ROLE OF STRENGTH OF HYPOTHALAMIC STIMULATION IN PRODUCTION OF AN ANTITUMOR EFFECT

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In contrast to weak (threshold) and strong (stressor), moderately strong electrical stimulation of the hypothalamus causes absorption of tumors (sarcoma 45 and sarcoma BP-1) in rats.

Previous investigations showed that weak, threshold, and strong stimulation (of stressor type) of the hypothalamus activates growth of developed tumors [3, 7].

In the present investigation we studied the effect of stimulation producing a definite general motor response, which we described as moderately strong stimulation, on growth of established experimental tumors.

EXPERIMENTAL METHOD AND RESULTS

Experiments were carried out on 153 noninbred and Wistar male rats weighing 100-120 g. Electrodes were implanted as described previously [6]. Stimulation began 1.5-2 weeks after transplantation of the tumors and continued three times daily, for 40 sec each time, at intervals of 3-5 min, with a pulsed current (50/sec, 0.5-0.05 msec) from an EI-1 pulse generator. The strength of stimulation varied from 0.5 to 1.5 mA. The position of the electrodes was determined histologically [7] or radiologically.

Ten series of experiments were carried out. In the experiments with sarcoma 45 (7 series) absorption of the tumors was observed in more than one-third of the experimental animals, and definite inhibition of growth in a like number. In experiments with sarcoma BP-1 (3rd, 4th, and 5th generation) obtained by means of 3, 4-benzpyrene, absorption took place in all animals stimulated. In the control group absorption of the tumors was not observed. The tips of the electrodes were located in the hypothalamus and adjacent structures of the thalamus.

When moderately strong stimulation was used, but with pulses of a frequency of 4/sec and correspondingly different strength, Yu. N. Bordyushkov [1] also observed absorption of sarcoma BP-1.

Investigation of some metabolic indices showed that moderately strong stimulation produces different changes from threshold and strong (stressor) stimulation [1, 2, 4, 5]. Strong stimulation, evoking a stress response, causes marked activation of tumor growth. Proliferation of connective tissue and lymphoid infiltration observed in tumors during absorption, along with necrosis and degeneration of the cells, accompanied by a simultaneous and considerable enlargement of the thymus and by lymphocytosis in the blood, are evidence of activation of the lymphatic system and the connective tissue, i.e., of changes differing from the stress response [8].

All this led to the conclusion that during moderately strong stimulation a general, nonspecific adaptive response develops, activating the protective forces of the organism – not a stress response but one of activation. Depending on the strength of stimulation, different general nonspecific reactions evidently may develop in the body.

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