

# DYNAMICS OF BACTERICIDAL PROPERTIES OF HUMAN SALIVA AND BLOOD SERUM DURING ADAPTATION TO ARCTIC CONDITIONS

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The dynamics of the bactericidal activity of the blood serum and of the lysozyme activity of the blood and saliva was studied in persons living beyond the Arctic circle (Noril'sk). During adaptation to Arctic conditions significant changes take place in the bactericidal activity of the serum and the lysozyme titer of the serum and saliva. Together with changes in the absolute values of these parameters, their circadian rhythms are disturbed. A period of 2 years is not long enough to restore the normal bactericidal activity of the serum or the lysozyme titer.

**KEY WORDS:** salivary lysozyme; bactericidal activity of the blood serum; human adaptation.

With the rapid increase of the Arctic population the investigation of the dynamics of the immunologic parameters during adaptation of man to Arctic conditions becomes particularly important. Accordingly, during the expedition of the Siberian Branch, Academy of Medical Sciences of the USSR, in Noril'sk in the summer of 1972 some parameters of nonspecific immunity were studied in the healthy inhabitants of this town.

TABLE 1. Dynamics of BAS Against *E. coli* and of Lysozyme Activity of the Serum and Saliva Depending on Duration of Residence in the Arctic ( $M \pm m$ )

Parameters studied	Duration of residence				
	a few days (control)	6 months	1 year	1½ years	2 years
BAS	1:12; 0,05 [34]	1:3; 0,05 [44]	1:3; 0,08 [19]	1:1; 0,05 [61]	1:2; 0,05 [38]
P	—	<0,001	<0,001	<0,001	<0,001
Serum lysozyme activity	25,0; 2,0 [34]	29,6; 1,9 [42]	23,0; 3,1 [14]	19,0; 1,5 [33]	19,0; 1,9 [48]
P	—	>0,1	>0,5	<0,05	<0,05
Salivary lysozyme activity	43,0; 2,9 [33]	42,0; 2,9 [40]	40,0; 4,1 [19]	26,0; 3,0 [42]	32,0; 2,6 [46]
P	—	>0,5	>0,5	<0,001	<0,02

Legend. Number of observations shown in square brackets; P) level of significance of differences compared with the control.

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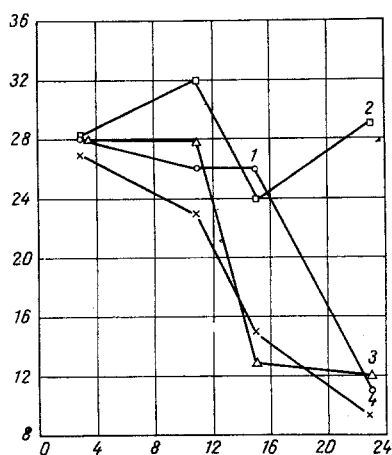


Fig. 1

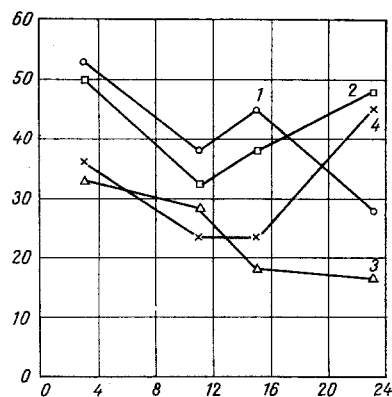


Fig. 2

Fig. 1. Diurnal dynamics of serum lysozyme plotted against period of residence of subjects in the Arctic. Duration of residence: 1) a few days, 2) 6 months, 3) 18 months, 4) 2 years. Abscissa, time of test (24-h clock); ordinate, lysozyme activity (in conventional units).

Fig. 2. Diurnal dynamics of salivary lysozyme depending on duration of residence in the Arctic. Legend as in Fig. 1.

#### EXPERIMENTAL METHOD AND RESULTS

The subjects investigated were 102 building workers (men aged from 20 to 24 years). The duration of their stay in the Arctic varied from a few days to 2 years. The subjects were admitted for 24 h to the hospital. Blood was taken and analyses made twice during the 24 hours (at 3 a.m. and 3 p.m. or at 11 a.m. and 11 p.m.). The bactericidal activity of the blood serum (BAS) against *Escherichia coli* was determined by a modified Martynova's method [2] and the lysozyme activity of the blood and saliva was determined by Dorofeichuk's method [1]. Before titration, the blood serum was inactivated at 56°C for 30 min to destroy complement. Lysozyme activity was expressed in conventional units based on the change in turbidity of the bacterial suspension under the influence of lysozyme. The results of the analyses were subjected to statistical analysis with the aid of Student's criterion and are given in Table 1.

The investigations showed that during human adaptation to the conditions of life in Noril'sk significant changes took place in the BAS: after a stay of 6 months in Noril'sk the BAS was 25% of its initial value, and later it fell even lower. A tendency for its recovery was observed by the end of the second year, but even then the values of the BAS were much lower than initially. The diurnal rhythm of this parameter disappeared.

The serum lysozyme titer also fell, starting from the second 6-month period of residence in Noril'sk, and it reached its minimum after 18 months. No clear tendency for this parameter to recover could be detected.

Diurnal fluctuations in the serum lysozyme activity of subjects resident in Noril'sk for between a few days and 6 months were slight. On the other hand, in persons resident in the Arctic region for 18 and 24 months the serum lysozyme activity was maximal at 3 a.m. and minimal at 11 p.m. (Fig. 1). The serum lysozyme activity in most groups investigated was maximal at 3 a.m. By 11 a.m. the lysozyme activity was lowered in all groups. During the afternoon (3 p.m.) the lysozyme activity fell still lower in persons resident in Noril'sk for 1.5-2 years but it rose in persons resident in the Arctic region not more than 6 months (Fig. 2).

Hence, during adaptation and acclimatization of man to Arctic conditions appreciable changes take place in the BAS and also in the serum and salivary lysozyme activity, with a general tendency toward their decrease. Besides changes in the absolute values of these parameters, their qualitative characteristics also changed (distortion of the diurnal rhythms). A period of 2 years is evidently too short to permit restoration of the normal BAS and lysozyme activity.

#### LITERATURE CITED

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