testing stimuli. During systematic exposure to sound of greater intensity (112 dB) seizure activity in KM rats does not disappear, incidentally, but myotonic convulsions do appear [4, 5]. Thus depending on the conditions of presentation and the intensity of the stimulus, different effects are observed. It can be postulated that the lowering of LSR which we observed is based on habituation or adaptation processes.

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EFFECT OF LONG-TERM HYPOKINESIA ON BIOGENIC AMINE CONTENT IN RAT BRAIN SYNAPTOSOMES

N. N. Panusheva

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Considerable attention has begun to be paid in recent years to metabolism of biogenic amines (BA) in connection with the study of the adaptive role of the sympathicoadrenal system in stress situations and various experimental procedures. Investigations [1, 5, 11, 14] have shown divergent changes in catecholamine (CA) and serotonin (5-HT) metabolism in the brain of animals during hypokinesia. However, data obtained by individual workers are rather contradictory, evidently because of the different experimental conditions used and the different approaches to the research.

The aim of this investigation was to study the dynamics of changes in the CA and 5-HT concentrations at the subcellular level in some parts of the motor system of the rat brain at different stages of long-term hypokinesia.

EXPERIMENTAL METHOD

Experiments were carried out on male Wistar rats weighing 140-170 g. A state of hypokinesia was induced by keeping the animals in individual restraining cages, limiting their movement severely. The test parameters were determined on the 30th, 60th, and 90th days of the experiment. Synaptosomes were isolated from the sensomotor cortex and caudate nucleus

Laboratory of Cytochemistry, Brain Institute, All-Union Mental Health Research Center, Academy of Medical Sciences of the USSR, Moscow.

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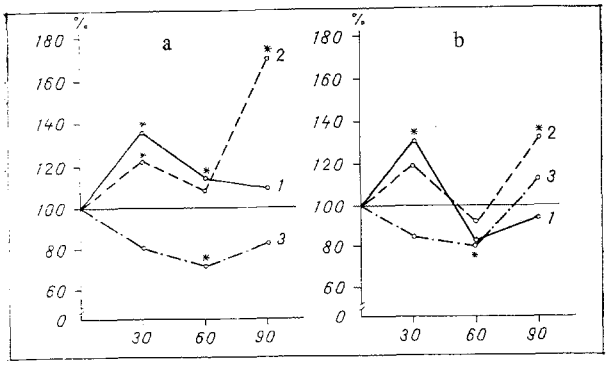

Fig. 1. Changes in concentration of biogenic amines in synaptosomes of rats under the influence of long-term hypokinesia. a) Sensomotor cortex; b) caudate nucleus. 1) NA; 2) DA; 3) 5-HT. *P < 0.05. Number of tests at each stage of the experiment was six. Abscissa, period of hypokinesia (in days); ordinate, changes (in percent).

of the rats' brain by centrifugation in a sucrose density gradient [12]. Concentrations of noradrenalin (NA), dopamine (DA) and 5-HT in subfractions of total synaptosomes (C + D) were determined fluorometrically [8]. The total protein concentration was determined spectrophotometrically [13].

The results were subjected to statistical analysis and expressed in micrograms/mg protein and in percentages of change compared with the normal, which was taken as 100.

EXPERIMENTAL RESULTS

It will be clear from Fig. 1a that after hypokinesia for 30 days the NA and DA concentrations in synaptosomes of the sensomotor cortex were significantly increased by 36 and 20% respectively, whereas the 5-HT level was lower by 19%. Hypokinesia for 60 days led to a further decline in the serotonin concentration in this formation (by 28%). After the same period of hypokinesia the CA level in synaptosomes of the sensomotor cortex was lower than at the previous time, but it still was a little above normal. After 3 months of hypokinesia the DA concentration in the sensomotor cortex showed an even greater rise (by 71%), whereas both NA and 5-HT levels showed a tendency toward normalization. Changes in the NA concentration in synaptosomes of the caudate nucleus (Fig. 1b) at the first stage of the experiment (30 days) were similar in direction to their changes in the sensomotor cortex. On the 60th day of hypokinesia the levels of the various monoamines fell below normal; the fall in the NA (by 18%) and 5-HT (by 19%) levels was significant. After 90 days of hypokinesia the NA and 5-HT levels in the caudate nucleus were within normal limits, whereas the DA concentration remained significantly raised (by 33%).

The data given in this paper demonstrate the opposite direction of changes in the CA and 5-HT concentrations in rat brain synaptosomes during long-term hypokinesia, whereas the stress reaction disappears and the effect of hypokinesia as such is observed [6, 7]. In the early stages of immobilization the animal's response to hypokinesia is evidently accompanied by the more intensive release of CA from the reserves, as a result of which their concentration in the brain formations studied rises. The fall in the level of all test substrates observed on the 60th day of hypokinesia can be explained by an increase in activity of their catabolic enzymes. In fact, in the writer's previous experiments, activation of monoamine oxidase (MAO) was observed at different times of hypokinesia, and its concentration reached a maximum on the 60th day of the experiment [4, 10]. The increase in MAO activity is probably compensatory in character and is linked with the regulatory role of this enzyme in maintaining the physiological level of mediators in the CNS. Further accumulation of DA can hardly be attributed to activation of its synthesis. This effect, against the background of increased MAO activity, is more likely to be due to a change in substrate specificity of the enzyme during long-term limitation of movement. There is evidence in the literature of transformation of the substrate specificity of MAO during immobilization during other

experimental procedures [2, 3, 9]. Utilization of 5-HT in the CNS is evidently increased as a result of MAO inactivation and some exhaustion of the serotoninergic system develops, and is most marked on the 60th day of hypokinesia.

The experimental data described above develop views on the functional role of biogenic amines in the activity of the CNS and their essential part in processes of adaptation to changes in environmental conditions and, in particular, to hypokinesia.

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