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A report groundwater arsenic contamination assay in the delta area of West Bengal

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Abstract

Groundwater contaminated with arsenic adds an extra percentage of arsenic load at the time of the different irrigated processes. In an arsenic-contaminated locality, an experimental drinking water contamination study was done on tap water, pump water used for irrigation, hand pump water used for cooking, and drinking in the delta area in West Bengal, Nadia, 24-Parganas (north and south) Hooghly, Bardhaman, suspicious villages and in Kolkata, in Bengal delta.

Keywords: Arsenic, delta area, pollution, toxicity.

Introduction

Arsenic contamination in groundwater is a kind of groundwater pollution usually caused by elevated arsenic levels in the groundwater (Smedley, and Kinniburgh, 2002; Mukherjee et al., 2006). Because deep tube wells are used for water delivery, arsenic pollution is a significant problem. This kind of groundwater has poisoned a considerable number of people. According to research, arsenic poisoning affects approximately 137 million individuals in over seventy nations.

Toxicity of Arsenic

There are many review articles published on arsenic toxicity in humans and animals (Diaz et al., 2015). Arsenic is one of the most

potentially toxic elements in the Bengal delta area.

The diseases like skin, bladder, liver, and lung cancers manifest due to it. Arsenic also induces epidemiological toxicity. As a result, there is the formation of excess reactive oxygen species (ROS), causing damage to organisms (Sharma et al., 2012). Arsenic pollution causes cytotoxicity and genotoxicity in the living body. The pronounced effect is visible in Humans, Domestic animals, and wild animals. Chronic exposure to arsenic causes arsenicosis, which includes skin lesions, black foot disease, peripheral vascular disease, and cancer. Several investigations, however, have documented arsenicosis as a result of increased levels in figure 1.

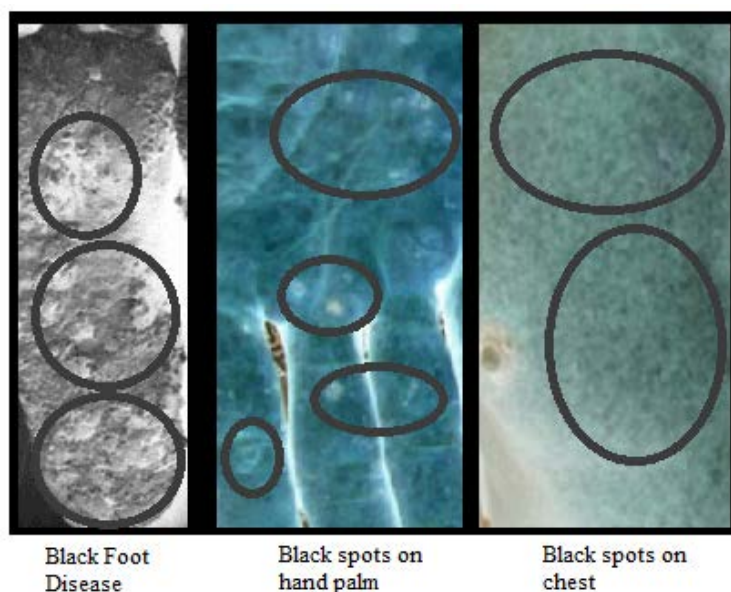


Fig. 1. Arsenic inflammation in human body.

Epidemiology

Carcinogenesis is a process, and it has been thoroughly investigated by (Ling and Te, 2000) that arsenic is a well-known carcinogen that affects humans. The gene proliferation processes (like DNA repair, differentiation) are a challenge when arsenic is present in the human system. Arsenic is vital for the production of reactive oxygen species, (ROS), which has a role in activating cancer. Apart from cancer, Arsenic has the potential to induce non-cancerous diverse illnesses like cardiovascular disease, skin disease, hypertension, and diabetes mellitus. It has been explored that glucose metabolism in mice is disturbed when integral pancreatic islet from mice, suffers unwanted change due to the presence of the trivalent (AsIII, MMAIII, and DMAII).

Arsenic induces and plays a significant role in causing diabetes by inhibition of pyruvate and -ketoglutarate dehydrogenases in the process of metabolism cycle. The probable pathways for the cause of hypertension, which is cardiovascular disease, highlights the

role of Arsenic in the process. Inflammation, endothelial dysfunction, changes the morphology of blood vessels and also is responsible for renal failure. Arsenic-induced process, in actual affects cell signaling, and therefore communication. It leads to apoptosis, resulting in increased cytokine production and activating caspase-9 through Apaf-1 and the apoptosome (Maaty, Grieco, Young and Bothner *et. al.*). The potential possibility of wellness intrinsic in each healthy cell suffers mutagenesis resulting in incompetence due to arsenic-induced illness.

Cytotoxicity

Cytotoxicity occurs when a cell finds itself amid pollutants and harmful substances. The problem barrier for the cell gets recognized. Problem transfer into a challenge when scientific assistance when scientific procedure and analysis get included. A few investigators came out with the various process, and proposals, identifying shortcomings to feel-good stories. The

arsenic threat in India necessitates more inclusion of successful stories to create a network of deep roots that can hold the promise of researchers. The development of research along the line will enable understanding the elements of the process that gradually will create effective ways to filter Arsenic. Arsenic removal methods likewise will help the cells to enjoy healthy surroundings.

Before that, it is necessary to identify the zone effect by random testing with standards test kits in the laboratory. Different school and college chemistry laboratories can play a significant role to identify the source of Arsenic infections to testify the groundwater, river water, and water used for agricultural

production. Arsenic groundwater contamination in India and narration of various corrective and precautionary measures taken up so far by different states. Although some success has been achieved, also failure has been experienced. Our paper would also discuss the Gangetic delta areas of West Bengal, a prominent arsenic zone.

The major Gangetic delta regions of West Bengal are Murshidabad, Nadia, the 24-Parganas (North and South), and Kolkata. This region of West Bengal has an extremely high population density and this delta region has the fourteen densely inhabited cities of top fifty densely population city in the world, according to data retrieved on 2008-08-22 (Directorate of Census Operations, 2009).

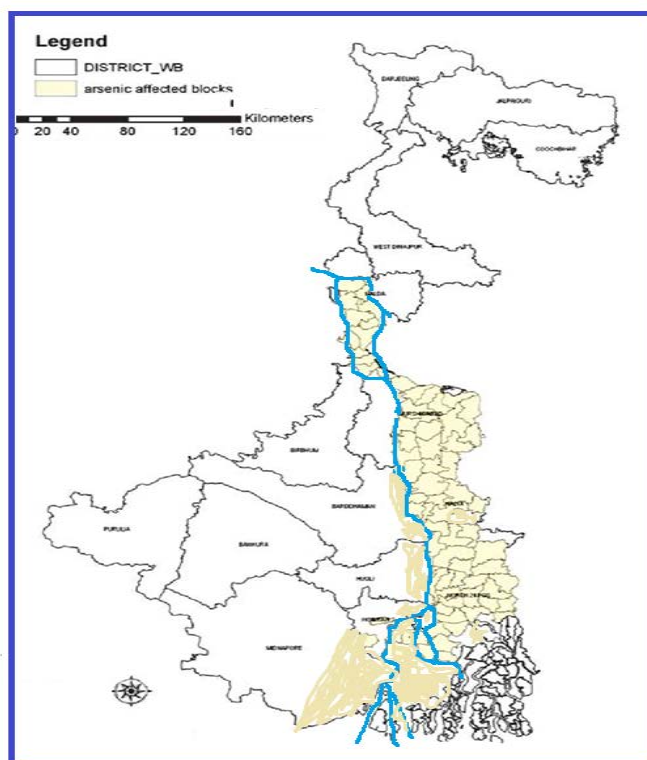


Fig. 2. West Bengal delta area.

Result and Discussions

Most of the water collected from the regular drinking water source from the wide range of areas around Nadia, 24-Pargagas (North and South), Midnapore (East), Hoogly and Kolkata. The water collected from Nazirpur, Haripur, Betai, Tehatta, Krishnanagar, Ranagath, Kalyani in the Nadia district has found the Arsenic level 0.02 <Sample <0.05 mg/L. Bangaon, Gobardanga, Maslandapur, Habra, Ashoknagar has found the Arsenic level Sample <0.02, 0.1 mg/L and few places are around 0.1 mg/L. Barasat, Naihati, Khardaha, Madhyamgram, New Barrackpore has found the Arsenic level 0.01 <Sample <0.02 mg/L, Dankuni, Rajarhat, Saltlake has found the Arsenic level Sample <0.01 mg/L, Baruipur, Ruby, Garia, Jadavpur has found the Arsenic level Sample <0.02 mg/L, Midnapore (East) has found the

Arsenic level Sample <0.02 mg/L shown in the below map Figure. 2. The drinking water contamination of arsenic in some of the area's in these delta region is found alarming and just below the permissible level and border line. So, drinking of such water for a prolong time can be harmful to human beings and as well as domestic animals. Using these Arsenic contaminated water for plantation and vegetation for the long time can further contaminate our food chain. Especially, underprivileged people of North 24-Parganas and Nadia in the border area of West Bengal are forced to use unpurified water for household use and drinking purposes. Such unpurified water having Arsenic level a slightly higher in range than the other area causing a tremendous impact on their health.

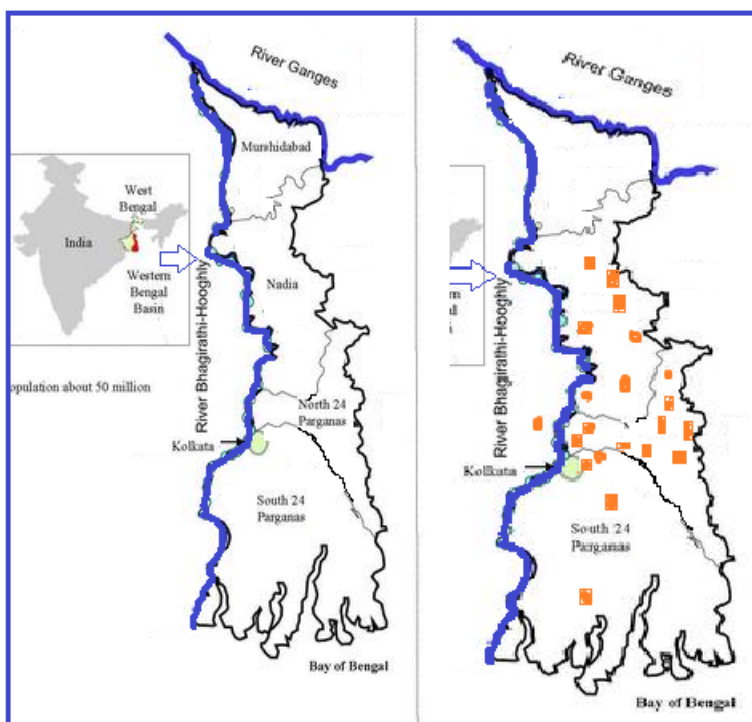


Fig. 3. Delta area under our servey.

Conclusion

Chronic arsenic poisoning caused by drinking arsenic-contaminated groundwater poses a severe threat to human health and well-being throughout the globe. Many skins, liver, cardiovascular, pulmonary, and gastrointestinal diseases may become worrisome in today's world. In addition, genetic aberrations may be caused by a variety of neurological abnormalities and genotoxicity. Because of the limited thickness of lithological orientation, the Ganga delta area in West Bengal is too much endangered, according to lithological and stratigraphic data.

But most of the samples experimented with are under the threshold limit. Still, long term consumption of even these levels can be harmful to human beings and domestic animals.

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