

EFFECT OF EXOGENOUS LIPOPEROXIDES ON  
THE CONTENT OF VITAMINS OF THE B GROUP  
IN THE ANIMAL LIVER

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Chronic experiments on young noninbred albino rats showed that systematic administration of lipid peroxides (sunflower oil containing 2.0% peroxides as iodine) leads to a marked decrease in the levels of thiamine, riboflavin, pantothenic and nicotinic acids, pyridoxine, biotin, inositol, and para-aminobenzoic and folic acids in the liver. It is postulated that the intensification of free-radical oxidation developing under the influence of exogenous lipid peroxides affects not only the lipid layers of the cells, but also their coenzyme systems.

In the modern view [2, 7, 12] organic peroxides, including lipid peroxides, can break down to produce highly active free radicals. Experiments on peroxides of sunflower oil by the electron paramagnetic resonance method have shown [4] that these lipid peroxides can break down to form free radicals from nonparamagnetic indophenol molecules. It has also been shown that the peroxides of sunflower oil can intensify the free-radical oxidation of tissue biolipids, accompanied by disorganization of cell metabolism or even by disintegration of cell structures.

Since vitamins are an important component of normally metabolizing cells and since most of them perform coenzyme functions [10], it was decided to study how the intensification of free-radical oxidation in the tissue lipids of the liver is reflected in the vitamin content of the organ.

EXPERIMENTAL METHOD

Noninbred albino rats weighing initially 135-140 g were used in the experiments. The animals were divided into two groups with 12 in each group: 1) experimental and 2) control. The animals of both groups were kept on a diet including protein (edible casein) 18%, fats (sunflower oil) 30%, carbohydrates (potato starch) 52% by calorific value, as well as the essential amount of vitamins [11] and mixed salts [14].

As the source of lipid peroxides the animal of group 1 received with their diet sunflower oil which had been specially oxidized by a rapid kinetic method [13] at 85°C and aerated at the rate of 60 liters/h. The animals of group 2 (control) received unoxidized oil. The characteristics of the oil before and after oxidation are given in Table 1, which shows that a result of oxidation of the oil there was a sharp increase only in the content of peroxides and the other indices of oxidation remained virtually unchanged. This shows that autooxidation of the oil was at its initial stage when the peroxide content was high, but the content of end products of radical autooxidation was still low. To avoid appreciable changes in the future both samples of oil were deaerated and were kept throughout the experiment on the animals at 0°C in an atmosphere of CO<sub>2</sub>.

The duration of the experiments on the animals was 10 weeks, during which systematic observations were made on growth and development of the animals. Definite inhibition of growth of the experimental rats was observed.

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TABLE 1. Characteristics of Sunflower Oil

Index	Before oxidation	After oxidation
Peroxides (in % as iodine)	0.05	2.0
Epoxides (in % oxygen)	0.015	0.02
Acid number (in mg KOH)	2.2	2.2

TABLE 2. Comparative Data for Vitamin Content in Liver of Animals (in  $\mu\text{g/g}$  fresh tissue)

Vitamin	Group of animals		P
	experimental (1)	content (2)	
Thiamine .....	$7,52 \pm 0,81$	$10,04 \pm 0,18$	$< 0,02$
Riboflavin .....	$21,14 \pm 1,04$	$36,67 \pm 2,24$	$< 0,001$
Pantothenic acid .....	$33,66 \pm 1,22$	$44,0 \pm 1,84$	$< 0,001$
Nicotinic acid .....	$300,9 \pm 2,3$	$338,1 \pm 4,0$	$< 0,001$
Pyridoxine .....	$4,36 \pm 0,08$	$5,79 \pm 0,64$	$< 0,02$
Biotin .....	$0,10 \pm 0,02$	$0,22 \pm 0,03$	$< 0,02$
Inositol .....	$814,1 \pm 7,21$	$897,8 \pm 9,7$	$< 0,001$
Para-aminobenzoic acid .....	$3,05 \pm 0,28$	$5,47 \pm 0,32$	$< 0,001$
Folic acid .....	$7,92 \pm 0,32$	$9,65 \pm 0,45$	$< 0,01$

Note. Content of dry substances (in %): group 1)  $39.6 \pm 0.2$ , group 2)  $38.6 \pm 1.2$ .

In homogenates of fresh liver comparative studies of the vitamin content were made [1, 3].

#### EXPERIMENTAL RESULTS

It follows from the results given in Table 2 that in the liver of the animals receiving oil with a high peroxide content with their food there was a marked decrease in the content of all vitamins of the B group tested. Since the experimental conditions for the two groups of animals differed only in the content of lipid peroxides in the diet, the cause of the decrease in the vitamin level in the liver must be regarded as the lipid peroxides.

The results of these experiments suggest that the intensification of free-radical oxidation in the tissue biolipids developing under the influence of exogenous lipid peroxides arises not only in cell biolipids, but also affects vitamins of the coenzyme systems. This leads ultimately to general disorganization of cell metabolism [4-6].

The results are in agreement with the views put forward by Tarusov and later developed by him and his followers [8, 9] on free-radical oxidative processes in living tissues.

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