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Radioanalytical investigations of uranium concentrations in natural spring, mineral, spa and drinking waters in Hungary

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As many other countries in the Central European region, (e.g. Czech Republic, Slovakia, Romania) Hungary is rich in spring-, thermal-, and mineral waters as well. Recently the consumption of natural mineral- and spring waters comes to be more and more popular in a certain populations. It is well known some of these waters have elevated level of dissolved naturally origin radionuclides, but their concentration may vary in a wide range. In some cases elevated level of dose exposure can be expected. In spite of this fact most of the recommendations do not apply to natural mineral waters and to waters that are classified as of medicinal benefit. From dosimetric point of view, it has a great importance to screen the radioactivity of these waters as well.
Within this work, the activity concentrations of uranium isotopes (²³⁴U, ^{23%}U, and ²³⁸U) were analyzed in some of the popular and regularly consumed Hungarian mineral-, spring-, therapeutically waters and tap waters. Samples were selected randomly and were taken from different regions of Hungary (Balaton Upland, Bükk Mountain, Somogy Hills, Mezőföld, Lake Hévíz).
Uranium isotopes were separated from impurities by extraction chromatographic resin and the activity concentrations were determined by using alpha; spectrometry.
Concentration (mBq L⁻¹) of ²³⁴U, ²³⁵U, and ²³⁸U in the waters is varied from 0.71 to 741.95, from <0.3 to 9.43, from 0.5 to 274.3 respectively.
In general, the highest uranium concentrations were measured in spring waters, while the lowest were found in tap waters. It can be established, in most cases radioactive disequilibrium was observed between uranium isotopes. The activity ratio between ²³⁴U and ²³⁸U varies from 0.630 to 4.717.
The doses for the analyzed samples of spring water are in the range 0.04–35.87 mu;Sv y⁻¹ with an average 4.86 mu;Sv y⁻¹.This is well below the 0.1 mSv y⁻¹ reference level of the committed effective dose recommended by WHO. The other naturally occurring alpha; emitting radionuclides (²²⁶Ra, ²¹⁰Po) will be analyzed later to complete the dose assessment. This study provides preliminary information for consumers and authorities about their internal radiological exposure risk due to annual intake of uranium isotopes via water consumption.

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