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Natural radionuclides in drinking water from the surroundings of the former Žirovski vrh uranium mine

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Under articles 35 and 36 of the European Atomic Energy Community (EURATOM) Treaty, the Member States of the European Union are obliged to inform the European Commission on a regular basis of the radioactivity levels in their environment. The Council directive 2013/51/EURATOM of 22 October 2013 laying down requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption, defines the maximum values for individual radionuclides to be monitored in drinking water. In the present study, the concentrations of the natural radionuclides Po-210, Ra-226, U-238 and U-234 were determined in surface, well and drinking water by alpha-particle spectrometry, while Pb-210 and Ra-228 were determined by beta counting and gamma-ray spectrometry. The tap water samples were collected on target areas and villages in the surroundings of the former uranium mine at Žirovski vrh, Slovenia to assess the effective exposure of the public. Many small springs used for water supply were included in this study. For determination of Po-210, Pb-210 and uranium radioisotopes, a sequential method was used. After addition of U-232 and Po-209 tracers and Pb2+ carrier, the radionuclides were coprecipitated with MnO2. Separation was carried out by selective separation of lead and polonium on a Sr resin column. Uranium was not retained and was determined in the effluent by separation on UTEVA resin. The procedure for Ra-226 was based on coprecipitation of Pb(Ra)(Ba)SO4, followed by alpha-particle spectrometry and determination of the recovery with Ba-133. For determination of Ra-228 coprecipitation with Ra(Ba)SO4 was performed and measured via its daughter Ac-228 by gamma-ray spectrometry. The results obtained show that values of natural radionuclides in drinking water from a private well in the surroundings of the former uranium mine were below values defined in the Directive.

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