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### Features of physiological processes in migrants and indigenous population of Ugra (Russia)

*Características de los procesos fisiológicos en la población migrante e indígena de Ugra (Rusia)*

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#### ABSTRACT

Amid the climatic and geographic conditions of the Northern territories, the human body, especially from migrants, is influenced by unusual, excessive and harsh environmental factors that are irrelevant to its nature. The current situation shows that the social and economic losses that entail conditions associated with a decrease in the population adaptability, especially non-indigenous, leads to the need not only to study the mechanisms of physiological changes in the residents of the Northern regions, but also to find ways to prevent diseases in the descendants of migrants living in the North of the Russian Federation.

**Keywords:** Indigenous Population, Migration, Physiology, Public Health.

#### RESUMEN

En medio de las condiciones climáticas y geográficas de los territorios del norte, el cuerpo humano, especialmente el de los migrantes, está influenciado por factores ambientales inusuales, excesivos y severos que son irrelevantes para su naturaleza. La situación actual muestra que las pérdidas sociales y económicas que conllevan condiciones asociadas con una disminución de la adaptabilidad de la población, especialmente los no indígenas, lleva a la necesidad no solo de estudiar los mecanismos de cambios fisiológicos en los residentes de las regiones del norte, sino también encontrar formas de prevenir enfermedades de los descendientes inmigrantes que viven en el norte de la Federación de Rusia.

**Palabras clave:** fisiología, Migración, población indígena, salud pública.

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## **INTRODUCTION**

Expanding economic activity in the Northern territories of the Russian Federation, including Khanty-Mansiysk Autonomous Okrug – Ugra (KHMAO-Ugra) over the last decade has led to a significant change in the structure and region's population growth. Thus, according to official open-source data, the resident population in the region over the past decade has shown an exceptionally constant growth trend (data obtained from the portal: <https://depsr.admhmao.ru/statisticheskaya-informatsiya-/informatsionny-demograficheskij-byulleten/>). However the urban population in the region is 92.3% of the total resident population of the autonomous okrug, the rural population –7.7% of the total resident population (data for the beginning of the year). With that, the aboriginal population, represented by three following ethnic groups – Khanty (1.3%), Mansi (0.8%), Nenets (0.1%) is only 2.2% of the resident population.

The migration rate over the last three years shows that population growth occurs both due to natural increase and due to migration inflow. However, to date, there is a situation in KHMAO-Ugra when migration flow rate into the region is getting its constant values, and population growth is due to the local population, with most of those being migrants and their descendants. With that, considering the timing of the onset of massive development and settlement of the region (second half of the 20th century), one can note that to date the third generation of migrants (grandchildren of the first settlers) is entering an active phase.

Thus, the emerging demographic trend leads to the fact that the Khanty-Mansiysk Autonomous Okrug-Ugra sees forming of a new (or already been formed new), growing population in the Northern region of the Russian Federation, with its ethnic makeup being represented predominantly by immigrants arrived from regions with different climatic and geographic conditions (temperate and southern latitudes). The need to study the physiological features and ensure the public health is a relatively new and urgent problem of biomedical disciplines and Northern studies (Koyunosov et al.: 2016).

## **1. MATERIAL AND METHODS**

The process of man-made development of Russia's Northern territories is accompanied by significant migratory movements of the population. The change of usual environmental habitats of migrants naturally causes a significant restructuring of all functional systems in the body. The main factors to cause changes in body functions in migrants and indigenous population of Russia's Northern regions is the following: 1) climatic and geographic (both atmospheric pressure and air temperature fluctuations, wind power, low humidity, geochemical features of the region, etc.) and 2) anthropogenic (oil production, air, rivers, soil pollution) factors.

To date, it has become obvious that the climatic conditions of the Northern regions in Russia are not stable as well, there are changes leading to significant shifts in the already existing adaptive characteristics. In this regard, many aspects of adaptation of the organism of migrants and the indigenous population for living in the Northern regions can be changed and corrected depending on the trends of climate change in these regions.

The rapid technological development of the Northern territories results in the fact that the health of migrants, and especially that of the indigenous people in the region, for the most part, begin to depend not so much on environmental factors as on the anthropogenic factors.

This situation results in the fact that at present the previously established ideas on the physiology of the non-indigenous and indigenous population of the Northern territories in Russia may be largely revised. In this regard, we further review the physiological changes that occur in the body of migrants when adapting to living in the Northern regions, their consequences, as well as the physiological characteristics of the body systems of the indigenous population.

## 2. RESULTS

**Anthropometry:** The earliest manifestations of the migrant bodies' reaction to evolving living conditions are changes in fat mass (increase in body mass index, BMI). These changes do not depend on gender, but are most pronounced in people aged 18-35 years (1st adult period). With that, population-featured studies have shown that the majority of young men in the region have a hypersthenic constitution (52.4%), while girls – normothermic (59.8%). However, when analyzing anthropometric data all the researchers agree that the observed constitutional changes in migrants of the North determine the resistance of their body to climatic and geographic living conditions (Koynosov et al.: 2016).

**Cardiovascular system (CVS):** To date, it is shown that CVS indicators depend on the time spent in the okrug. Thus, in the first years of residence in the region, migrants of the North show an increase in the heartbeats rate, blood pressure, systolic and minute cardiac output of blood circulation, peripheral vascular resistance, circulating blood volume, an increase in hemoglobin blood count and blood flow acceleration. With a longer stay, there are signs of bradycardia and a decrease both in myocardial contractile function and circulating blood volume, blood flow deceleration and continued compensatory increase in blood pressure, peripheral vascular connection and hemoglobin blood count.

Children of migrants have this CVS changes remained in place: moderate decrease in myocardial contractility, liability to bradycardia, cardiac arrhythmias, and manifestations of endothelial dysfunction. With aging, the peculiarities of the CVS functioning in them are aggravated, so the CVS parameters in the migrants' descendants of the North differ from the norms adopted for the regions of temperate latitudes (Rusak et al.: 2013).

Most researchers agree that the observed changes in the CVS parameters in migrants of the North and their children permanently residing in Ugra relate to living conditions. These shifts provide them with effective implementation of the system functions, i.e. they are of an adaptive-compensatory nature. However, the summation of the deviations of CVS indicators, which are not pathological in isolation, results in a general pre-pathological condition onset in migrants of the North. This is the condition that explains the observed increase in prevalent cardiovascular diseases (strokes, heart attacks) and mortality from these pathologies in the Northern regions.

**Respiratory system:** Changes in the respiratory system in migrants of the North are quite similar in nature and do not depend on the residency period in the region and do not differ by gender. In particular, there is a decrease in vital lung capacity, respiratory and reserve capacity in regard to the values typical for the temperate latitudes population of the Russian Federation (Nifontova et al.: 2017). Such changes are solely a consequence of the system function adaptation to the climatic and geographical conditions of the region. However, cold air contributes to the occurrence of migrants' pre-pathological disorders of the respiratory system.

**Blood and hematopoiesis:** Changes in hematological parameters in migrants of the North and their descendants are also unidirectional. Thus, women show a decrease in the lower standards of hemoglobin and hematocrit values, less blood oxygen saturation, especially in wintertime. There is a low level of neutrophils and a decrease in their functional activity among healthy young northerners compared with peers from the temperate latitudes in Russia (Soloviev et al.: 2012).

Generally, blood composition changes in migrants of the North correlate with the changes in the cardiovascular system and the respiratory system. General changes in these physiological systems have allowed us to state that the adaptation of the cardiovascular, respiratory and hematopoietic systems to living in climatic and geographic conditions of the region is based on anti hypoxic strategy. The formation of the latter in migrants of the North occurs within 7-10 years of residence in the region. The obtained state of the migrants' body can be valued as pre-pathological.

**Immune system:** The greatest influence of climatic and geographic conditions in migrants of the North is experienced by the immune system. It is shown that migrants of the North, arriving from the temperate and

southern latitudes of the Russian Federation, when adapting to environmental conditions, almost immediately experience an immunity decline, both humoral and cellular components (Trotsenko: 2009).

Such a decrease in the immune status causes chronologically first maladaptive disorders in migrants, resulting in the pathology onset – diseases of the upper respiratory tract, ear, throat, nose. The immune system under stress also results in the fact that the non-indigenous population of the region (including the descendants of migrants) experiences the allergies incidence rise.

There is no doubt the observed changes in the immune system are caused by climatic and geographic factors, but there is a reason to believe that anthropogenic factors in the progression of immune disorders in migrants in the region play a more significant role in the progression of pathological processes than previously thought.

**Hormonal system and metabolism:** The features of the hormonal system reaction and changes in metabolism in the adaptation dynamics in the non-indigenous population to living conditions in the Northern region were studied fragmentarily. First off, it was found that the result of adaptation is the formation of a special «northern» type of metabolism in migrants of the North, in which lipids become the main substrate of energy exchange. This type of metabolism corresponds to the manifestations of metabolic syndrome, which is 25.7% in the young population of KHAMAO-Ugra aged 18-35 years, while in men – 19.4%, and in women – 30.1%. The emerging type of metabolism explains the increase in total lipids, total cholesterol, triglycerides, as well as the decrease in antiatherogenic and the increase in proatherogenic lipoproteins. Free radical oxidation of blood proteins is activated with a decrease in the reserves of antioxidant protection (vitamin E, A, selenium) (Diagileva: 2012).

The metabolic changes described above occur amid the hormonal changes. In particular, it was demonstrated that in male migrants of the North, compared with the residents of the central part of Russia, the blood serum contains more estrogen, and in female migrants – less follicle-stimulating hormone. Representatives of both genders have increased levels of adrenal cortex hormones in their blood, daily disorders of melatonin secretion are found (Gubina, & Koynosov: 2016).

**Musculoskeletal system:** Changes in the musculoskeletal system occurring when adapting to climatic and geographic conditions of the Northern territories mainly remains to be secondary, i.e. are determined by changes in other functional systems. Thus, the abovementioned features of metabolism result in the fact that young residents of Northern regions (usually migrant children) have an increase in fat and muscle tissue with a decrease in bone mass. There was also a decrease in muscle performance due to the cold factor. In general, immigrants who migrate from South to North, and their descendants, have low mineral bone density compared to the residents in the source region (Demeke et al.: 2015).

Reduced bone mineralization of migrants might be related to the observed increase in the occurrence of fractures among the Ugra population, with a high occurrence of joints hypermobility cases, posture disorders and connective-tissue dysplasia in the region. The observed changes in bone mineral density, along with high BMI, according to some researchers, also increase the risk of early onset of osteoporosis in residents of the Northern regions (Mihaylin: 2012).

At the moment, it is believed that the main cause of musculoskeletal system changes in migrants of the North and their descendants is due to reduced motor activity. Unusual for migrants climatic and geographic conditions in the region are likely to cause a decrease in motor activity.

**Mental state:** It is shown that the process of adaptation of migrants to living in new conditions is accompanied by a number of changes in their mental state. Thus, it is noted that Northern migrants have their own assessment of physical and mental health (SF-36 questionnaire) depending on gender. In women, the subjective assessment of physical health status decreased as the period of stay in the region grows, though with no decrease of that in mental health, and in men, on the contrary, with growing period of stay, the subjective assessment of physical health did not change, while the mental one decreased. Testing also revealed that mental stress in migrants of the North was more pronounced in the young social group and was

expressed as rigidity, increased anxiety, frustration, depression. With that, the depression level in female descendants of migrants was inversely correlated with motor activity, i.e. low motor activity was accompanied by depressive states and, conversely, respondents with high motor activity had isolated cases of depression (Sirusina et al.: 2013).

**Vulnerable groups:** The abovementioned analysis revealed not only those body systems subject to the greatest adaptive pressure in migrants of the north but also groups of migrants most vulnerable to changing living conditions. These groups include people of the first adult age, especially young students (aged 18-25). This fact is proved by a significant increase in cases of non-communicable diseases within this group in Ugra, which are based on existing (in descendants of migrants) or acquired (in newly arrived migrants) changes in the functional state of almost all body systems.

Monitoring of the structure of the diseases in this group of residents in the region shows a prevailing number of diseases of the endocrine system, respiratory and digestive organs, diseases of the blood and hematopoietic organs. In general, the researchers identify a certain pattern – the biological age of young people, residents of the region, descendants of migrants significantly exceeds their chronological age.

We should also emphasize the problem of physiological variability of body functions in persons born in the regions of temperate and southern latitudes and migrated to the North, and persons born and living in the region, who are descendants of migrants in 2-3rd generations (children and grandchildren of migrants). In this regard, we have come across only one study suggesting that new settlers are more vulnerable to adverse environmental factors, as the next generation already has a number of adaptive properties inherited from the first one. The adaptation of the first is of either an individual or phenotypic character. In subsequent generations, adaptation involves a component of a new emerging genetic pool.

It is shown that the long adaptation process of the local population of Ugra (Khanty and Mansi) to environmental conditions resulted in the formation of a special somatic (ecological) type of constitution, which is characterized by a relatively small height and weight, with a high incidence of asthenic body type. The study of CVS parameters revealed credible low values of the sympathetic division tone in the indigenous population compared with migrants, especially in young people (aged 18-25). It was found that only 5.2% of the total indigenous population have high BMI values, while in the non-indigenous it totaled to 48.8%. Also, it is proved that one of the manifestations of genetically set adaptation in indigenous people of the North to environmental conditions is a higher content of antiatherogenic lipid fractions (Sevostianova: 2013).

It is no doubt that most of the noted physiological characteristics of the indigenous population are determined by their long residence in the harsh climatic conditions of the region, so they are set and determined genetically. However, changes of habitat (climate change, anthropogenic impact) currently result in the fact that the physiological constants of the indigenous population of the Northern regions represent the rapidly changing values. The main drivers of these shifts are urbanization and anthropogenic pollution.

Thus, urbanization has led to the increased activity of sympathetic effects of autonomic regulation, increased body mass index, blood lipid change towards increased content of proatherogenic fractions. Evolving the eating behavior of the population results in hypovitaminosis, especially for fat-soluble vitamins (Popova et al.: 2018).

Generally, nowadays there is a situation where representatives of the indigenous population of the Northern territories have maladaptive disorders, which is expressed not only in the change of morphometric characteristics but also in the reduction of resistance to diseases, among which the occurrence of endocrine and infectious diseases, diseases of the circulatory, digestive organs is significantly growing.

Thus, to date, there is a significant change in phenotypic features concerning physiological characteristics in the indigenous people of KHAMO-Ugra due to anthropogenic impact. The high level of urbanization in the region leads to the leveling of the physiological advantages of indigenous people compared to the non-indigenous population. In our view, it blurs away the boundaries when choosing approaches to maintaining the health of both non-indigenous and indigenous population. There is a unification of health protection issues for the region's residents.

## CONCLUSION

A significant change in the demographic structure in the KHMAO-Ugra currently actualizes performing studies on the processes of adaptation to a new habitat among the non-indigenous population. Formed concepts of changes in the physiological functions of the organism of migrants also require correction due to the growing anthropogenic impact on the human environment, also resulting in climate change.

Such changes in the living environment (climate and anthropogenic changes) make health vulnerable, not only in separate groups of non-indigenous (as a rule, people of first adult age) but also the indigenous population of the Khanty-Mansiysk Autonomous Okrug - Ugra, who have genetic mechanisms of adaptation to the living conditions.

These circumstances make it necessary to develop measures preventing negative (pre-pathological) physiological changes in all residents of the Northern regions of the Russian Federation. Yet another important field in Northern studies is addressing the fundamental question of how (if any) adaptation changes in migrants of the North are occurring in a number of generations (to date, a predominant number of studies performed feature migrants of the first generation). The relevance of this topic relates to the fact that as of today the third generation of migrants is reaching an active phase of life, as well as the fact that the solution to this problem is important for the strategic objectives of the development of the Northern Arctic territories of the Russian Federation.

## BIBLIOGRAPHY

DEMEKE, T, EL-GAWAD, GA, OSMANCEVIC, A, GILLSTEDT, M, & LANDIN-WILHELMSEN, K (2015). "Lower bone mineral density in Somali women living in Sweden compared with African-Americans". *Arch Osteoporos*, No.10, pp.208-210.

DIAGILEVA, VB (2012). "Human health and features of the metabolic syndrome among Northern region residents". *Academic Journal of Western Siberia*. No. 3. pp. 13-14.

GUBINA, AE, & KOYNOSOV, AP (2016). "Seasonal changes in some indicators of the hormonal status of the Northern region residents". *Scientific Medical Bulletin of Ugra*, 2 (10), pp. 44-48.

KOYNOSOV, PG, KOYNOSOV, AP, CHIRYATIEVA, TV, ORLOV, SA, & IONINA, EV (2016). "Somatic-biological features of mature aged men and women in the Middle Ob region". *Medical science and education of Ural*, 17 (4 (88)), pp. 34-39.

MIHAYLIN, AI (2012). "On the issue of assessing the osteoporosis risks". Russian Academy of Medical Sciences". *Bulletin of the National Research Institute of Public Health*, No. 4, pp. 101-103.

NIFONTOVA, OL, LITOVCHENKO, OG, BAGNETOVA, EA, & KONKOVA, KS (2017). "Indicators of the functional state of the respiratory system of students of a Northern university". *Human ecology*, No. 2, pp. 17-21.

RUSAK, SN, ESKOV, VV, MOLYAGOV, & DI, FILATOVA, OE (2013). "Annual dynamics of climatic factors and population health in Khanty-Mansiysk Autonomous Okrug". *Human Ecology*, No. 11, pp.19-24.

SEVOSTIANOVA, EV (2013). "Features of lipid and carbohydrate metabolism of the human in the North (literature review)". *Bulletin of Siberian Medicine*, 12 (1), P. 93-100.

SIRUSINA, AV, SHALIMOVA, EY, & RAGOZIN, ON (2013). "Gender differences in the pattern of latent factors of life quality depending on the residence period in the Northern region". *Bulletin of new medical technologies*, 20(4), pp. 53-56.

SOLOVIEV, VS, SOLOVIEVA, SV, ELIFANOV, AV, & PANIN, SV (2012). "Parameters of red blood and its antioxidant properties in new settlers of the North // Bulletin of Tyumen State University". *Ecology and environmental management*, No. 6, pp. 123-127.

TROTSSENKO, AA (2009). "Ecological and physiological aspects of nonspecific human immunity in the North". *Bulletin of Kostroma State University named after N.A. Nekrasov*, 15(3), pp. 22-26.

POPOVA, MA, PALUSHKEVICH, AS, & GRAUDINA, VE (2018). "Pathological changes of vegetative regulation and their connection with metabolic disorders in a subpopulation of indigenous peoples of Khanty-Mansiysk Autonomous Okrug - Ugra in the conditions of urbanization". *Modern issues of science and education*, No. 2, pp. 27-29.

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