BIOGEOCHEMICAL INDICATORS OF HUMAN ORGANISM ASH RESIDUE OF SOME RUSSIAN CITIES

M.A. Deriglazova
Scientific advisors professor N.V. Baranovskaya, professor L.P. Rihvanov
associate professor I.A. Matveenko
National Research Tomsk Polytechnic University, Tomsk, Russia

The element composition of human organism is tightly connected with geochemical conditions of the environment, in which person lives, therefore this information is important for both medicine and geoecology. But, on the other hand, it is important to know in what chemical compounds these elements exist, how they affect the human organism and how toxic they are. Due to this fact in the current paper we are researching the human organism ash residue by electronic microscope. The results of this research allow us to make some suggestions on form of existence of some elements in the human organism.

Ash residue of human organism it is a crematory material, which remains after burning a human body. 107 samples from different cities of Russia were analyzed in the process of research: St. Petersburg, Novokusnetsk, Rostov-on-Don, and Yekaterinburg.

The purposes of the first research stage were to determine the element content of human organism ash residue; to calculate concentration coefficients of relative average value; and to determine the specific elements for each city. The purpose of the second research stage was to determine in what chemicals these specific elements exist in the human organism by electronic microscope.

Results of INAA permit us to distinguish regional features of human organism ash residue of Novokusnetsk: Ca, U; of Novosibirsk: Co, Sb, Au; for Rostov-on-Don: Sc, Cr, Ag, La, Ce, Eu, Yb, Hf, Ta, Th; for St. Petersburg: Na, Fe, Zn, Sm, Tb, U; for Yekaterinburg: As, Br, Rb, Sr, Cs, Ba.

It is known that the mineral basis of human organism is hydroxyapatite ($Ca_5(PO_4)_3(OH)$), because this mineral makes up about 50-70% of our bones [1]. Therefore, the basis of ash residue of human organism should be such elements as calcium, phosphorus, oxygen and hydrogen. And our research bears witnesses to this fact. The matrix (basis) of human organism ash residue is oxygen, calcium, carbon, phosphorus, as well as other elements, which also constitute the matrix, but in smaller amounts: sodium, potassium, magnesium (Table). Besides, oxides of metals (iron, zink, aluminum, copper, lead) were found in the ash residue in large amounts.

Table

The chemical composition of matrix of human organism ash residue

The element	Average with error (%)
C	13,6±9,06
O	40,27±2,81
Na	4,41±0,84
Mg	1,34±0,54
P	10,29±2,31
K	1,89±0,65
Ca	26,79±7,08

But the most interesting elements are not macro-and micronutrients, because they are probably technogenic particles. For example, they are chemicals of rare and radioactive elements: particle from Novosibirsk, which is consists from 37% of lanthanum, cerium, thorium and neodymium, 40% of phosphorus and oxygen , this composition is close to the mineral called monocyte ((Ce, La, Nd ... Th) PO_4). Samples from Yekaterinburg contain a lot of grains of barium and sulfur, which are close to the mineral barite ($BaSO_4$), it is consist of 25-29% of Ba, 1-5% of S and 32% of O. Besides, we can find iron oxides in those grains, which are the barite's impurity. It is necessary to notice that barium is an element, which concentrates mostly in the samples of Yekaterinburg, and it can be the result of metallurgical specification of this region.

The most interesting finding is particles from Novosibirsk samples consisting from 41% of gold. The coefficient of concentration of Au in Novosibirsk is more then 3 and it means that this element accumulates in the organism of Novosibirsk residents. On the one hand, it can be explained by natural reasons (gold deposits located in this territory: alluvial placer of gold, gold-bearing weathering crust, gold-quartz ore). On the other hand, it can be the result of Novosibirsk refinery operation. It is more important that these particles are man-made and many gold compounds can be toxic for people. When it accumulates in organism, it can lead to various diseases.

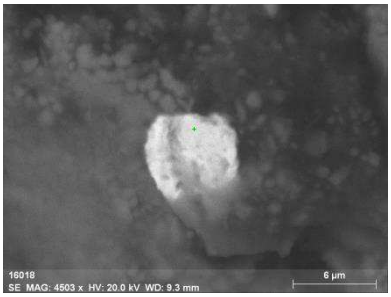

Fig. Gold particle in the ash residue of human organism

Thus, the results of this research determine in what chemicals some elements occur in highest and lowest concentrations in human organism. Genesis of these particles is mostly natural, but also there are man-made particles, which show the geochemical conditions of environment.

References

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REGULARITIES OF SPATIAL DISTRIBUTION OF URANIUM AND RADIUM ON THE INKAY FIELD (REPUBLIC OF KAZAKHSTAN)

O.A. Dzhabiyev
Scientific advisors associate professor V.A. Domarenko, associate professor L.V. Nadeina
National Research Tomsk Polytechnic University, Tomsk, Russia

The Inkay field is is the largest sheeted and infiltration field in Kazakhstan and the CIS. Ore-bearing zones of the field are traced from the northeast to the south at distance about 55 km with their general width from 7 to 17 km.

The field is opened in 1976 by party No. 27 (the chief V. N. Plekhanov, the chief geologist N. N. Petrov) during search of recognaissance drilling. In 1979-1983 preliminary investigation was made, and in 1981-1991 the first stage of the detailed investigation was carried out by specially created expedition No. 7. During this period natural multiborehole experiment on uranium extraction by way of underground leaching was carried out and as a result it was confirmed not only high profitability of uranium production with this method, but also it was confirmed basic possibility of passing extraction from uranium ores of other components: scandium, rhenium, rare-earth elements.

The folded base on a field lies at a depth up to 2-3 km and it is presented by terrigeno- siliceous Cambro-Ordovician formations.

The MZ-KZ coal mine of deposits begins the multicoloured, rather dense gravel and sandy-argillaceous formations localized in falls of the surface of mid and late Paleozoic level. They are hypothetically senomansky age. The Ore-hosting complex is presented by Mynkuduksky and Inkuduksky horizons of Upper Cretaceous.

The uranium mineralization is localized almost in all lithological rock varieties with a certain inclination to average-grained sand. The structure and quantitative ratio of the detrital material, both rock-forming and accessory, don't differ practically from field ores of Mynkuduk horizon.

The bulk of uranium concentrates in rocks of clay aleuritic filler. Texture of ores is disperse, finely disseminated. Structure is interstitial.

The uranium mineralization is presented by pechblende and coffinite in the ratio: on the whole for the field 82 and 18% respectively, for the mineralization in the Inkuduksky horizon – 77 and 23%, and for the mineralization in Mynkuduksky horizon – 87 and 13%.

Siderite, calcite, native selenium, sphalerite, chlorite, polianite, apatite and pyrites (seldom marcasite) are discovered in authigene mineralization besides uranium minerals. [2]

Various methods of research, including the radiometric one are used on the field. The dependence of results of radioactive balance product measurement on radioactive decay, capacities of ore congestion, etc. is the main lack of radiometric methods of approbation on young uranium fields of hydrogenous type. Imbalance in the number of products of radioactive decay leads to results falsifications so long as the content of uranium 238 is not identified by gamma-ray intensity, and concentration of radium 226 and products of its disintegration is determined by intensity of gamma radiation. Radioactive imbalance is usually connected with those products of radioactive decay of uranium ranks, possessing sharply various geochemical properties. They show tendency to division and spatial isolation, especially in the conditions of a hyper genesis zone. As well as all alkali-earth elements, radium possesses the only form of oxidation +2, it is inclined to a complex formation a little. There is as a form of Ra2 ion + in water solutions. Chlorides, bromides, iodides, sulfides and radium nitrates are soluble in water. Its sulfates, carbonates, phosphates, chromates, fluorides and oxalates are slightly soluble in water. Uranium is complexable: carbonate, sulphatic, fluoride, phosphatic and hydroxyl. [1]

The period of time (1,7 million years) is necessary for establishment of radioactive balance between uranium and all products of its disintegration (provided these products won't be removed from places of their formation). The