

EFFECT OF INTRAGASTRIC INJECTION OF OXYGEN ON NITROGEN METABOLISM IN ACUTE EXPERIMENTAL TOXIC HEPATITIS

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UDC 616.36-002.1-099-092.9-085.77.4-032:611.33/-07:
616.153.49+616.36-008.934.9/-07

In a previous investigation the author demonstrated the beneficial effect of intragastric injection of oxygen on the tissue respiration and the lipid and glycogen content of the liver, and also on the serum β -lipoprotein level in acute experimental toxic hepatitis caused in rats by administration of carbon tetrachloride.

It was therefore decided to investigate to what extent the intragastric injection of oxygen in acute toxic hepatitis may influence restoration of the disturbed indices of nitrogen metabolism in the liver and blood serum.

EXPERIMENTAL METHOD

Experiments were carried out on 60 male albino rats kept on a normal laboratory diet. The animals were divided into six groups: group 1—control (intact animals); group 2—intact animals receiving intragastric injection of oxygen (5 ml/100 g); group 3—intact animals receiving intragastric injection of nitrogen (5 ml/100 g); group 4—animals with acute toxic hepatitis (poisoned with CCl_4 injected subcutaneously on alternate days in doses of 0.3 ml/100 g); group 5—animals with acute toxic hepatitis receiving intragastric injection of oxygen; group 6—animals with acute toxic hepatitis receiving injection of nitrogen.

On the 7th day from the beginning of the experiment, i.e., on the second day after the last injection of carbon tetrachloride, the animals of group 4, 5, and 6 and the intact rats were decapitated and determinations were made of the total and nonprotein nitrogen in their liver and also of the concentration of total protein and protein fractions in their blood serum. In all the animals the tissue respiration of the liver was investigated (in a Warburg's apparatus) and the content of total lipids in the organ was determined (to verify development of toxic hepatitis and acute fatty infiltration of the liver).

EXPERIMENTAL RESULTS

The results given in the table show that intragastric injection of oxygen and nitrogen into intact animals was not accompanied by changes in their indices of nitrogen and lipid metabolism or in the tissue respiration of the liver, in agreement with reports in the literature [1].

Acute toxic hepatitis produced in rats by poisoning with carbon tetrachloride was accompanied by development of fatty infiltration of the liver and also by a decrease in the protein content of the liver parallel with an increase in the nonprotein nitrogen concentration (see table). The ratio between the nonprotein nitrogen content and the protein nitrogen content demonstrated that in acute toxic hepatitis protein breakdown in the liver took place more intensively.

At the same time a disturbance of the albumin-forming function of the liver was observed, as shown by a clear decrease in the content of the albumin-fraction in the blood serum, associated with a decrease of the total protein content. The changes in the other serum protein fractions in the animals with acute hepatitis consisted of a slight increase in the content of the β - and γ -globulin fractions.

The changes in nitrogen metabolism observed in this series of experiments, like the changes discovered earlier in the lipid and carbohydrate metabolism, took place against the background of hypoxia of the liver tissue (depression of the tissue respiration of liver slices; see table).

Department of Pathophysiology, Central Postgraduate Medical Institute, Moscow (Presented by Active Member of the Academy of Medical Sciences of the USSR P. D. Gorizontov). Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 64, No. 8, pp. 51-53, August, 1967. Original article submitted January 29, 1966.

Index	Intact animals		Animals with acute toxic hepatitis	
	Control (12)	Intragastric injection of oxygen (12)	CCl ₄ poisoning (12)	CCl ₄ poisoning plus intragastric injection of oxygen (8)
Liver	Protein	16.53±0.4	17.07±0.3	15.49±0.45
	Nonprotein nitrogen	0.25±0.06	0.24±0.07	<i>P</i> <0.001
	Nonprotein nitrogen/protein nitrogen, %	9.6±0.71	8.40±0.84	0.30±0.04
	Total lipids (in g%)			<i>P</i> <0.001
	expressed in dry substance			11.6±0.6
Blood serum	QO ₂	14.5±0.61	16.6±0.58	21.3±0.63
	QCO ₂	4.8±0.1	4.6±0.19	<i>P</i> <0.001
	Total protein (in g%)	3.6±0.11	3.8±0.14	5.9±0.02
		7.31±0.12	7.22±0.05	<i>P</i> <0.001
	Albumin (in g%)	3.2±0.1	3.2±0.09	3.6±0.25
				2.8±0.16
				6.55±0.3
				2.1±0.07

Note. Number of experiments in parentheses.

The results indicating the beneficial effect of intragastric injection of oxygen on the indices of nitrogen metabolism in the animals with acute toxic hepatitis point definitely to the pathogenetic role of hypoxia in the development of the changes described above. As the table shows, intragastric injection of oxygen into animals with toxic hepatitis inhibits the development of fatty infiltration of the liver and restores the normal indices of nitrogen metabolism, as expressed by an increase in the total protein content and a decrease in the nonprotein nitrogen content in the liver, and also by an increase in the total protein and albumin content in the blood serum. In control experiments with intragastric injection of nitrogen into animals poisoned with carbon tetrachloride, no such beneficial effects was observed.

LITERATURE CITED

1. N. A. Savitskii, Oxygen Therapy [in Russian], Moscow (1940).