

THE CHANGE IN THE REACTION OF THE HEART TO STROPHANTHIN DURING EXPERIMENTAL THIAMINE DEFICIENCY

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Pathological cardiac conditions, such as mitral defects, are accompanied by a thiamine deficiency in the system [3], while thiamine deficiency alone can lead to serious changes in the heart muscle [5, 6, 7]. Thus the thiamine deficiency accompanying cardiac failure increases the difficulty of the course of the pathological process.

Some work devoted to the problem of the effect of thiamine on cardiac function in the course of various illnesses is available in the literature. B. A. Ovchinnikov [4] established that thiamine deficiency accompanied by cardio-vascular diseases leads to a disturbance of the carbohydrate metabolism, which is re-established with the administration of thiamine. I. I. Isakov [2], observing the effect of thiamine on the heart by electrocardiography, noted an increase in the intensity of the stimulation processes in the cardiac muscle.

We set ourselves the problem of studying the reactivity of the heart of animals to the administration of strophanthin under conditions of experimental thiamine deficiency. Strophanthin was chosen as a frequently-used specific cardiac remedy which has a rapid effect and is not cumulative.

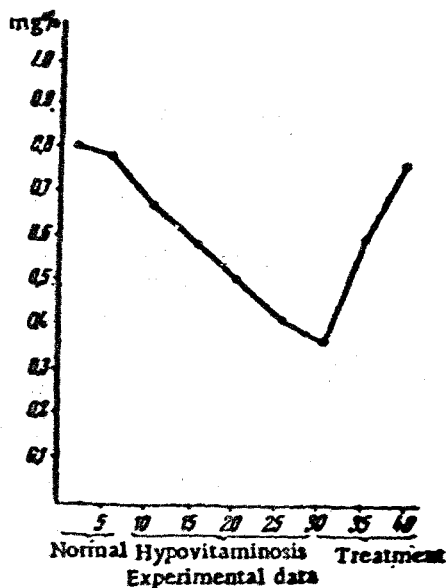


Fig. 1. Changes in the thiamine content of the blood.

EXPERIMENTAL METHODS

The experiments were carried out on 4 dogs. The record of the bioelectric currents of the heart during the action of strophanthin were carried out by electrocardiography under normal conditions and against a background of hypovitaminosis. The strophanthin was administered intravenously in therapeutic doses, after 3-4 minutes the electrocardiogram was recorded from the second lead.

At first the reaction of the heart of a normal animal to strophanthin was studied, then the animals were transferred to devitaminized food. While hypovitaminosis was developing the electrocardiogram of the dogs was recorded periodically by the indicated method. While the observations were made, the amount of free thiamine in the animals' blood was determined by fluoroscopy (Fig. 1).

EXPERIMENTAL RESULTS

During the administration of strophanthin solution to normal animals, we observed on the electrocardiogram a small but constant increase in the voltage of the ventricular R wave, a noticeable lengthening of the P-P interval,

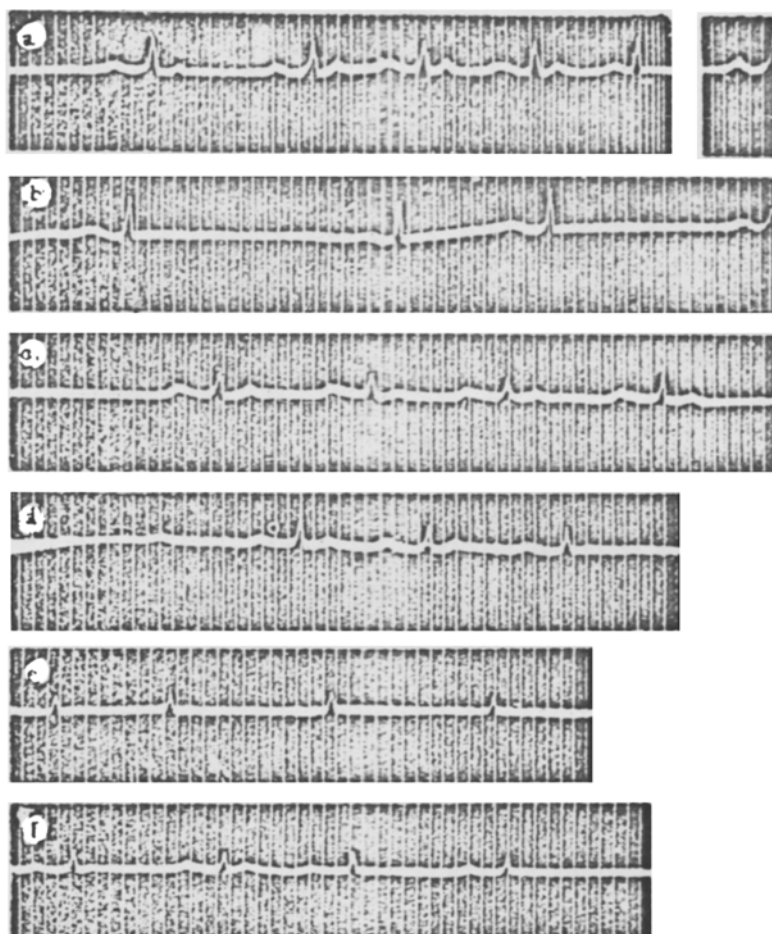


Fig. 2. Electrocardiograms of the dog Lyuks.

a) Second lead; b) after administration of strophanthin, second lead; c) on the 13th day of hypovitaminosis; d) on the 13th day of hypovitaminosis after administration of strophanthin; e) on the 29th day of hypovitaminosis; f) on the 29th day of hypovitaminosis after administration of strophanthin.

i.e. an obvious slowing of the cardiac rhythm. Thus, normally the voltage of the dog Lyuks' R wave was equal to 5 mm, the rhythm was 120 beats per minute. After the administration of strophanthin, the R wave was equal to 7 mm, the rhythm was 80 beats per minute (Fig. 2 a, b).

We obtained similar results with all the remaining dogs.

On the 13-15th day of keeping the animals on a devitaminized diet, a decrease in the reaction of the heart to strophanthin was already observed, which was clearly evidenced on the 27-29th day of the experiment. With further deepening of the avitaminosis the reaction disappeared completely.

The voltage of the R wave of the dog Lyuks on the 13th day of hypovitaminosis did not increase with the administration of strophanthin, the rhythm did not slow appreciably. The amount of the vitamin decreased during this period (from 0.8 to 0.6 mg%) (Fig. 2, c, d). On the 25-27th day of the diet complete absence of the reaction of the heart to strophanthin administration was observed, continuing until the end of the experiment, i.e., until the 29-30th day of the diet (Fig. 2, e, f).

Without bringing the animals to a state of complete avitaminosis, we transferred them to the usual food and daily administered thiamin intramuscularly in therapeutic doses.

By the 5-6th day of treatment the amount of the vitamin in the blood grew from 0.4 to 0.6-0.7 mg%, while with the administration of strophanthin a reaction of the heart was observed, reaching normal on the 10-12th day of thiamine therapy.

Parallel control experiments which were carried out on a dog without a background of hypovitaminosis were accompanied by a constantly evident reaction of the heart to strophanthin. This allows the conclusion to be drawn that the change in the reaction of the heart to the specifically acting substance is the consequence of the systemic state of hypovitaminosis.

On the basis of our observations and of data in the literature it can be concluded that in cardio-vascular diseases it is expedient to apply thiamine therapy in addition to the administration of specifically acting cardiac preparations.

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