

EFFECT OF CHRONIC STIMULATION OF THE SCIATIC NERVE ON SERUM PROTEINS AND WATER-SOLUBLE LIVER PROTEINS

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Prolonged stimulation of the sciatic nerve in rats produces a lasting (up to 60 days) decrease in concentration of albumins and an increase in that of α_1 -, β_2 -, and γ -globulins in the blood serum. In the liver tissue, an increase in the concentrations of albumins and β_2 -globulins is accompanied by a decrease in concentration of β_1 - and γ -globulins.

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Nociceptive stimuli modify the physiological activity of some systems of the body [3]. Data for changes in the blood protein fractions of animals during nociceptive stimulation are few in number and contradictory in nature [1, 2, 4, 8, 9].

Proteins fractions of the blood serum and liver were studied in albino rats exposed to prolonged stimulation of the sciatic nerve which was regarded as nociceptive in character.

EXPERIMENTAL METHOD AND RESULTS

Prolonged nociceptive stimulation of rats of both sexes was carried out by Kravtsov's method [5]. Liver proteins were extracted with 0.9% NaCl solution after preliminary freezing of the tissue with liquid nitrogen [6]. The serum proteins and liver proteins thus obtained were investigated electrophoretically on agar by the method of Ilkov and Nikolov [11]. The fractions obtained by electrophoresis were identified with the MF-4 microphotometer. The results obtained were subjected to statistical analysis [7].

In the experiments of series I the serum and liver proteins were investigated 5, 10, 20, 30, 60, and 90 days after nociceptive stimulation. To exclude changes resulting from operative trauma, the experiments of series II were carried out, in which a mock operation was performed on the animals (without ligation of the sciatic nerve) and the proteins were investigated at the same time after this mock operation as in series I.

The control experiments (series II) showed that during the first 2 weeks changes took place in the serum and liver proteins connected with operative trauma. The normal values were restored after 20 days.

Prolonged nociceptive stimulation had a marked effect on changes in the serum and liver protein fractions. A persistent decrease in the serum albumins was observed at all times of investigation, but in the liver, this index was increased, as shown by the A/G ratio. An increase in the content of α_1 -globulins in the serum and liver also was observed.

The results of these experiments and data in the literature [10] suggest that the decrease in serum albumin content is probably due to a compensatory increase in synthesis of albumins and α_1 -globulins in the liver and other organs of the reticulo-endothelial system.

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TABLE 1. Relative Content (in %) of Protein Fractions of Blood Serum and Liver (M ± t)

	Days after application of ligature	Prealbumins	Albumins	Globulins						A/G rates	
				α_1	α_2	α_3	β_1	β_2	γ		pre- γ
Blood serum	Con-trol	—	45.0 \pm 1.1	4.8 \pm 0.31	6.1 \pm 0.53	4.5 \pm 0.35	17.9 \pm 0.78	9.3 \pm 0.53	12.4 \pm 0.34	—	0.85 \pm 0.03
	20	—	30.9 \pm 1.2 <0.001	9.5 \pm 0.61 <0.001	5.9 \pm 0.49 >0.5	4.6 \pm 0.24 >0.5	17.9 \pm 0.51 >0.5	14.5 \pm 0.46 <0.001	16.7 \pm 0.91 <0.001	—	0.44 \pm 0.03 <0.001
	30	—	34.3 \pm 0.62 <0.001	6.1 \pm 0.35 <0.02	6.6 \pm 0.21 >0.05	5.6 \pm 0.39 >0.05	17.6 \pm 0.57 >0.5	14.2 \pm 0.48 <0.001	15.8 \pm 0.77 <0.001	—	0.55 \pm 0.02 <0.001
	60	—	36.7 \pm 1.1 <0.001	6.5 \pm 0.48 <0.01	6.1 \pm 0.5 >0.5	6.1 \pm 0.63 >0.5	17.6 \pm 0.8 >0.5	10.2 \pm 0.44 >0.2	16.9 \pm 0.65 <0.001	—	0.53 \pm 0.03 <0.001
	90	—	44.9 \pm 0.96 >0.5	4.7 \pm 0.87 >0.5	5.7 \pm 0.43 >0.5	4.9 \pm 0.83 >0.05	18.8 \pm 0.55 >0.5	8.5 \pm 0.63 >0.5	12.5 \pm 0.55 >0.5	—	0.81 \pm 0.04 >0.5
Liver	Con-trol	4.0 \pm 0.29	10.9 \pm 0.51	6.3 \pm 0.42	9.7 \pm 0.27	8.2 \pm 0.40	30.5 \pm 0.90	6.9 \pm 0.33	12.9 \pm 0.44	10.5 \pm 0.44	0.18 \pm 0.03
	20	3.1 \pm 0.44 <0.2	16.7 \pm 0.31 <0.001	10.6 \pm 0.5 <0.001	9.6 \pm 1.25 >0.2	6.3 \pm 0.80 <0.01	18.3 \pm 2.30 <0.001	13.2 \pm 0.76 <0.001	12.6 \pm 0.66 >0.5	9.6 \pm 0.63 >0.2	0.25 \pm 0.01 <0.001
	30	3.6 \pm 0.31 <0.5	16.7 \pm 0.63 <0.001	10.3 \pm 0.37 <0.001	9.4 \pm 0.40 >0.5	5.8 \pm 0.42 <0.001	18.7 \pm 0.66 <0.001	12.3 \pm 0.49 <0.001	12.5 \pm 0.69 <0.5	10.7 \pm 0.32 >0.5	0.26 \pm 0.01 <0.001
	60	3.8 \pm 0.38 >0.5	16.4 \pm 0.63 <0.001	7.3 \pm 0.36 >0.05	9.8 \pm 0.49 >0.5	9.1 \pm 0.58 >0.2	21.6 \pm 0.77 <0.001	11.7 \pm 0.38 <0.01	10.5 \pm 0.65 <0.01	9.8 \pm 0.65 >0.5	0.27 \pm 0.02 <0.001
	90	4.4 \pm 0.4 >0.2	11.8 \pm 0.44 >0.05	7.4 \pm 0.48 >0.05	10.2 \pm 0.56 >0.2	7.7 \pm 1.1 >0.5	27.9 \pm 0.99 >0.05	7.9 \pm 0.41 >0.05	12.2 \pm 0.31 <0.2	9.7 \pm 0.43 >0.5	0.21 \pm 0.01 >0.2

Definite changes in the content of β_2 - and γ -globulins in the serum were observed from the 20th day of nociceptive stimulation. Similar changes were also found in the liver tissue, the only difference being that changes in the content of γ -globulins occurred later (Table 1).

In the liver tissue the increase in content of β_2 -globulins was accompanied by a decrease in the level of β_1 -globulins. The return to normal was complete by the end of the 3rd month.

Prolonged nociceptive stimulation thus causes appreciable changes in the albumin and globulin fractions of the blood serum and liver.

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