ANTIGENIC STRUCTURE OF HUMAN KIDNEY TISSUE

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The antigenic structure of human kidney tissue was studied by the gel-diffusion reaction in agar. Eight or nine different antigens were found in saline extracts of human kidney, of which two or three are specific for the kidney, one is identical with liver antigen, and two or three identical with antigens of liver, heart, lung, spleen, and blood serum; while two antigens are identical with other organ antigens only (liver, heart, lung, spleen) and not with blood serum antigens.

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Only a few reports exist in the literature concerning the formation of antigenic properties of kidney tissues in embryogenesis, and the test objects used were mainly hens and mice [1, 2, 4, 5, 7, 8].

The object of the present investigation was to study water-soluble antigens of the human kidney as a preliminary to the study of the formation of these kidney tissue antigens during human embryogenesis.

EXPERIMENTAL METHOD

Immune sera were obtained against saline extracts of kidney tissue obtained from a person dying from trauma in 5 rabbits. Kidney tissue homogenate, diluted 1:10, was injected intraperitoneally into each rabbit. One month later the animals received 8 intravenous injections of kidney tissue extract in the following doses: one injection of 0.5 ml, 3 of 1 ml, 3 of 1.5 ml, and 1 of 2 ml, with intervals of 3-4 days between injections. The total dose of protein per rabbit was 30 mg. Sera were obtained on the 11th day after the last injection. The titer of the sera was 1:1000-1:8000. Antisera concentrated by McErlean's method [6] were used in the investigation.

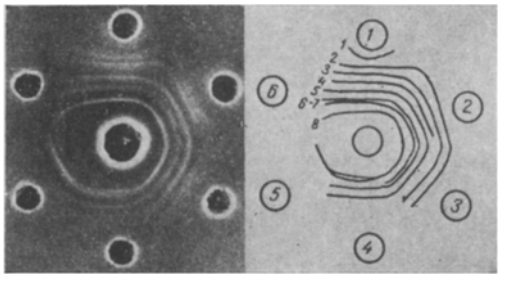

Fig. 1. Gel-diffusion reaction in agar. Central well contains concentrated kidney antiserum. Peripheral wells contain extracts of human kidney tissue: 1) extract in dilution 1:10 with protein concentration 3 mg/ml; 2-6) extracts diluted 1:20, 1:40, 1:80, 1:160, 1:320. Precipitation band No. 1 was formed not with all kidney antisera. In some experiments an additional precipitation band appeared before band No. 8.

Saline extracts of human organs (kidney, liver, heart, lung, spleen) and human blood serum were used in reactions with antisera.

The main method of investigation was the gel-diffusion reaction in agar described by Ouchterlony [9]. The ring-precipitation reaction also was used to determine the titer of the sera.

EXPERIMENTAL RESULTS

To detect the highest titer of antigens present in saline extracts of human kidney tissue, in each case 2 or 3 experiments were carried out with concentrated serum and with 6 different dilutions of extract (1:10, 1:20, 1:40, 1:80, 1:160, 1:320).

Kidney antisera formed 7-9 precipitation bands with saline extracts of human kidney tissue (Fig. 1), indicating that the kidney extract contained 7-9 different antigenic components.

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TABLE 1. Characteristics of Human Kidney Tissue Antigen

Human tissue	No. and order of formation of precipitation bands								
	№ 1	№ 2	№ 3	№ 4	№ 5	№ 6	№ 7	№ 8	№ 9
Kidney	±	+	+	+	+	+	+	±	+
Liver	0	+	0	+	+	+	0	±	+
Heart	0	+	0	+	0	+	0	±	+
Lung	0	+	0	+	0	+	0	±	+
Spleen	0	+	0	+	0	+	0	±	+
Blood serum	0	+	0	0	0	0	0	±	+

Note. Here and in Table 2, bands counted from wells with extracts; +) positive reaction; 0)negative reaction ±) precipitation bands formed not with all concentrated kidney antisera.

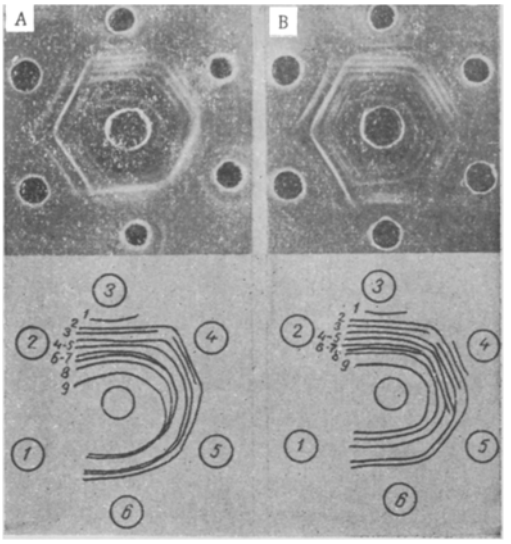

Fig. 2. Identity of human kidney tissue antigens of other organs and blood serum of the same organism. Central wells contain concentrated kidney antiserum; peripheral wells contain: 1, 2) human blood serum; 3, 4) human kidney extract, 5, 6) extract of human liver (A), heart extract (B).

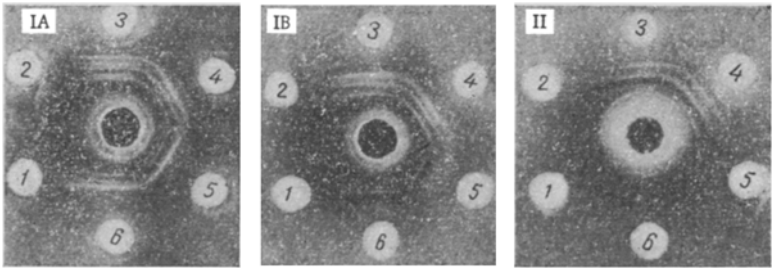

Fig. 3. Gel-diffusion reaction in agar with absorbed sera. Central wells contain kidney antiserum absorbed with blood serum (I), blood serum and extracts of liver, heart, lung, and spleen (II); peripheral wells contain: 1, 2) blood serum; 3, 4) kidney extract; 5, 6) liver extract (IA) and lung extract (IB, II).

To determine the organ-specificity of each antigen detected in the kidney extract, experiments were carried out using extracts of kidney and other organs (liver, heart, lung, spleen), and also human blood serum. When precipitation bands between kidney antiserum and kidney extract, on the one hand, and between the same serum and extracts of different organs, on the other hand, merged this was taken as evidence of their identity.

The results of experiments with all concentrated kidney antisera are given in Table 1.

Antigens Nos. 1, 3, and 7 were found to be specific for kidney, antigen 5 was identical with liver antigen, and antigens Nos. 4 and 6 were identical not only with liver antigens, but also with antigens of the heart, lung, and spleen, while antigens Nos. 2, 8, and 9 were also identical with blood serum antigens (Table 1, Fig. 2).

To confirm the results described above, experiments were carried out with absorbed kidney antisera. Absorption was carried out by Björklund's method [3] at room temperature (18-20°), in some cases with human blood serum only and in other with serum and extracts from the heart, spleen, lung, and liver.

TABLE 2. Detection of Antigens in Saline Extracts of Adult Human Kidney Tissue

Kidney antisera	No. and order of formation of precipitation bands								
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9
Absorbed: with blood serum	±	0	+	+	+	+	+	0	0
with blood serum and extracts of heart, lung, spleen	±	0	+	+	+	±	+	0	0
with blood serum and extracts of heart, lung, spleen, and liver	±	0	+	0	0	0	+	0	0

Kidney antisera absorbed with blood serum continued to react with human kidney extract, although fewer precipitation bands were formed: 6 instead of the 9 detected with unabsorbed sera (Table 2, Fig. 3). These absorbed kidney antisera also reacted with liver extract, forming 3 precipitation bands merging with particular bands (Nos. 4-6) formed between these same sera and kidney extract (Fig. 3, IA). Two precipitation bands were formed with extracts from the heart, lung, and spleen, merging with two bands (Nos. 4 and 6) obtained with kidney extract (Fig. 3, IB). No reaction was found with human blood serum.

The results of this experiment confirm those of the previous tests (Table 1, Fig. 2) and indicate, in particular, the presence of common organ antigens, possessing no features of similarity with serum proteins.

Kidney antisera absorbed with blood serum and also with extracts of human heart, lung, and spleen reacted with kidney and liver extracts like sera absorbed with serum proteins only (only band No. 6 was not always formed); no reaction was found with other heterologous extracts (of heart, lung, and spleen) or with blood serum. The results of this experiment show that human kidney tissue extract contains several common organ-specific antigens, for extracts of the heart, lung, and spleen did not completely absorb kidney antisera against all the common organ antigens (these sera continued to react not only with kidney extract, but also with liver extract).

Concentrated kidney antisera absorbed with blood serum and with all heterologous extracts, including liver extracts, reacted as a rule only with human kidney extract to form 2 or 3 precipitation bands. In these experiments there was usually no reaction with extract of human liver, heart, lung, and spleen or with human blood serum (Fig. 3, II). Sometimes, however, it was impossible to absorb the serum completely against all heterologous antigens. Serum No. 863, for example, continued to react with liver and kidney extract, forming one precipitation band with the latter, merging with one of the 3-4 bands formed between this serum and kidney extract. This absorbed serum did not react with extracts of heart, lung, and spleen or with human blood serum. The fact that the absorbed sera formed 2 or 3 precipitation bands only with kidney extracts and did not form analogous bands with any of the other extracts is evidence that human kidney tissue extracts contain antigens specific for this organ.

The investigation thus showed that saline extracts of human kidney contain 8 or 9 antigens, of which 2 or 3 are specific for kidney, 1 is identical with liver antigen, 2 are identical with antigens of other human organs (liver, heart, lung, spleen), but not with blood serum antigens; and finally, of which 2 or 3 are identical with antigens of all these organs and also of blood serum.

The further study of the antigenic structure of the kidney at various stages of human development may help to elucidate the principles governing the establishment of immunologic specificity of this organ in embryogenesis.

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