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THE ROLE OF VITAMINS AND VITAMIN-CONTAINING PRODUCTS IN REDUCING ACUTE INFECTIOUS DISEASES OF THE POPULATION OF THE NORTH

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The literature review presents current data from the study of domestic and foreign literature of recent years on the effect of vitamins, vitamin-containing products and other nutrients on the reduction of acute infectious diseases in the population of the Far North.

The purpose of the study: to identify the possibilities of preventing acute respiratory viral diseases by increasing the effectiveness of preventive measures using modern methods of optimizing the nutrition of the population of the North.

Methodical approaches. The study of the literature was carried out in sections: “Seasonal fluctuations in acute infectious respiratory diseases”, “Peculiarities of human immunity in different seasons of the year”, “Nutrition and the immune system”, “Possibilities of using local raw materials in the diets of the population of the North for preventive purposes”

Results. The patterns of formation of seasonal transient immunodeficiencies and immune dysfunctions against the background of alimentary-dependent deficiency of macro- and microelements, unbalanced with the nutritional needs of the population living in the North, were determined. The existing and priority fundamental approaches to the formation of diets using products of the local raw material base are analyzed. It is necessary to diversify the diet of the population of the North by including vitamin-mineral complexes and products with immunomodifying properties. Industrially produced functional foods should be used, which can increase immune defenses and reduce the prevalence of viral respiratory diseases and their consequences.

Conclusion. The analyzed publications indicate that an increased incidence in a certain season can be considered as a problem of the formation of transient induced immunodeficiency in the Far North. One of the reasons for this is the peculiarity of the functioning of the immune system in conditions of seasonal rhythms. Modern possibilities of nutrition science allow to actively form a balanced daily human diet. The increase in immunity is achieved through the use of vitamins and vitamin-containing complexes and other nutrients that can increase the level of immune protection and, accordingly, reduce the prevalence of viral respiratory diseases and their consequences, which is extremely important for the population living in the extreme conditions of the Arctic zone.

Keywords: population of the North, seasonality, immunity, respiratory diseases, preventive nutrition.

Introduction. Despite the abundance of publications, the issues of full-fledged human life and the protection of his health are far from being solved in the extreme natural and climatic conditions of the North [1, 24].

Significant efforts in the field of public health do not lead to a significant decrease in the prevalence of viral respiratory diseases among the population living in vast territories that make up more than 64% of the territory of Russia [22],

In this regard, the Decree of the Chief State Sanitary Doctor of the Russian Federation "On measures to prevent influenza and acute respiratory viral infections, including a new coronavirus infection (COVID-19) in the 2020-2021 epidemic season" was adopted (it was registered with the Ministry of Justice of Russia July 29, 2020 N 59091) [7].

This document defines purely anti-epidemic measures. But scientific publications describe the experience of solving problems with the help of nutrition correction through the use of vitamins and microelements, probiotics, specialized food products. The possibility of positive dynamics of increasing immunity, reducing the frequency of diseases, improving their prognosis in different seasons of the year has been proven.

Extreme and sub-extreme climatic and geographical conditions of the North are characterized by a pronounced cold effect (prevailing negative air temperature), low absolute air humidity, periodic strong winds, changes in light photoperiodicity (polar night, polar day), lack of oxygen, sudden changes in atmospheric pressure, instability of the magnetosphere, adaptation to which is achieved at the cost of a significant morphological and functional stress of the human body [5, 22].

Scientific publications describe the experience of solving problems with the help of nutrition correction through the use of vitamins and trace elements, probiotics, prebiotics, specialized foods. The possibility of positive dynamics of immunity indicators, reduction of the frequency of diseases, improvement of their prognosis has been proved. The use of this experience is especially expedient for the population of the North.

One of the significant components of the morbidity of the population of the North are acute respiratory viral infections (ARVI), which includes a number of diseases of predominantly upper respiratory tract of viral etiology.

The diseases caused by these different etiological agents share common mechanisms of transmission, many stages and features of pathogenesis, as well as clinical manifestations. The situation with the spread of SARS in the North is characterized by an excess of morbidity rates in all age groups of the population of

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the North compared to the corresponding indicators in the Russian Federation. An analysis of the incidence of children and adolescents in the northern territories indicates that the Nenets, Yamalo-Nenets Autonomous Okrug (YaNAO) fall into the risk zone, in which, according to the class of respiratory diseases, the incidence is 1.3–1.7 higher than in the Russian Federation [5] (Table).

According to various authors, a severe course and deaths were observed in various acute respiratory viral infections (adenoviral disease, parainfluenza, respiratory syncytial infection), which occurred both in the form of mono and mixed infection [9].

Typical for the North are conditions associated with a lack of intake of vitamins and minerals in the body, with increased needs for them, especially in unfavorable seasons of the year. To meet the physiological needs of the body, a whole complex of nutrients is needed, the composition and quantity of which change throughout life. Essential amino acids, polyunsaturated fatty acids, vitamins, minerals, pro- and prebiotics are vital. Unfortunately, the actual nutrition of the population of the North among almost all age, ethnic and professional groups of those surveyed has a large number of deviations towards deficiency and imbalance in micronutrients [22].

For example, studies have shown that the winter diet of the inhabitants of Yakutia is represented by low-calorie food, not only low in the main macronutrients (proteins, fats, carbohydrates), but also with a lack of vital micronutrients such as Ca, Fe, Mg, Se, as well as vitamins. : A, D, C, group B, both in the city and in the villages [23]. These intertwining circumstances necessitate the search for new ways to prevent acute respiratory diseases. The present article is devoted to the solution of the question: "How to solve these problems?".

The purpose of the study: to identify the possibilities of preventing acute respiratory viral diseases by increasing the effectiveness of preventive measures, using modern possibilities for optimizing the nutrition of the population of the North.

Seasonal fluctuations in acute infectious respiratory diseases. Respiratory viral diseases are seasonal. The reference, in fact, to the winter epidemic of respiratory infectious diseases is contained in the ancient Greek records of Hippocrates - the "Book of Epidemics", written around 400 BC. e. and translated from Greek in 1941 and 1944 [6].

Seasonality of respiratory infections is a phenomenon of fluctuations in the incidence of various respiratory tract infections during the year, while maintaining a similar pattern of fluctuations from year to year in the same periods. There is some relationship between the incidence and severity of disease on the one hand, and low temperature and humidity on the other.

It is believed that cold air reduces the natural resistance to infection in the nasal passages. It is not excluded and the launch of the processes of violation of the immune system. There are other hypotheses on the effect of temperature on morbidity. Each of them can, to one degree or another, contribute to the incidence [39].

According to most researchers, the main factors contributing to seasonality are changes in environmental parameters in the form of temperature and humidity, which increase the resistance of the virus and its rate of transmission. This is due to the fact that the annual epidemics of SARS, including influenza, spread faster and more intensively in the winter and pre-winter seasons of the year [9, 14].p

In the same seasons of the year, peculiar processes of modeling congenital and acquired in the course of life human immune responses to viral infections of the respiratory tract are observed. A relationship has been established between the prevalence of respiratory viral infections and an increase in the incidence of pneumonia [18].

Nevertheless, the decrease in the negative consequences of seasonal fluctuations in acute respiratory diseases can be minimized by knowing the characteristics of immunity in different seasons of the year.

First detected morbidity in the population of the northern territories of the Russian Federation in 2014

Territories	Incidence by class B per 1000 population			All population per 100 thousand	
	whole population	children DOR	teenagers	ARD. URT	Flu
Russian Federation	333.4	1170.5	674.7	19474.7	9
Republic of Karelia	481.5	1757.6	1099.5	36195.2	28.1
Komi Republic	484.6	1809.3	882.3	36777.3	10.1
Arkhangelsk region	440.8	1679.7	991.3	33113.8	38.1
including:					
Nenets Autonomous Okrug	665.4	2058.4	1148.1	38639.8	27.8
Arkhangelsk Region (excluding the Nenets Autonomous Okrug)	432.3	1660.6	983.4	32905.2	38.5
Tyumen region	362.2	1181.9	690.8	30712	12.1
including:					
Khanty-Mansi Autonomous Okrug-Yugra	385.3	1253.2	649.9	28052.9	9.5
Yamalo-Nenets Autonomous District	497.5	1570.1	855.9	36772.5	26.5
Tyumen region without autonomous regions	284.8	923.3	659.8	31413.2	9.6
Republic of Sakha (Yakutia)	493.9	1532.1	718	22604.2	18.4
Magadan Region	319.6	1285.5	516.1	20812.8	84.5
Chukotka Autonomous District	504.8	1527.4	944.8	15357.7	4

Notes: Efimova N.V., Gornov A.Yu., Tikhonova I.V., Zarodnyuk T.S. INFLUENCE OF ENVIRONMENTAL FACTORS ON THE INCIDENCE OF RESPIRATORY BODIES IN THE POPULATION OF THE NORTHERN REGIONS // Modern problems of science and education. - 2016. - No. 6; URL: http://science-education.ru/ru/article/view?id=25581 (date of access: 20.07.2021), where (DOR) - diseases of the organs respiratory; ARD - acute respiratory diseases; URT - upper respiratory trac

Features of human immunity in different seasons of the year. According to our assumption, seasonality of infectious diseases and their pathologies is based on changes in the activity of the immune system. Among the factors that directly affect immunity are seasonal changes in temperature, absolute humidity, weather severity, duration and intensity of insolation. These listed factors can be classified as seasonal environmental changes. They are supplemented by environmental features, the nature of work or study, living conditions. In any case, in order to take measures that increase the effectiveness of reducing diseases and preventing their undesirable consequences, it is important to know the seasonally determined patterns of immunity formation. The analysis of publications makes it possible to shade some of these regularities [36, 41].

The problem of maintaining immunity is especially important for survival in the harsh winter conditions of the North, which exposes people to severe physiological stress, which is defined as an adaptive process [22].

Many diseases and physiological processes have an annual frequency. More than 4,000 protein-coding mRNAs have been found in leukocytes and adipose tissue that have seasonal expression profiles, with inverted patterns observed between Northern regions. It was found that the cellular composition of the blood varies depending on the season [10, 41].

Suggested to explain the periodicity of the expression of genes responsible for the immune response, not only in ARVI, but also in autoimmune diseases, which constitutes a deep pro-inflammatory transcriptomic profile during the European winter, accompanied by an increased level of soluble IL-6 receptors and C-reactive protein, risk biomarkers these diseases. The peak of these diseases occurs in winter [36].

It has been suggested that it is possible to use the evolutionarily determined mechanisms of human immunity to predict periods of immunologically complex states. The primary ecological signal by which the season can be anticipated is changes in daily photoperiodicity.

Other environmental factors, interacting with the photoperiod, affect immune function and pathological processes. Data on seasonal fluctuations that occur against this background and change the structure and immune functions of lymphatic organs and pathological processes, as well as their possible interaction with environmental stressors, are considered. Seasonal peaks in the size and structure of the lymphatic organs usually occur in late autumn or early winter. It has also been suggested that impaired immune function may occur during particularly severe winters when stressors override the increase in immune function caused by short daylight hours [36, 41].

Thus, the priorities of the determinants of the emergence and spread of infectious diseases in the winter season are diverse, and especially in the conditions of the North. The integrating mechanism that determines the likelihood of occurrence, course and outcome of ARVI is the readiness of the immune system to respond and its reaction in the event of adverse epidemiological situations.

These regularities are confirmed by the fundamental work, which presents in detail the information that the immune system, in connection with its functional tasks, is the key to protecting the body from pathogenic external and internal factors. The variant of the immune response chosen by the body is determined by the general structure of metabolism in its various manifestations: energy, plastic, utilization [28].

Thus, an increased level of morbidity in a certain season can be considered as a problem of the formation of a transient induced immune disorder. In the Far North, the cause of such disorders is the non-optimal adaptation of the body to environmental conditions. All this makes it possible to form the principles of non-specific activities using evidence-based recommendations on nutrition.

Nutrition and the immune system. The problem is reflected in the guide to healthy nutrition, prepared by a team of authors edited by academician V. A. Tutelyan [15], in articles reflecting various aspects of the relationship between nutrition and immunity [34],

The following postulates are relevant to the problem under discussion. The immune system is a powerful multi-component homeostatic system that needs a large number of energy and plastic components. A balanced, wholesome diet allows the maintenance of immune cell function, the initiation of effective responses against pathogens, and a rapid response to prevent chronic inflammation [34, 38].

The exact composition of a varied, balanced and healthy diet depends on individual characteristics (such as age, gender, lifestyle and degree of physical activity), locally available foods and dietary customs. The need for the main ingredients of food depends on the traditions of the peoples of the North and the nature of labor activity [22, 23].

To maintain the optimal regulation of the immune system, it is also necessary to provide the body with microelements. Some trace elements play a key role in the function of the immune system, vitamins (C, D, A, E, B6, B12, folic acid), minerals (zinc, iron, copper, selenium, magnesium). They help maintain the structural and functional integrity of mucosal cells, provide the synthesis of antimicrobial factors and antibodies, are involved in the differentiation, proliferation, functioning and migration of innate and adaptive immunity cells, antigen recognition, play an important role in inflammation, antioxidant effects. Micronutrient deficiencies and imbalances lower immune defenses, making a person more susceptible to infections. [10,28,38,40,42].

Almost all forms of immunity suffer from protein-energy deficiency. The reason is the role of amino acids with immunoactive properties. These amino acids include: aspartic and glutamic acids, serine, alanine, arginine, lysine. They accelerate the transformation in the bone marrow of the precursors of immune cells - T-lymphocytes into mature cells. Along with tryptophan, they stimulate thymus-dependent immunity.

Immune active amino acids enhance the production of specific antibodies. They also accelerate the production of leukocytes necessary to combat viruses and bacteria [4,10,15,28].

Glutamine is found in lymphocytes and macrophages and determines the level of cellular immunity. Lymphocytes are involved in the production of antibodies. Macrophages are inhibited and inactivated by viral and bacterial agents. Methionine, arginine, and valin provide cell immunity energy. Serotonin, like its predecessor, tryptophan provides overall body resistance [38].

The deficiency of polyunsaturated fatty acids that make up the spectrum of lipids reduces immunity. The activity of T-cells, as well as macrophages, depends on their presence in the body. They stimulate the production of prostaglandins, substances that have a pronounced anti-inflammatory effect. They provide protection of the respiratory tract from infections, preventing the occurrence of acute respiratory viral infections [10, 28].

The influence of vitamins on the regulatory mechanisms of the immune system is widely presented in the specialized literature. But they are presented most profoundly at a high evidence level in relation to vitamin D [8,40]. The immune regulatory properties are described, the effectiveness and prospects of its use in the prevention of acute respiratory viral

infections are proved. The results of numerous studies indicate that vitamin D is a bioregulator with a wide range of properties. This made it possible to use the wide possibilities of using this nutrient in prevention (ARVI), including during the current pandemic of coronovirus infection [21, 29].

In 2017, a meta-analysis was conducted of 25 randomized controlled trials involving a total of 11,321 people aged 0 to 95 years. Relationships between vitamin D intake and the incidence of acute respiratory infections have been identified. It turned out that with the addition of vitamin D, the risk of developing at least one case of SARS decreased by 12%. With regular use of vitamin D, the preventive effect was even more evident. The results were more striking among people who had low vitamin D sufficiency [40].

The role of vitamin D in the prevention of acute respiratory diseases is shown in the works of V.B. Spirichev and his students that the importance of vitamin D use is especially clear when combined with 12 vitamins [12].

Relatively recently conducted randomized trials have shown the effectiveness of the use of probiotics and probiotic-containing products in the prevention of widespread winter acute respiratory infections. The effect was traced among children of the first year of life, among preschoolers and schoolchildren. The high reproducibility of the results has been proven when comparing experimental groups and groups receiving placebo [25, 27].

Among the molecular mechanisms by which probiotic bacterial strains influence the antiviral response, the role of stimulation of Toll-like receptors (TLR) and NOD-like membrane receptors has been proven in recent years. TLR-2 recognizes lipoteichoic acids and bacterial cell wall lipoproteins. TLR-4/MD-2 are lipopolysaccharide sensors of gram-negative bacteria, TLR-9 recognize unmethylated CpG-sequences of bacterial DNA [25].

Currently, there are publications on the prevention of coronovirus infection and its likely complications using nutrient correction options. It has been suggested that vitamin C, having antioxidant and anti-inflammatory properties, contributes to the neutralization of free radicals and protects lung cells from the aggressive effects of the virus [35].

Vitamin C, being an immunostimulant, enhances the production of interferon proteins, which are among the first to fight viruses [20].

A number of studies have shown that sufficient intake of vitamin D affects antiviral protection and shows the role of this vitamin in reducing the risk of respiratory tract infection. It has been suggested that vitamin D may be useful in the prevention of coronovirus infection [17, 37].

Currently, the ability of zinc to block the activity of the coronavirus RNA polymerase enzyme and prevent its reproduction is being studied, which is also important in preventive work to prevent an increase in the number of diseases [42].

Possibilities of using raw materials in the diets of the population of the North for preventive purposes. The ecological features of the regions of the Far North contributed to the adaptation of the human body to extreme environmental conditions and the development of certain specific features in nutrition, which made it possible to use many products of the local raw material base as food, which ensure the normal growth and development of the body [19].

Of particular importance is the use of products that grow in local conditions. These products include wild berries. Due to the harsh growing conditions, the northern berries contain a smaller amount of vegetable sugars, but in terms of the content of vitamin C and other useful substances, they are in no way inferior to the berries of the southern regions.

Among the northern berries, the most common are cloudberries, blueberries, lingonberries, cranberries, blueberries. These berries contain macro and microelements necessary for the human body (phosphorus, iron, magnesium, cobalt, silicon, calcium), vitamins of groups B, A and E, fatty acids (omega-3 and omega-6), sugars, pectin and tannins. , fiber, which play an important role in maintaining health.

In addition to products of plant origin, the diet of northerners contains products of animal origin. The combination in the diet of products of plant and animal origin is necessary to strengthen the immune system and can be regarded as biologically more complete due to the mutual enrichment of some proteins with amino acids of others. At the same time, the daily requirement for protein should fill both the total protein consumption and the need for essential amino acids.

The North is especially rich in sea and river fish: whitefish, muksun, nelma, omul, broad whitefish, vendace. Northern fish has an excellent taste, contains a number of amino acids, polyunsaturated fatty acids (omega-3), which have an anti-sclerotic effect on blood vessels, improve their elasticity, and lower blood cholesterol levels. In addition, northern fish is a natural source of substances such as iodine, vitamin D, phosphorus and high-quality protein with a full spectrum of amino acids. [13,17,19,22].

The indigenous inhabitants of the Far North traditionally harvest marine animals: walruses, beluga whales, seals, as well as game: partridge, goose, duck. But the reindeer is of particular importance. Its meat contains up to 12 mg% of vitamin C, which is 13 times more than in cattle meat (0.9 mg%), 6% more protein than beef, less fat. Not only deer meat and milk are used in food - blood and internal organs are also valuable. [13,30].

At the same time, in order to increase the effectiveness of ARVI prevention in epidemiologically unfavorable seasons of the year, it is necessary to diversify the diet of the population of the North by including vitamin-mineral complexes, food products enriched with them, fermented milk products containing probiotics ("BIOYBALANS", "BIOKEFIR", etc.). .).

It is also advisable to use food products with immunomodifying properties: rose hips, lemon, honey, ginger, propolis, turmeric, garlic and seafood.

It is necessary to use functional foods of industrial production, or products prepared on the basis of the use of cryotechnologies.

Examples of natural and specialized food products, vitamins, multivitamin-microelement complexes, probiotic products that have an evidence-based basis for the safety and effectiveness of preventing acute respiratory viral infections can be given: Yakut national dairy products [19,31]; Deer meat [13,30]; Ultra-pasteurized milk drink enriched with a multivitamin premix "SCHOOL MILK" [2,26]; Vitamin and vitamin-mineral complexes [4,11,16]; Vitamin D [17,33]; Probiotic products [32].

Conclusion. Features of the functioning of the immune system in the Far North increase the risk of the emergence and spread of SARS, including COVID-19. The modern possibilities of nutritional science make it possible to actively shape the daily diet of a person and, accordingly, reduce the prevalence of acute respiratory viral infections and their consequences, which is extremely important for the population living in these regions.

The analyzed publications indicate that an increased level of morbidity in a certain season of the year can be considered as a problem of the formation of a transient induced immune disorder in the Far North. One of the reasons for this is the peculiarity of the functioning of the immune system in conditions of seasonal rhythms.

These works describe the experience of solving the problem by correcting diets through the use of vitamins and vitamin-containing complexes, micro- and macroelements, probiotics, prebiotics, specialized products with immunomodifying properties and functional foods of industrial production, as well as products of local raw materials that can increase the level of immune protection and reduce the prevalence of viral respiratory diseases and their consequences.

Reference

1. Aftanas LI, Voevoda MI, Puzyrev VP. Arkticheskaya medicina: vyzovy XXI veka. V kn.: Nauchno-tekhnicheskie problemy osvoeniya Arktiki: Nauchnaya sessiya Obshchego sobraniya chlenov RAN. V kn.: Nauchno-tekhnicheskie problemy` osvoeniya Arktiki: Nauchnaya sessiya Obshhego sobraniya chlenov RAN. [Arctic medicine: challenges of the XXI century. In the book: Scientific and technical problems of the development of the Arctic: Scientific session of the General meeting of members of the Russian Academy of Sciences. M.: Nauka, 2014: 104-110 (In Russ.).]

2. Belousova TV, Loskutova SA. Dinamika otdel'nyh pokazatelej zdorov'ya uchashchihsya gimnazii na fone priema «SHKOL'NOGO MOLOKA». (data obrashcheniya: 27.01.2022)

[Dynamics of individual indicators of the health of pupils of the gymnasium against the background of the reception of "SCHOOL MILK". date of the application: 27.01.2022). Voprosy` detskoj dietologii. [Problems of pediatric nutritiology. 2014; (3): 8-12 (In Russ.).] URL: https://rucont.ru/efd/611568

3. Vitaminnaya obespechennost' vzroslogo naseleniya Rossijskoj Federacii (1987–2017 gg.). Kodentsova VM, Vrzhesinskaya OA, Nikityuk DB, Tutelyan VA. [Vitamin supply of the adult population of the Russian Federation (1987–2017)]. Voprosy` pitaniya. [Nutrition issues .2018; 87(4):62-68 (In Russ.).] DOI: 10.24411/0042-8833-2018-1004

4. Vliyanie dopolnitel'noj vitaminizacii na metabolizm limfocitov krovi Prakhin EI, Akimova NS, Savchenko AA, Gerasimchuk AN. [The effect of additional vitaminization on the metabolism of blood lymphocytes].Sibirskoe mediczinskoe obozrenie. [Siberian Medical Review]. 2008; (5): 50-54 (In Russ.).]

5. Vliyanie faktorov sredy obitaniya na zabolevaemost' organov dyhaniya naseleniya severnyh regionov.. [The influence of environmental factors on the incidence of respiratory organs in the population of the northern regions. Efimova NV, Gornov AYu, Tikhonova IV, Zarodnyuk TS. Sovremennye problemy nauki i obrazovaniya. [Modern problems of science and education. 2016; (6): 74 (In Russ.).]

6. Gippokrat-sochineniya-t-2-gosudarstvennoe-izdatelstvo-medicinskoj-literatury [Gippokrat. Sochineniya. 2. Gosudarstvennoe izdatel`stvo mediczinskoj literatury`. [Modern publishing house of medical literature. M.-L.: Medgiz, 1944: 510 (In Russ.).]

7. Gosudarstvennyj-doklad-federalnoj-sluzhby-po-nadzoru-v-sfere-zashchity-prav-potrebitelej-i-blagopoluchiya-cheloveka-o-sostoyanii-sanitarno-ehpidemiologicheskogo-blagopoluchiya-naseleniya-v-rossijskoj-federacii-v-2020-godu-m-tfederalnaya-sluzhba-po-nadzoru-v-sfere-zashchity-prav-potrebitelej-i-blagopoluchiya-cheloveka. Gosudarstvennyj-doklad-federalnoj-sluzhby-po-nadzoru-v-sfere-zashchity-prav-potrebitelej-i-blagopoluchiya-cheloveka-o-sostoyanii-sanitarno-ehpidemiologicheskogo-blagopoluchiya-naseleniya-v-rossijskoj-federacii-v-2020-godu-m-tfederalnaya-sluzhba-po-nadzoru-v-sfere-zashchity-prav-potrebitelej-i-blagopoluchiya-cheloveka. [State report of the Federal Service for Supervision of Consumer Rights Protection and Human Welfare "On the state of sanitary and epidemiological welfare of the population in the Russian Federation in 2020]. M. Federal'naya sluzhba po nadzoru v sfere zashchity prav potrebitelej i blagopoluchiya cheloveka. [Federal Service for Supervision of Consumer Rights Protection and Human Welfare. 2021: 256 (In Russ.).]

8. Gromova OA, Toroshchin IYu. Vitamin-d-smena-paradigmy [Vitamin D – a paradigm shift]. M: MCNMO. 2016: 464 (In Russ).

9. Karetkina GN. Gripp i ORVI: lechenie i profilaktika v nastupivshem epidsezone 2015-2016 gg. [Influenza and ARVI: treatment and prevention in the coming epidemiological season 2015-2016] «Lechashchij vrach». [Attending doctor. 2015; (11):46-54 (In Russ.).]

10. Klinicheskaya-immunologiya. Kozlov VA, Savchenko AA, Kudryavtsev IV, Kozlov IG, Kudlai DA, Prodeus AP. et al. [Clinical Immunology. Krasnoyarsk: Polikor, 2020: 386 (In Russ.).]

11. Kodentsova VM, Vrzhesinskaya OA. Vitaminno-mineralnye-kompleksy-sootnoshenie-doza-ehffekt [Vitamin-mineral complexes: dose-effect ratio]. Voprosy`. Pitaniya. [Journal of Nutrition. 2006; 75(5): 30–39 (In Russ.).]

12. Kodentsova VM, Risnik DV, Moiseenok AG. Koncepciya-spiricheva-v-b-d3-12-vitaminov-razvitie-i-vnedrenie [The concept of VB. Spirichev. D3 + 12 vitamins. Development and implementation]. M.: Biblio-Globus. [Moscow: Biblio-Globus. 2020: 236 (In Russ.).] DOI: 10.18334/9785907063655

13. Lebedeva UM, Stepanov KM. Monitoringovye-issledovaniya-ocenki-fakticheskogo-pitaniya-i-prodovolstvennoj-bezopasnosti-v-respublike-saha-yakutiya [Monitoring studies to assess actual nutrition and food security in the Republic of Sakha (Yakutia)]. Voprosy` pitaniya [Journal of Nutrition. 2016; 85 (S2): 105 (In Russ.).]

14. Maly VP, Andreichin MA, Lyadova TI. Gripp-sezonnyj-ptichij-pandemicheskij-i-drugie-ORVI. [Influenza (seasonal, avian, pandemic) and other acute respiratory viral infections] M.: GE`OTAR-Media. [Moscow: GEOTAR-Media. 2012: 320 (In Russ.).]

15. Nauchnye-osnovy-zdorovogo-pitaniya. Tutelyan VA, Vyalkov AI, Razumov AN, Mikhailov VI, Moskalenko KA. M.: [Scientific foundations of healthy eating] Izdatel`skij dom «PANORAMA» [Publishing house "PANORAMA". 2010: 816 (In Russ.).]

16. Novitskaya VP, Prakhin EI. Vozrastnye-osobennosti-aktivnosti-fermentov-limfocitov-i-ih-vzaimosvyaz-u-detej-Krajnego-Severa [Age features of the activity of lymphocyte enzymes and their relationship in children of the Far North] Yakutskij mediczinskij zhurnal. [Yakut medical journal. 2020; 4(72): 94-97 (In Russ.).]

17. O-protivovirusnyh-ehffektah-vitamina-D Meditsinskiy sovet. Gromova OA, Torshin IYu, Frolova DE, Lapochkina NP, Limanova OA. [About antiviral effects of vitamin D] Medicinskij sovet [Medical advice. 2020; (3): 152-158 (In Russ.).] https://doi.org/10.21518/2079-701X-2020-3-152-158

18. Opyt-sravnitelnogo-analiza-zabolevaemosti-pnevmoniyami-i-ostrymi-respiratornymi-infekciyami-verhnih-dyhatelnyh-putej-posle-vnedreniya-sistemy-ehpidemiologicheskogo-monitoringa-pnevmonij. Kravchenko NA, Gavrilova TA, Khakimova.MI, Kazanova VB, Vasilyeva EI, Botvinkin AD. [The experience of comparative analysis of the incidence of pneumonia and acute respiratory infections of the upper respiratory tract after the introduction of the pneumonia epidemiological monitoring system] E`pidemiologiya i vakczinoprofilaktika. [Epidemiology and vaccination. 2019; 18(1): 96-104 (In Russ.).] https://doi.org/10.31631/2073-3046-2019-18-1-96-104

19. Ocenka-fakticheskogo-pitaniya-kachestva-i-bezopasnosti-prodovolstvennogo-syrya-i-pishchevyh-produktov-v-respublike-Saha-(Yakutiya) Lebedeva UM, Rumyantseva AN, Stepanov KM, Ignatieva ME, Grigoriev VP. [Assessment of actual nutrition, quality and safety of food raw materials and food products in the Republic of Sakha (Yakutia)] . Yakutskij mediczinskij zhurnal. [Yakut medical journal. 2015; 3(51): 64-9 (In Russ.).]

20. Parakhonsky A.P, Induktory-interferona-v-profilaktike-i-lechenii-infekcionnyh-zabolevanij [Interferon inducers in the prevention and treatment of infectious diseases]. Fundamental'nye issledovaniya [Basic Research]. 2007; (11):124-125 (In Russ.).

21. Pigarova EA, Plescheva AV, Dzeranova LK. Vliyanie-vitamina-D-na-immunnuyu-sistemu [Effects of vitamin D on the immune system]. Immunologiya. [Immunology] 2015; 36 (1):62-66 (In Russ.).]

22. Pitanie-i-Sever-gigienicheskie-problemy-Arkticheskoj-zony-Rossii-(obzor-literatury) [Nutrition and the North: hygienic problems of the Arctic zone of Russia (literature review).]. Istomin AV, Fedina IN, Shkurikhina SV, Kutakova NS. Gigiena i Sanitariya. [Hygiene and Sanitation. .2018; 96(6): 557-563 (In Russ.).]

23. Politika-v-oblasti-zdorovogo-pitaniya-naseleniya-respubliki-Saha-Yakutiya Tutelyan VA, Gorokhov AV, Mikhailova EI, Vladimirov LN, Lebedev MP, Ignatieva ME. et al. [Policy in the field of healthy nutrition of the population of the Republic of Sakha (Yakutia)]. Yakutskij mediczinskij zhurnal. [Yakut medical journal. 2015; 3(51): 6-9 (In Russ.).]

24. Principialnye-podhody-k-razrabotke-prioritetnyh-i-perspektivnyh-programm-prodleniya-dlitelnosti-i-uluchsheniya-kachestva-trudosposobnogo-perioda-zhizni-cheloveka-v-ehkstremalnyh-usloviyah-na-osnove-optimizacii-pitaniya-i-privedenie-ego-v-sootvetstvie-s-ehtnogeneticheskimi-i-populyacionnymi-osobennostyami-naseleniya-Severa. Kasparov EV, Vasiliev VA, Prakhin EI, Manchuk VT. Problemy-sohraneniya-i-obespecheniya-sanitarno-ehpidemiologicheskogo-blagopoluchiya-naseleniya-v-arktike-materialy-nauchno-prakticheskoj-konferencii-s-mezhdunarodnym-uchastiem-5-6-oktyabrya-2017-g-SanktPeterburg [Fundamental approaches to the development of priority and promising programs for extending the duration and improving the quality of the working period of a person's life in extreme conditions based on the optimization of nutrition and bringing it into line with the ethnogenetic and population characteristics of the population of the North. Problems of preserving and ensuring sanitary and epidemiological well-being of the population in the Arctic]. Materialy` nauchno-prakticheskoj konferenczii s mezhdunarodny`m uchastiem 5-6 oktyabrya 2017 on October 5-6 2017 [Materials of the scientific and practical conference with international participation October 5-6, 2017. Saint-Petersburg: OOOIPK Costa, 2017: 114-117 (In Russ.).]

25. Probiotiki v kompleksnoj profilaktike respiratornyh-infekcij Gorelov AV, Ploskireva AA, Bondareva AV, Kanner EV. [Probiotics in the

complex prevention of respiratory infections]. Voprosy` prakticheskoj pediatrii [Questions of practical pediatrics]. 2014; 9(5): 77-83 (In Russ.).

26.Rezultaty-vnedreniya-programmy-«Shkolnoe-Moloko-v-Rossii-i-na-Ukraine. Kondratyeva EI, Gorelova JYu, Ladodo KS, Prakhin EI, Shadrin OG, Davtyan KA, Dyogteva GN, Labinov VV, Khapacheva DE, Guznischeva OA. [Results of implementation of the SCHOOL MILK program in RUSSIA and UKRAINE.] Voprosy detskoj dietologii. [Problems of pediatric nutritiology. 2013; 11(1): 69-78. (In Russ.).]

27. Rol' probioticheskih sredstv v profilaktike sezonnoj zabolevaemosti ORVI. Kunelskaya NL, Izotova GN, Bessarab MV, Nagibina MV, Laryushkin YuV. [The role of probiotic agents in the prevention of seasonal incidence of ARVI]. Meditsinskiy sovet. [Medical advice. 2013; (2): 46-50 (In Russ.).] DOI: 10.21518/2079-701X-2013-2-46-50

28. Savchenko AA, Borisov AG. Osnovy klinicheskoj immunometabolomiki RAMN SO NII Medicinskih problem Severa. [Fundamentals of Clinical Immunometabolomics RAMN SO Research Institute of Medical Problems of the North. Novosibirsk: «NAUKA», 2012: 263 (In Russ.).]

29. Snopov SA. Mekhanizmy dejstviya vitamina D na immunnuyu sistemu.2014; 16(6): 499–530. [Mechanisms of Vitamin D's Action on the Immune System]. Mediczinskaya immunologiya. [Medical immunology. 2014; 16(6): 499-530 (In Russ.).]

30. Stepanov KM. Olen'e moloko biologicheski cennyj produkt. [Deer milk biologically valuable product] Molochnaya promy`shlennost` [Dairy industry. 2010; (2): 32-34 (In Russ.).]

31. Stepanov KM, Lebedeva UM, Eliseeva LI. Biohimicheskie i mikrobiologicheskie osnovy proizvodstva YAkutskih nacional'nyh kislomolochnyh produktov novogo pokoleniya. (data obrashcheniya: 18.03.2021). [Biochemical and microbiological foundations of the production of the Yakut national fermented milk products of a new generation (date of access: 03/18/2021).]. Fundamental`ny`e issledovaniya. [Basic research]. 2014; (9-8): 1756-1759 (In Russ.).] URL: http://www.fundamental-research.ru/ru/article/view?id=35135

32. Usenko DV. Probioticheskie produkty v profilaktike respiratornyh infekcij. [Probiotic products for the prevention of respiratory infections]. Consilium Medicum [Consilium Medicum. 2007; 9(3): 82-6 (In Russ.).]

33. Schwartz GYa. Renessans vitamina D: molekulyarno-biologicheskie, fiziologicheskie i farmakologicheskie aspekty. Medicinskij Sovet. Renessans vitamina D: molekulyarno-biologicheskie, fiziologicheskie i farmakologicheskie aspekty. [Renaissance of Vitamin D. molecular biological, physiological and pharmacological aspects]. Medicinskij Sovett [Medical advice. 2015; (18):102-103 (In Russ.).]

34. Calder PC. Feeding the immune system. Proc. Nutr. Soc. 2013; 72(3): 299-309. DOI: 10.1017/S0029665113001286

35. Carr AC, Maggini S. Vitamin C and Immune Function. Nutrients. 2017; 9(11): 1211. DOI: 10.3390/nu9111211.

36. Demas GE, Nelson RJ. Seasonal changes in immune function. Q Rev Biol. 1996; 71(4):511-48. DOI: 10.1086/419555.

37. Ilie PC, Stefanescu S, Smith L. The role of vitamin D in the prevention of coronavirus disease 2019 infection and mortality. Aging Clin Exp Res. 2020; 32(7): 1195-1198. DOI: 10.1007/s40520-020-01570-8.

38. Optimal Nutritional Status for a Well-Functioning Immune System Is an Important Factor to Protect against Viral Infections. Calder PC, Carr AC, Gombart AF, Eggersdorfer M. Nutrients. 2020; 23; 12(4):1181. DOI: 10.3390/nu12041181.

39. Price RHM, Graham C, Ramalingam S. Association between viral seasonality and meteorological factors :Sci Rep. 2019; 30;9(1):929. DOI: 10.1038/s41598-018-37481-y.

40. Vitamin D supplementation to prevent acute respiratory tract infections: Systematic review and meta-analysis of individual participant data. Martineau AR, Jolliffe DA, Hooper RL, Greenberg L, Aloia JF, Bergman P. et al. BMJ (Online), 2017: 356. DOI: https://doi.org/10.1136/bmj.i6583

41. Widespread seasonal gene expression reveals annual differences in human immunity and physiology. Dopico X, Evangelou M, Ferreira R. et al. Nature Communications, 2015; 6, 7000 ISSN 2041-1723 (online)

42. Zinc and respiratory tract infections: Perspectives for COVID 19 (Review). Skalny A, Rink L, Ajsuvakova O. et al. Int J Mol Med.2020; 46, 1: 17-26. DOI: 10.3892/ijmm.2020.4575

POINT OF VIEW

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TOPICAL ISSUES OF ETHNICITY TYPING IN THE ANATOMICAL AND ANTHROPOLOGICAL RESEARCH

Numerous scientific studies in various fields of medicine have reliably shown the presence of features in the predisposition, occurrence, course, treatment, rehabilitation and prevention of various nosological forms in representatives of certain ethnic groups. This article presents a review of the scientific literature on the study of the history of the emergence of ethnic groups. Various theories and concepts of the ethnos based on different methodological approaches are described. Despite the centuries-old numerous studies of scientists around the world, there is still no unity in the scientific community in the approach to the definition of ethnicity and ethnicity. The analysis of scientific literature has shown that domestic researchers in their works, when dividing into groups, use different principles for determining ethnicity. Currently, the active migration processes observed all over the world, the expansion of socio-cultural borders have led to the formation of ethnically mixed groups of the population for several generations. A new anthropological type of population (mestizos) is being formed, which has distinctive morphofunctional indicators and, possibly, a specific level of climatogeographic, social adaptation. Thus, the study of morphofunctional characteristics, patterns of physical development, individual typological features of a large stratum of the population (mestizos) at different segments of the ontogenetic cycle seems relevant and timely, and will make it possible to compile a morphofunctional portrait of the modern population of the Republic of Sakha (Yakutia).

Keywords: ethnos, mestizos, morphofunctional indicators, Yakutia.

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Since ancient times, the study of the historical development of the peoples of the world, their origin, speech, culture, economy, territory of residence, appearance and much more have aroused the scientific interest of ethnographers [1, 2]. An important place in ethnography is occupied by the study of the history of the emergence of ethnic groups and the study of interethnic relations. The purpose of our research is to summarize extensive scientific information concerning the issues of theories, concepts of ethnos and analysis of classifications of races in anatomical and anthropological studies. To achieve this goal, we have set the following tasks: to conduct a theoretical analysis of scientific and educational literature on the problem of research; to systematize the information studied; to consider the main racial classifications of modern anthropologists; to describe the basic principles of ethnic differentiation in modern biomedical