



Potential of Application of Geoinformation Technologies to Study Spatial Structure of Biogeochemical Provinces

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Chernobyl NPP accident of 1986 has led to practically single emission of radioactive iodine isotopes in atmosphere. As a result the areas that have already been noted for iodine deficiency in the natural environment were affected by radioiodine fallout. Consequently, during 3 month period the large areas in Russia and Belarus hosted a unique natural and anthropogenic geochemical anomaly formed by different isotopes of the same element that triggered a sharp increase of thyroid disorders within these areas.

To study the geochemical factors responsible for distribution of the thyroid gland diseases we since 2003 we have started to develop a specialized geographic information system (GIS) "Bryansk-Iodine" (Korobova, Kyvylin, 2004) that has continued with a financial support of the Russian Foundation for Basic Research (projects/grants No 07-05-00912, 10-05-00148, 13-05-00823). The last study is performed for the adjacent areas of Russia (Bryansk region) and Belarus (Gomel region).

At present time the database of GIS "Bryansk-Iodine" consists of 3 data sets. The cartographic block includes the demographic data (settlements' population by some year and sex) and a number of digitized administrative and thematic maps such as maps of Cs-137, I-131 and Sr-90 contamination density, topographical, soil, hydrogeological and landscape-geochemical maps of different scale. The medical data set contains anonymous information on cases of thyroid disorders, thyroid and stomach cancer cases as well as the urine iodine attributed to the settlements. The experimental block is devoted to the field sampling data and results of chemical analysis of water, soil, potato and milk samples collected from 2005 till 2017. Originality of database is confirmed by state registration.

GIS technology application allowed estimation of stable iodine status for all the settlements of Bryansk and Gomel regions based on calculation of the soil iodine supply with due regard to variation of iodine content in different soil types, their granulometry and squares within areas circumscribed by the 2.5 km and 5 km radii with the centre in the particular settlements. The incorporated medical data allows evaluation of contribution of the geochemical factors to morbidity within any part of study area.

The main result of GIS "Bryansk-Iodine" application was the cartographical evaluation of thyroid disorders risk obtained by overlay of map layers and scoring of spatial variation of iodine deficiency and radioactive iodine fallout (or "attack") followed by verification of the risk map by medical data.

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To provide cooperation with the partners abroad and to present the results we plan to use Web-GIS.

References

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