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HORMONAL STATUS AND LIPID SPECTRUM IN THE POPULATION OF SAMBURG VILLAGE, THE YAMAL - NENETS AUTONOMOUS REGION

ABSTRACT

We estimated main indices of lipid metabolism and hormonal status in blood serum obtained from indigenous inhabitants (tundra Nenetses) of Samburg village and non-indigenous population (mostly Russians) who arrived from other regions. The study revealed an increased concentration of insulin in all groups and a lower level of cortisol and thyroxin (women) in non-indigenous population. Hypertriglyceridemia and hypercholesterolemia as well as a high atherogenic index were found in the representatives of non-indigenous male population. A high level of insulin, an increased content of atherogenic fractions of lipoproteins, and a decrease in HDL content at a low activity of the thyroid gland and adrenal cortex are likely to result in the development of metabolic syndrome, especially in the representatives of non-indigenous population.

Keywords: hormones, lipid spectrum, tundra Nenets, non-indigenous population, Samburg village the Yamal-Nenets Autonomous Okrug.

INTRODUCTION

Human adaptation in the Far North is accompanied by essential alteration of all physiological systems. The so-called "polar stress syndrome" emerges in non-indigenous population and deteriorates functional parameters of many systems of the body. The formation of a "northern type of metabolism" is characterized by rearrangement of the exchange of proteins, lipids and carbohydrates [2].

The study aimed to compare the level of hormonal metabolism and lipid status in non-indigenous and indigenous population of Samburg village, the Yamal-Nenets Autonomous Okrug.

MATERIALS AND METHODS

The study was carried out under the agreement on scientific cooperation with the Institute of Cytology and Genetics SB RAS (ICG SB RAS). Material for the study was collected during the expeditions to the Yamal-Nenets Autonomous Region (YNAR) in 2014 by researchers from the Laboratory of population ethnogenetics at ICG SB RAS under the supervision of the Laboratory Head Ph.D. (biol.) Osipova L.P.

The study was approved by the bioethics Commission Institute of Cytology and genetics. Blood donations were taken in compliance with international rules using the informed consent from volunteers who were practically healthy at the time of the study. The study involved indigenous persons and non-indigenous population of Samburg village (latitude 67°0' north, longitude 78° 25′ east), Purovsky district. Overall, 80 inhabitants (40 men and 40 women) 21 – 65 years of age were examined. Among them were representatives of indigenous nation (tundra Nenetses) and non-indigenous population (mostly Russians) who came from other regions.

Blood was taken from the ulnar vein after 10-12 hours of night fasting. The concentrations of thyroxin (T4), triiodothyronine (T3), thyrotrophic hormone (TTH), cortisol, dehydroepiandrosterone sulfate (DHEAS) and testosterone in blood serum were measured with ELISA test kits (St. Petersburg), estradiol with HEMA ELISA kits (Germany), insulin with Monobind Inc kit (USA), and ACTH with Biomerica

Table 1

Blood content of hormones in representatives of indigenous and non-indigenous population of Samburg village (M ± m)

Hormones	Indigenous men	Non-indigenous men	Indigenous women	Non-indigenous women
Insulin (0.7 – 9.0 μIU/mL)	12.44 ± 1.79	16.37 ± 2.10	15.05 ± 1.40	**16.18 ± 1.39**
P	-		-	
Cortisol (150 – 660 nmol/L)	**711.50 ± 62.01**	**624.55 ± 53.38**	604.20 ± 61.62	499.65± 49.56
P	-		-	
DHEA-S (0.8 – 3.9 μg/mL)	2.34 ± 0.20	2.15 ± 0.16	1.25 ± 0.08	1.54 ± 0.15
P	-		-	
TTH (0.23 – 3.4 μIU/mL)	1.47 ± 0.15	1.70 ± 0.11	1.78 ± 0.22	1.80 ± 0.21
P	-		-	
T_4 (53 – 158 nmol/L)	119.15 ± 5.27	133.15 ± 5.67	76.75 ± 5.01	62.55 ± 2.18
P	-		P< 0.05	
T_3 (1.0 – 2.8 nmol/L)	1.29 ± 0.05	1.28 ± 0.08	1.80 ± 0.12	1.80 ± 0.12
P	-		-	
Testosterone (12.1 – 38.3 nmol/L)	21.42 ± 1.79	18.53 ± 1.92	1.52 ± 0.22	1.52 ± 0.22
P	-		-	

Table 2

Blood content of lipids in representatives of indigenous and non-indigenous population of Samburg village (M ± m)

	Indigenous men	Non-in-digenous men	Indigenous women	Non-indigenous women
CS, mmol/L	4.76±0.22	5.60±0.34	4.73±0.19	5.16±0.27
P	P < 0.05		–	
TG, mmol/L	0.82±0.06	1.86±0.30	0.98±0.09	1.35±0.16
P	P < 0.001		–	
CS-VLDL mmol/L	0.25±0.04	0.82±0.22	0.37±0.06	0.71±0.22
P	P < 0.01		–	
CS-LDL mmol/L	3.06±0.21	3.70±0.29	3.06±0.14	3.30±0.27
P	–		–	
CS-HDL mmol/L	1.46±0.11	1.09±0.11	1.30±0.10	1.15±0.07
P	P < 0.01		–	
AI	2.49±0.26	4.81±0.55	3.00±0.29	3.82±0.41
P	P < 0.001		–	
FFA mmol/L	0.46±0.07	0.60±0.08	0.49±0.06	0.53±0.05
P	–		–	

ELISA kit (USA). The concentrations of total cholesterol (TCS), CS of very low, low and high density lipoproteins (CS-VLDL, CS-LDL, CS-HDL), triglycerides (TG) and free fatty acids (FFA) in blood serum were measured on a Labsystem (Finland) autoanalyzer using Biocon (Germany) kits; atherogenic index (AI) was calculated as a ratio of TCS-CS-HDL to CS-HDL.

Statistical treatment was carried out with Statistika 9.0 software using nonparametric statistical methods (Mann-Whitney rank sum test and Spearman correlation coefficient).

RESULTS AND DISCUSSION

The study of hormonal status revealed an increased concentration of insulin in all groups: indigenous and non-indigenous, men and women. In all groups, insulin content exceeded the reference values, i.e. it was above 9.0 μIU/mL (Table 1). In non-indigenous women, the concentration of insulin was higher and insulinemia was observed in 95% of cases as compared to indigenous persons. In non-indigenous men, this parameter was higher by 32% in comparison with indigenous population (Tables 1). Statistically significant differences in the content of insulin between men and women were not found. The increased concentration of insulin may testify to the development of insulin resistance in men and women; however, this is more pronounced in the group of non-indigenous population. Similar results were obtained in our study of female population of Tazovsky village (YNAO) [1]. A high level of insulin was found by Keyl V.R. et al. [3] in the personnel of JSC ALROSA in Mirniy, the Republic of Sakha (Yakutia), particularly in ground services.

A reliable decrease in thyroxin concentration (T4) by 23% (P < 0.01) and cortisol content by 21% was found in non-indigenous women as compared to indigenous ones (Table 1). A lower content of cortisol was observed in non-indigenous men (Table 1). Blood serum content of cortisol in indigenous persons (males and females) was at the upper limit of reference values (Tables 1).

Analysis of the lipid profile in the representatives of indigenous and non-indigenous population showed some differences: non-indigenous men had significantly higher contents of TCS, TG, CS-VLDL and atherogenic index, whereas the level of CS-HDL was lower by 34% (Table 2). Therewith, in non-indigenous men, lipid indices exceeded the reference values of physiological norm (Recommendations of the Russian

Scientific Society of Cardiologists, 2012): TCS (> 5 mmol/L), TG (> 1.7 mmol/L) and AI (> 3 units); this reliably indicates the presence of hypertriglyceridemia and hypercholesterolemia.

Thus, inhabitants of the village showed an increased concentration of insulin in all groups and a lower level of cortisol and thyroxin (women) in non-indigenous population. Hypertriglyceridemia and hypercholesterolemia as well as a high atherogenic index were found in the representatives of non-indigenous male population.

High level of insulin, increased content of atherogenic fractions of lipoproteins, and suppressed synthesis of HDL at a low activity of the thyroid gland and adrenal cortex can give rise to the development of metabolic syndrome, especially in the representatives of non-indigenous population.

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THE HEMOGRAM CONDITION OF THE SAKHA REPUBLIC'S NORTHERN AND CENTRAL POPULATION

ABSTRACT

We studied peripheral blood parameters of population of the northern (Anabarskij) and central (Megino-Kangalasskij) regions (uluses) of Yakutia. We revealed significant differences in the hemogram. More than 50% of the residents of the Megino-Kangalasskij ulus have increased red blood cell count and hemoglobin concentration, which is not typical for the indigenous people, especially for women. The Anabarskij ulus residents have absolute and relative monocytosis probably associated with food and the environment. The blood count is more harmonious in the population of the Anabarskij ulus.

Keywords: Arctic, hemogram, golden blood proportion, monocytosis.

INTRODUCTION

Currently the incidence rate of our population needs a serious care for human's state of health, in connection with possible harmful effects of surrounding and social environment factors, defining effects of their impact on health, which requires biomedical research with finding a morphologiccomposition of peripheral blood. Totality of quantitative and qualitative indices of complete blood count characterizes cell counts of the peripheral blood, conditionof the functional reserves of the body, adaptative processes of the hematopoietic system in response to the intensity and character change of influencing environmental factors. Besides that, participation of hematosis organs in forming mechanisms of protection and compensating for various pathologic processes is estimated [7]. That's why available and fast analysis of hemogram is used for rating adaptation condition of human's organism.

Purpose. Evaluation of hematologic blood indices of Anabarsky and Megino-Kangalassky districts' residents.

MATERIALS AND METHODS

Research was conducted among working-age population from Northern and Central districts at the age of 18 to 65. In total 386 people were surveyed, 184 from Anabarsky district and 202 from Megino-Kangalassky district.

Cells of peripheral blood per unit volume ($1mm^3$) of blood were determined by a hematologic automatic analyzer MICROS 60 (France), using