

Assessment of Exposure to Natural Radiation in the Kingdom of Saudi Arabia

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ABSTRACT

The present paper summarizes an overall assessment of exposure to natural radiation in the majority of highly populated regions of the Kingdom. Results obtained from different measuring techniques on concentrations of naturally occurring radionuclides, gamma-ray dose rates at 1 m above soil surface, gamma-ray dose rates from the monitoring stations and radon concentrations are summarized and illustrated. Analysis of the collective effective doses from natural radiation exposure is conducted and average exposures are assessed. Comparison of the obtained average doses with previously reported dose rate levels previously obtained using thermoluminescent dosimetry for the same regions of the Kingdom has been conducted.

INTRODUCTION

The most significant human exposures to ionizing radiation comes from the premordial long-lived radionuclides existing naturally in the earth crust, which are namely the uranium-238 and thorium-232, together with their radioactive daughters and potassium-40. Exposure to terrestrial gamma radiation emitted from the soil surface, inhalation and ingestion of radon-222 and 220 emanating from earth crust due to the decay of the uranium and thorium series, and the long lived radionuclides existing in the human body all together contribute more than 83% of the total human exposure⁽¹⁾. So, measurement of concentrations of naturally occurring long lived radionuclides in the upper soil crust, and levels of the terrestrial gamma radiation above the soil surface is an essential step for accurate evaluation of the exposures of human being to ionizing radiation.

In the Kingdom of Saudi Arabia, a comprehensive program for measurement of concentrations of premordial and man-made radionuclides in the soil crust and gamma-ray dose rates have been carried out in different regions⁽²⁾. Moreover, a radiation monitoring network consisting of 15 monitoring and warning stations has been set up recently in the highly populated cities and at some selected locations of the country, to monitor and record the gross gamma dose rates. The monitoring data was collected from the monitoring stations for about 3 years⁽³⁾. Other works devoted to dose rate evaluation at different cities of the Kingdom have been carried out using the thermoluminescent dosimetry by some authors⁽⁴⁻⁵⁾.

The present paper aims to summarize an overall assessment of the exposure to terrestrial radiation and naturally occurring radionuclides in highly populated cities and regions of the Kingdom.

