Radon and Thoron Concentrations Inside Ancient-Egyptian Tombs at Saqqara Region: Time-resolved and Seasonal Variation Measurements

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Abstract

For complete assessment of inhalation doses of radon and its progeny inside the three main ancient Egyptian tombs in Saqqara, seasonal radon concentrations have been measured by using a new electronic device that allows for measurement of real-timeïresolved radon concentrations. Measurements were complemented by very fast measurements of thoron concentrations, which turned out to be low. Based on these measurements, annual residence time inside these tombs and the newest International Commission on Radiological Protectionïrecommended radon dose conversion coefficients or seasonal effective doses were calculated. The results indicate that workers receive highest annual effective doses of up to 140 mSv, which exceeds the annual limit of 20 mSv, whereas lower values up to 15 mSv are received by guides. In contrast, much lower doses were obtained for one-time visitors of the investigated tombs. The obtained results are somewhat different but still consistent with those previously obtained by means of fixed passive dose meters at some of the investigated places. This indicates that reasonable estimates of the effective dose of radon can be also obtained from short-term radon measurements carried out only twice a year (summer and winter season). Increasing the ventilation, minimizing the working times, etc., are highly recommended to reduce the annual effective dose.

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