

Levels of Some Antiviral Antibodies in Patients with Different Serum Content of Total Cholesterol

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We measured the content of specific antibodies to some viral antigens (herpes, cytomegalovirus, measles, rubella, mumps) in patients with different levels of total serum cholesterol. The levels of IgG to the most prevalent viral infections (measles, herpes, rubella) were higher in patients with 6-7 mmol/liter total serum cholesterol (mild and moderate hypercholesterolemia). These data confirm the relationship between the status of the lipid transporting system and antiviral immunity and the existence of a "cholesterol optimum" (mild and moderate hypercholesterolemia) for maximally effective functioning of the immunity system.

Key Words: *immunity system; lipid transporting system; total cholesterol; antiviral immunity*

The relationship between the status of the lipid transporting system (LTS) and immunity system (IS) was demonstrated in many reports. Lipoproteins are characterized by a wide spectrum of regulatory effects on cellular and humoral immune response [9,10,13,15], immune cell metabolism [8,11,12,13], and cytokine production [4,7]. The parameters of antigen-nonspecific immune status improve with increasing the total cholesterol (TC) content [2,6]. The data on the status of antigen-specific component of IS in subjects with different LTS parameters are scanty.

We measured the levels of specific antibodies to some viral antigens in patients with different serum TC levels.

MATERIALS AND METHODS

A total of 99 patients (64 women and 28 men aging 34-61 years) with I-II degree arterial hypertension (participants of a cardiovascular disease prevention program in 2000-2001) were examined. The parameters of LTS (including TC measurement using Cormay

Diana diagnostic kits) were evaluated in all patients twice during 1 year (with 6-month interval). Mean TC values were estimated [5].

By the moment of examination none of the patients had acute or chronic infections. Antibodies to viral antigens were measured by enzyme immunoassay: IgG to types I/II herpes viruses, IgM to cytomegalovirus (Roche), IgG to rubella, measles, and mumps viruses (Bioservis). The sera were not titrated; the level of specific antibodies was evaluated by optical density (OD) of the sample, which, according to instruction for test systems, is a semiquantitative measure of antibody level in a sample.

The results corresponded to normal distribution criteria, and hence, the data were statistically processed using parametric tests [1].

RESULTS

Analysis of correlations of OD levels for measles, rubella, and herpes virus antigens showed a statistically significant, though weak, positive correlation between OD and TC level ($r=0.27, 0.22, 0.22$, respectively; $p<0.05$), which can be interpreted as an increase in the content of virus-specific antibodies with increasing of serum TC level. No correlation between

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the levels of specific antibodies to cytomegalovirus and mumps virus and cholesterol levels was detected.

In order to compare the levels of specific antibodies in patients with different cholesterol content, we evaluated the difference between the mean OD values in subjects with higher and lower TC levels (e. g., mean OD >4 mmol/liter minus mean OD <4 mmol/liter, etc., with a 0.5 mmol/liter step; Fig. 1).

Curves for measles, rubella, and herpes viruses are similar, with two peaks: the differences between the levels of specific antibodies in subjects with higher and lower TC values present as a peak in the 4-5 mmol/liter interval, followed by a drop and another peak at 6.5-7.5 mmol/liter TC. This is true only for IgG antibodies to the most prevalent viral infections (measles, rubella, herpes). No trend of this kind was observed for IgM antibodies to cytomegalovirus and IgG to mumps virus. Presumably, humoral immunity to mumps virus decreases with age, because no revaccination with mumps vaccine is usually carried out and the levels of antibodies in subjects over 40-50 years decrease [3]. The absence of changes in the content of IgM to cytomegalovirus suggests that elevated TC level is associated with the development of secondary immune reactions and the formation of memory cells, rather than with the primary immune response.

These findings can be explained by a systematic error during enzyme immunoassay, caused by increased nonspecific adsorption in sera with high cholesterol level. However, there were no lipemic sera (for which this effect was described) among the studied samples. Similar results were obtained in tests with enzyme immunoassay kits produced by different companies.

Another possible explanation is age-related increase in TC level and the appearance of a relationship between the level of specific antibodies and patient's age (but not cholesterol content): the older the subject, the higher is the probability of contact with the viruses and, presumably, the higher are OD values. In this case the increment of OD could be monotonous (without peaks and drops). But we know that IS activity decreases with age.

Our data confirm the close relationship between the status of lipid-transporting system and IS, but it is difficult to interpret these results unambiguously. We assume the existence of a "cholesterol optimum" for maximally effective IS functioning: the first peak (differences between the levels of specific antibodies) approximately corresponds to normal TC level, while the second peak falls into hypercholesterolemia [5]. Presumably, cholesterol should be regarded as an endo-

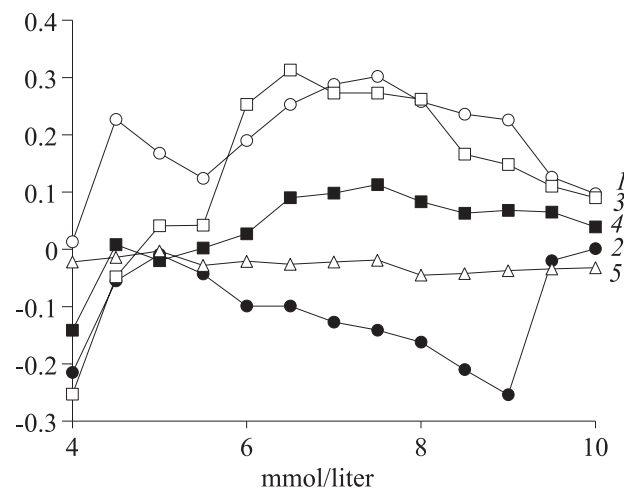


Fig. 1. Differences in optical density (OD) for viral antigens in patients with different levels of total cholesterol. Abscissa: borderline values of total cholesterol for which mean OD was calculated. Ordinate: difference between mean OD in patients with cholesterol level above and below the borderline values for measles (1), mumps (2), rubella (3), herpes (4), and cytomegalovirus (5).

genous immunomodulator, and hence, the immunity system can be modulated by regulating activity of the lipid-transporting system.

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