STIMULATION OF ANTIBODY PRODUCTION BY THE BLOOD SERUM OF PARTIALLY HEPATECTOMIZED HOMOLOGOUS DONORS TAKEN IN THE EARLY POSTOPERATIVE PERIOD

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UDC 616.15-097.5-02:616.36-089.873-092.9

The primary immune response in rabbits was investigated after simultaneous injection of antigen and the blood serum of partially hepatectomized homologous donors, obtained 1 and 2 h after the operation. The serum of partially hepatectomized rabbits was shown to stimulate antibody production, as reflected in an increase in the number of antibody-forming cells in the recipients' spleen, elevation of the blood antibody level, and acceleration of the replacement of synthesis of antibodies of the 19S (IgM) type by that of 7S (IgG) – antibodies. The stimulating effect of the serum obtained 2 h after the operation was stronger than that of the analogous serum taken 1 h after hepatectomy.

The authors have shown previously that the blood serum of partially hepatectomized rabbits, taken 4, 7, and 24 h after the operation, stimulates antibody formation [1].

In the investigation described below, the action of rabbit serum taken in the early postoperative period after partial hepatectomy on the immune response was studied.

EXPERIMENTAL METHOD

Chinchilla rabbits weighing 2-2.3 kg were used. The left lobe of the liver (35-40% of the total mass of the organ) was removed from the donor animals, which were exsanguinated 1 and 2 h after the operation.

TABLE 1. Titers of Hemagglutinins ($\log_2$) in Rabbits after Single Injection of Sheep's Erythrocytes Combined with Homologous Serum

Group of animals	No. of animals	Days after injection of antigen					
		3-rd	7-th	11-th	15-th	19-th	23-rd
1	6	3,20±0,31 (0)	8,17±0,17 (4,00±0,00)	7,50±0,29 (4,75±0,25)	6,75±0,25 (5,50±0,29)	6,75±0,25 (5,75±0,25)	6,50±0,29 (6,00±0,00)
2	6	3,30±0,33 (0)	9,00±0,26 (4,30±0,21)	8,25±0,25 (4,75±0,25)	7,25±0,25 (5,75±0,25)	7,00±0,00 (6,25±0,25)	6,75±0,25 (6,50±0,29)
3	5	2,40±0,24 (0)	5,00±0,63 (0)	4,70±0,33 (<4,00)	4,70±0,33 (4,00±0,00)	4,70±0,33 (4,30±0,33)	4,30±0,33 (4,00±0,00)
4	5	2,40±0,24 (0)	4,80±0,37 (0)	4,30±0,33 (<4,00)	4,30±0,33 (4,00±0,00)	4,30±0,33 (4,30±0,33)	4,00±0,00 (4,00±0,00)
5	5	2,60±0,24 (0)	6,60±0,24 (0)	6,30±0,33 (4,00±0,00)	6,00±0,00 (4,30±0,33)	6,00±0,00 (5,00±0,00)	5,00±0,00 (4,70±0,33)

Note. Titers ($\log_2$) of 7S (IgG)-antibodies given in parentheses.

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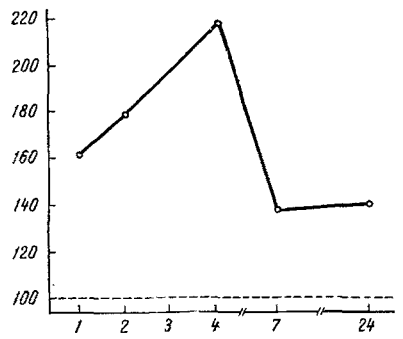

Fig. 1. Stimulating effect of serum of partially hepatectomized rabbits plotted against time after operation. Ordinate, percentage stimulation. Abscissa, time after operation (in h). Level of immune response to antigen and normal rabbit serum taken as 100%.

The antibody concentration in the recipients' blood was determined by the hemagglutination test in the OX-603 microtitrator of the Takachi system. The IgM-antibodies were inactivated with 0.2 M 2-mercaptoethanol solution, pH 7.3 [2]. Some animals were sacrificed on the 7th day of the experiment so that the number of antibody-forming cells in the spleen could be determined [3].

EXPERIMENTAL RESULTS

Simultaneously with the antigen (1 ml 20% suspension of sheep's erythrocytes), rabbits received an injection of 5 ml of the serum of partially hepatectomized rabbits obtained 1 h (group 1) and 2 h (group 2) after the operation, normal rabbit serum (group 3), or the serum of rabbits undergoing a mock operation (group 4). The animals of group 5 received only antigen in physiological saline (Table 1).

The highest titer of hemagglutinins, starting from the 7th day after injection of antigen, was found in the rabbits receiving the serum of partially hepatectomized donors. Serum taken 2 h after the operation was more active than that obtained 1 h after hepatectomy. The difference between the titers of these animals and of the animals receiving antigen in physiological saline alone was statistically highly significant.

It must be emphasized that the serum of the partially hepatectomized donors brought about a more rapid replacement of the synthesis of 19S (IgM)-hemagglutinins by that of 7S (IgG)-antibodies (Table 1).

The results of determination of the number of antibody-forming cells in the spleen of the recipients (845 ±19 and 1125 ±27 per 10^6 spleen cells respectively in groups 1 and 2, and 258 ±7, 250 ±11, and 349 ±15 respectively in the three control groups) agreed completely with the results of the serological analysis given above. They indicate that the increase in antibody titer resulting from administration of the serum of partially hepatectomized homologous donors was due to its stimulating action on antibody formation.

By using the results given in Table 1 and those of the investigations published previously [1] a curve was plotted to show how the stimulating effect of the serum of the hepatectomized donors depends on the time elapsing after the operation (Fig. 1). Maximal values of the antibody titers observed in all cases on the 7th day after immunization were used to plot the curve. The titer of hemagglutinins in rabbits receiving antigen together with normal rabbit serum was taken as the initial level. It is evident that during the first 4 h after hepatectomy the concentration of the stimulating factor in the serum increases exponentially, after which its concentration falls sharply, and remains at a low level for at least 17 h after the operation. Bearing in mind these dynamics of the stimulating action of the serum, the existence of at least 2 active factors can be postulated, one of them inactivated or excreted from the body rapidly, whereas the second (present in lower concentration or possessing lower activity) persists in the blood stream for a longer period.

LITERATURE CITED

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