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ARSENIC CONTAMINATION OF GROUND WATER OF BUDHIA NALA REGION FARIDABAD

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ABSTRACT

Arsenic present in the drinking water is a new, unfamiliar problem to the most of the population in India and in many neighboring countries. Adverse effects of arsenic contamination depend on the dose and duration of exposure. Sources of arsenic in groundwater are mostly geogenic as arsenic is present in alluvial sediments of the delta and is present in all rocks, soils, water, air and in biological tissues.In the present work fifteen samples of underground water are collected from Budhia Nala region, Faridabad and tested for arsenic and other metal contamination on Atomic Absorption Spectroscope. No significant level of arsenic contamination was found in any sample. All samples showed arsenic contamination at ppb level. But extensive withdrawals of this water for irrigation can contaminate surface soil and plants. It can also affect food chain. Regular and long time use of this water for drinking may generate health problems in living beings. Author advised not to use this water for drinking without purification atleast sedimentation in earthen pots minimum for four hours required before use. Additionally author suggests proper testing of soil and vegetation growing in this region.

Keywords: Sedimentation, contamination, geogenic, arsenic.

INTRODUCTION

Arsenic is ubiquitous in the environment, usually being present in small amounts in all rocks, soils, water, air and biological tissues[1]. Until the discovery of arsenic in drinking water in 1993, well water was regarded as safe for drinking[2]. Over the past two three decades, occurrence of higher concentration in drinking water has been recognized as a major public health concern in several part of the world including India. With the discovery of new sites in the recent past arsenic concentration scenario has changed considerably throughout the world. Between 2000 and 2005 arsenic related groundwater problems have emerged in different states like Bihar, Uttar Pradesh, North East States, Chattisgarh, Hyderabad and Chandigarh etc[3].

Adverse health effects of arsenic depend strongly on the dose and duration of exposure. Specific dermatological effects are characteristics of chronic exposure of arsenic while salient dermatological features are melanosis (pigmentation) and keratosis (rough dry popular skin lesions) both may be spotted or diffuse[4]. Chronic exposure to arsenic is also responsible for reproductive, haematological and diabetic effects in humans. Other than this ingestion of inorganic arsenic is an established cause of skin, bladder and lung cancer[5]. Children and infants are more susceptible to arsenic toxicity as their water consumption on body weight basis is very high. They show elevated level of arsenic in hair and nails[6,7].

Faridabad is an industrial area has large number of varied industrial units dealing in production of lubricants, glues, rubber paints, pigments dyes, pesticides, fertilizers, pharmaceuticals, ceramics, metallurgy, machine tools, electrical appliances, electroplating and batteries. Despite the instructions of pollution control board to install ETPs and discharge effluents only after treatment, they release effluents without treatment either in to local water bodies or dump in to ground. Sources of arsenic are mostly geogenic as arsenic is present in alluvial sediments of the delta and in all rocks. Mechanism and cause of arsenic leaching from source has not been established as yet. Many theories of oxidation[8-10], reduction [11], carbon reduction and microbial reduction have been suggested[12,13]. In the wake of all ill effects of arsenic

in this work estimation of arsenic was carried out in water samples collected from various tube wells and hand pumps from nearby region of Budhia Nala at Faridabad.

EXPERIMENTAL

All 15 samples were collected from Budhia Nala region, Faridabad as per sampling protocol. Water samples were preserved with 4.0 ml HCl per litre and analysed within one month of collection.

Digestion of samples

2.0 ml Sulphuric acid and 1.0 ml of Perchloric acid are added to samples before heating on hot plate at 474K for 10 hours then at 413K for 2 hours. After cooling the samples 10.0 ml 1:1 HCl is added and heated for 30 minutes at 400 K. now 1.0 ml of 10%KI and 1.0 ml of 5% ascorbic acid I and deionised water is added to makeup volume of sample 25.0 ml.

The digested samples were analysed for total arsenic concentration at the laboratory of the Geological survey of India and at the laboratory of Manav Rachana International University, Faridabad using Atomic Absorption Spectroscopy and Flow Injection Atomic Absorption Spectroscopy.

Rigrous quality control procedures were followed throughout the analysis. Two blank solutions were run with each sample. Calibration of the instrument was made with standard solutions 1.0, 2.0, 4.0, 6.0, 8.0 and 10.0 ppb of arsenic.

RESULTS AND DISCUSSION

The concentration o f arsenic in all 15 samples are shown in table 1. Most of the samples have arsenic concentration below 2.0 ppb level and are in recommended safety limit as it is evident from the table. Three samples numbered 9,10and 12 have little higher concentration of arsenic i.e. above 2.0 ppb. This higher concentration of arsenic may be because of shallow aquifer layer.

Table-1: Concentration of arsenic in water samples

Sample No.	Concentration of arsenic (ppb)	Sample no.	Concentration of arsenic (ppb)
1	1.45	9	2.25
2	1.44	10	2.75
3	1.40	11	1.25
4	0.82	12	2.01
5	0.90	13	1.89
6	1.75	14	1.95
7	1.70	15	1.39
8	1.75	Permissible limit(mg/l)	10

In the light of above findings it worthwhile to mention that extensive withdrawal of underground water can contaminate surface soil and can increase concentration of arsenic in aquifers.

It is recommended that industrial effluents must be treated properly before they are discharged. So the adverse effects on the aquatic life, food chain and human health can be prevented. There is need to measure level of arsenic in vegetables grown in that area and in surface soil of that area.

As sensitivity o each individual is different for arsenic so underground water must kept in earthen pots for minimum 3 to 4 hours for sedimentation before it is used for cooking and drinking purposes.

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