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Chronic low level arsenic may increase the risk of lung carcinogenesis: Role of inflammatory responses

Dona Sinha
Chittaranjan National Cancer Institute, India

Abstract

Groundwater arsenic contamination is a serious public health concern in the Indian subcontinent. This study was undertaken to investigate whether chronic low level arsenic exposure (>10 to 50 ppb) in drinking water increases the risk of lung carcinogenesis among never-smokers. A stratified randomized cross-sectional study was conducted involving 226 never-smoking asymptomatic (without arsenic related skin lesions) adult males (median age 37 yr) from arsenic exposed areas of Nadia district ,West Bengal and 212 age- and gender matched never smokers (control subjects) from arsenic-free villages of the same district.

The concentration of arsenic in drinking water, as measured by atomic absorption spectroscopy, was 34.82 ± 11.67 (SD) µg/L in endemic and 2.92 ± 1.35 µg/L in control villages ($p<0.001$). The pap-stained smears of spontaneously expectorated sputa of arsenic-exposed subjects showed increased number of inflammatory cells and alveolar macrophages along with increased prevalence of metaplasia of and dysplasia of airway epithelial cells, when compared with that of controls. In addition, their sputa contained elevated levels of macrophage elastase, matrix metalloproteinase-2 and 9. Besides, the arsenic -exposed subjects had elevated plasma levels of pro- inflammatory mediators like interleukin-6 and 8, C-reactive protein and tumor necrosis factor-alpha ($p<0.05$). Flow cytometric study showed remarkable increase in the generation of reactive oxygen species in the airways. In essence, long-term low level chronic arsenic exposure is hazardous for human health as it causes airway inflammation, induces oxidative stress, and alters cellular differentiation that may increase the risk of carcinogenesis in the lung.

Biography

Dr. Dona Sinha is a faculty at the Chittaranjan National Cancer Institute, a premiere National Cancer Institute of India. Her prime research interest concerns health impacts of arsenic in human population, MMP biology with respect to tumor migration and invasion, and chemopreventive as well as chemotherapeutic effects of phytochemicals. She obtained her doctoral degree in 2007 and has contributed in 24 peer reviewed reports. She has reviewed a number of prestigious journals including Molecular Cancer Therapeutics, Molecular Nutrition and Food Research and Anti Cancer Drugs. Dr. Sinha is an active member of American Association of Cancer Research and Life member of Indian Science Congress Association and All India Congress of Cytology and Genetics.