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Determination of 226Ra and 222Rn content in thermomineral water and assessment of radiation risk

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Determination of 226Ra and 222Rn activity concentration in water has been recognized as one of the most important tasks in the preservation of public health, since increased content of these radionuclides in drinking water may lead to increased health risk. Generally, the presence of 226Ra in water samples is potentially dangerous due to its radiotoxicity and has been related to the cancer of bones [1]. On the other hand, its decay product 222Rn is recognized as a potential cause for the development of lung cancer. Over the decays, several techniques have been developed for the determination of 226Ra and 222Rn in water–ɣ spectrometry, α spectrometry, and liquid scintillation counting.

The concentration of 226Ra in water depends mostly on the geology of the area and may be elevated if water passes through rocks with elevated content of 238U. Thus, it is especially important to measure the content of 226Ra and 222Rn in thermal and mineral water, since these waters are groundwater and a high concentration of 226Ra is expected to be found [2]. At the same time, thermal and mineral water is used for different kinds of treatment [3], such as musculoskeletal diseases, arterial hypertension, bone fracture, post-traumatic conditions, neurological disorders, sports injury, etc, which may lead to increased doses due to inhalation and ingestion.

In this work, the activity concentration of 226Ra and 222Rn in thermomineral water samples was determined by using the liquid scintillation counting (LSC) technique. The samples were collected from spa Niska Banja [4] located in the southern part of Serbia. A comparison between two methods of sample preparation–one phase and two phases, for 226Ra determination, was made. At the same time, the 222Rn content was measured with the active radon device RAD7 and a comparison with the LSC result was conducted. Furthermore, the doses from ingestion and inhalation of 222Rn, as well as from ingestion of 226Ra were calculated. The annual effective doses were estimated for patients and tourists and compared with levels for the public imposed by the legislation of the Republic of Serbia.

References:

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