BLOOD AND CEREBRAL SEROTONIN OF RATS IN NARCOSIS

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Investigations by a number of authors have shown that various medicinal substances, exerting an action on the central nervous system, influence the serotonin level in the blood and brain [2-4].

The purpose of this work was to study the influence of ether, thiopental, and hexenal narcosis on the serotonin content in various sections of the brain and in the blood of rats.

Serotonin Content in the Blood (in μg/ml), in the Entire Brain (Excluding the Cerebellum), and Its Various Sections (in μg/g) in the Rat During Ether, Thiopental, and Hexenal Narcosis

Investigated material		Narcosis	Time (in min)	Number of experiments	Statistical indices	
					$M \pm m$	$P <$
Blood		Control		60	0,15±0,01	
		Ether	20	60	0,25±0,01	0,01
		Thiopental	15—17	60	0,23±0,008	0,01
		Hexenal	10—13	60	0,22±0,008	0,01
Entire brain		Control		30	0,34±0,014	
		Ether	20	30	0,63±0,014	0,01
		Thiopental	15—17	30	0,62±0,014	0,01
		Hexenal	10—13	30	0,61±0,014	0,01
Sections of the brain	Stem	Control		30	0,30±0,014	
	Midbrain and subcortical ganglia			30	0,20±0,014	
	Cortex			30	0,016±0,0016	
	Control	Ether	20	30	0,91±0,03	0,01
	Midbrain and subcortical ganglia		20	30	0,33±0,014	0,05
	Cortex		20	30	0,030±0,0014	0,01
	Stem	Thiopental	15—17	30	0,70±0,014	0,01
	Midbrain and subcortical ganglia		15—17	30	0,38±0,014	0,01
	Cortex		15—17	30	0,027±0,0014	0,01
	Control	Hexenal	10—13	30	0,64±0,014	0,01
	Midbrain and subcortical ganglia		10—13	30	0,40±0,014	0,01
	Cortex		10—13	30	0,025±0,0014	0,01

PROCEDURE

The experiments were carried out on white rats (females and males) weighing 150-200 g. Thiopental (50 mg/kg) and hexenal (100 mg/kg) were administered intraperitoneally, and subcutaneously only in certain experiments. After submerging the rats into a state of deep narcosis they were decapitated, the blood was withdrawn, and the brain removed for analysis. The serotonin from the tissues was extracted with acetone according to the method of Amin and coauthors [1]. The serotonin determination was carried out by the biological method of Vane [5]. Strips of fundus ventriculi of the white rats were used as test objects. Standards were prepared from serotonin-creatine sulfate.

RESULTS OF THE EXPERIMENTS

During ether, thiopental, and hexenal narcosis an increase in the serotonin content was detected in the blood, in the entire brain (excluding the cerebellum) and various sections of it (see table). No change in the serotonin level in the cerebellum of anesthetized rats was observed.

A comparative estimate of the serotonin content in various sections of the brain indicated that during ehter narcosis, its maximum concentration was noted in the brain stem and cortex, and to a lesser degree in the midbrain and subcortical ganglia. During barbiturate narcosis (thiopental and hexenal), the greatest increase in the serotonin level appeared in the stem, midbrain, and subcortical ganglia and to a lesser degree—in the cortex.

During ether narcosis, the greatest serotonin concentration was noted after 20 min, during thiopental narcosis—after 15-17 min, and during hexenal narcosis—after 10-13 min from the moment of the administration of the narcotic.

It should be noted that the onset of deep narcotic state in the rat corresponds to a maximum increase in the serotonin content in the brain and in the blood. After the ether narcosis is stopped, the rat "awakes" in only 10-15 min, and the serotonin content decreases to a level close to that of the control. Consequently, there is a definite connection between the degree of narcosis and the increase in the serotonin content in the brain and blood.

The mechanism of the influence of ether, thiopental, and hexenal upon serotonin metabolism is obscure. Possibly, these substances inhibit monoamine oxidase or promote the acceleration of serotonin synthesis.

In conclusion, it should be emphasized that in view of the increase in the serotonin content in various portions of the brain and in the blood of rats during ether, thiopental, and hexenal narcosis, this biological amine evidently plays a definite role in the complex mechanisms of narcosis.

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