

THE SORPTIVE PROPERTIES OF BRAIN TISSUE IN NEWBORN AND ADULT RATS

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In a study conducted to determine why newborn ratlings are more sensitive to barbiturates than are adult rats, we discovered, in experiments in which the same dose of Medinal [barbital sodium] per 1 g of animal weight was administered to newborn and adult rats, a larger content of the experimental substance in the brain of the newborn ratlings [1].

Because of the under-developed nature of their hypophysial-adrenal system, the newborn animals are comparable to adrenalectomized adult rats [3]; like the former, the resistance of the latter to barbiturates is low, and a high content of these substances is found in the brain [4]. On the basis of the literature and our own data, we concluded that the high Medinal content found in the brain of newborn ratlings or adrenalectomized adult rats is due to increased permeability of the blood-brain barrier and is the reason for the greater sensitivity of these animals to barbiturates.

Discussion of the data obtained brought up the question of whether the high Medinal content found in the brain of newborn ratlings and adrenalectomized adult rats could be due to increased sorption of Medinal by the brain tissue rather than to increased permeability of the blood-brain barrier.

We used D. N. Nasonov's method [2] in this work to determine the sorptive properties of brain tissue.

METHOD

Thirty rats were used in the experiments: ten newborn ratlings, ten intact adult males weighing 120-130 g each and ten adrenalectomized male rats of the same age as the intact animals, which were used in the experiment one week after the operation. All the animals received a 0.5% aqueous solution of neutral red intraperitoneally injected in a dose of 100 mg/kg weight. Neutral red easily penetrates the blood-brain barrier of both adult rats and newborn ratlings. This dose of the stain is easily tolerated by control animals. The rats were decapitated 30 min after the injection of the stain; 0.2 g pieces of the brain were placed in 1 ml alcohol acidified with sulfuric acid; a photoelectrocolorimeter (FEK-M) was used 20 hrs later to determine the amount of stain in the fluid.

RESULTS

The data obtained are given in the table.

Neutral Red Sorption by the Brain Tissues of Rats

Experimental material	Amount of neutral red sorbed (in $\mu\text{g}/\text{ml}$ alcohol)	Significance
Brain of newborn ratlings	7.6 ± 2.1	$D < 0.001$
Brain of intact rats	23.3 ± 2.43	
Brain of adrenalectomized rats	21.2 ± 5.57	$D > 0.5$

The table shows that the brain tissue of the adult rats was considerably more sorptive than that of the newborn ratlings. Adrenalectomy did not change the sorptive properties of the brain.

The higher content of neutral red found in the brain of the newborn animals, therefore, was not due to greater sorption of this substance by the brain tissue. The weaker sorptive properties of the brain of the newborn animals can be ascribed to some extent to the smaller number of nerve cells per unit of brain weight in the newborn than in the adult animals [5].

SUMMARY

The sorption properties of the brain were determined in newborn ratlings, in adult intact and adrenalectomized rats after administration of the same dose of neutral red (per gm of body weight). The data obtained with the aid of photolorimetry show that the sorption faculty of the newborns is three times lower than that in adult rats, while adrenalectomy does not change the sorption properties of the brain in adult rats. This investigation confirms the conclusions of the previous author's works according to which increased Medinal content in the brain of the newborn ratlings is a result of increased permeability of the hematoencephalic barrier.

LITERATURE CITED

1. I. V. Markova, Byull. Eksper. biol. i med., 50, (1960), 10, 87.
2. D. N. Nasonov and V. Ya. Aleksandrov, Biol. zhurn 6, (1937), 1, 117.
3. E. Endroczi and K. Toth, Acta physiol. Acad. sci hung., (1955), 8, p. 33.
4. A. Komiya and K. Shibata, J. Pharmacol. exp. Ther., 116, (1956), p. 98.
5. P. Mandel, Quoted in: Nucleic acids [in Russian], (Moscow, 1957).

All abbreviations of periodicals in the above bibliography are letter-by-letter transliterations of the abbreviations as given in the original Russian journal. *Some or all of this periodical literature may well be available in English translation.* A complete list of the cover-to-cover English translations appears at the back of this issue.
