

SOME DATA ON THE MECHANISM OF ANTIANEMIN'S EFFECT ON THE HEMOPOIETIC PROCESSES

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The liver preparation antianemin (cobalt-containing liver extract) is now widely used in the clinical treatment of hematologic diseases. The research of several authors [1,5] has established that it possesses a high hemopoietic activity and has a good therapeutic effect in pernicious anemia and many other anemias.

Nevertheless, the various aspects of antianemin's effect on the hemopoietic organs are still far from sufficiently understood. The existing theories on this question are often abstract in nature and unsupported by experimental data.

In this connection, we decided to study one of the aspects of antianemin's action on the organs of the blood system — specifically, to ascertain the part played by the reflex component in the processes of intensified hemopoiesis provoked by the administration of this preparation. We decided first to establish the nature of the blood system's reaction to its one-time administration, and then to determine the effect of the preparation when used in combination with novocain.

Experimental Methods

The experiments were performed on three adult male dogs. It was first established, in control experiments, that the animals had become accustomed to the conditions of the experiment and to the experimental setup after an initial period of 10-15 days. This was proved by the fact that the very procedure of taking blood under the experimental conditions did not, in time, cause any regular changes in the composition of the blood.

In the first series of experiments, the animals were subcutaneously injected in the neck region with antianemin in a dose of 1-2 ml, and the qualitative and quantitative changes in the various indices of the animals' peripheral blood were determined. Blood specimens were taken from a small incision in the ear before the administration of the preparation (control), and then 1, 2, 3, 4, and 5 hours after the injection.

In the second series of experiments, we administered antianemin in combination with novocain. For this purpose, we first injected 2 ml of an 0.5% novocain solution by syringe into the neck region. One or two minutes later, without removing the needle, we injected antianemin into the same place, using another syringe. Blood specimens were taken at the same intervals as in the first series of experiments.

In both experimental series, we studied the quantitative changes in the leukocytes, erythrocytes, and reticulocytes, the percent of hemoglobin and the leukocyte formula by the usual laboratory methods.

In the first series of experiments, we succeeded in establishing the fact that a single injection of antianemin into the organism of the experimental animals caused a regular reflex reaction of the blood system.

TABLE 1

Change in Leukocyte Formula and Absolute Number of Leukocytes After Administration of Antianemin

Investigation time	Eosinophils		Neutrophils						Lymphocytes		Monocytes	
			young		stab		polymorpho-nuclear					
	%	absolute	%	absolute	%	absolute	%	absolute	%	absolute	%	absolute
Before injection	15	1470	2	196	3	294	54	5292	22	2156	4	392
After injection:												
1 hr	13	1222	2	188	2	188	56	5264	24	2256	3	282
2 hr	14	1610	2	230	3	345	55	6325	21	2415	5	575
3 hr	12	1764	4	588	4	588	56	8232	21	3087	3	441
4 hr	14	2674	3	573	4	764	59	11269	19	3629	1	191
5 hr	11	2079	5	945	6	1134	58	10962	18	3402	2	378

TABLE 2

Change in Leukocyte Formula and Absolute Number of Leukocytes After Administration of Antianemin and Novocain Solution

Investigation time	Eosinophils		Neutrophils						Lymphocytes		Monocytes	
			young		stab		polymorpho- nuclear					
	%	absolute	%	absolute	%	absolute	%	absolute	%	absolute	%	absolute
Before injection	11	1144	1	104	2	208	57	5928	26	2704	3	312
After injection:												
1 hr	12	1368	2	228	3	342	57	6498	24	2736	2	228
2 hr	13	1183	0	—	3	273	60	5460	22	2002	2	182
3 hr	11	1386	2	252	2	252	62	7812	22	2772	1	126
4 hr	8	840	1	105	3	315	61	6405	24	2520	3	315
5 hr	9	1008	1	112	3	336	60	6720	25	2800	2	224

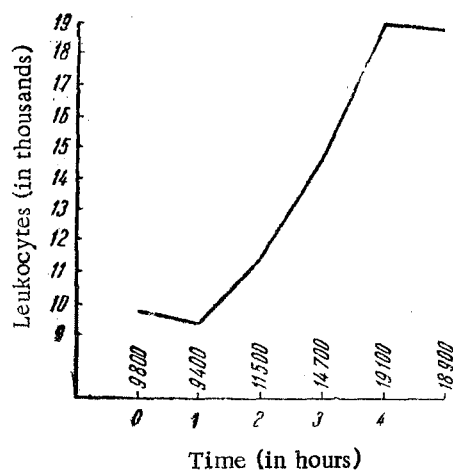


Fig. 1. Change in number of leukocytes after antianemin injection.

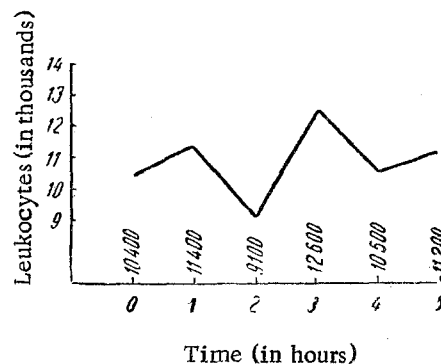


Fig. 2. Change in number of leukocytes after administration of antianemin combined with novocain solution.

Beginning the third hour after the administration of the preparation, we observed marked leukocytosis in the animals, and this continued to increase for the next few hours (Fig. 1). In a few cases, the increase in the number of leukocytes constituted 7000 or more within five hours. The number of leukocytes returned to the original level after 20-25 hours. Qualitative changes in the leukocyte formula attended the quantitative changes described

above. These chiefly consisted in an absolute and relative increase in the number of neutrophilic leukocytes; there was a marked increase in the content of stab neutrophils and young forms. In several experiments, we also observed an increase in the number of eosinophils (Table 1).

The number of erythrocytes and reticulocytes, and the percent of hemoglobin usually did not undergo any sort of regular change. One should mention, however, that repeated administrations of the preparations were attended by a gradual increase in the level of these ingredients. Keeping this in mind, we directed our attention primarily to the white blood changes.

In the second series of experiments, we studied the effect of preliminary novocainization of the antianemin injection place on the same blood indices.

We did not observe the characteristic changes in the experimental blood indices mentioned above under these conditions. In other words, preliminary novocainization eliminated the quantitative and qualitative changes in the white blood (Fig. 2). This picture was observed in almost all the experiments of this series (Table 2).

In order to better understand the data obtained, we performed a few additional experiments in which the combination of novocain and antianemin was done as follows. Novocain was injected into the neck region, and then antianemin was injected into the thigh of the same animal. Under these conditions, the reaction of the blood system was practically identical to the results obtained in the experiments of the first series.

In another series of control experiments, we tested the effect of antianemin injected into a region infiltrated with a physiological solution. For this purpose, we first injected 2 ml of a physiological solution into the neck region, then antianemin into the same place two minutes later. The results of the investigations showed that antianemin's effect on the hemopoietic processes was totally preserved in this case.

Analyzing the data obtained, therefore, one can conclude that antianemin possesses a high hemopoietic activity, its effect on the function of the hemopoietic organs being manifested after only a single injection into the organism. Preliminary novocainization of the antianemin injection place removes the typical picture of the blood system reaction. One can assume that novocain, by blocking the peripheral sensory nerve apparatuses, sharply disturbs the development of the effect resulting from the injection of antianemin. These data also suggest that the leukocyte reaction of the blood system is specifically related to the functional condition of the nervous system. Similar works carried out by other authors [2,3,4] confirm this conclusion. This, however, does not imply that the reaction of the blood system to the administration of antianemin is realized solely through nervous mechanisms. Humoral-hormonal factors also seem to play a definite part. Our investigations give reason to conclude that the reflex component plays a definite and important role in the mechanism of antianemin's action on the blood system, specifically on the hemopoietic processes.

SUMMARY

The aim of the work was to determine the role played by the reflex component in the processes of intensified hemopoiesis following administration of antianemin. The study of the blood system reaction to a single administration of the preparation in dogs was followed up by investigation of the effect produced by the same preparation in combination with novocain solution. It appeared that a pronounced, gradually increasing leukocytosis begins to develop three hours after a single dose of antianemin administration. Neutrophilosis is seen with a shift to the left. No quantitative or qualitative changes occur, however, in the white blood after preliminary novocainization of the antianemin injection site. The data obtained demonstrate that the reflex component plays a definite role in the mechanism of antianemin action.

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