

EFFECT OF NUCLEAR GLYCOPROTEINS ON THE ACTIVITY OF RAT BRAIN ACETYLCHOLINESTERASE AND GABA-TRANSFERASE

O. Kh. Saitmuratova

UDC 612.091.04

The effect of nuclear glycoproteins on the activity of the acetylcholinesterase and GABA transferase of the mediator system of the rat brain has been studied.

The functional role of the proteins synthesized in the cell nuclei and especially in the nuclei of brain neurons has, on the whole, remained an unsolved problem. According to the hypothesis of a number of researchers, the proteins synthesized in the nuclei are responsible for the growth and differentiation of cells [1] and the decondensation of chromatin [2], and suppress the RNA polymerase activity of the nuclear chromatin [3]. However, there has so far been no concrete answer to the question of the role of the nuclear proteins — glycoproteins (GPs) — synthesized.

We have previously isolated GPs and studied their physicochemical properties and have begun a study of their functional role [3]. In the present paper we give the results of a study of the effect of nuclear glycoproteins (NGPs) on the activity of the acetylcholinesterase (ACE) and GABA transferase involved in the rat brain mediator system. Disturbances in the neuromediator system may play an important role in the appearance of disturbances in the activity of the central nervous system (CNS), besides which, with an inadequate supply of iodine to the organism, hypothyroidism and also the corresponding disorders of the CNS may develop.

The activity of the NGPs was studied on experimental animals with iodine deficiency (hypofunction of the thyroid gland). The experiments were performed on 42 random-bred white rats of both sexes aged one month: 1st group of animals — the control: rats kept under standard vivarium conditions with a normal provision of iodine; 2nd group — kept on a diet with 60% less iodine in the ration than the control; 3rd group — receiving the antithyroid agent methylmercaptoimidazole (MMI, methimazole) in the form of a 0.01% solution; 4th group — receiving the antithyroid agent propylthiouracil (PTU) in the form of a 0.01% solution. Six animals were used for each variant of the experiments.

Results on the activity of the enzymes ACE and GABA transferase in rats are given in Table 1.

The results obtained show that, in the three types of experimental animals, on acting for a short time both NGPs lowered the activity of ACE. On chronic action, higher doses of the 1-NGPs also lowered the activity of the enzyme, while the 2-NGPs raised this index in all types of animals by from 21 to 42% as compared with the controls. An analogous pattern was obtained for the brief action of the NGPs on GABA transferase. In the case of chronic action, both NGPs stimulated the activity of this enzyme.

As can be seen from Table 1, the 2-NGPs raised the activity of ACE and, particularly, GABA transferase in all the experimental groups of animals by factors of 2.0-2.5 on chronic action, which showed an increase in the concentration of mediators under the influence of low-molecular-mass GPs.

The considerable restoration of the levels of ACE and GABA transferase may have a positive influence on processes of learning and memory, while without the restoration of these indices serious disturbances of the CNS may arise [6].

The increase in the concentration of mediators under the influence of the low-molecular-mass 2-GPs is apparently connected with changes taking place in the synaptic apparatus. It is also not excluded that they act as inductors of ACE and GABA transferase.

A. S. Sadykov Institute of Bioorganic Chemistry, Academy of Sciences of the Republic of Uzbekistan, Tashkent, fax (3712) 62 70 71. Translated from *Khimiya Prirodnikh Soedinenii*, No. 3, pp. 434-435, May-June, 1997. Original article submitted November 12, 1996.

TABLE 1

Index	Animal group							
	1 (control)		2 (iodine-deficient)		3 (MMI)		4 (PTU)	
	1G	2G	1G	2G	1G	2G	1G	2G
Acetylcholinesterase	93	93	74	94	66	88	85	78
	63 ^x	110 ^x	79 ^x	121 ^x	72 ^x	129 ^x	73 ^x	142 ^x
GABA transferase	94	97	66	95	72	89	87	93
	101 ^x	111 ^x	120 ^x	339 ^x	117 ^x	352 ^x	124 ^x	398 ^x

*The results obtained are expressed as percentages of the control. 1G, 2G — 1- and 2-NGPs (MM 25-30 and 10-15 kDa, respectively); x — chronic action of the NGPs.

Thus, on the chronic administration to experimental animals of NGPs with MM 10-15 kDa the ACE activity rises by 10-42% and the GABA transferase activity by a factor of 2.0-2.5 in comparison with a control.

EXPERIMENTAL

The GABA transferase activity was measured by a polarographic method [7], and the ACE activity by Yakovlev's method [4]. The NGPs were synthesized and isolated by the method of [5]. The effect of the 2-NGPs on the activities of ACE and GABA transferase was studied by the single brief i/p administration of 20 $\mu\text{g}/\text{kg}$ and three chronic treatments with 100 $\mu\text{g}/\text{kg}$ body weight of the animals.

REFERENCES

1. I. B. Zbarskii and K. A. Perevoshchikova, Dokl. RAN, **107**, 285 (1956).
2. M. N. Gudnikova, N. O. Shevchenko, P. Ya. Boikov, Yu. I. Mitrokhin, and I. I. Todorov, Biokhimiya **50**, No. 12, 1990 (1985).
3. O. Kh. Saitmuratova, Dokl. RUz, No. 1, 43 (1993).
4. V. A. Yakovlev, Kinetics of Enzymatic Catalysis [in Russian], Nauka, Moscow (1965).
5. O. Kh. Saitmuratova, Neirokhimiya, **8**, No. 1, 70 (1989).
6. A. Suina, Endocrinol., **52**, No. 1, 52 (1991).
7. A. B. Steinbach, Neurosci. Lett., **29**, No. 4, 307 (1980).