# ARSENIC IN DRINKING WATER CAUSES MULTIPLE HEALTH HAZARDS: AN EMERGING ENVIRONMENTAL PANDEMIC

CHIEN-JEN CHEN*

*Genomics Research Center, Academia Sinica, Taipei, Taiwan*
***cjchen@ntu.edu.tw***

Arsenic is a ubiquitous element in the crust of the earth. It is transported in the environment mainly by water. Although arsenic is one of the oldest poisons identified and used in ancient time, the systemic health hazards of long-term exposure to arsenic in drinking water have been intensively investigated only since 1960s. Arsenic in drinking water has been well documented to cause multiple health hazards including characteristic skin lesions (hyperpigmentation and/or depigmentation, palmosolar hyperkeratosis, Bowen's disease and skin cancers), blackfoot disease, ischemic heart disease, cerebral infarction, peripheral vascular disease, microvascular diseases, abnormal peripheral microcirculation, carotid atherosclerosis, QT prolongation in electrocardiography, hypertension, goiter, diabetes mellitus, posterior subcapsular lens opacity, pterygium, slow neural conduction, retarded neurobehavioral development, erectile dysfunction, as well as cancers of the lung, kidney, bladder, liver and prostate. Several biomarkers of susceptibility to arsenic-induced health effects have been identified. They include arsenic methylation capability, folate and carotenoids intake, and genetic polymorphisms of enzymes involved in xenobiotic metabolism, DNA repair, and oxidative stress. Further exploration of gene-environment and gene-gene interactions on the development of arsenic-induced health hazards is in urgent need.
The cancer risk associated with arsenic in drinking water in Taiwan has been analyzed to set up the maximal contamination level of arsenic in drinking water by the World Health Organization and Environment Protection Agency of the USA. According to the WHO Guidelines for Drinking-Water Quality, 0.01 mg/L was established as a provisional guideline value for arsenic. The guideline is intended for use as a basis for the development of national standards in the context of local environmental, social, economic, and cultural conditions. Due to the rapid growth of human population, severe surface water pollution, global warming and climate change, more and more world populations are using groundwater as the main drinking water source. The global disease burden of chronic arsenic poisoning from drinking groundwater has significantly expanded from few confined endemic areas to a pandemic environmental calamity all over the world in the late 20th century. The number of victims exposed to arsenic from drinking water is rapidly increasing. Hundreds of millions of people are living in areas where the arsenic content in drinking water exceeds the maximal contamination level recommended by the World Health Organization.

Keywords: arsenic, drinking water, cancer