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Evaluation on the Drinking Water Quality Concerning Bacteria and Inorganic Nitrogen Using Ten Spring Water Samples

Masayuki Goto, Takehiko Kaneko, Riho Endo, Reiko Takanashi, Hadjime Nakajima, Tadashi Furuhata
Wayo Women's University, Department of Health and Nutrition
2-3-1, Konodai, Ichikawa-shi, Chiba, Japan 272-8533
gotoh@wayo.ac.jp; t-kaneko@wayo.ac.jp

Extended Abstract

Water supply self-sufficiency rate in nationwide of Japan is 97.8% according to the data in 2014. Although tap water in Japan hardly recognizes bacterial contamination, a certain percentage of the people, especially elderly, have a habit of drinking spring water on a daily basis, because they hate the chlorine sterilization odor in tap water. However, the quality of the water is not hygienically guaranteed and unfortunately they are not paying much attention to sanitary risks. In the previous study, we continued the investigation of the concentration of 15 trace elements (B, Al. Cr. Mn. Fe. Ni, Cu, Zn, As, Se, Mo, Cd, Sb, Pb, and U) using spring water from six locations of the urban area for five years. At that time for 5 years, we did not recognize any acute/chronic harm to the human body. As the quality of water changed greatly with time, it was judged that continuous investigation in the future was necessary [1]. In this study, we investigated spring water samples to evaluate the hygienic safety by examination concerning the bacterial contamination and inorganic nitrogen. These survey items were expected to promptly reflect deterioration of water quality.

Ten spring water samples including six locations used in past investigation were collected from Nov. 26, 2016 to Jan. 27, 2017. We investigated the safety of those samples by checking on bacteria. EC blue test and desoxycholate agar test were carried out for coliform and fluorescent EC blue test was used for *E. coli*. Other general bacteria was detected by standard agar test. Inorganic nitrogen (e.g. NH_4-N, NO_2-N, NO_3-N) was evaluated by using each ion selective pack test and digital pack test meter: (KYORITSU CHEMICAL Corp, Japan.).

The coliform was detected in the range of 260 to 1 CFU/mL in five samples on desoxycholate agar test. The results of EC blue test in the same samples were positive. *E. coli* was positive reaction in two of the five samples. These spring water samples were judged inappropriate for drinking. In the other five samples, there were no *E. coli* and no coliform. The number of general bacteria were detected 2100 to 0 CFU/mL. Three samples, which showed 2100, 400 and 110 CFU/mL, were out of the drinking water quality standard (100 CFU/mL). The concentrations of NH_4-N and NO_2-N in each sample were not detected. NO_3-N concentrations were the range of 40.8 to 0.27 mg/L in ten samples. Two samples (i.e. 40.8 and 21.1 mg/L) exceeded the standard quality value (NO_3-N <10 mg/L) of drinking water. The sample in which NO_3-N concentration of 40.8 mg/L was detected showed positive reaction of *E. coli* and 110 CFU/mL of general bacteria.

Five of the 10 spring water did not meet the quality standard criteria of drinking water by bacteriological examination and evaluation of inorganic nitrogen. We concluded those five samples were not suitable for drinking.

In conclusion, it was very useful to quickly detect the hygiene problems of spring water samples by bacteriological examination and evaluation of inorganic nitrogen.

Reference

[1] Y. Manaka, M. Goto, T. Kaneko, "Analysis and Successive Observation of 15 Trace Elements in Spring Water at Six Locations," Program Booklet P13, *3rd International Conference on Environmental Pollution and Remediation*, Toronto, Ontario, 2013.