ALLERGOLOGY

The State of Bioamine System in Rats with Chronic Allergic Encephalitis

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Changes occurring in chronic allergic encephalitis are studied in rats. Demyelination is paralleled by pronounced neuronal alterations manifesting themselves as suppressed metabolism of the plastic apparatus and inhibition of regeneration processes. Microspectrofluorimetry of immunocompetent and endocrine organs reveals considerable rearrangements in the bioamine system.

Key Words: *chronic allergic encephalitis; neurons; plastic apparatus; bioamine system*

Considerable investigative effort has been focused on the immune status of patients with multiple sclerosis. Our goal was to study the bioamine system of rats with chronic allergic encephalitis (CAE).

MATERIALS AND METHODS

Experiments were performed on 16 outbred male albino rats weighing 260-280 g. Chronic allergic encephalitis, which is regarded as a model of multiple sclerosis, was induced as described elsewhere [1-3]. The rats were injected with 0.07 mg BCG vaccine and 280-310 mg wet weight brain mass/kg body weight. Intact rats (n=16) of similar age and body weight served as the control.

Clinical signs of the disease were observed three weeks after the injection. The animals became slow-moving and anorexic. After 2 months, the hind limb pareses were observed. Some rats developed trophic ulcers on the hind limbs. These symptoms were observed throughout the entire experimental period. The rats were killed by ether overdosage 45, 75, and 105 days after the injection.

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All internal organs were studied histologically. They were fixed in 10% neutral formalin and embedded in paraffin. Paraffin sections were stained with hematoxylin and eosin and by the Van Gieson method. Serial sections prepared from brain specimens were stained by the method of Nissl and Spielmeyer, and some sections were stained by the Cajal method.

Hypophysis, thyroid, pancreatic, and adrenal glands, thymus, lymph nodes, spleen, and brown fat were studied by immunoluminescent analysis. Cryostat sections were stained for histamine by the Cross method and for catecholamines (CA) and serotonin (ST) by the Falk method. Photometry was performed in an ML-2 microscope (excitation wavelength 360-380 nm). Microspectrofluorimetric analysis was carried with the use of an FMEL-1A luminescent adapter (output voltage 900 V, excitation wavelength 480 nm and 525 nm for identification of CA and ST, respectively). The intensity of fluorescence was recorded in arbitrary units and expressed as the mean for each group. The results were analyzed using Student's t test.

RESULTS

Typical demyelination foci were observed in the white matter of the brain and sometimes in the

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cerebellum. There were no signs of glial fibrosis throughout the experimental period. However, on day 105 of experimental CAE lacunae surrounded by gliofibrous capsule formed in the brain. In most animals, necrobiotic and dystrophic lesions developed in the walls of cerebral arteries. Sometimes the vascular wall was infiltrated with the plasma, which led to its homogenization and atrophy of cellular elements. Pronounced changes were observed in the brain cortex. The number of neurons per unit area decreased by 18% compared with the control. Dramatic drop in the number of binuclear neurons indicated reduction in neuronal regenerative potential. The predominance of dark neurons in the brain pointed to decreased metabolic activity of neuronal plastic apparatus. Morphological changes occurring in the brain in CAE were described in our previous report [2].

Microspectrofluorimetry revealed a statistically significant increase in the histamine content of vascular walls in all studied organs and tissues. The increase was maximal on day 75. In the adrenals, an increase in histamine content was the highest (Fig. 1, *a*). A slight increase in histamine content of thymic pulp became more pronounced on day 75. A similar dynamics of histamine content was observed in the red pulp of the spleen.

Catecholamine and serotonin contents increased in all studied organs but not in brown fat. On day 75, the increase was most pronounced in blood vessels and nerve endings in all organs. The CA content increased in thymic macrophages and thyroid follicles. On day 45, a slight decrease in the CA content was observed in the adrenals, while on day 75 it increased 8- to 10-fold in all adrenal zones (Fig. 1, *b*).

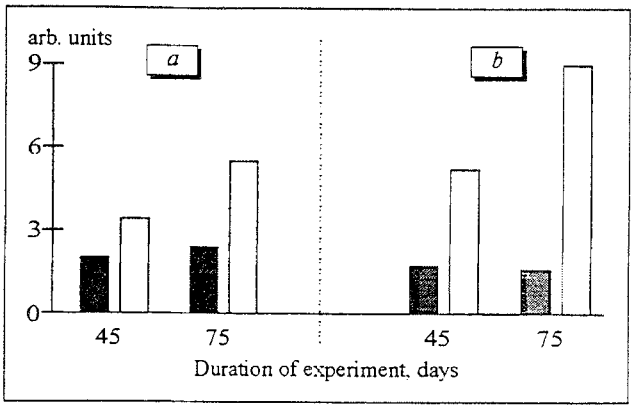

Fig. 1. Increase in the histamine (*a*) and catecholamine (*b*) contents in the adrenals of rats with experimental CAE. Dark bars: control rats; light bars: experimental rats.

When multiple sclerosis is studied, the attention is focused primarily on immunocompetent organs and demyelination. Our study revealed considerable changes in brain neurons and bioamine system of the internal organs. Dystrophic and necrobiotic processes in brain neurons are paralleled by suppression of metabolic activity of the plastic apparatus, reduction of regenerating potential, and arterial damage. Substantial rearrangements of bioamine system were revealed in the internal organs.

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