

Title: Transfer factors of naturally occurring radionuclides from soil-to-rice cultivated in Bangladesh and associated health implications

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Abstract: This study investigates the uptake of naturally occurring radionuclides (^{226}Ra , ^{232}Th , and ^{40}K) from soil by rice plants in extensively cultivated regions in Bangladesh. It also evaluates the potential radiation risks associated with rice consumption by the Bangladeshi populace. High purity germanium (HPGe) gamma-ray spectrometry was employed to measure the concentrations of radionuclides in both soil and rice samples. For ^{40}K , our results agree with the International Atomic Energy Agency's (IAEA) published value; however, the transfer factors (TF) for the other two radionuclides differ considerably. Despite the fact that the IAEA based its publication of TFs for ^{226}Ra and ^{232}Th on clay soil, the majority of the soil profile in the present study was silty clay with a little alkalinity. Moreover, the data obtained may have been impacted by the growing seasons, cultivation methods, and soil fertility. Additionally, the annual effective dose due to the ingestion of radioactivity resulting from rice consumption was evaluated and the results agree with UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiation), 2000. With a few exceptions, the excess lifetime cancer risk (ELCR) values for ^{226}Ra , ^{232}Th , and ^{40}K were below the globally average permissible level (1×10^{-3}). In light of this, the current study indicates that consuming rice does not pose an immediate health risk to the general public. By studying TFs among various rice varieties and geographical areas, scientists can develop models to forecast the possible radiation exposure from rice consumption and pinpoint activities or areas that require additional attention.

Keywords: Radionuclide uptake Transfer factors (TF) Rice cultivation

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