

INFLUENCE OF THYROIDIN ON THE CONDITION  
OF THE VISCERA OF THE WHITE RAT (AS  
INDICATED BY VITAL STAINING OF THE TISSUES)

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In many studies it has been shown that in experimentally produced endocrine pathologies there is a disturbance in the conditions of the protoplasmic colloids with the result that the sorptive properties of the cells and tissues are altered [11]. It has been shown [2, 4, 5, 13] that the sorptive properties of tissue structures are determined by the physico-chemical condition of the cell proteins. It has also been established that under the influence of various adverse factors there is a change in the affinity of the protoplasm for vital stains. The amount of stain taken up may serve as an index of the physiological condition of the cell, and changes in it reflect the course of the alterations in protein reactions developing in the substrate in response to the action of nonadequate stimuli.

We have studied the influence of thyroidin on the condition of tissues on the viscera of experimental animals, and have found no reference in the literature to investigations of this problem. For the investigation we used the method of vital staining in the intact animal [3, 6, 9]; in this way we were able to study the functional condition of the tissue elements in terms of the amount and distribution of the dye taken up.

#### EXPERIMENTAL METHOD

The experiments were carried out on white male rats weighing 145-180 g. The experimental animals received 0.25 g per 100 g weight by mouth for 10 days.

Vital staining was effected by intravenous injection of a 1% solution of neutral red dissolved in Ringer's solution free from sodium carbonate. The rats were killed by decapitation 1 and 2½ h after injection of the neutral red, and then the liver, kidneys, small intestine, spleen, testes, lungs, heart, brain, and skeletal muscle were rapidly removed, washed in Ringer, and transferred to a 1% solution of hydrochloric acid in 96% ethyl alcohol for extraction of the dye. The extraction was continued for 24 h, after which the alcoholic extracts were examined in a FÉK-M3 photoelectric calorimeter.

The amount of dye taken up by the organ was referred to 1 g of tissue. Experiments with the control animals were carried out under the same conditions.

A comparison was made of the degree to which the experimental and control tissues were stained, and the extent to which the dye was bound to the tissues was expressed as a percentage of the control value.

The results were treated statistically. The significance of the changes was assessed by means of the *t* test. Differences were considered significant at a level of  $P < 0.05$ .

#### EXPERIMENTAL RESULTS

White rats treated with thyroidin and killed one hour after the injection of neutral red showed a statistically significant increase in the uptake of the dye in the liver, kidneys, small intestine, heart, and skeletal muscle (see table). There was a genuine reduction of the uptake of the dye by the testes and brain. There was no difference from the control in the spleen and lung tissue.

Staining of Tissues of Experimental White Rats at Various Times After Injection of Neutral Red (as percentage of controls)

Tissue investigated	1 h after injection		2 <sup>1</sup> / <sub>2</sub> h after injection	
	M	T	M	T
Spleen	+ 16.7	> 0.05	+ 5.3	> 0.05
Lung	+ 21.3	> 0.05	+15.8	> 0.05
Liver	+ 69.6	<0.05	+78.9	<0.05
Kidney	+ 37.5	<0.05	+49.2	<0.05
Heart	+103.4	<0.05	+90.6	<0.05
Testes	- 31.5	<0.05	+19.7	> 0.05
Brain	- 28.8	<0.05	-40.9	<0.05
Small intestine	+ 41.6	<0.05	+ 9.4	> 0.05
Skeletal muscle	+ 82.1	<0.05	+55.6	<0.05

Note. 1. In each of the control and experimental groups we used 12 animals. 2. The signs + or - indicate an increase or decrease, respectively, in the uptake of stain by tissues. 3. M indicates the mean arithmetic change in the amount of stain as a percentage of the control value.

of rats take up stain. According to published reports [8, 12, 14] the reduction in the affinity of protoplasm for vital stain is observed when there are manifestations of adaptation. This gives reason to suppose that the observed reduction in sorptive properties is causally related to the development of protective and adaptive processes directed towards increasing the resistance of nervous tissue and of the sex organs to the action of pathological stimuli.

The results that we have reported reveal the nature of the pathological and compensatory reactions developing in tissues under the influence of thyroidin.

#### SUMMARY

Experiments were carried out on male albino rats which were given 0.25 g of thyroidin per 100 g body weight for 10 days. Vital staining with neutral red was used to study the interaction between the tissues of the different viscera (spleen, lungs, liver, kidneys, heart, testes, brain, small intestine, and skeletal muscle).

In the animals receiving thyroidin there was a change in the sorptive property of the tissue of the liver, kidneys, heart, testes, brain, small intestine and skeletal muscle, which was thought to result from denaturation of cellular proteins.

The results obtained reflect the nature and specific features of pathological and compensatory reactions occurring in tissues under the influence of thyroidin.

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In the experimental rats, 2<sup>1</sup>/<sub>2</sub> h after injection of the dye a regular increase was observed in the sorption volume of tissues of the liver, spleen, and skeletal muscle. At this time the uptake of neutral red by the brain was significantly reduced. There was no significant difference in the staining of the tissues of the spleen, lung, testes, or small intestine in either the experimental or the control groups.

Thus, the result of these experiments indicates that when additional thyroidin is injected there is a disturbance of the sorptive properties of the tissues of certain of the viscera.

It is known [2, 4, 5, 8, 13] that an increased uptake of vital stains is due to the development of changes in the tissue protein structures which resemble denaturation. We think that the increased uptake of stain which we have found in the tissues is to be interpreted in this way. This view is in line with the results of many investigators [1, 7, 10], who have shown that profound disturbances of protein metabolism occur under conditions of increased thyroid activity.

An important fact which we have established and which deserves attention is that treatment with thyroidin reduces the extent to which the tissues of the testes and brain

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All abbreviations of periodicals in the above bibliography are letter-by-letter transliterations of the abbreviations as given in the original Russian journal. *Some or all of this periodical literature may well be available in English translation.* A complete list of the cover-to-cover English translations appears at the back of this issue.

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