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LIPID METABOLISM IN THE NON-INDIGENOUS POPULATION OF YAKUTIA DEPENDING ON LENGTH OF STAY IN THE NORTH

ABSTRACT

Changes in lipid metabolism, depending on the length of residence in the North, in the winter season in the non-indigenous population of Yakutia, aged 18 to 62 years, were examined. It was revealed that the adaptation of the organism to the North conditions is accompanied by changes in lipid metabolism. In the first year of residence in the North in the blood serum high cholesterol is compensated by increasing the content of HDL cholesterol and APO A-I. This is indicated by the coefficient of atherogenicity, which varies within the limits of normal values. At residence in the North from 2 to 5 years lipid metabolism indicators correspond to normal values; after 5 years - there is an increase in the level of cholesterol and atherogenicity coefficient due to an increase in LDL cholesterol.

Keywords: adaptation, indicators of lipid metabolism, the North.

Introduction

Adaptive changes in the human body to the conditions of the North have a number of common physiological signs: the stage of the process, the absence of a definite period for each stage, the passage of several phases in adaptive rearrangements. All these adaptive changes correspond to the formula proposed by G. Selye (1977): anxiety, stress, exhaustion [8].

In high-latitude conditions, adaptation is carried out by enhancing lipid metabolism, which is beneficial to the body, since the oxidation of fats produces more energy than glucose oxidation.

The goal of the study was to study the changes in lipid metabolism parameters depending on the time of residence in the North.

Material and methods. Studies were conducted in the winter season. A total of 318 newly arrived residents of Yakutia aged 21 to 67 years were surveyed, the average age was 46.91 ± 2.72 years.

Exclusion criteria from the study were exacerbations of chronic diseases, the presence of oncological, infectious and viral diseases. Were also excluded individuals with coronary artery disease, past heart attack and stroke in anamnesis To assess the objective state, a survey was conducted on the questionnaire developed at the Yakutsk Scientific Center of Complex Medical Problems of the Siberian Branch of the Russian Academy of Medical Sciences; received informed consent of respondents to conduct research, taking blood.

Blood for biochemical research was taken from the ulnar vein in the morning hours on an empty stomach 12 hours after meals.

Determination of total cholesterol (CH), triglycerides (TG), high density lipoprotein cholesterol (HDL cholesterol) was performed by the enzymatic method.

Low-density lipoprotein cholesterol (LDL cholesterol) and very low-density lipoprotein cholesterol (VLDL cholesterol) were calculated by the formula Friedewald et al. (1972) [9]. The coefficient of atherogenicity was calculated according to the formula proposed by A. Klimov. (1977) [5].

Apoproteins apo A-I and apo B were determined by immunoturbidimetric method using La Roche reagents. The method is based on measuring the fine suspension, formed as a result of the immunological reaction of anti-apoproteins with antibodies. By the degree of development of turbidity, the concentration of apoproteins is judged.

Behind hypercholesterolemia taken a cholesterol level ≥ 5.0 mmol/l, increased level of LDL cholesterol is ≥ 3.0 mmol/l, reduced levels of HDL cholesterol – ≤ 1.0 mmol/l in men and 1.2 ≤ in women. Hypertriglyceridemia attributed levels of TG ≥ 1.7 mmol / l.

All biochemical studies were performed on an automatic biochemical analyzer Cobas Mira Plus by La Roche (Switzerland) using Biocon reagents (Germany).

The statistical processing of the data was carried out using the SPSS Statistics 17.0 application statistical software package. Standard methods of variational statistics were used: calculation of mean values, standard errors, 95% confidence interval. The data in the tables are presented in the form M ± m, where M is the mean, m is the mean error. The reliability of the differences between the averages was estimated using the t Student-Kolmogorov-Smirnov test. Probability of the validity of the null hypothesis was assumed for $p < 0.05$. Correlation analysis was performed using the Pearson and Spearman method.

Indicators of lipid metabolism depending on the period of residence in the North (mmol /L)

Indicators of lipid metabolism	1 year (n=17)	From 2 to 5 years (n=25)	5-9 years (n=18)	10-19 years (n=43)	More than 20 years (n=215)
TG	0,99±0,11	1,16±0,43	1,45±0,20	1,11±0,08	1,18±0,04
Cholesterol	6,36±0,37	4,96±0,51	6,16±0,27	6,24±0,21*	6,19±0,08*
HDL cholesterol	2,0±0,12	1,40±0,09	1,58±0,13	1,66±0,07	1,54±0,03
LDL cholesterol	3,49±0,32	3,02±0,40	3,95±0,26	4,02±0,19	4,13±0,07
VLDL cholesterol	0,31±0,05	0,53±0,20	0,66±0,09	0,54±0,06	0,54±0,02
Atherogenic coefficient	2,93±0,51	2,62±0,54	3,29±0,41	2,94±0,23	3,19±0,09

*Note: * compared with the group with experience up to 5 years $p < 0.05$.

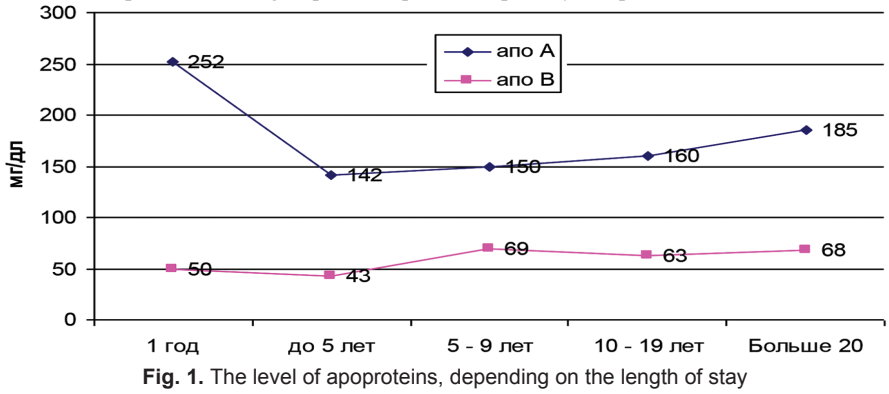

Fig. 1. The level of apoproteins, depending on the length of stay

Results and discussion. The energy supply of adaptation reactions is a very complex biochemical process. It should be borne in mind that adaptation to the severe natural and climatic conditions of the North requires an increase in the energy metabolism of the organism and the transition from the carbohydrate type of metabolism to fat, as the role of lipids in the energy supply of adaptive reactions increases [4].

Analysis of the dependence of the state of lipid metabolism on the time of residence showed that the alien population had the highest value of total cholesterol in the first year of residence in the North. The increase in the level of HDL cholesterol in the blood 1,2 - 1,4 times in this period in comparison with other groups indicates the adequate mobilization of body reserves, as a result of which there are no atherogenic changes in blood (Table 1).

In the studies of Novosibirsk scientists it was shown that adaptive changes in the body lead to significant changes in the lipid metabolism. We received a high level of HDL cholesterol in newly arrived people to the North also does not contradict the literary data [7].All these shifts in lipid metabolism indicators reflect the mobilization of energy resources for the adequate functioning of tissue metabolic pathways in response to the combined effects of natural climatic stimuli and social factors [2].

At the periods of residence from 2 to 5 years, there is «stabilization and synchronization of regulatory and homeostatic processes» [3], which is expressed in the normalization of lipid metabolism. In our studies, signs of destabilization in the newly arrived residents began after 5 years of residence in the North. In this group of visitors, dyslipidemia was characterized by expressed hypertriglyceridemia, increased levels of total cholesterol and LDL cholesterol. In groups with «northern experience» of more than 10 years, dyslipidemia was caused by an increase in the blood of total cholesterol and LDL cholesterol. In these groups, the TG level was relatively low in comparison with the group of persons with an experience of 5-9 years.

The increase in blood levels of antiatherogenic and atherogenic fractions of cholesterol, associated with the duration of residence in the North, indicates an adaptive character of the lipid spectrum change, although the increase in HDL is not fully compensated for dyslipidemia, as confirmed by the high atherogenicity coefficient.

Our data on the increase in the level of HDL cholesterol associated with the duration of residence in the North are consistent with the literature data, but in these studies, unlike our studies, the coefficient of atherogenicity corresponded to normal values [1,6].

The content in the blood of apoproteins also had some differences, depending on the length of residence in the North. So, in the first year of arrival, the level of apo A-I, the main transport protein of HDL, was 1.4-1.8 times higher than in individuals with a longer residence time in the North. Subsequent decrease in the content of apo A-I (experience up to 5 years) was associated with normalization of lipid metabolism. The relative increase in blood apo A-I in the studied groups was associated with an increase in the blood of HDL cholesterol (Figure 1).

The level of apo B, which is a protein that carries all the triglyceride-rich atherogenic lipoproteins - VLDL, LDL, did not differ significantly in these groups, depending on the northern experience, although it tended to increase with increasing «northern experience».

Thus, the adaptation of the human body to the conditions of the North is accompanied by changes in lipid metabolism. In the first year of life in the north in the serum, high cholesterol is compensated by an increase in cholesterol-lowering cholesterol and apo A-I. This is indicated by the coefficient of atherogenicity, which varies within the limits of normal values. From 2 to 5 years, the values of lipid metabolism correspond to normal values; after 5 years of life, there is an increase in the level of cholesterol and the coefficient of atherogenicity due to the increase in LDL cholesterol.

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