

Talk 3.3

High prevalence of uranium in groundwater of Punjab: A comparative study of its distribution, potential source & health risk assessment

Satvir SINGH¹, B.S. BAJWA^{1*}, Tanu SHARMA¹, Inderpreet KAUR²

¹Department of Physics, Guru Nanak Dev University, Amritsar-143005, India

²Department of Chemistry, Guru Nanak Dev University, Amritsar-143005, India

Email: bsbajwa1@gmail.com

The present study has been undertaken to assess the distribution of the uranium in groundwater along with health risks associated with its ingestion, covering South-West (SW) and Northern (N) regions of Punjab state, India. The uranium concentration in groundwater of SW and N regions of Punjab has been observed to be varying from 1.3 to 541.8 $\mu\text{g L}^{-1}$ and BDL to 68.6 $\mu\text{g L}^{-1}$, with mean values of 93.6 and 8.9 $\mu\text{g L}^{-1}$, respectively. It has been observed that 78% of analyzed samples particularly from the SW-Punjab, exceeded the maximum permissible limit sets by WHO(2011) of 30 $\mu\text{g L}^{-1}$ and even 52% of the samples exceeded 60 $\mu\text{g L}^{-1}$, the limit recommended by AERB (2004) of India. The measured annual effective dose ranged from 9.9 to 1084.0 $\mu\text{Sv y}^{-1}$ and 0 to 106.7 $\mu\text{Sv y}^{-1}$ for SW and N Punjab, respectively. The chemical toxicity has been found to be in the range of 0.44 to 48.65 $\mu\text{g Kg}^{-1}\text{day}^{-1}$ with an average of 6.38 $\mu\text{g Kg}^{-1}\text{day}^{-1}$ for SW-Punjab, which is quite higher than AERB recommended limit of 4.53 $\mu\text{g Kg}^{-1}\text{day}^{-1}$. The HQ for SW-Punjab was found to be greater than 1, indicating significant risk due to intake of uranium contaminated water from the SW region. However, the uranium concentration with its both radiological and chemical risks in all the analyzed groundwater samples from N-Punjab was observed to be well below the international and national recommended safe limits. The quite high levels of TDS, salinity and conductivity have also been observed particularly in SW region of Punjab, which might have increased the leaching of uranium through the formation of carbonates and bicarbonates. Maximum uranium concentration in groundwater has also been observed only at shallow depths. In SW-Punjab, it is being recommended to use the canal water for drinking purposes and domestic uses by urban and rural populations than groundwater sources.