

Seasonal variability of iodine and selenium in surface and groundwater as a factor that may contribute to iodine isotope balance in the thyroid gland and its irradiation in case of radioiodine contamination during accidents at the NPP

Elena Korobova, Lyudmila Kolmykova, Boris Ryzhenko, Viktor Berezkin, and Anastasia Saraeva

Vernadsky Institute of Geochemistry and Analytical Chemistry, Russian Academy of Sciences (GEOKHI RAS), Geochemical Dept., Moscow, Russian Federation (korobova@geokhi.ru)

Radioiodine release to the environment during the accident at the Chernobyl NPP led to the increased risk of the thyroid cancer cases within the contaminated areas, the effect being aggravated in conditions of stable iodine and selenium deficiency in local food chains. Although the drinking water iodine is usually believed to contribute not more than 10% to local diet, our estimations accounting of water content in other products and several regional studies (e.g. India and Australia) proved its portion to be at least twice as much. As radioiodine isotopes are short-lived, their absorption depends greatly on stable iodine and selenium sufficiency in thyroid gland in the first few days of contamination and seasonal variation of stable iodine and selenium in local sources of drinking water may be significant as modifying the resulting thyroid irradiation in different seasons of the year. The main goal of the study was to evaluate seasonal variation of levels of iodine and selenium in natural waters of the Bryansk region as a possible factor affecting the radioiodine intake by thyroid gland of animals and humans in case of radioiodine contamination during the accident. Seasonal I and Se concentration was measured in the years of 2014 and 2015 at 14 test points characterizing surface (river and lake) and drinking groundwater.

Obtained data proved considerable seasonal variation of I and Se concentration in natural waters (3,7-8,1 $\mu\text{g/l}$ and 0,04-0,4 $\mu\text{g/l}$ respectively) related to physico-chemical water parameters, such as pH, Eh and fluctuations in concentration of dissolved organic matter. The widest I and Se seasonal variability was observed in surface and well waters, maximum I level being found in autumn at the end of vegetation period characterized by active I leaching from the decomposed organic residues by long lasting precipitations. The content of selenium in the surface waters during summer-autumn (0,06-0,3 $\mu\text{g/l}$) was higher than in spring (0,04-0,05 $\mu\text{g/l}$). In drinking water from centralized supply pipeline low concentration of both elements was also registered in spring (3,7-4,3 $\mu\text{g/l}$ (I) and 0,04-0,08 $\mu\text{g/l}$ (Se)). Accounting of the fact that both the Chernobyl and Fukushima accidents took place in spring, we hypothesis that low iodine intake with water may have contributed to the risk of higher radioiodine intake by thyroid gland in the period of the accident.

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