ARCTIC MEDICINE

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MEDICAL AND ECOLOGICAL RESEARCH IN THE SAKHA REPUBLIC (YAKUTIA): HISTORY, REALITY, PROSPECTS

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ABSTRACT

The article presents a historical insight on the first medical and environmental research in the Republic, what tasks were solved and what results were obtained in a survey of the population of the Vilyui group of uluses. Medical and environmental research is nowadays of great importance, especially in light of the last precedent on the River Ireliah in summer, 2018.

To eliminate the negative impact of environmental pollution on the health of the population in the area of activity of mining enterprises, we have developed a method of medical and environmental monitoring. Medical and ecological monitoring is a dynamic study of environmental pollution with a frequency of 3 or 5 years.

Taking into account the peculiarities of the northern / Arctic ecosystems (fragility, limited capacity, short trophic chain), small number of indigenous people and a negative trend in demography (Yakuts, SIM), features of industrial development of the North, represented mainly by the mining industry, oil and gas processing enterprises (in the future) and in order to prevent the medical consequences of pollution, the priority tasks are:

1) Medical and ecological monitoring is the only uncontested and mandatory condition for mining in the Republic of Sakha (Yakutia);

2) The organization extracting minerals in the territory of the republic is obliged to finance medical and ecological monitoring, which should be established by a legal act of the Republic of Sakha (Yakutia);

3) A research and development institution engaged in medical and ecological monitoring should be equipped with modern analytical equipment and appropriate human resources.

Keywords: medical and ecological monitoring, the activities of mining enterprises, microelementoses, northern ecosystems, the Arctic.

Introduction. In accordance with the priorities of the draft Strategy for the socio-economic development of the Republic of Sakha (Yakutia) until 2030 with the definition of the main directions until 2050 (Decree of the Government of the Republic of Sakha (Yakutia) of December 26, 2016 No. 455) is going to be implemented a program of comprehensive research (KNI) of the Republic of Sakha (Yakutia) aimed at the development of its productive forces and social sphere in 2016-2020; approved by the Ministry of Education and Science of the Russian Federation of October 25, 2016; by the Federal Agency of Scientific Organizations of 26.12.2016; the Head of the Republic of Sakha (Yakutia) from 10.28.2016.

Objective. The main content of this work at this stage in accordance with the Program on Scientific and Technological Information is determined by the need to conduct comprehensive Medical and ecological monitoring of the health status of the population of the Sakha Republic (Yakutia) in the area of activity of mining enterprises. At the same time, the monitoring will be carried out with the aim of timely detecting environmental pollution and its negative impact on human health in its early stages, taking into account territorial and ethnic peculiarities, social and economic development of the republic.

Results and discussion. We have repeatedly emphasized that the activities of the mining industry are fraught with environmental pollution with the priority for the deposit being developed with heavy and rare earth metals, with their subsequent ingress through river ecosystems into the food chain: phyto-zoobenthos - fish population - floodplain vegetation - milk, domestic / wild meat animals and birds – human being, with the further development of severe somatic and neurological diseases, included in the literature under the general name microelementosis. Fresh in memory is a sad precedent with the Vilyui group of uluses, when as a result of careless negligence of the enterprises of ALROSA in the 80-90s of the last century, the incidence of abnormalities in the development of children and malignant tumors increased sharply among the population, which was explained in our studies joint with Tomsk geneticists as a manifestation of chemical mutagenesis. The incidence of endocrine pathology has also increased significantly - up to 4-6 times, pathology of the blood system - up to 2-3, cardiovascular, digestive, urinary and other organ systems - from 1.5 to 2 times. There are signs of negative trends in demographic indicators of the population [1].

As expected, in human biological environments - in hair and in blood, the content of microelements, which represent a natural geochemical background, and microelements, which are part of the kimberlite of the Verkhnemunsky kimberlite field, which includes diamond deposits in the Vilyui River basin, significantly increased. Thus, the level of manganese in human blood exceeded its standard values by 3-4 times, aluminum - by 2.5; in the hair - silver - 2-3 times or more, boron - 2 times, aluminum, manganese, nickel, titanium, chromium - many times their standard values.

The data obtained indicated that:

1) the activity of diamond-mining enterprises led to the pollution of the Vilyuy River's ecosystem with microelements that are part of kimberlite and elements of the natural geochemical background of the province;

2) technogenic pollutants in the form of heavy rare-earth metals are involved in the ecological / food chain with their accumulation in the human body with the development of severe somatic and neurological pathology of man.

From the literature it is known that microelements, as a result of industrial environmental pollution, affect the living cell and the organism as a whole, primarily by:

1) influencing the genome of the living cell;

2) suppression of immunological reactivity, where their action is carried out by activation of recessive genes;

3) effects on various enzymatic and metabolic processes that constantly occur in a living organism [2-7].

Significant changes occurred in the parameters of immunological homeostasis: in more than ½ of all the examined, indicators of both cellular, and humoral and natural immunity were sharply reduced. The changes were most pronounced in terms of the T-system of immunity, phagocytosis and humoral protection of the body (Ig A, Ig M). As in the analysis of morbidity, immunological homeostasis suffered depending on how far from the sources of pollution the population lived. Thus, the indicators of the T-system of immunity in the village of Suldyukar were reduced in 40.7%, in the village of Bordon - in 36.5%, in the village of Jarkhan - in 28.9% of the examined, the phagocytic activity of leukocytes in the village of Syuldyukar was suppressed in 75.0 %, in the village of Bordon - in 37.7%, in the village of Zharkhan - in 29.0% of the examined, Ig A was reduced in the village of Suldyukar - in 70.0%, in the village of Bordon - in 55.4%, in the village of Jarhan - in 39,0% surveyed. The established pattern indicates that:

1) the nature of the identified disorders of the immunological homeostasis is di-

rectly related to the level of the general morbidity of the population and determines it;

2) the degree of violation of immunological homeostasis indicators is determined by the intensity of industrial pollution - it becomes higher as it approaches the enterprises of the diamond industry and the Vilyui reservoir.

These data were obtained by the participants of the research expedition organized by the order of the Presidium of the SB RAS No. 406 of May 10, 1989. The head of the expedition department was appointed the head of the Department of Nature Protection of the Presidium of the Yakutsk Scientific Center of the SB RAS, Doctor of Biological Sciences D.D. Savvinov. The medical part of the expedition was entrusted to lead the prof. V.G. Krivoshapkin. The research results were issued in the form of a scientific report submitted to the Founder of the expedition after a thorough independent examination, in addition, the materials of the expedition were published in numerous publications as scientific articles and monographs.

The practical output of the results of the expeditions was that, in order to "restore the health of the population and the ecology of the region," ALROSA has so far paid to the budget of 8 districts of the diamond-bearing province two-percent deductions from the company's billions in profits.

The last decade is characterized by the fact that diamond mining is confidently advancing into the Arctic zone of the Republic - the Tomtorskoe deposit of rare-earth metals (niobium), the Anabarskoe diamond deposit are being developed, development of the Mangazeysky silver-mercury deposit will begin next year, etc.

It does not take into account two important factors:

1) Northern ecosystems, especially the Arctic, are characterized by a very limited ecological capacity, therefore, they are less resistant against anthropogenic and man-made pollution. Under these conditions, even minimal concentrations of pollution, accumulating in a relatively short period of time, can increase to toxic values.

2) The Arctic is the territory of compact residence of the indigenous peoples of the North (SIM). At the same time, environmental pollution and the inclusion of heavy rare-earth metals in the food chain in the conditions of northern / arctic ecosystems can in a tragic way affect the fate of the ethnic groups inhabiting them.

To eliminate the negative impact of environmental pollution on the health of the population in the area of activity of mining enterprises, we have developed a method of medical and environmental monitoring. Medical and ecological monitoring is a dynamic study of environmental pollution with a frequency of 3 or 5 years, in particular, of the river system, with priority for a given field of heavy and rare earth metals, the appearance of the same metals in human blood, the identification of clinical, functional, morphological and physiological parameters of pathology associated with shifts in microelement homeostasis and the development of human microelementosis in their early (reversible) stages, the study of the state of the immune system, Ave types of metabolism - lipid, carbohydrate, quality of life of the population, demographic indicators (fertility, mortality, life expectancy), as well as the incidence of the population.

Using the developed methodology, the first (initial) stage of medical and ecological monitoring of public health in the area of the Tomtor deposit of rare-earth metals was carried out. To this end, in the period from 2015 to 2017, the population of four villages of the Oleneksky and Anabarsky national regions was surveyed, covering 1237 people. The selection of persons for a comprehensive survey was conducted by random sampling, the coverage of the survey in the sample was not less than 70%. Three of the four villages (Zhilinda, Kharyalyakh, Olenek - Oleneksky, Yuryung-Khaya - Anabarsky districts) were settlements of the small indigenous population of indigenous peoples.

he first (initial) stage of monitoring consisted in the study of the radiation situation, the content of trace elements in the environment, the content of the same trace elements in human blood, the main indicators of immunological homeostasis - AFP, REA, gamma-IFN, IL-6, IL-18, CRP, indicators lipid, carbohydrate metabolism, adaptive capacity of the cardiovascular system according to Mayevsky, functional and morphological indicators of the main organ systems such as cardiovascular, respiratory, digestive, urinary, musculoskeletal, endocrine, hematopoietic and other, structures of morbidity of the population by organ systems, main demographic indicators - birth rate, mortality, life expectancy, etc., disability, quality of life according to the WHO QOL-100 questionnaire.

The data of the first stage of monitoring were reported at the first Republican Ecological Congress, as well as published in the press.

Investigation of food chain links for micronutrient contamination is becoming an important and indispensable condition in emergency situations. So, for example, when a dam of dredging pits and tailing dumps is broken, when a river ecosystem is polluted with microelements that are part of kimberlite and microelements that constitute the province's natural geochemical background.

A similar precedent happened in the summer of 2018, when the dam of the dredging pit on the r. Irelyah, which led to massive pollution of the Vilyui River. The accident caused concern among the public and the population of the republic. The scientific community will have to give a scientifically based conclusion on the extent of the environmental damage caused by the accident on the environment and the health of the population of the Vilyui River basin.

According to the analysis of water samples taken in the vicinity of Verkhnevilyuisk on September 14, 2018, conducted by the Testing Center of Chemical and Soil Faculties of Moscow State University, the manganese content exceeded the standard values by 26, iron - 23, aluminum - 27, copper - 31 times. While the content of barium, lead, strontium and titanium, which are part of the kimberlite of Verkhnemunskoye field, was 3 to 13 times lower than their standard values [8]. The remaining trace elements, the level of which at the peak of pollution was up to 30 times higher than their normative values, are not part of kimberlite and represent the natural geochemical background of this diamondiferous province.

The upcoming medical and ecological studies to clarify the environmental and medical consequences of the accident that occurred due to the breakthrough of the dam of dredging pits on the Irelyah river are designed to solve the following tasks:

1)To study the content in the food chain: water - fish tissue - floodplain vegetation - milk - meat of wild / domestic animals and birds - biological environments of human trace elements whose content in the water of the Vilyui River at the peak of pollution exceeded their standard values.

2)To carry out strict accounting in the riverine settlements of persons acutely ill during the period of maximum pollution of the Vilyui River. Pay particular attention to the acute pathology of the circulatory system (myocarditis, myocardiopathy), the digestive system (enteritis, acute hepatitis, pancreatitis), the nervous system (encephalitis, meningitis), the genitourinary system (pyelitis).

All these persons should take blood from a vein for trace elements whose content in the water exceeded their standard values. With positive results of blood tests and in the presence of clinical signs of acute microelementosis, arrange treatment, medical and social rehabilitation and medical examination of the victims.

Conclusion. Taking into account the peculiarities of the northern / Arctic ecosystems (fragility, limited capacity, short trophic chain), small number of indigenous people and a negative trend in

demography (Yakuts, SIM), features of industrial development of the North, represented mainly by the mining industry, oil and gas processing enterprises (in the future) and in order to prevent the medical consequences of pollution, the priority tasks are:

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COMORBIDITY OF CLINICAL SYMPTOMS OF REFLUX DISEASE WITH LIPID-METABOLIC PARAMETERS IN YAKUTS

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ABSTRACT

The aim of the study was to assess the association of clinical manifestations of reflux disease with lipid-metabolic parameters in individuals of the Yakut nationality. The study included 100 patients with gastroesophageal reflux disease of the Yakut nationality who were in the emergency room of the Republican Hospital No. 2 - the Center for Emergency Medical Care and the Gastroenterological Department of the Yakut City Clinical Hospital during 2010-2013. The share of men was 37%, women - 63%. The mean age was 46.9 (SD = 11.35) years. Preliminary verification of the diagnosis of GERD was performed according to the recommendations of the Mayo Clinic and the Montreal Consensus (2006). Statistical processing and analysis of data were performed using the IBM SPSS Statistics 19. Paired comparisons were performed using the Mann-Whitney test. To assess the relationship of the clinical symptoms of reflux disease with the components of the metabolic syndrome, a binary logistic regression method was used with forced inclusion of predictors. Determination of the relationship of clinical symptoms of gastroesophageal reflux disease with lipid-metabolic criteria in the Yakuts revealed contribution components of metabolic syndrome, in particular abdominal obesity, arterial hypertension and triglycerides in the development of dyspeptic symptoms such as bloating, heaviness in the epigastrium, esophageal (belching) and extraesophageal manifestations (night cough) of the reflux disease.

Keywords: blood pressure, lipids, metabolic syndrome, gastroesophageal reflux disease, comorbidity, logistic regression.

The urgency of issues related to the problem of comorbidity of the digestive system and metabolic syndrome (MS), currently does not require a special introduction. Gastroesophageal reflux disease (GERD) is a multifactorial disease that causes local chronic inflammation, which increases the risk of developing Barrett's esophagus (BE) and esophageal adenocarcinoma (EAC). However, not every patient with GERD develops the terrible complications mentioned above, which suggests that other inflammatory mechanisms may exist in the pathogenesis of BE and EAC. It is known that abdominal obesity, as a central component of MS, contributes to gastroesophageal reflux. Abdominal obesity, which causes systemic inflammation, is characterized by an increase in circulating pro-inflammatory cytokines, including C-reactive protein, leptin, interleukin-6, and α-tumor necrosis factor, also contributes to the development of BE and EAC [7, 8, 11]. In this regard, of particular interest is the study of the combined course of GERD and MS. Currently, there are isolated works in Russia [3-5] devoted to the comorbidity of these diseases in certain groups of the population, and the results of the research require generalization and addition.

Research objective: to evaluate the association of clinical manifestations of reflux disease with lipid-metabolic parameters in individuals of the Yakut nationality.

Materials and methods of the research. The work was carried out as part of the research project "Metabolic Syndrome and Chronic Non-Communicable Diseases among the Residents of Yakutia" (registration number of YSU: 11-01M.2009.). The study protocol was approved by the local ethical committee at the Yakut Science Center of Complex Medical Problems