RISK ASSESSMENT OF RADON PROGENY IN AFRICAN DWELLINGS

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ABSTRACT

Radon is a radioactive noble gas. Of all radon isotopes only two, radon-222 (radon) and radon-220 (thoron) occur in significant amounts indoors. The state of equilibrium of thoron and the decay products is very low and varies a lot due to the short half-life of thoron. That of radon and progeny is relatively high and stable due to the relatively longer half-life. As a result, the equilibrium equivalent radon concentration, EERC, can be used to determine the level of radon progeny in indoor air. Exposure to radon and radon progeny is the dominating source of exposure to ionizing radiation in most countries. The radon levels vary between dwellings, and depend on inflow of soil gas and the type of building materials. In indoor air, the degree of radioactive equilibrium between radon and its short-lived progeny depends on the aerosol concentration and its size distribution and the air exchange rate. The degree of equilibrium is expressed in terms of the equilibrium factor which is used in determining the dose to the lungs from radon progeny. The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and the International Commission on Radiological Protection (ICRP) have adopted a worldwide factor of 0.4 for indoor air. Measurement of radon gas is therefore considered to be a good alternate for approximating the concentrations of the radon decay products. To make a reliable estimate of the radon risk, a long-term (three months to a year) measurements of radon are required. The most important route of exposure to radon and its decay products is inhalation. It is the inhalation and deposition in the airways of radon progeny that give rise to irradiation by alpha particles of sensitive cells in the lung tissue. The radiation dose delivered to the lung from inhaled radon progeny is dominated by the alpha particles emitted by the short-lived radon decay products. These alpha particles have very short ranges in tissue hence they deliver a high density of DNA damage to cells in these short distances. This paper discusses the radon progeny levels and the doses received by residents in Africa estimated from radon concentrations levels reported by different researchers in the continent and as measured using continuous and passive monitoring techniques.

Key words: Radon progeny, EERC, Cancer risk, lung cancer, equilibrium factor.