

CATECHOLAMINE AND SEROTONIN CONCENTRATIONS IN LYMPH NODES AFTER DEAFFERENTATION

V. A. Izranov

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In the modern view neurotransmitters not only play a functional role in transmission of the nervous impulse, but they are also involved in the maintenance and control of tissue nutrition. Trophic disturbances have been shown to be accompanied by local changes in transmitter concentrations. During the development of neurogenic trophic disorders caused by application of excessive stimulation to reflexogenic zones, changes in catecholamine concentrations are found in the affected organs. Conversely, local normalization of the transmitter composition leads to healing of trophic ulcers [1, 2, 4, 5].

Meanwhile the transmitter balance in lymphoid tissue in neurogenic trophic disturbances caused by destruction of the sensory innervation of an organ has been inadequately studied. There are no data in the literature on the relative and absolute concentrations of biogenic amines in the tissues of the deafferented lymph node (LN).

The aim of this investigation was to study changes in catecholamine and serotonin concentrations in various structures of the dog's popliteal LN after its sensory denervation.

EXPERIMENTAL METHODS

Experiments were carried out on 10 adult mongrel dogs of both sexes in the course of 1 month (February). The animals were divided into two groups: control and experimental (five dogs in each group). Deafferentation of the popliteal LN in animals of the experimental group was carried out by division of the dorsal roots of the spinal cord at the level L_2-S_2 unilaterally. During the operation the animals were anesthetized with ether and thiopental. Animals of the experimental group were killed 2 weeks after the operation by injection of thiopental sodium. The popliteal LN of the deafferented and contralateral limbs were studied. The group of intact animals served as the control. Immediately after sacrifice, LN were frozen in a cryostat. Frozen sections were mounted on slides and treated by the Falck-Hillarp method in the modification in [6]. The sections were examined visually under the LYUMAM-IZ microscope. Bioamines were determined quantitatively by means of the FMÉL-IV spectrofluorometric attachment.

EXPERIMENTAL RESULTS

Analysis of the results of cytospectrofluorometric investigations of the catecholamine and serotonin levels showed (Table 1) that the concentrations of biogenic amines in animals of the control group reached a maximum in the most brightly luminescent structures of LN: in adrenergic nerve fibers, the trabecular-elastic complex, and the monoaminocytes (macrophages) of the medulla. Relative low concentrations of catecholamines and serotonin were observed in the diffuse lymphoid tissue of the medulla and in the follicles.

The catecholamine concentration in all structures of LN studied 2 weeks after deafferentation was lower than normal in both deafferented and contralateral limbs ($P < 0.05$). Under these circumstances there was no difference in the transmitter concentration in the deafferented and contralateral limbs. The fall in the catecholamine levels was possibly caused by exhaustion of reserves of the transmitter as a result of removal of the adequate afferent impulsion and the appearance of pathological centripetal impulses, based on stimulation of the central end of the divided nerve [2, 4].

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TABLE 1. Concentration (relative units) of Serotonin (A) and Catecholamines (B) in Structures of Popliteal LN in Animals of Control and Experimental Groups ($M \pm m$)

Structure of LN	Control		Deafferented limb		Contralateral limb	
	A	B	A	B	A	B
Diffuse luminescence of follicle	274 \pm 9	319 \pm 14	245 \pm 10	238 \pm 5	359 \pm 18	204 \pm 9
Monoaminocytes of medulla	754 \pm 21	349 \pm 17	858 \pm 12	266 \pm 11	1039 \pm 26	246 \pm 11
Diffuse luminescence of medulla	374 \pm 10	322 \pm 27	308 \pm 12	237 \pm 9	463 \pm 21	215 \pm 8
Adrenergic nerve fibers	844 \pm 18	381 \pm 17	702 \pm 20	245 \pm 11	996 \pm 27	252 \pm 8
Trabecular-elastic complex	781 \pm 23	365 \pm 11	535 \pm 30	171 \pm 5	792 \pm 31	210 \pm 6

The serotonin concentration 2 weeks after deafferentation also was lower in the deafferented than in the control limb ($P < 0.05$). The exception was the medullary monoaminocytes (macrophages) of LN, in which the serotonin concentration was increased. According to some authorities [3], monoaminocytes are serotonin-producing cells. At this stage there was perhaps a compensatory increase in serotonin production in these structures.

Elevation of the serotonin level ($P < 0.05$) compared with normal was observed in adrenergic nerve fibers and macrophages in LN of the contralateral limb. In the diffuse lymphoid tissue of the medulla, and in the follicles and trabecular-elastic complex, a tendency was observed for the serotonin level to rise.

In a focus of sensory denervation, 2 weeks after its production, the monoamine concentration thus falls. Catecholamines and serotonin respond to deafferentation in the same way — by lowering of their initial level.

An imbalance between monoamines of divergent type was clearly recorded in structures of LN of the contralateral limb microspectrofluorometrically: elevation of the serotonin level and lowering of the catecholamine concentration. The low catecholamine concentration in LN of the contralateral limb can be taken as evidence of the generalized form of response of an animal's nervous system to a dystrophic focus of neurogenic origin.

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