Investigation of environmental radiation of sand and soil samples from Dead Sea beach, Jordan

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This study's goal is to quantify the levels of naturally occurring radioactivity in Dead Sea (Jordan) soil and beach sand. In addition to enjoying the hot sun, many visitors and residents are used to coming to the Dead Sea coastline to benefit from the salt water's ability to treat a variety of skin conditions. To safeguard individuals, it is crucial to assess the environmental radiation that originates from soil and sand. This problem has been the subject of numerous studies in the past. This work has considerable credibility because it demonstrated that the earlier research are reasonably accurate and meet international criteria.

Fifty samples of soil and fifty samples of sand were collected from different locations along the seashore. Using a high purity germanium detector with a relative efficiency of 40%, the radionuclide concentrations of three naturally occurring radionuclides (232Th, 226Ra, and 40K) were measured separately for soil and sand. The following average radioactive quantities were discovered in Dead Sea beach sand samples: 226Ra, 232Th, and 40K. The corresponding values were 50.96 ± 4.35 $Bq \cdot Kg^{-1}$, 123.93 ± 16.15 $Bq \cdot Kg^{-1}$, and 952.05 ± 122.15 $Bq \cdot Kg^{-1}$. For soil samples, the corresponding radionuclide activity values were 13.98 ± 2.89 $Bq \cdot Kg^{-1}$, 166.34 ± 17.32 $Bq \cdot Kg^{-1}$, and 1265 ± 116.27 $Bq \cdot Kg^{-1}$ on average.

Another significant quantity was computed in order to finish the radiation survey from the measured samples: the rate at which radionuclides in soil and sand samples are absorbed. It was determined that the average absorbed dose rate from radionuclides in sand was 76.33 $nGy \cdot h^{-1}$. It was also determined that the average absorbed dose rate in soil was 110.04 $nGy \cdot h^{-1}$. In order to examine the impact of radiation doses on humans, a set of radiation risk criteria was evaluated. The external hazard index (Hex), gamma radiation representative level index (Iγ), and radium equivalent activity (Req) readings were all below the UNSCEAR and ICRP reports' suggested levels. Conclusion: At least for the purposes of this study, there were no radiological effects on Jordanians or visitors to the Dead Sea shoreline. These findings can be used as a guide for further research.