ORGANIZATION OF HEALTH, MEDICAL SCIENCE AND EDUCATION

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THE SCIENTIFIC ACTIVITY OF MEDICAL INSTITUTE: PROSPECTION

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The research work is the priority of the Medical Institute of North-Eastern Federal University. In present the 22 departments and employs 150 staff, including 35 doctors and 90 candidates of Sciences, the average age of the faculty for 47 years. The growth and impact of research is of course linked to scientific staff, thus in the period since 2008 employees of the Medical Institute defended 10 theses for the degree of Doctor of Medical Sciences and 60 - for the degree of Candidate of Medical Sciences. To date, the share of the settled is 83.3%. In medical school work Petrova P. G. - academician of the Academy of Sciences of Sakha (Yakutia), honored worker of higher school of Russia, honored scientist of Sakha (Yakutia), Krivoshapkin V. G. – academician of the Academy of Sciences of Sakha (Yakutia), honored worker of science of the Russian Federation, Tobokhov A.V. - academician of the Academy of Sciences of Sakha (Yakutia), honored scientist of Sakha (Yakutia) Alekseev R. Z., Basharin K. G., Palshin G. A., M. V. Khandy.

Successfully work teams of scientific schools, recognized in Russia and abroad: school under the leadership of P. G. Petrova «Physiological and medical aspects of health of various groups of the population in the Republic of Sakha (Yakutia)» and school of Professor M. V. Khandy «Regional features of physiology and pathology of childhood in the North.» Conducting fundamental, applied and clinical studies in 7 laboratories of the clinic for the study of etiology, pathogenesis and peculiarities of diseases in the North allows for clinical and research work at a high level. On the basis of laboratory carried out fundamental, search and applied scientific researches directed on the decision of actual problems of medical, biological, pharmaceutical science and health care, creating innovative strategies and infrastructure research activities. Since 2011, when the Arctic innovation center of NEFU was established and registered small innovative enterprises (SIE): «Gifts of Yakutia» (Director E. E. Borisov), «Genodiagnostic» (Director N. R.Maximova) and «BIO-Spectrum» (Director Y. A. Akhremenko). Since 2011 them was 6 know-how, obtained 6 patents of the Russian Federation, won more than 10 grants on the development of innovation infrastructure, totaling more than 5 million.

The main scientific direction of the medical Institute for many years was the theme of «Physiological and medical aspects of health of different population groups in the Republic of Sakha (Yakutia)», which included directions for the development and implementation of health and medical technologies in order to enhance the quality of life of the population in the North, medico-ecological monitoring of the health status of the population in the area of industrial development of the North; the study of the dynamics and development of long-term forecasts of demographic development and preservation of health of the population of Sakha (Yakutia).

We have great advances in genomic medicine, our genetics are known worldwide due to the discovery of new diseases from the group of hereditary metabolic diseases and the identification of new gene mutations. On the basis of educational and scientific laboratory «Genomic medicine» fundamental and applied research in the field of medical genetics, the search for new mutations in ethnically isolated populations of the Sakha (Yakutia), implemented a test system and molecular techniques for the diagnosis of hereditary and genetically-predisposed diseases. In 2017, the laboratory staff has developed a biochip for DNA diagnostic of being a carrier of five hereditary diseases: 3-M syndrome, SOPH syndrome, tyrosinemia type 1, hereditary methemohlobinemia type I, hereditary non-syndromic deafness 1A type, and also developed a fluorescent test systems based on graphene oxide for DNA diagnostics carrier 3-M syndrome in the population of Sakha (Yakutia). These test systems are more effective analogues (in qualitative and economic terms) than modern methods of routine DNA diagnostics (PCR-RDRP, PCR in real time). The laboratory staff received two patents for the invention in 2017: «Method of diagnosing point mutations in native DNA using graphene oxide» (patent of the Russian Federation No. 2614111) and «Method of simultaneous diagnosis of hereditary diseases» (Patent of the Russian Federation No. 2627115). In the future, the laboratory plans to introduce test systems and molecular technologies based on biological microchips and PCR in the «real-time» mode for the diagnosis of hereditary and hereditary predisposed diseases, to participate in molecular screening for frequent monogenic diseases in conjunction with the Medical genetic center of the National Center of Medicine of Sakha (Yakutia), to carry out genetic support in transplantation, oncology, reproduction using next-generation sequencing methods (NGS), genetic certification of the population (carrier of frequent monogenic diseases, «sports passport», «passport of women's health», etc.).

In the field of regenerative medicine, the material and technical base of the laboratory for the development of cellular biomedical products in the clinic is equipped, conservation and transplantation of skin fibroblasts are carried out. Today, dermal cells are used to treat patients with thermal lesions in the Thermal Trauma Department of RBN№2. One of the bold and promising directions is the creation of a composite tissue-engineered transplant of functional liver tissue. The project involves the search for and development of new innovative methods of radical treatment of irreversible liver lesions, ensuring the extension of life of patients and maximum functionality, the demand is determined by the increasing frequency of severe liver diseases in the country. This technology will replace organ transplantation, which has a number of side effects, potential risks and long queues for their implementation. At the first stage there is a search for new materials for the manufacture of tissue-engineered matrix for the transplantation of cultured cells together with the Department of Chemistry of NEFU and Technopark of Yakutia.

For many years, leading professors of the medical Institute have been working on clinical testing and implementation of modern diagnostic, therapeutic and reconstructive methods for thermal injury. Now there is a development of the Protocol of «Controlled tissue regeneration» on the basis of a reasonable choice of modern wound coatings depending on the stage and course of the wound process, the volume of tissue defect and local blood supply monitoring data, monitoring of

antibiotic resistance and improving the effectiveness of antibiotic therapy of the wound process in patients with thermal trauma and improving reconstructive plastic surgery of scar tissue changes, applied in cosmetology practice in patients with consequences as a result of thermal injury.

Every year the number of publications, including journals, refereed by the RF HAC and foreign publications cited in the databases of Scopus and Web of Science, is growing. Leading professors of the medical Institute for publication activity (h-index): Maksimova N. R. - 13, Krivoshapkin V. G. - 12, Petrova P. G. -8, Savvina N. B. - 7. Since 2009 teachers of the Medical Institute published 1058 scientific articles in peer-reviewed journals of the RF HAC, 1681 publications were registered in the database of RSCI, 149 articles in Scopus and 112 publications in the Web of Science. The total number of scientific citations in the RSCI was 268. For 10 years, 82 monographs, 228 educational and methodical manuals were published, 38 of them with the stamp of UMO of the Ministry of health of the Russian Federation, guidelines and recommendations, more than 95 collections of scientific papers, numerous articles and abstracts were published at various national, national and international conferences, symposia and congresses. With 2015 comes the e-series of the journal «Vestnik NEFU: Medical Sciences" (chief editor Petrova P. G.), from 2016 edition included in the database of RSCI.

For 10 years more than 45 scientific works on grants and target programs of various levels, international clinical studies, topics on analytical departmental target programs of the Ministry of education and science of the Russian Federation, on state Order of the Ministry of education and health, on FTP, through the Bortnik Fund, on grants of the head of the Republic Sakha (Yakutia), etc. the total amount of funding amounted to 95 908 666 rubles. Annually teachers of the Medical Institute apply for grants of international, Federal and national levels, joint research projects with colleagues from Russian universities and research institutes, from 2009 to 2017 received 33 patents.

Also, the Institute staff organizes scientific and practical conferences, schools, symposia, round tables on the most topical issues of medical science, one of the most important scientific events, bringing the main achievements of the year, is the traditional national Congress «Ecology and human health in the North» (http://ehhn.s-vfu.ru/). According to the results of recent years, the Congress was attended by an average of more than a thousand participants from among scientists, teachers and health professionals.

The teachers of the Institute successfully works in many scientific areas, the results of research are being implemented in practice. The main of them are, first, fundamental and applied scientific research to monitor the health and quality of life of the population of the region, and secondly, the study of the load of hereditary and congenital diseases among the population of the region by the development of methods of diagnosis and treatment of congenital diseases, hereditary and multifactorial diseases of the population, as well as the development and implementation of science-based predictive models of health indicators.

In accordance with the priorities of the project «Strategy of socio-economic development of the Republic of Sakha (Yakutia) up to 2030 with the determination of the key directions to 2050» approved by the resolution of the government of the RS (Ya) from 26.12.2016 No. 455, the Government of the Republic implemented the program of comprehensive scientific research. In the framework of the integrated programme of scientific research, the medical Institute NEFU implemented the state contract on the theme: «A multi-factor study of the health status of the indigenous and alien population of the RS (Ya) in order to optimize regional programs to improve the quality of life of the inhabitants of the Republic, taking into account territorial and ethnic characteristics in the conditions of modern socio-economic development.» As part of this work, a comprehensive survey of the population in 4 districts of Yakutia was conducted, where a multifactorial study of the health status of the population was conducted, including a medical examination of the population, a laboratory analysis of blood on 68 parameters, blood sampling for molecular genetic studies.

Since 2017 implementation of the project «System medical and environmental monitoring of the health status of the population living in close proximity to the areas of falling of the separated parts of the launch vehicles in the regions of the Republic of Sakha (Yakutia)», within which a survey of the population in Aldan, Kobyai, Vilyuisk and Verkhnevilyuisk districts was conducted.

The capacity of the medical Institute of NEFU to organize and conduct research works from year to year is expanding. In 2017 on the initiative of the rector of North-Eastern Federal University Mikhailova E. I., formed a medical cluster on the basis Medical Institute, hospitals and the simulation training centre of the University for the solution of strategic tasks in the sphere of protection of public health. The activity of the cluster is a system of sustainable interaction of the main components: education, science, innovation and practice. The cluster members are the Academy of Sciences of the RS (Ya), the Ministry of Health of the RS (Ya), the Ministry of Nature Protection of the RS (Ya), the Ministry of Education of the RS (Ya), «Technopark of Yakutia», medical organizations of the Republic, as well as the Chukotka Autonomous district, Kamchatka region, Magadan region. In addition to the teaching staff and research staff, young scientists are also involved in the scientific activities of the Medical Institute, they are students and graduate students in the student scientific communities in various areas of medical science.

In the future, the scientific activity of the Institute is preparing to resume the work of the dissertation Council on medical Sciences, work to increase the amount of funding for research, expand the ties of mutually beneficial cooperation of the University with interested Russian universities, scientific institutions, which will undoubtedly increase the quality and quantity of research work, increase the number of publications in high-rated scientific journals and increase the rating of the Department among medical universities of the country.

Today, thanks to our University, we have an excellent base, trained, qualified personnel, there is a practical reserve and experience that will allow us to realize our most daring plans in life.

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HYGIENE, SANITATION, EPIDEMIOLOGY AND MEDICAL ECOLOGY

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ENVIRONMENTAL HEALTH MONITORING IN THE ZONE OF ACTIVITY OF THE MINING INDUSTRY IN THE REPUBLIC SAKHA (YAKUTIA)

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Introduction

The activities of mining industry are fraught with pollution of the environment, primarily water sources which are a priority for the field being developed by heavy and rare-earth metals. Their subsequent entry into river ecosystems and migration along the ecological chain: phyto-zoobenthos - fish population - floodplain vegetation - milk, meat of domestic animals - man, further threatens the development of severe somatic and neurological diseases, included in the literature under the common name “microelementoses”.

The content of the work and discussion

The mining industry is one of the main components of the industrial development of Yakutia in the 20th century, including gold mining in the Aldan region, diamonds in Mirny, tin in Ust-Yansky, and so on. With all its huge contribution to the economy and state budget of the republic, one should not forget the negative aspects of the activities of various enterprises of the industry.

Fresh in memory 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. In addition, the incidence of endocrine pathology, the pathology of the blood system, cardiovascular, digestive, urinary and other body systems has increased significantly. There were signs of negative trends in the demographic indicators of the population. This precedent was studied by the participants of the research expedition of the SB RAS, the results of the studies were formalized in the form of a Scientific Report, the materials of the expedition were published in numerous publications in the form of scientific articles and monographs. The medical part of the expedition was headed by prof. V.G. Krivoshapkin.

With the aim of “restoring the health of the population and the ecology of the region”, ALROSA has so far paid 8 regions of the diamond province to the budget, and in recent years, one-percent deductions from its profits. Recently, the activity of mining enterprises in the Arctic zone of the Republic of Sakha (Yakutia) has significantly increased - the Tomtor deposit of rare-earth metals (niobium), the Anabar diamond deposit are being developed, and the development of the Mangazeya silver-mercury deposit will start next year, etc. In doing so, consider the following:

The Arctic ecosystem is characterized by a very limited ecological capacity, therefore, it is less resistant to anthropogenic and technogenic pollution, and much more time is required to inactivate and detoxify pollution compared to other regions. Under these conditions, even the minimum concentrations of contamination in a relatively short period of time can increase to toxic and life-threatening concentrations. This is a shortening of the food (trophic) chain in the Arctic.

The Arctic is the territory of compact residence of indigenous small-numbered peoples of the North (indigenous peoples). According to the population census of 2002 and 2010, in 8 years out of 45 ethnoses from the number of indigenous peoples in 25 there was a decrease in the population, 7 of which reduced the population by 3-7 times, 2 ethnic groups disappeared altogether [1]. Consequently, environmental pollution and the inclusion of heavy and rare earth metals in the food / food chain under northern / arctic ecosystems can be detrimental to the fate of the ethnic groups that inhabit them.

Nowadays, according to our studies of 2015, the content of microelements in the blood of residents of village of Zhilinda of the Olenek Evenk national ulus are within the limits of reference values (Table 1). In addition, there are data from the administration of the Olenek Evenk national ulus on the content of microelements in the water environment of the Tomtor rare-earth metal deposit (Table 2). Another matter, their dynamics in the conditions of industrial production on the territory of this region is of interest.

To exclude the negative impact of environmental pollution on the health of the population in the mining zone, we developed a methodology for medical and environmental monitoring (annex). At the same time, it should be noted that in practice there is an Environmental Monitoring carried out by the Center for Environmental Monitoring of the Ministry of Nature Protection of the Republic of Sakha (Yakutia). And Medico-ecological monitoring is purely our Yakut know-how.

Medico-ecological monitoring is a dynamic study of environmental pollution (annex) with a periodicity of 3 or 5 years.

An important part of monitoring is the study of the level of morbidity in the body’s basic systems, such as cardiovascular, respiratory, digestive, urinary, endocrine, musculoskeletal, etc. The peculiarity of medical-ecological monitoring is the search in the clinical manifestation of the pathology of these body systems of the features characteristic for this and that type of microelementosis. The obtained indicators are analyzed each time in comparison with the initial state of the environment, the health of the population, incl. demographic indicators, quality of life before the development of this field.

Conclusion

Thus, a series of medical and