection Agency(EPA). In addition to this chromium-6 in drinking water has been linked to certain stomach cancers. Exposure of animals to chromium-6 in drinking water induced tumors in the alimentary tract, with responses in the mouse small intestine. The widest form of DNA damage induced by chromium-6 is Cr-DNA adducts, which cause mutations and chromosomal breaks. Otherwise, chronic iron(Fe) overload results primarily from genetic disarray characterized by increased iron absorption and from diseases that require frequent transfusions.

In this study, 12 spring waters and 7 tap waters analyzed. Inductively Coupled Plasma-Mass Spectroscopy(ICP-MS) system was utilized for metals concentration in spring and tap waters. Furthermore, Ion Chromatography(IC) system was evaluated for anion and cation determination in spring and tap waters. The chromium levels were above the limit values in the tap waters, moreover, above the limit values in 25% of the spring waters and proximate to the permissible limits in 75%. Therewithal, the iron concentrations in tap water, both in spring water, were above the permissible limits.

People in Yozgat city drink chromium-polluted tap water, much of it likely in the cancer-causing hexavalent form. Moreover, people here also use tap water to prepare meals. Given the scope of exposure and the magnitude of the potential risk, we believes require public water suppliers to test for it. However, we believe that it is necessary to support the independent bodies like ours(BOZOK UNIVERSITY-BILTEM-TOXICOLOGY LABORATORY) to carry out analyzes at certain intervals.

Key Words: chromium, iron, drinking water, toxicity

Table 1. Descriptive statistics for drinking water in different places of Yozgat Province, Turkey

| | Spring Water (n=12) | | | | Tap Water (n=7) | | | |
|-----------|---------------------|--------|--------|---------|-----------------|--------|--------|--------|
| | Mean | S.D. | Min | Max | Mean | S.D. | Min | Max |
| Al (ppb) | 15,27 | 44,98 | 0,00 | 157,27 | 19,31 | 24,36 | 4,93 | 67,90 |
| Cr (ppb) | 4,77 | 2,13 | 2,45 | 9,41 | 12,70 | 3,57 | 5,77 | 16,04 |
| Mn (ppb) | 0,18 | 0,34 | 0,00 | 0,88 | 9,11 | 13,81 | 0,49 | 33,65 |
| Fe (ppb) | 687,49 | 391,70 | 334,45 | 1491,42 | 581,85 | 89,76 | 471,95 | 667,26 |
| Ni (ppb) | 3,37 | 1,43 | 1,60 | 6,63 | 9,70 | 3,23 | 4,78 | 13,45 |
| Cu (ppb) | 0,00 | 0,00 | 0,00 | 0,00 | 56,61 | 50,56 | 1,48 | 144,34 |
| As (ppb) | 1,89 | 1,87 | 0,00 | 5,66 | 1,94 | 0,38 | 1,29 | 2,27 |
| Se (ppb) | 0,08 | 0,27 | 0,00 | 0,95 | 0,60 | 0,71 | 0,00 | 1,44 |
| Cd (ppb) | 0,07 | 0,22 | 0,00 | 0,77 | 0,01 | 0,01 | 0,00 | 0,02 |
| Sb (ppb) | 0,17 | 0,25 | 0,04 | 0,92 | 0,09 | 0,04 | 0,06 | 0,16 |
| Pb (ppb) | 0,11 | 0,22 | 0,00 | 0,79 | 1,64 | 1,71 | 0,31 | 5,33 |
| Br (ppb) | 17,90 | 20,09 | 0,00 | 46,90 | 2,00 | 4,33 | 0,00 | 11,60 |
| Ca (ppm) | 88,94 | 40,80 | 36,13 | 146,61 | 74,46 | 13,76 | 48,13 | 87,17 |
| F (ppm) | 0,16 | 0,07 | 0,08 | 0,35 | 0,22 | 0,06 | 0,12 | 0,28 |
| PO4 (ppb) | 0,70 | 1,83 | 0,00 | 6,00 | 9,20 | 7,62 | 0,00 | 23,50 |
| K (ppm) | 0,35 | 0,21 | 0,15 | 0,81 | 1,96 | 0,20 | 1,70 | 2,35 |
| Cl (ppm) | 25,03 | 24,04 | 2,75 | 65,19 | 18,25 | 10,36 | 9,53 | 40,31 |
| Mg (ppm) | 28,90 | 30,77 | 5,51 | 123,54 | 47,47 | 12,24 | 23,45 | 57,33 |
| Na (ppm) | 15,36 | 6,14 | 7,99 | 24,33 | 36,50 | 17,69 | 15,69 | 66,40 |
| NH4 (ppb) | 1,20 | 4,13 | 0,00 | 14,30 | 162,10 | 282,08 | 0,00 | 661,60 |
| NO3 (ppm) | 12,90 | 12,80 | 0,63 | 35,50 | 6,97 | 2,41 | 3,26 | 9,38 |
| SO4 (ppm) | 38,66 | 30,19 | 7,34 | 94,33 | 77,30 | 24,53 | 28,38 | 95,09 |