Arsenic – India’s health crisis attracting global attention

Water, water, everywhere,
Nor any drop to drink.
— Samuel Taylor Coleridge

The spread of arsenic contamination in groundwater seems to be assuming gargantuan proportions. What is worse is that inhabitants of the affected areas are unaware and the local authorities totally oblivious to this grave problem. It was known that West Bengal (WB) and Bangladesh had high levels of arsenic in the groundwater, but slowly the problem is spreading to other states like Uttar Pradesh. This is confirmed by the reports of All India Institute of Medical Sciences, New Delhi that people living in the Ballia district of UP also have high levels of arsenic in their blood, hair, nails, etc.

According to the Union Ministry of Water Resources, eight districts of WB and one district of Bihar are arsenic-contaminated. The fact is that arsenic is increasingly found in the districts of Bihar, Terai UP and even Assam. Scientists report that arsenic is natural and is found in this region because it came with the silt deposited by the mighty rivers centuries ago. This silt was deposited when the rivers meandered and slowed down, so it is widespread in the deltas of WB and Bangladesh.

In WB and Bangladesh, the surface resources of sweet water such as rivers, wetlands, flooded river basins and oxbow lakes are among the largest in the world. These two areas are known as the land of lakes are among the largest in the world. These two areas are known as the land of rivers and receive approximately 2000 mm annual rainfall. Proper watershed management and village participation are needed for proper utilization of these huge bodies of water.

How it began

The first cases of arsenic poisoning in WB were reported up in the early 1980s. Water from tube wells was identified as the culprit. These wells were having depths in the range of 20–150 m. Although the arsenic-contaminated water at first came mainly from the middle of the three aquifers in WB, researchers now believe that the problem is more extensive. ‘No tube well of any depth is safe in the arsenic-affected villages’, says Dipankar Chakraborty (Director and Head, School of Environmental Studies, Jadavpur University). According to him, the situation caused by the arsenic-polluted drinking water in eastern India and Bangladesh is alarming. Nine districts in WB, India and 42 districts in Bangladesh have arsenic levels above the WHO maximum permissible limit of 50 µg/l. The area and population of the 42 districts in Bangladesh and nine districts in WB are 92,106 sq km and 79.9 million and 38,865 sq km and 42.7 million respectively. Chakraborty and his group started their survey for arsenic-affected villages in 1989 in WB, whereas the work in Bangladesh began in 1995. According to their survey, more than 1000 villages are arsenic-affected in the nine districts of WB. As more villages are surveyed, more arsenic-affected villages are discovered. They suggest that the problem is related to large-scale withdrawal of groundwater. The seasonal fluctuation of water table results in rapid and regular intake of oxygen within the pore space of the sediments. This inflow breaks down sulphides in the arsenic-laden pyrite rock through oxidation and thus releases arsenic into the water.

Arsenic toxicity

According to Subhas Mukherjee (Calcutta Medical College), symptomatology of arsenic toxicity may develop insidiously after the intake of arsenic-contaminated water. Clinical features include diffuse melanosis (darkening of the skin) in the whole body or on the palm of the hand, spotted pigmentation commonly seen on the chest, back or limbs, leucomelanosis, burnous mucous membrane melanosis on the tongue, gums, lips, etc., conjunctival congestion, nonpitting swelling of the feet, hepatomegaly, splenomegaly, ascitis, etc. Squamous cell carcinoma, basal cell carcinoma, Bowen disease, carcinoma of the lungs, uterus, bladder, etc. are apparent in patients with advanced cases that have suffered for many years.

There is no medicine for chronic arsenic toxicity; safe water, nutritious food, fruits and vegetables and physical exercise are the only preventive measures to fight chronic arsenic toxicity.

According to Chakraborty and his group, the prophylactic measures that should be adopted to combat the present arsenic crisis include the following:

1. In most of the villages surveyed in WB and Bangladesh, an average of 35% of the tube wells contain water that is safe to drink. These wells should be tested for arsenic every 3–6 months.
2. Epidemiological research is needed in the arsenic-affected areas to characterize and quantify the arsenic-related public health burden and to document the long-term health benefits of arsenic exposure reduction.
3. People should be made aware that their arsenic-related diseases are due to the arsenic-contaminated groundwater they are using for drinking and cooking.

Solutions for alleviating the arsenic problem

1. An estimated 30 million people in the Ganges delta are drinking well water contaminated with naturally occurring arsenic. India so far has spent $3 million on arsenic removal plants (ARPs) to capture the dissolved arsenic using ferric salts. About 20% of the plants are functioning well; many are not removing arsenic to the required standard. Villagers are not being trained to maintain the plants. Of the 2000 arsenic-removal plants installed in the villages of WB, 4 out of 5 are either abandoned or deliver smelly and discoloured water. According to a 2004 report of the School of Environmental Studies (SOES), Jadavpur University, out of 20 ARPs, 15 were found in good working condition; of which 8 were not useful in removing arsenic (according to the Indian standards value of arsenic in drinking water) and 14 (93.3%) were not useful in removing arsenic (according to WHO recommended value of arsenic in drinking water). Out of 16 ARPs, 14 (87.5%) were not useful to remove iron from raw water (according to Indian standard value and WHO recommended value of iron in drinking water).

The report further states that though the treatment plants were installed for supplying safe water, the endeavour fails to succeed because of technological limitation of the plants, lack of proper service and maintenance, lack of peoples’ participation, lack of awareness of people, lack of education, village politics, poor socio-economic condition, etc. Thus in the villages predominant in India and Bangladesh, development of such technology is possible only when bureaucrats, technocrats and villagers cooperate with proper village level participation.
Antarctica and Arctic: India’s contribution

As the Indian team of scientists left for Antarctica from Goa in December 2004 for the 24th Expedition, it is of interest to trace the origins and perspectives of polar research. Although the presence of land near the southern pole was predicted in the 3rd century BC by the Greek, the reports of Captain James Cook (UK, 1773) about his trips on crossing the Antarctic Circle and seeing the existence of wildlife led one to believe the presence of land. Even so, the existence of a southern polar continent was not proven until the 19th century. Much of the early ventures of the Antarctic land/waters that were undertaken were for sealing and whaling activities. The presence of a peninsular region was realized accidentally when ships got wrecked in adverse weather conditions. The UK, France, Norway, Sweden, Belgium, Germany, Russia and the USA are some of the countries to have started expeditions during the 19th and early 20th centuries. Most of the work was done using timber-hulled sailing ships that lacked the structural strength, power and sophisticated navigation aids of modern era.

The first recorded ongoing settlement on Antarctica was in 1903 when the Scottish National expedition established a building on Laurie Island. The station was handed over to Argentina the following year and was later named ‘Orcadas’. It is the longest continuously operating station in Antarctica. The International Geophysical Year (1957), proved to be a landmark in the history of Antarctic expeditions. After that, permanently staffed stations were established at many points around the continent. Most national Antarctic programmes continue using vessels as the principal means of transporting supplies and personnel. Air transport is also used by many operators for inter and intra-continental movement of personnel and supplies.

1 December 2004 was the 45th anniversary of the signing of the Antarctic Treaty and India has been part of this treaty for the past 21 years (since 19 August 1983). The first Indian Wintering was conducted in the permanent station ‘Dakshin Gangotri’ built in 1983 on the Prince Astrid ice shelf. Following this, India was admitted as member of the Scientific Committee on Antarctic Research (SCAR) in 1984 and a member of Convention for the Conservation of Antarctic Marine Living Resour-