EFFECT OF PITUITARY SOMATOTROPIC HORMONE ON THE DYNAMICS OF RESTORATION OF TOTAL PROTEIN AND ITS FRACTIONS IN RABBITS TRANSFUSED WITH DEXTRAN AFTER ACUTE BLOOD LOSS

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Injection of pituitary somatotropic hormone into rabbits with acute blood loss after transfusion with dextran leads to more rapid recovery of the serum protein level through a general stimulation of metabolism, participation of dextran in metabolism, and stimulation of protein synthesis in the liver.

There is a wide field for the administration of somatotropic hormone (STH) to stimulate protein synthesis in the body.

In the investigation described below the effect of STH was studied on the dynamics of restoration of total protein and its fractions after acute blood loss in rabbits transfused with the blood substitute dextran.

EXPERIMENTAL METHOD

Rabbits weighing 3-3.5 kg were used in the experiments. Bleeding was carried out through a waxed catheter inserted into the femoral artery of the unanesthetized animals until bleeding stopped completely. The mean blood loss was 20 ml/kg body weight. Immediately after blood loss, a rapid transfusion of dextran was given into the femoral vein in a dose equal to the volume of blood lost. After the transfusion of dextran the rabbits were divided into two groups, with 10 rabbits in each group. Group 1 was the control, the rabbits of group 2 received STH by subcutaneous injection in a dose of 0.5 mg/kg body weight daily for 6 days. The total protein concentration (by Kjeldahl method) the protein fractions (by electrophoresis on on paper [2]), and the blood sugar (by the Hagedorn-Jensen method were determined in both groups.

TABLE 1. Effect of STH on Restoration of Total Serum Protein Level After Acute Blood Loss in Rabbits Receiving Dextran Transfusions (M ± m)

Experimental conditions	Number of animals	Serum Protein level					
		initial	after transfusion of dextran (time in days)				
			1	2	3	4	5
Acute blood loss plus dextran	10	6,5±0,13	4,2±0,1	4,9±0,12	5,3±0,2	5,8±0,2	6,4±0,2
Acute blood loss plus dextran plus STH	10	6,3±0,18	4,1±0,1	5,3±0,1	5,9±0,16	6,2±0,15	6,5±0,12

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TABLE 2. Restoration of Blood Serum Protein Fractions after Dextran Transfusion and Injection of Growth Hormones into Rabbits after Acute Blood Loss (M ± m)

Experimental conditions	Number of animals	Protein fractions (in percent)			
		albumins	globulins		
			α	β	γ
Control (intact rabbits)	10	55,5±2,5	17,7±1,7	13,3±1,3	13,6±0,9
Acute blood loss plus dextran (5th day)	9	49,3±1,8	20,3±1,5	18,9±1,2	10,9±0,8
Acute blood loss plus dextran and STH (5th day)	9	55,4±1,6	19,3±1,3	14,2±1,7	12,0±1,1

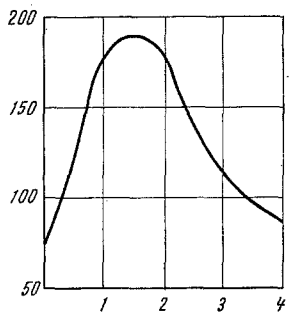

Fig. 1. Change in blood sugar concentration in rabbits after blood loss and dextran transfusion (mean of ten experiments). Abscissa, time after dextran transfusion (in days); ordinate, blood sugar (in mg%).

EXPERIMENTAL RESULTS

Previous experiments on dogs with lethal blood loss showed that after dextran transfusion restoration of the serum proteins was complete by the 5th-7th day, at a time when all the dextran had been excreted [1]. However, nearly all the dogs showed a considerable dysproteinemia: a decrease in the albumin and a relative increase in the globulin fractions [4]. Similar changes in the serum protein fractions also were found in rabbits transfused with dextran after acute blood loss. Injection of STH slightly hastened the restoration of the total serum protein level in these rabbits and, as Table 1 shows, restoration was complete on the 4th day. By this time nearly all the dextran had been eliminated from the blood stream. The rate of clearance of dextran from the circulating blood was determined from the change in the blood sugar concentration (Fig. 1).

During the first few hours after transfusion of dextran the blood sugar rose to 200-250 mg%, after 24 h it fell to 140-170 mg%, and was back to normal on the 3rd-4th day. Characteristically, the restoration of the total serum proteins took place parallel to elimination of the dextran from the body. As previous experiments showed [3], dextran is held in the body in the reticulo-endothelial system (the liver, kidneys, and spleen). Retention of dextran in the organs, especially in the liver where most of the plasma proteins are synthesized, evidently leads to dysproteinemia and a longer time is required for complete recovery to take place after blood loss.

The whole mass of plasma proteins can be synthesized in the body in 3 days [5], whereas in the present experiments the process of recovery was lengthened to 5 days. It is evident that dextran, which is held in the reticulo-endothelial system, delays protein synthesis in the organs. The protein concentration in the liver after dextran transfusion fell from 18.8 to 14.8 g% ($P < 0.02$). This indicates inhibition of protein synthesis during the first few days after dextran transfusion, at a time when the dextran is held in the liver cells.

The results given in Table 2 show that restoration of the albumen and γ-globulin fractions, which are synthesized in the liver, is delayed after dextran transfusion. Consequently, the therapeutic effect of dextran after blood loss would be considerably increased if, besides being eliminated from the body, it also stimulated metabolism in general and protein synthesis in particular.

These experiments show that injection of STH under analogous conditions (group 2) led to the more rapid recovery of the serum proteins. Complete restoration occured on the 3rd-4th day and the normal composition of the blood proteins was restored. Under the influence of STH the albumin and γ-globulin fractions, whose recovery was delayed after dextran transfusion, were increased (Table 2). The more rapid restoration of these serum protein fractions under the influence of STH can evidently be explained, on the one hand, by participation of dextran as a polysaccharide in metabolism and, on the other hand, by the stimulation of protein synthesis in the body and, in particular, in the lever. This was confirmed not only by the rapid recovery of the serum protein fractions, but also by the increase in the protein concen-

tration in the liver from 14.8 to 17.9 g% ($P < 0.001$). Elimination of dextran from the circulating blood of the rabbits took place uniformly after injection of STH until the serum proteins were restored.

It can accordingly be concluded from these results that injection of STH after dextran transfusion for acute blood loss helps to bring about the more rapid recovery of the serum proteins. STH, by increasing metabolism and stimulating protein synthesis in the body, potentiates the therapeutic properties of dextran after blood loss.

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