NATURE OF BENACTYZINE ACTIVATION OF RNA AND PROTEIN SYNTHESIS IN THE BRAIN

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Activation of RNA and protein synthesis by the cholinolytic benactyzine is observed in the hypothalamus, a region of the brain with adrenergic mediation. This activation, it is suggested, is caused by the massive liberation of noradrenalin from presynaptic depots.

Previous investigations showed that benactyzine inactivates the processes of RNA and protein synthesis in the brain [1, 2]. The mechanisms of the pulmonary action of benactyzine, like that of other muscarine-like cholinolytics on brain functions, consists essentially of blocking of the muscarine-sensitive cholinergic structures of neurons and the liberation of acetylcholine and noradrenalin from presynaptic depots [3-5].

In the investigation described below the role of each of the primary effects of benactyzine in the activation of RNA and protein synthesis was studied.

EXPERIMENTAL METHOD

Experiments were carried out on cats of both sexes weighing 3-4 kg. Benactyzine was injected intraperitoneally into the animals in a dose of 5 mg/kg as an aqueous solution with a concentration of 10 mg/ml. To study RNA synthesis, adenine-8-C^{14} (100 μCi/kg) was injected simultaneously with the benactyzine. To investigate protein synthesis, leucine-2-C^{14} (200 μCi/kg) was injected 1 h after the benactyzine. The animals were decapitated 1 h after the injection of the isotope, the brain was removed, and the region of the hypothalamus located posteriorly to the optic chiasma and including the median eminence and mamillary bodies was taken; the depth of tissue removed was 1.5-2 mm. This region is known [7, 8] to contain structures with predominantly adrenergic mediation. The gray matter of the cortex (including structures with predominantly cholinergic mediation [6]) was taken from all parts of both hemispheres. The material chosen was homogenized in 10 volumes (distilled water per unit weight). The methods of isolation of RNA and proteins were described earlier [2, 9]. The intensity of incorporation of the radioactive precursors into RNA and proteins was measured as the relative specific activity (RSA), the ratio between the specific activ-

TABLE 1. Intensity of Incorporation of C^{14}-Precursors (RSA) into RNA and Proteins of Cerebral Cortex and Hypothalamus in the Control and after Treatment with Benactyzine

Compounds	Part of brain				Compounds	Part of brain			
	cortex		hypothalamus			cortex		hypothalamus	
	control	experiment	control	experiment		control	experiment	control	experiment
RNA					Proteins				
$M \pm m$	260±33	232±30	333±33	448±49	$M \pm m$	52±3	53±4	47±6	61±9
%	100	89	100	135	%	100	102	100	129
n	5	5	5	5	n	5	5	5	5
P		>0,05		<0,05	P		>0,05		>0,05

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ity of RNA or protein (in pulses/min/mg), and the specific activity of the dry powdered homogenate (in pulses/min/mg).

EXPERIMENTAL RESULTS AND DISCUSSION

Benactyzine did not affect the incorporation of adenine-C^{14} into RNA of the cortical gray matter, but it activated this process in the hypothalamus (Table 1).

Incorporation of leucine-C^{14} into proteins of the cortical gray matter after injection of benactyzine was indistinguishable from the control; in the hypothalamus, on the other hand, just as in the case of RNA, protein synthesis was intensified (by 30%).

Treatment with benactyzine thus led to correlated activation of RNA and protein synthesis in the hypothalamus, with its predominantly noradrenergic mediation. Demin et al. [10] found that adrenalin loading induces an increase in the RNA concentration in spinal neurons of cats. Consequently, the activation of RNA and protein synthesis now observed could be due to the liberation of noradrenalin under the influence of benactyzine.

It is not yet clear whether cholinergic components of the primary effect of benactyzine, i.e., blocking of the muscarine-sensitive cholinergic receptors and liberation of acetylcholine, has any effect of protein synthesis.

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