ARSENIC : A GLOBAL MONSTER

SUBHANKAR DAS* AND AMAL ROY CHOWDHURY*

Arsenic can cause acute and chronic toxic effects in the living system. There are several uses of arsenic in industry and in agriculture. The major uses of arsenic compounds in the glass industry and in the production of semiconductor are well established. The biggest calamity of arsenic toxicity has been documented as the development of arsenicosis by using the underground water as drinking purpose. As many as 20 countries are reported to have unveiled such incidents so far. Major disastrous effects of arsenic toxicity were reported from Bangladesh and West Bengal, India. In West Bengal alone, 6 million of population are at risk through arsenic exposure in drinking water. Exposure to arsenic via drinking water is associated with significant elevation of pimentation and keratoses which may eventually lead to skin cancer. Other systemic affections are cardiovascular irregularities, GI symptoms, neuropathy, abnormal pregnancy outcome and respiratory disorders. Chronic arsenic exposure, sometimes may found to cause cancer to various internal organs e.g. bladder, lung, kidney, liver etc. Arsenic is absorbed through gastrointestinal (GI) tract after its exposure and get metabolised in the liver before being excreted through urine in different forms. In course of such metabolism, arsenic is methylated to monomethyl arsonic acid (MMA) and to dimethylarsenic acid (DMA) which may easily be excreted.

The primary objective of screening of arsenic toxicity is to identify the stages of toxicity and elimination of it from the body. The current management of acute and chronic arsenic poisoning relies on supportive care and chelation therapy. Clinical studies revealed that chelating agents like DMSA, DMPS, BAL, D-penicillamine have little effect on modifying the deleterious effect of arsenic induced toxicity. Several unfocussed area has been discussed in this aspect, so that newer approach might have come with new hope to encounter this global monster.

In the second half of the nineteenth century, pollution of air, water, soil and food has become a threat to the plant and animal communities, including the human race due to arsenic contamination. Arsenic poisoning is not only a tragedy for the people but also a test before our modern science and us. It starts in ancient Greece, touches down in today's America and several other countries like Argentina, Austria, Australia, Bangladesh, Chile, China, Finland, Germany, India, Inner Mongolia, Jamaica, Japan, Mexico, Nepal, Pakistan, Spain, Sweden, Taiwan, Thailand, Vietnam (Table 1). The biggest mass-poisoning case in the world has known is taking place in Bangladesh[6]. However, in West Bengal, India also, the ground water in 9 of 18 districts is heavily contaminated with arsenic. At present, almost 6 million people are endemically exposed to that through hand pumped tube wells. The concentrations of arsenic in those water samples 60-560 ppb, thus greatly exceeding the current contamination level laid down by WHO[115] and USEPA[116] i.e. 10μg/L. The routes of arsenic to which human being and other animals are actually exposed have been reported in different literature worldwide. Arsenic in drinking water is the most important route for arsenic contamination to animal kingdom and confers a great threat to human society in different parts of the world. Presently more than 19 countries of the world are suffering in the environmental disaster of arsenic poisoning through drinking water. Gorai et al[13] first reported the incidence of chronic arsenic toxicity from a village of 24 parganas in West Bengal, India.

* Dept. of Industrial Toxicology, Regional Occupational Health Centre, Indian Council of Medical Research, Block-DP, Sector-V, Salt Lake City, Kolkata-91.