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# MICROMORPHOLOGY OF NEUROSECRETION IN NEUROHYPOPHYSIS OF RATS UNDER EXPERIMENTAL CONDITIONS

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In the literature we find numerous reports about changes /1*
in the vasopressin and oxytocin level in the blood under the most different emotional, stress and other circumstances (Labhart, 1957). However, it happens that there is practically no information about changes in the morphologic picture of neurohypophysis under the above conditions.

Within the framework of our studies on neurosecretion, we attempted to determine the changes in quantity of neurosecreted substances in the neurohypophysis of rats under certain test situations.

For the experiments we used 5-month old female Wistar rats; in the control group we checked changes in quantity of neurosecretion for total withdrawal of water and for excessive water intake. The animals were fed by Larsen fodder and sacrificed by means of intraperitoneal injected thiopental; the material destined for fine tissue studies was fixed in a mixture according to Bouin, imbedded in paraffin, and tinted with chrome alum-haematoxylon -Phloxin according to Gomori. With this method the neurosecreted substance appears as a selective dark blue color. In order to check the subjective optical effect of the preparation by means of an objective method, we made use of the colorimetric /2
determination of color intensity of the preparation (at 400x enlargement) by means of the spectral colorimeter SPEKOL of ZEISS Co., Jena, GDR (Klein, 1969)--whereby we took into consideration certain inaccuracies of this method. We present the results in percent of light permeability compared to the standard solution of the control group.

The neurohypophysis of the ad libitum (about 20 ml per day)

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*Numbers in the margin indicate pagination of original foreign text.

water-drinking animal is diffused and affected by small granules of neurosecretion, which in some places form Lacuna which fill the interfibrilary areas; in contrast to other mammals e.g. Canis familiaris, Didelphys virginiana, Macaca mulatta, Homo sapiens the neurosecretion of the rat is not concentrated in the periphery of the neurohypophysis. Pericapillary accumulation does not occur and Herring bodies are not found (figure 1).

In animals which live 13 days without any water, neurosecretory substance had practically disappeared, only a few neurosecretory granules were retained. Herring bodies were found in only one case (figure 2). For several animals a moderate pericapillary concentration of neurosecretion is perceived.

For animals to whom we furnished an additional 20ml of intraperitoneal water in addition to normal water intake, the neurohypophysis was overfilled with enormous quantities or neurosecretions; the granules are stored diffusely in the entire organ (figure 3). The concentrations penetrate into the edge parts of the zone.

The actual tests were divided into three groups:

I. One group of animals lived 21 days uninterrupted in complete darkness with ad libitum water intake (that is, about 20ml per day).

II. The second group was constantly exposed to six 100W flourescent lamps (6264 Lux) for 21 days with 20ml water intake per day (ventilator was operated constantly).

III. The third group of animals was exposed to immobilization /3
stress, whereby three test versions were used in order to eliminate any influence of different quantities of water intake on the quantity of neurosecretions in the neurohypophysis.

a) For 9 days the animals were mechanically immobilized for 23 hours (per day) with intraperitoneal water intake (20 ml per day which corresponds to the physiological quantity)

b) 23 hour immobilization for 8 days with total water withdrawal

c) 23 hour immobilization for six days with access water, i.e. 40 ml intraperitoneal per day.

The results of our test and the analysis of histological

solutions led to these conclusions.

I. The neurohypophysis of the animals who lived for 21 days in complete darkness is overloaded with neurosecreted substance (figure 4). Subjectively, the amount is greater than for over-watered animals who lived under normal light conditions. The colorimetric values were - 9.8%. The neurosecretored granules form Lacuna, in several cases pericapillary accumulations show up, but without formation of Herring bodies. In one animal in the Infundibulum region we found the "string of pearls" arrangement characteristic of the dog for the neurosecreted substance in the axon.

II. The neurohypophysis of rats living 21 days under constant light is also diffusively filled with neurosecretions. The quantity is signigicantly smaller than that found in animals living in darkness and in the control group (figure 5); the colorimetric values was 6%. The neurosecretions are concentrated in the Zona intermedia, and in places it is even pericapillary. Diffuse lacuna are present, but we did not find any Herring bodies.

The immobilization tests led to the following results:

IIIa. For animals receiving 20 ml of intraperitoneal water, the quantity of neurosecretion was practically the same as for animals without stress (figure 6).

This was also confirmed by the colorimetric values of -0.5% to +2.5%. /4

IIIb. For animals without water intake, rear hypophysis lobe configuration was similar to rats without immobilization, i.e. the neurohypophysis is practically without neurosecretion, except for individual Herring bodies (figure 7); the colorimetric values were +4%.

IIIc. For over-watered immobilized animals, i.e. 40 ml intraperitoneal water per day, the neurosecretion picture of the rear hypophysis lobe is similar to that of animals without stress. Only the pericapillary arrangement of granule neurosecretion is no longer in the background (figure 8); the colorimetric values were -7%.

Discussion

The phenomenon of quantity increase in neurosecretion in animals

living for longer periods in darkness can be interpreted by a reduction in metabolism. Such information is found in the literature (Scharrer and Scharrer, 1954, I.) In the course of hybernation the activity of the neurosecretion system is increased (e.g. in Eliomus quercinus, Legait et. al., 1968). Among hibernating animals we have access to Pleocotus auritus; his heurohypophysis is diffuseively charged with neurosecreted substance. (Since the entire test series was performed in winter, we did not have available a neurohypophysis of the bat from the summer months for comparison).

In the literature we find that for certain stress situations (e.g., pins in the tail of the test animal: Scharrer and Scharrer, 1954, II; Englehardt, 1968) the quantity of neurosecretion is decreased in the neurohypophysis. However more accurate information on the extent of the reduction is lacking. It is our opinion that in a comparison of this information with the results of our test it must be taken into consideration that we are dealing with different geneses of injury. The painful stress is more associated with the nervous systems. For immobilization stress primarily metabolic changes are in the foreground with brain edema, hemorrhage and degenerative necrotic changes in adrenal gland which /5 we found in immobilized rats. These influences can probably have a different effect on the neurosecretion system than pain stress.

We assume that the explanation of the results of our experiments is not found in the adaptation to relatively long-lasting stress due to immobilization, since according to a supplemental experiment, even a single 20-hour immobilization did not have any decisive effect on the quantity of neurosecretion in the neurohypophysis.

We found that for rats the frequency of occurrence of Herring bodies changes. For normal animals it is practically non-existent but with an increase in quantity of neurosecretion, it increases numerically. The occurrence of these bodies which, represent a local accumulation of neurosecreted substance, is judged in rats to be a special form of depot storage of neurosecretion under pathophysiological circumatances. This finding

is different for other animals, e.g. for Canis familiaris, for which the numerical occurrence of Herring bodies is characteristic even under physiological circumstances and differs from pericapillary accumulation which is also not characteristic of the rat, but is regular in man and for instance in Talpa europaea, Macaca mulatta.

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