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PRELIMINARY SURVEY OF ARSENIC CONCENTRATIONS IN WATERS OF DIFFERENT SOURCES IN HOCHIMINH CITY AND OTHER PROVINCES

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ABSTRACT

Preliminary survey for arsenic concentration in well and surface waters was conducted in Ho Chi Minh City and some adjacent provinces. 180 samples were collected and analyzed. Results obtained show that:

1) In well water, the average concentrations of arsenic are quite low compared with the Vietnamese standards, i.e. In Ho Chi Minh city the average concentrations and its range (in $\mu\text{g/L}$) are 2.27 and (0.12-5.1). The figures for Lam Dong, Binh Thuan, Ninh Thuan and Tien Giang provinces are 0.84, (0-6.58); 2.19, (0-9.43); 2.72, (0.37-6.8); and 3.7, (0.12-5.10), respectively. Recently, the people living around the to-be-closed biggest landfill site of Dong Thanh, Ho Chi Minh city, worry the possibility of arsenic contamination of the landfill leachate into their well water, 31 well water samples in surrounding area of landfill site were collected and analyzed. Results show that the average arsenic concentration is low (0.42) and the concentration range is narrow (0.11-3.8).

2) In surface water the average concentration of arsenic is also quite low compared with the Vietnamese standards, i.e. In Lam Dong province, the average concentration and its range (in $\mu\text{g/L}$) are 2.44 and (0.75-5.28). The figures for Binh Thuan, Ninh Thuan and Tien Giang provinces are 4.49, (0.32-11.64); 7, (0.01-16.29); and 1.35, (0.2-3.1), respectively.

Based on this preliminary survey, it can be concluded that arsenic concentrations in water in studied areas are not higher than standards, and unlikely to impose impacts for the health of people consuming these waters directly or indirectly through water treatment processes.

Keywords: arsenic, atomic absorption spectrophotometry, landfill leachate, surface water, well water.

Introduction

During the last few years, the issue of arsenic in water, especially in well water leading to health problems for people in Bangladesh, Africa and elsewhere in the world triggered the attention of Vietnamese authority and scientific circles.

To evaluate the existing arsenic concentration in various types of water in HCMC and adjacent provinces (Lam Dong, Ninh Thuan, Binh Thuan, Tien Giang), we made the preliminary survey, collecting samples from above-mentioned areas and analyzed for arsenic concentrations using atomic absorption spectrophotometer. We assumed that if the preliminary survey prevailing significant data, the next intensive research would be conducted to draw the pattern of arsenic concentration distribution in the region.

Methods

Sample collection. Water samples were taken from sources, stored in plastic containers and acidified by HNO_3 , transported to laboratory and stored in 4°C freezer. Samples were taken in the period from August to mid-September of 2001.

Analysis. Water samples were analyzed using Atomic absorption spectrophotometer Varian 220 A in the Physio-Chemical and Biological Analysis Center, University of Agriculture and Forestry, Ho Chi Minh City, Vietnam. Arsenic in the sample was determined by HG-AAS method. Recovery tests were conducted frequently to ensure the reliability of the results.

Results and discussion

Arsenic in well water ($\mu\text{g/L}$):

The Ministry of Health of Vietnam issued the temporary standards (4) stipulating the concentration of arsenic in both city and rural drinking water to be 50 $\mu\text{g/L}$. The Ministry of Science, Technology and Environment issued the Vietnamese standards (6) stipulating the arsenic concentration in surface water class A using as source for domestic water to be 50 $\mu\text{g/L}$. This standard also stipulates the arsenic concentration in underground and drinking water to be 50 $\mu\text{g/L}$.

Concentrations of arsenic in well water samples collected in HCMC and other five provinces (*Table 1*) are quite low compared with those obtained in Hanoi (2) and with Vietnamese standards for As (50 $\mu\text{g/L}$). Only few samples with concentrations are higher than 10 $\mu\text{g/L}$.

Table 1. Concentration ($\mu\text{g/L}$) of arsenic in well water samples collected in Ho Chi Minh City and some adjacent provinces.

Sample No.	Province				Name		
	Lam Dong	Binh Thuan	Ninh Thuan	Tien Giang	Ho Chi Minh (1)	Ho Chi Minh (2)	Ba Ria Vung Tau
1	2.89	7.33	4.06	2.61	0.87	0,40	6.20
2	0.85	1.04	1.25	0.95	1.21	0,06	7.02
3	0.55	0.55	2.91	7.44	1.28	0,06	ND
4	1.66	4.91	4.14	3.59	1.13	0,73	-
5	ND	9.43	1.24	ND	3.25	0,24	-
6	0.85	0.20	0.62	13.21	4.46	0,15	-
7	ND	ND	0.37	13.52	0.12	0,15	-
8	0.47	4.09	0.83	0.81	2.96	0,11	-
9	1.87	2.26	6.80	1.02	5.10	0,16	-
10	1.59	ND	4.97	6.55	2.37	0,16	-
11	0.02	2.40	-	1.63	-	0,20	-
12	ND	0.53	-	0.01	-	0,33	-
13	2.32	0.41	-	1.90	-	0,21	-
14	1.33	2.31	-	8.65	-	0,18	-
15	0.48	0.06	-	2.69	-	0,13	-
16	0.45	1.35	-	0.72	-	0,11	-
17	ND	1.24	-	6.17	-	0,13	-
18	ND	0.34	-	0.60	-	0,17	-
19	ND	3.56	-	9.40	-	0,16	-
20	0.01	0.49	-	1.00	-	0,20	-
21	ND	1.22	-	0.95	-	1,05	-
22	0.09	4.44	-	0.02	-	2,50	-
23	0.10	-	-	ND	-	3,80	-
24	6.58	-	-	ND	-	0,94	-
25	ND	-	-	0.42	-	0,23	-
26	0.41	-	-	12.38	-	0,26	-
27	0.16	-	-	-	-	0,23	-
28	-	-	-	-	-	0,26	-
29	-	-	-	-	-	0,12	-
30	-	-	-	-	-	0,11	-
31	-	-	-	-	-	0,12	-
Range	0-6.58	0-9.43	0.37-6.80	0-12.38	0.12-5.10	0.11-3.8	0-7.02
Average	0.84	2.19	2.72	3.7	2.27	0.42	

Note: ND: not detectable

(1) : well water in normal areas (2): Well water around landfill site area

Arsenic in natural water (µg/L)

Most of natural water samples were taken from rivers, some from lakes (Lam Dong). Results from *Table 2* show that most of samples contain arsenic concentrations lower than Vietnamese standards.

Table 2. Concentration (µg/L) of arsenic in surface water samples collected in provinces adjacent to Ho Chi Minh City.

Sample No.	Province name			
	Lam Dong	Binh Thuan	Ninh Thuan	Tien Giang
1	3.26	7.53	16.29	1.14
2	5.28	1.29	4.34	1.40
3	2.35	6.00	8.05	1.34
4	2.44	2.94	7.21	1.08
5	2.20	10.74	0.01	0.86
6	0.86	11.64	6.10	1.08
7	4.85	2.94	-	2.47
8	4.00	3.00	-	3.10
9	0.75	3.32	-	1.60
10	1.42	2.75	-	2.27
11	0.96	3.25	-	0.90
12	0.95	1.56	-	0.59
13	-	0.32	-	0.91
14	-	7.71	-	1.21
15	-	3.42	-	1.53
16	-	4.25	-	1.36
17	-	3.72	-	0.20
Range	0.75-5.28	0.32-11.64	0.01-16.29	0.20-3.10
Average	2.44	4.49	7	1.35

Conclusion

Even though the arsenic contamination in Hanoi city is proved to be the alarming issue (2), our preliminary study prevails that in Ho Chi Minh city and some other southern provinces, the arsenic concentration in well and surface water were detected to be lower than Vietnamese standards, thus unlikely to cause health problems for people. Further time-scale and spatial study should be conducted to have the detail pattern of arsenic concentration.

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