

THE MECHANISM OF REGULATION OF THE GROWTH OF ORGANS IN EMBRYOGENESIS

COMMUNICATION II. THE ACTION OF SPLENIC TISSUE TRANSPLANTS FROM CHICK EMBRYOS, ENLARGED UNDER THE INFLUENCE OF ADULT SPLEEN ON GROWTH OF THE ORGANS OF NORMAL CHICK EMBRYOS

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In our previous communication [2], and in work by other authors [4-9], it has been shown that organs transplanted on to the chorioallantois of chick embryos stimulate growth of the corresponding organs in these embryos.

Those writers who have attempted to explain the mechanism of this phenomenon have adopted two principal points of view. According to one of these [1, 3, 5], substances from the transplant penetrate into the corresponding organs of the embryos and stimulate the biosynthesis of proteins. The most widely held view at the present time, however, is [7] that whole cells from the transplant of the spleen growing on the chorioallantois pass into the spleen of the recipient embryo with the blood stream. As a result of the action of the antigens of the embryonic tissues, these cells produce antibodies, which cause pathological hypertrophy of the corresponding organs of the embryos.

Action of Transplants of Splenic Tissue of Chick Embryos, Enlarged under the Influence
of Adult Spleen, on Growth of the Organs of Chick Embryos of 10 Days of Incubation

Time during which spleen of embryos was under influ- ence of spleen of adult fowl	No. of cases	Mean weight of organs (in mg)					
		spleen		heart		liver	
		in abso- lute figures	as per- centage of con- trols	in abso- lute figures	as per- centage of con- trols	in abso- lute figures	as per- centage of con- trols
2 days	21	21,43	<u>252,1</u>	110,3	121,6	322,24	<u>144,2</u>
(control).	9	8,5	100	90,3	100	223,4	100
4 days	22	71,0	<u>606,8</u>	174,7	<u>123,6</u>	688,4	<u>186,7</u>
(control).	18	11,7	100	141,3	100	368	100
7 days	31	60,8	<u>520</u>	162,4	115	647,6	<u>175,7</u>
(control).	18	11,7	100	141,3	100	368	100

Note. The figures indicating statistically significant changes in the weight of the organs are framed.

In our first communication [2] we showed that the degree of stimulation of growth of the embryonic organs under the influence of the transplants, and the specificity of their action are dependent on both the age of the recipients and the age of the donors. It was also shown that pieces of the spleen of chick embryos, incapable of producing antibodies, stimulate growth of the organs of recipient embryos.

These findings evidently conflict with the views of Simonsen [7], for immunized spleen cells from adult fowls (by Simonsen's method) would be expected to act identically on embryos of different periods of development. The cells of embryonic spleens, which are incapable of producing antibodies, would be expected to have no action whatsoever on growth of the organs of recipient embryos.

Simonsen's views were thus not confirmed, and the question of the mechanism of the growth-stimulating action of the transplants is still in effect unanswered.

In an attempt to solve this problem, we undertook special investigations. In the present communication we describe the results of some of these investigations, in which we studied the action of pieces of embryonic spleen, which had increased in size under the influence of previously transplanted pieces of the spleen of adult fowls, on the growth of the spleen in normal embryos.

EXPERIMENTAL METHOD

As recipients we used chick embryos incubated for 10 days. The donors were embryos of 12, 14, and 17 days of incubation. The experiments were carried out as follows. Pieces of the spleen of adult fowls were transplanted on to the chorioallantois of chick embryos of 10 days of incubation. The spleens of the embryos, which had grown in size under the influence of the transplants, were extracted 2, 4, and 7 days after transplantation, and pieces of them were again transplanted on to the chorioallantois of 10-day embryos. The experimental method is described in detail in the first communication [2].

EXPERIMENTAL RESULTS

The results of the experiments are presented in the table.

It may be seen from the table that after transplantation of pieces of the spleen of chick embryos of 12 days of incubation, which had previously been exposed for two days to the influence of transplants of the spleen of adult fowls, a considerable increase in the growth of the spleen took place (by 152.1%), together with a small increase in growth of the liver (by 44.2%) of the recipient embryos. No significant change in the weight of the heart took place.

After transplantation of the spleen of chick embryos of 14 days of incubation, previously exposed to the influence of transplants of the spleen of adult fowls for four days, a considerable increase in the growth of the spleen (by 506.8%) and a small increase in the growth of the heart (23.6%) and liver (86.7%) were observed in the recipient embryos.

After transplantation of the spleen of chick embryos of 17 days of incubation, previously exposed to the influence of transplants of the spleen of adult fowls for seven days, considerable stimulation of growth of the spleen (by 420%) was also observed. Growth of the liver was also stimulated, although not to the same extent (75%). The growth of the heart was essentially unaltered.

Thus, the embryonic spleen, when enlarged under the influence of transplants of adult spleen, stimulates very considerably the rate of growth of the spleen of recipient embryos, and to a much lesser degree stimulates the growth of other organs.

As we showed previously [2] the spleen of adult fowls and the spleen of chick embryos stimulate growth of the spleen of recipients. The stimulation in these cases, however, was expressed to a far less degree than that of transplants of the spleens of embryos previously exposed to the action of transplanted pieces of adult spleen.

It is obvious that the number of cells of the adult spleen in the enlarged spleens of the embryos cannot be greater than in the transplants of adult spleen. Even if the number of cells introduced from the transplant into the modified tissues of the spleens (as suggested by Simonsen [7]) was equal to the number of "adult" cells in the "adult" transplant itself (which, of course, is unlikely), then in this case the rate of growth of the spleen could not be as high as took place in our experiment. The results which we obtained cannot, therefore, be explained

on the basis of Simonsen's views. On the contrary, it may be postulated from our findings that under the influence of substances passing from the organ transplants into the same organs of the recipient embryos, a modification of the processes of biosynthesis takes place in the latter, which leads to stimulation of the processes of growth.

SUMMARY

Pieces of spleen of adult hens were transplanted onto the chorionallantoic membrane of chick embryos (10 days of incubation). Enlarged spleens of these embryos were again transplanted onto the chorionallantoic membranes of embryos-recipients (10 days of incubation). Transplantation of pieces of such spleens led to very strong growth stimulation of the spleens in embryos-recipients.

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All abbreviations of periodicals in the above bibliography are letter-by-letter transliterations of the abbreviations as given in the original Russian journal. *Some or all of this periodical literature may well be available in English translation.* A complete list of the cover-to-cover English translations appears at the back of this issue.
