AOGS 2006

Uptake of Some Elements by Humans from Aerosols — A Case Study of Delhi and Bangalore Regions

SUDARSHANA ANAND[1], SUDESH YADAV[1], VINOD JAIN[1]

[1] *Jawaharlal Nehru University*

Aerosol research has gained tremendous importance globally due to the cumulative effects of increasing industrialization and urbanization on aerosol production which can have an alarming impact on the climate of the planet as well as the health of its inhabitants. Therefore, there is an increasing need to study aerosols for all of their physicochemical and biological aspects on both local and global scales. World over extensive research has gone into studying the physical and the chemical aspects of aerosols. However, little nformation is yet available on the health impacts of aerosols particularly in the Asian context. Here we report uptake of various elements that are concentrated in aerosols by the human body in Delhi and Bangalore cities and their possible health effects. In many urban areas, for example in Delhi, inhalable fractions of aerosols are known to have high concentrations of elements such as Cu, Zn, Pb, Ba, Ni and Cr (Yadav and Rajamani, 2004). Also aerosols in the North West part of India seem to be particularly enriched in these elements. If so, there is a high possibility of these elements getting into the human system either directly or indirectly through water and food. To determine the concentrations of these elements that are present in significant concentrations in the inhalable fractions of aerosols, human hair and blood samples are used as proxies. Both these regions have contrasting geographic and climatic conditions. Delhi (altitude: 213-305m above MSL) located on the fringes of the Thar desert which supplies considerable amount of dust, is semi-arid with annual rainfall of 60-80 cms and temperatures varying between 1-45 deg C. Bangalore(altitude of 900m above MSL) receives a high annual rainfall of 80-100 cms and being located on the fringes of tropical forests of the Sahyadri Mountains(Western Ghats)receives little crustal contribution to the aerosols. Samples from least polluted mountainous areas of Himalayas(Gangothri)and Sahyadri (Ooty)were also collected as reference samples. All the samples were digested in a microwave system. Elemental analyses were carried out using both ICP-MS and ICP-AES methods using multi-element standard solutions from Merck. The elements analyzed include Al, Ca, Mg, Ni, Cu, Ba, Zn, Pb, Cr, Sr, K, Na, Si, and P in about 100 samples of blood and hair. Preliminary results indicate a possible human uptake of elements from the aerosols. In comparison to the international reference and local background values(Gangothri), Delhi and Bangalore samples of human hair and blood show significant enrichment of these elements. Samples from Gangothri are comparable to those of the international reference values. Delhi samples have much higher concentrations of several

elements, especially Al, Zn, Pb and Cu. Although the Bangalore samples are also enriched compared to the reference values, they are much less enriched relative to the Delhi samples. Bangalore samples have negligible contributions from the crustal aerosols as compared to the Delhi samples where the crustal contributions seem to be very high. Elements enriched in the PM 10 aerosols or the respirable fractions include Ca, Mg, Al(crustal)and Ba, Zn, Cu, Pb, Ni, Cr(anthropogenic). In all the samples, hair seems to be a better long term indicator of elemental uptake compared to blood. The health effect of aerosols can be several as indicated by studies elsewhere and will be discussed.