THE EFFECT OF HIGHER NERVOUS ACTIVITY DISTURBANCE ON
HEMOglobin Metabolism

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The influence of the nervous system on hemoglobin metabolism has not yet been sufficiently explored. The data in the literature regarding the influence of the nervous system on the peripheral blood picture [1, 2, 3, 7, 9, 10], in most cases, refers only to leukocytes. There is much less work regarding the influence of the nervous system on the red blood [1, 4, 6, 12] and in the few existing works, the authors barely mention the influence of the nervous system on hemoglobin decomposition intensity. As is known from the works of N. M. Nikolaev [8], G. F. Lang [6], Ya. G. Uzhansky [11] and others, there is a very close relationship between the processes of erythrocyte hemoglobin regeneration and decomposition. Therefore, in studying red blood changes, one must examine the indices of both the intensity of the hemolytic processes and the intensity of erythrocyte hemoglobin regeneration.

The purpose of this work was to study the effect of disturbance in higher nervous activity on the decomposition and synthesis of hemoglobin experimentally, in order to more nearly approach the explanation of the possible parts played by the nervous system in the pathogenesis of various anemias.

EXPERIMENTAL METHODS

To study hemoglobin metabolism, the intensity of hemoglobin decomposition was determined from the stercobilin excreted with the stool (by Terven's method) and the intensity of erythrocyte regeneration was determined from the amount of reticulocytes in the blood, the level of hemoglobin and the number of erythrocytes.

The experiments were done on 4 dogs; higher nervous activity was disturbed in 2 of the dogs by combining the food and defense unconditioned reflexes, and in the other 2 by combining the inhibitory and stimulatory processes after first producing conditioned defense, electric skin reflexes to the continuous sound of a bell and a differentiation to its interrupted ringing. A total of 16 experiments were done combining the unconditioned reflexes, and 62 were conducted with the second variant of the method.

During the experiments, daily stercobilin excretion was determined before during and after the combination. Examination of stercobilin content in the stool was done on a two-day amount of stool. A total of 124 stool analyses for stercobilin excretion were done on the 4 dogs. Blood was taken periodically from the ear before and many times during the experiment (44 blood analyses were done).

EXPERIMENTAL RESULTS

In the dog Belka, weighing 7.8 kg, higher nervous activity was disturbed by combining the food with
The dog was put in a chamber and given a trough of meat; then, the moment the dog touched the meat, his paw was given an electric shock. After the first combination of the food with the painful stimulation, the dog no longer touched the meat, but turned away and afterwards, whenever he saw the meat, began to yelp and tear away from the straps. It was very difficult to lead the dog into the chamber; it resisted, snapped and whined, but, nevertheless, the combination was produced daily.

Stercobilin excretion before the collision was from 1.9 to 2.7 mg per day. After the collision, stercobilin excretion increased and reached the maximal level (7.6 mg) about the 3rd-5th day, then decreased to 3.4 mg per day. The amount of reticulocytes increased from 3.5 to 6.5%, but the hemoglobin level decreased slightly from 19.8 to 17.9 g%.

A combination was produced by the same means as in Belka in the dog Palma, which weighed 11.4 kg. After the very first combination of the food and defense unconditioned reflexes, the dog became very aggressive, pulled away from the straps and yelped. In this dog, stercobilin excretion was from 1.1 to 9.2 mg per day before the combination, but, by the 6th day of the experiment, it increased to 36.7 mg, i.e., was almost 4 times greater than before the combination. On the 7th-8th day, stercobilin excretion decreased to 13.1 mg per day. The amount of reticulocytes did not change. By the 6th day, the hemoglobin level had decreased from 19.8 to 17.9 g% (Fig. 1).

Therefore, when food and defense unconditioned reflexes were combined, a temporary intensification of hemoglobin decomposition was observed: pigment excretion in the stool increased, and the level of hemoglobin slightly decreased.

In the dog Shartik (6.8 kg) higher nervous activity was disturbed by colliding the stimulatory and inhibitory processes. A positive conditioned reflex to a continuous sound with an electric skin reinforcement was first produced in the animal. The answering reaction was expressed by the paw being jerked back, which reaction was kymographically recorded. A differentiation was produced to a bell which rang with interruptions (60 interruptions per minute). The action time of the conditioned stimulus was 20 seconds, and the time of the combined action of the conditioned and unconditioned was 5 seconds. The conditioned reflex developed slowly in this dog. It appeared first at the 8th combination, but was not permanent until the 63rd. The latent period of the conditioned reflex was from 2 to 8 seconds. The conditioned reflex was clearly expressed, we began to produce the differentiation in the dog after the 22nd experiment, and this appeared after the very first combination. During the development of the differentiation, the dog fell from time to time into an inhibited condition, and the conditioned reflex, at first, often disappeared.

When the experiment with the combination was begun, the conditioned reflex was firmly established in the dog, and the differentiation was absolute.

In the experiment with the combination, we gave the continuous bell sound for 20 seconds, then immediately after this bell, we rang the interrupted bell for 20 seconds, then again the continuously ringing bell, and then the electric current reinforcement. Gradually the number of alternating conditioned stimuli was increased to 5, 7, 9 up to 25. At first, the experiments were done every day, then with small interruptions. The activity of the nervous processes in the animal was good; the dog reacted quickly to the continuous bell sound by jerking back its paw, did not move its paw to the interrupted bell, then jerked it back again to the continuous