RADIUM EQUIVALENT ACTIVITY OF BUILDING MATERIALS AND GAMMA RAY DOSE RATES IN ORDINARY HOUSES OF SÃO PAULO, BRAZIL

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The major contribution to the radiation exposure received by the general population is due to natural sources, which include external sources such as cosmic radiation and radioactive nuclides present in building materials and internal sources from inhalation and ingestion of naturally occurring radionuclides in air and diet. The external radiation exposure from natural radioactivity represents, approximately, 50% of the average annual dose caused to the human body by all natural and artificial radiation sources. Natural radioactivity in building materials is the most important source of external radiation exposure in dwellings because of the gamma rays emitted from ^{40}K and members of the uranium 238 and thorium 232 decay chains.

The specific activity of building materials determined in many countries shows that concrete is one of the most potential sources of elevated radiation exposure. However, very little is known about the natural radioactivity of Brazilian construction materials and, in 1991, our group was charged by the Santo André district of São Paulo, Brazil, to predict the exposure rates of several ordinary houses built almost of concrete, knowing the activities of the building materials.

A total of 38 samples of 6 different materials (4 raw and 2 building products) were collected and prepared for activity concentration measurements by using high resolution gamma-ray spectrometry.

Since ^{226}Ra is fairly the most critical radionuclide for radiation exposure considerations, the radium equivalent activity was calculated for all the 38 samples, in order to compare the specific activities of the construction materials containing different amounts of radium, thorium and potassium. The results varied from 90.7 Bq/kg (concrete beam) to 242.2 Bq/kg (concrete). The effective dose equivalent rate due to the indoor gamma radiation from the building materials was performed following the 1988 UNSCEAR procedures. The values obtained ranged from 4.0×10^{-3} mSv/y (concrete beam) to 0.3 mSv/y (concrete) which is below the 2.4 mSv/y assumed UNSCEAR value for natural radiation sources.