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EFFECT OF α-TOCOPHERYL ACETATE ON SOME BLOOD BIOCHEMICAL PARAMETERS OF ALBINO RATS EXPOSED TO ACOUSTIC STRESS

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KEY WORDS: noise; lipid peroxidation; α-tocopherol; cholesterol.

There is much evidence in the literature on the harmful action of sound on the body [11, 12]. An important role in the mechanisms of realization of the effects of various pathological factors has recently been ascribed to changes in the intensity of free-radical processes taking place in the body. Marked intensification of lipid peroxidation (LPO) has been demonstrated in various extremal states [3, 5]. In view of the facts mentioned above, and also of evidence [4] of the direct formation of free radicals in an aqueous medium under the influence of mechanical oscillations with a frequency of 7-200 Hz in experiments *in vitro*, in order to determine the degree of participation of LPO in the mechanisms of realization of the pathological effects of noise on the body the effectiveness of induction of LPO was studied in various tissues of albino rats [6, 7] and considerable changes were demonstrated in the LPO system in the brain, liver, and heart. This paper gives the results of an investigation of the intensity of LPO and also of the level of the endogenous antioxidant α-tocopherol, and of the risk factor, cholesterol, in the plasma and erythrocyte membranes, in animals receiving α-tocopheryl acetate and exposed to the action of noise.

EXPERIMENTAL METHOD

Experiments were carried out on male albino rats weighing 150-220 g, kept under ordinary animal house conditions. The animals were divided into six groups: rats of group 1 served as the control, rats of groups 2-6 were exposed to the action of noise (91 dB) with maximal energy in the region of middle and high frequencies. Additionally, in each experimental group a subgroup of rats receiving α-tocopheryl acetate (TPA) intraperitoneally throughout the experiment in a dose of 1 mg/kg was distinguished. The duration of exposure to noise of animals of the various groups was 1 and 8 h, and 7, 28, and 56 days, respectively, for 8 h each day.

The animals were decapitated. The background level of lipid peroxides (LP) in the plasma was determined by the method in [14]. The LP concentration was expressed in nmoles malonic dialdehyde (MDA) per 1 ml of plasma. Erythrocyte membranes were isolated by the method in [15]. Activity of LPO systems in erythrocyte membranes was determined by measuring accumula-

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TABLE 1. Effect of Noise on LPO Parameters in Rats' Blood (M ± m)

Parameter studied	Experimental conditions	Group of animals					
		1-	2-	3-	4-	5-	6-
LP concentration, nanomoles MDA/ml plasma	Noise (18)	5,25±0,214	5,96±0,135***	6,92±0,365***	4,86±0,249	6,47±0,452***	6,48±0,149*
	Noise+TPA(9)	(15)	5,023±0,12	3,33±0,35*	4,645±0,13***	5,95±0,17***	5,41±0,49
TP concentration: in plasma, mg%	Noise (18)	3,55±0,47	3,6±0,052	3,44±0,107	2,46±0,087*	3,3±0,081	2,94±0,082*
	Noise+TPA(9)	(32)	2,47±0,073*	2,9±0,01*	3,37±0,079	4,53±0,034*	3,7±0,17
in erythrocytes, μg/ml protein	Noise (18)	3,255±0,075	3,083±0,024***	3,155±0,068	2,45±0,065*	2,52±0,22**	2,06±0,114*
	Noise+TPA(9)	(24)	3,22±0,175	1,97±0,07*	4,2±0,04*	2,18±0,06*	2,82±0,06*
Protein concentration in plasma, g%	Noise (18)	6,113±0,088	5,28±0,078*	6,0±0,117	6.6±0,24***	7,3±0,266*	6,8±0,117*
	Noise+TPA(9)	(32)	7,4±0,43***	6,6±0,31	6,85±0,37	8,27±0,24*	4,6±0,02*

Legend. *P < 0.001, **P < 0.01, ***P < 0.05 compared with control. Number of animals shown in parentheses.

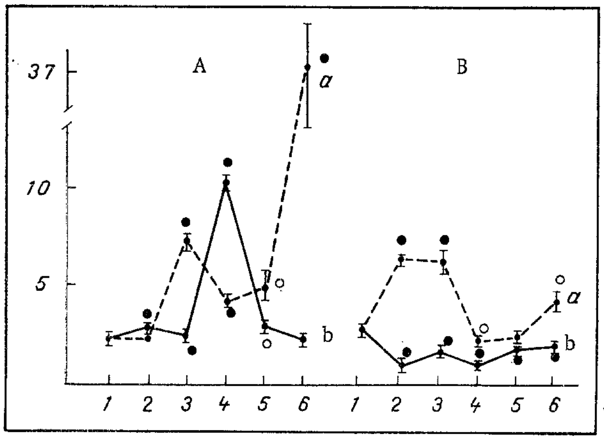

Fig. 1. Levels of ADLPO (A) and NDLPO (B) in erythrocyte membranes of rats exposed to noise (a) and receiving TPA (b). Abscissa, group of animals; ordinate, MDA concentration (in nmoles/mg protein).

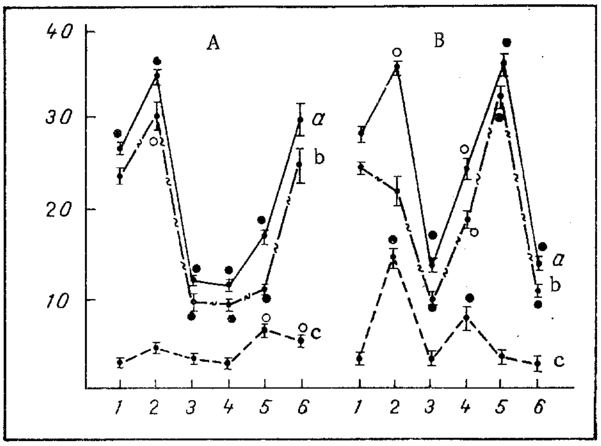

Fig. 2. Plasma cholesterol level in rats exposed to noise (A) and receiving TPA (B). Abscissa, groups of animals; ordinate, cholesterol level (in mg%). a) TCh, b) ECh, c) FCh.

tion of MDA during incubation for 30 min. To investigate ascorbate-dependent LPO (ADLPO) the incubation medium contained 40 mM Tris-HCl, pH 7.4, 0.8 mM ascorbate, and $12 \cdot 10^{-6}$ M of Mohr's salt, and to investigate NADPH-dependent LPO (NDLPO) it contained $2 \cdot 10^{-4}$ M sodium pyrophosphate, $12 \cdot 10^{-6}$ M of Mohr's salt, and 1 mM NADPH. The LP content was expressed in nmoles MDA/mg protein [3]. The concentrations of total (TCh), free (FCh), and esterified (ECh) cholesterol were determined by the unified method of Slatkis-Zak [9]. The α-tocopherol (TP) concentration was determined fluorometrically by the method in [13] on a Hitachi (Japan) spectrofluorometer. The protein concentration was determined by Lowry's method [16]. The results were subjected to statistical analysis and correlation analysis, using standard programs.

EXPERIMENTAL RESULTS

The plasma LP level 1 h after the beginning of exposure to noise was raised, and the increase became significant after 8 h (Table 1). Daily exposure to noise for 8 h caused a fall in the background LP concentration to the control level after 7 days, followed by a stable increase after 28 and 56 days (Table 1). A fall in the TP level was observed in both plasma and erythrocyte membranes. Changes in the TP level in the erythrocyte membranes were evidently the result of changes in the intensity of both ADLPO and NDLPO in them (Fig. 1A).

The plasma TCh level fell sharply 8 h after the beginning of exposure to noise, and it remained at this level until the end of the 7th day of exposure, after which a tendency was observed for this parameter to increase (Fig. 2A). However, these changes were mainly due to changes in the ECh concentration, whereas the FCh level was raised at all times of the experiment. The TCh/protein ratio in the erythrocyte membranes fell only very slightly under these circumstances 8 h after the beginning of exposure (Fig. 3A). Just as in the plasma, the FCh concentration in the erythrocyte membranes rose sharply, except on the 7th day of exposure. It is a particularly interesting fact that by the end of the 8th hour of exposure to noise no ECh could be detected in the erythrocyte membranes, an observation which coincides with maximal intensification of ADLPO and NDLPO in them. Correlation analysis revealed close correlation between the parameters studied (Table 2).

Data in the literature on the fractional composition of membrane cholesterol are contradictory [10]. The results of the present investigation show that the FCh/Ch ratio was a little higher than 1. Cholesterol is known to play an important role in the stabilization of biomembranes and to have a considerable effect on their microviscosity and also, consequently, on activity of several membrane-bound enzymes and on membrane permeability.

Prophylactic administration of TPA helped to maintain the background LP concentration close to the control level. The plasma TP concentration, after a transient fall, returned to the control value, and actually exceeded it a little during prolonged exposure to noise. Sim-

TABLE 2. Coefficients of Correlation between Parameters Studied

Parameter studied	ADLPO	NDLPO	Plasma		
			TCh	ECh	TP
ECh of erythrocytes	0,63	0,67	0,82	0,78	—
FCh of erythrocytes	—	—	—	—	0,56

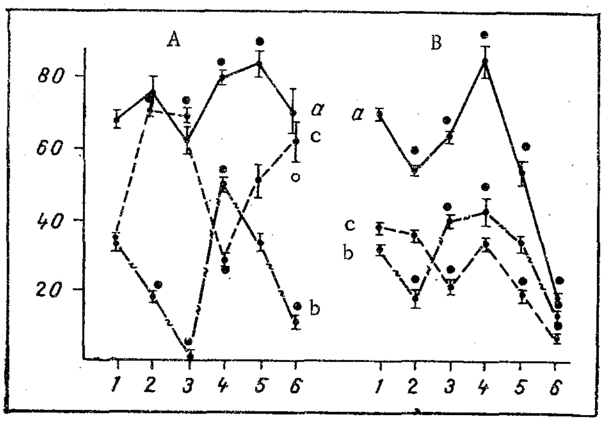

Fig. 3. Cholesterol concentration in erythrocyte membranes of albino rats exposed to noise (A) and receiving TPA (B). Ordinate, cholesterol level (in μg/mg protein). Remainder of legend as to Fig. 2.

ilar changes also took place in the erythrocyte membranes (Table 1). Depression of NDLPO was observed, but the intensity of ADLPO varied within limits close to the control level, except when investigated on the 7th day (Fig. 1B). The plasma cholesterol level also fluctuated, with a marked tendency for the TCh level to fall on account of both FCh and ECh (Fig.2B). Similar changes also were observed in the erythrocyte membranes: a marked decrease in the TCh concentration, due mainly to FCh (Fig. 3B).

The results thus demonstrate changes in the LPO system, the TP level, and the cholesterol fractions in the plasma and erythrocyte membranes during prolonged exposure to noise with an intensity of 91 dB. Administration of TPA had a regulating influence on the parameters studied.

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EFFECT OF LITHIUM SALTS ON NEUROPATHOLOGICAL SYNDROMES OF SPINAL ORIGIN

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KEY WORDS: lithium chloride; lithium hydroxybutyrate; sodium hydroxybutyrate; generator of pathologically enhanced excitation; spinal cord; myoclonus and pain syndrome of spinal origin.

Lithium salts are being used on an ever-increasing scale in neurologic practice. One of them which deserves special attention is lithium hydroxybutyrate, because both the cation (lithium) and the anion (hydroxybutyrate) possess definite pharmacological properties, and their combined action determines the specific effects of the compound [4, 5, 7].

The aim of this investigation was to study the effect of lithium hydroxybutyrate on two forms of spinal cord pathology: generalized myoclonus and a pain syndrome of spinal origin. Their distinguishing pathogenetic feature is that generators of pathologically enhanced excitation (GPEE) are created in various sytems of the spinal cord [3]. Consequently, it was important, first, to discover whether hydroxybutyrate is effective in both forms of pathology,

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