ANTIGENIC STRUCTURE OF MATURE OÖCYTES OF Rana temporaria

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Eight antigens are found in the frog oöcyte, four of them specific for oöcytes, two with a similarity to the antigens of the blood serum and of many of the organs tested,and, finally, two identical with antigens of different organs but not of the blood serum.

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One of the important problems in modern embryology is the study of the principles governing establishment of the antigenic properties of tissues of various organs during embryogenesis of animals and man. Besides species specificity, every organ is known to be characterized by the possession of antigens specific for it alone and also of antigens common to all organs, i.e., antigens resembling those of many organs not of the blood serum. Few results obtained by studying the dynamics of changes in antigens common to all organs during the formation of organs in human and animal embryogenesis can be found in the literature [1, 2, 3]. Such antigens have been shown to appear earlier than organ-specific antigens.

It is expedient to begin the investigation of what is responsible for the presence of these similar antigens in different organs by studying the antigenic structure of mature sex cells and the initial stages of development of the oöcyte. Investigations of this type may possible shed light on the process of establishment of the antigenic structure of organs in the period of their formation.

The object of the present investigation was to look for the presence of antigens similar to those found in various organs in the mature unfertilized oöcytes of the frog (Rana temporaria).

EXPERIMENTAL METHOD

Mature oöcytes of R. temporaria were obtained under laboratory conditions by stimulating the frogs with pituitary.

Antisera against antigens of the frogs' oöcytes were obtained in rabbits by intraperitoneal injection of a homogenate of oöcytes (20 g oöcytes in 600 ml physiological saline) in doses of 10 ml 3 times at intervals of 3 days. One month later the rabbits were given intravenous injections of 0.5 ml of extract of oöcytes 3 times on alternate days. Sera were obtained on the 9th day after the last injection.

Saline extract of mature frog oöcytes was used in the experiments, together with blood serum and extracts from the following organs: the crystalline lens, heart, kidneys, muscles, liver, spleen, lung, testis.

The principal method of investigation was by the precipitation reaction in agar.

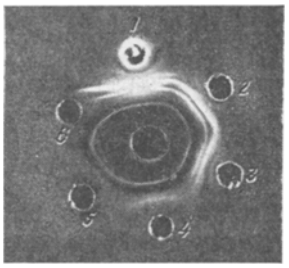

Fig. 1. Results of precipitation reaction of agar. Central well contains antiserum against frog oöcytes, peripheral wells contain extracts of oöcytes in dilutions of: 1) 1:10, 2) 1:20, 3) 1:40, 4) 1:80, 5) 1:160, and 6) 1:320.

EXPERIMENTAL RESULTS

The results of one of the experiments using antiserum and saline extract from the oöcytes of a frog in various dilutions are illustrated in Fig. 1. They show that serum against frog oöcytes formed 8 precipitations bands

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TABLE 1. Similarity between Antigens of Mature Frog (R. temporaria) Oöcytes with Tissue Antigens of Various Organs from the Same Animal

Organ from which extract was prepared	Number and order of precipitation bands obtained with sera against frog oöcytes							
	№ 1	№ 2	№ 3	№ 4	№ 5	№ 6	№ 7	№ 8
Oöcytes	+	+	+	+	+	+	+	+
Lens	0	0	0	+	0	+	0	0
Heart	0	+	0	+	0	+	0	0
Kidneys	0	+	0	+	0	+	0	0
Liver	0	+	0	+	0	+	+	0
Spleen	0	+	0	+	0	+	+	0
Lung	0	+	0	+	0	+	+	0
Testis	0	+	0	+	0	+	+	0
Muscles	0	+	0	+	0	+	0	0

Note. Here and in Table 2. + denotes well-marked precipitation bands, ± weak bands, 0 denotes absence of precipitation band.

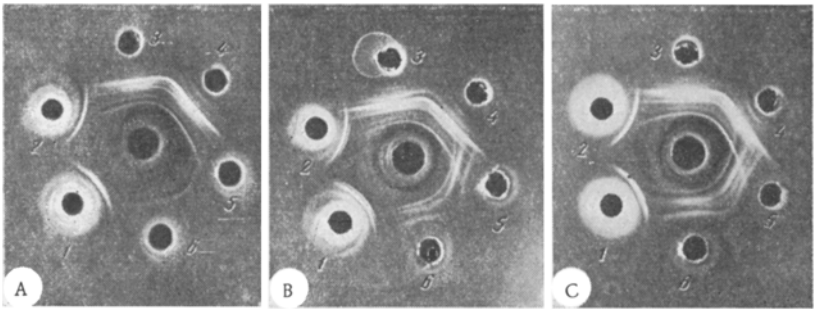

Fig. 2. Detection of antigens similar to antigens of the lens (A), heart (B), and liver (C). Central wells contain serum against frog oöcytes, peripheral wells: 1 and 2) frog's blood serum; 3 and 4) extract of oöcytes; 5 and 6) lens extract (A), heart extract (B), liver extract (C).

with saline extract of oöcytes in a dilution of 1 : 10, the same serum with extract diluted 1 : 20 gave 7 precipitation bands, 4 bands each with extract diluted 1 : 40 and 1 : 80, 3 bands with extract diluted 1 : 160, and only one precipitation band with extract diluted 1 : 320.

Of the 8 different oöcyte antigens thus detected, antigens Nos. 3, 5, and 8 (counting away from the wells containing extracts) were present in the highest concentrations, for they could be seen with extract diluted up to 1 : 160, 1 : 160, and 1 : 320 respectively.

The results of the precipitation reaction in agar with sera against frog oöcytes and extracts from various frog organs are given in Table 1 and Fig. 2. Sera against frog oöcytes reacted not only with extract from oöcytes, but also with extracts from various frog organs. A positive reaction was obtained also with blood serum, when 1-3 precipitation bands were formed.

The results thus showed that of the 8 antigens detected in a saline extract of frog oöcytes, antigens Nos. 1, 3, 5, and 8 are specific for oöcytes. The other antigens were similar to antigens from various frog organs.

To confirm the results described above, analogous experiments were carried out using sera against frog oöcytes absorbed by Björklund's method first with blood serum or extract from a particular frog organ, and then with blood serum and a mixture of extract from different organs.

As Table 2 and Fig. 3 show, the results of this experiment confirmed the data given in Table 1 and also showed that frog oöcytes contain antigens specific for them (Nos. 1, 3, 5, 8) and also antigens (Nos. 2, 6)

TABLE 2. Results of Precipitation Reaction in Agar with Serum against Frog Oöcytes Absorbed by Various Antigens

Serum against frog oöcytes	Number and order of precipitation bands obtained with extracts from frog oöcytes							
	№ 1	№ 2	№ 3	№ 4	№ 5	№ 6	№ 7	№ 8
Absorbed by blood serum and extract from:	+	0	+	+	+	0	±	+
Lens	+	+	+	0	+	0	±	+
Heart	±	0	+	0	+	0	±	+
Kidney	+	0	+	0	+	0	±	+
Muscle	+	0	+	0	+	0	±	+
Liver	±	0	+	0	+	0	0	+
Lung	+	0	+	0	+	0	0	+
Spleen	±	0	+	0	+	0	0	+
Testis	±	0	+	0	+	0	0	+
Adsorbed by blood serum and mixture of all extracts	±	0	+	0	+	0	0	+

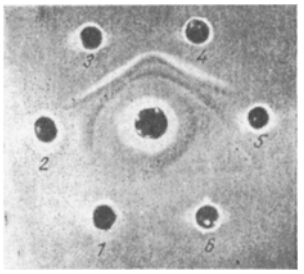

Fig. 3. Detection of antigens specific for oöcytes. Central well contains serum against frog oöcytes absorbed by blood serum and mixture of extract from lens, heart, kidney, liver, spleen, lung, and testis. Peripheral wells contain: 1 and 2) blood serum; 3 and 4) extract from oöcytes; 5 and 6) mixture of extracts from all heterologous organs mentioned.

similar to antigens of the blood serum and many organs. On the other hand, the oöcytes also contain antigens (Nos. 4, 7) not identical to serum antigens but identical with antigens of other organs (common organ antigen).

The study of the antigenic structure of early stages of development of the fertilized oöcyte will help to shed light on the dynamics of changes taking place in all antigens of the oöcytes and, in particular, the common organ antigen. It may also possibly help to solve the problem of the origin of these antigens and, finally, to clarify the process of formation of the antigenic structure of organs during organogenesis.

LITERATURE CITED

1. R. F. Averkina, Zh. Obshch. Biol., 29, No. 2, 229 (1968).
2. N. G. Andreeva, Morphoimmunologic Analysis of Hen Kidney Tissues in Ontogenesis. Candidate Dissertation [in Russian], Moscow (1967).
3. V. M. Barnabanov, Zh. Obshch. Biol., 27, No. 2, 252 (1966).