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Chemical composition of drinking water as a possible environment-specific factor modifying the thyroid risk in the areas subjected to radioiodine contamination

Lyudmila Kolmykova, Elena Korobova, and Boris Ryzhenko
Vernadsky Institute of Geochemistry and Analytical Chemistry (kmila9999@gmail.com)

Water is one of the main natural agents providing chemical elements' migration in the environment and food chains. In our opinion a study of spatial variation of the essential trace elements in local drinking water is worth considering as the factor that may contribute to variation of the health risk in areas contaminated by radionuclides and radioiodine in particular. Radioiodine was proved to increase the risk of thyroid cancer among children who lived in areas contaminated during the Chernobyl accident. It was also shown that low stable iodine status of the contaminated area and population also contributed to the risk of this disease in case of radionuclide contamination. The goal of the study was to investigate chemical composition of the drinking water in rural settlements of the Bryansk oblast' subjected to radioiodine contamination and to evaluate speciation of stable I and Se on the basis of their total concentration and chemical composition of the real water samples with the help of thermodynamic modelling. Water samples were collected from different aquifers discharging at different depths (dug wells, local private bore holes and water pipes) in rural settlements located in areas with contrasting soil iodine status. Thermodynamic modelling was performed using original software (HCh code of Y.Shvarov, Moscow State University, RUSSIA) incorporating the measured pH, Corg and elements' concentration values. Performed modelling showed possibility of formation of complex CaI+ ion in aqueous phase, I sorption by goethite and transfer of Se to solid phase as FeSe in the observed pH-Eh conditions. It helped to identify environmental conditions providing high I and Se mobility and their depletion from natural waters.
Both the experimental data and modeling showed that I and Se migration and deficiency in natural water is closely connected to pH, Eh conditions and the concentration of typomorphic chemical elements (Ca, Mg, Fe) defining the class of water migration in landscapes (according Perel'man, 1975). Obtained data will be used for evaluation of contribution of I and Se status of drinking water to the risk of thyroid diseases among local population.