17. Studies on the Heredity of the Group-Specific Isoagglutinin in Normal Human Serum. IV.

On the Heredity of Anti-C Agglutinin.

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Introduction.

Antigen C, not found in the blood cells of the group O, but found in both group A and B, was named by Hibino in 1938. Iseki and Kobayashi were first ones to prove that the anti-C agglutinin existed in the human sera of group O (1942). The following method was used to prove anti-C agglutinin.

The absorption of anti-B agglutinin in human serum of group O was first carried out with blood corpuscles (B_2B_3) of a rabbit and then divided into two parts, one which was completely absorbed (β_{II}), the other incompletely absorbed. 1/4 amount of the group A blood was added to the upper clear liquid of the latter, left for 2 hours at room temperature and then again group B blood was added to the supernatant fluid. After absorption with blood corpuscles of rabbit, the residual anti-B agglutinin, which was not absorbed with group A blood is β_I , while one which was completely absorbed contains β_{II} and anti-C agglutinin (Table I).

Table I

Classification of anti-B agglutinin (β_I , β_{II}) and demonstration of anti-C agglutinin (γ) in the human serum of group O.

Anti-B and Anti-C agglutinins			Tested by	Absorbed by									
				Control					Rabbit blood				
				2	4	8	16	32	2	4	8	16	32
Human serum of group O	A	$\beta_{II}(\beta_2\beta_3)$	The blood of group B	++	++	++	+	+	-	-	-	-	-
		$\beta_I(\beta_1\beta_2\beta_3)$		++	++	++	+	+	++	+	-	-	-
	O	$\alpha\beta_{II}$		++	++	++	+	+	-	-	-	-	-
		$\alpha\beta_I$		++	++	++	+	+	++	+	-	-	-
		$\alpha\beta_{II}\gamma(\text{anti-C})$		++	++	++	+	+	++	+	-	-	-

According to C. Kobayashi (1942) the antigen C is analyzed into partial antigen C_I , C_{II} , C_{III} and as it is known that the blood corpuscles of rabbit have a structure of $B_{II}+B_{III}+C_{II}+C_{III}$, strictly

speaking, the anti-C agglutinin found in human serum of the group O is the anti-C_I agglutinin. The authors divided the ones with and without anti-C agglutinin with the above method and studied its hereditary relationship.

Experimental Results.

100 families with a totals of 420 persons in all were examined. Out of 125 persons with group O, 28 persons (22.4%) had anti-C agglutinin. This percentage is almost identical with Kobayashi's 21.4%, the frequency of anti-C agglutinin is 6.7%. The agglutinin titers were all low (2-8x).

For the convenience of explanation, γ stands for persons with anti-C agglutinin and 0 for those without anti-C agglutinin. The following 3 combinations obtained (Table II).

(1) Both parents without anti-C agglutinin (0×0).

There are 90 families in this combination with a total of 195 children of which 9 persons (4.6%) had anti-C agglutinin and 186 (95.4%) without anti-C agglutinin.

(2) There were 9 families with one of the parents having anti-C agglutinin ($0 \times \gamma$). 17(77.3%) children without and 5(22.7%) with anti-C agglutinin were born to these parents.

(3) Both parents with anti-C agglutinin ($\gamma \times \gamma$).

Only one family with all three children (100%) having anti-C agglutinin. The frequency of anti-C agglutinin being 7% is strictly identical with the results obtained by theoretical calculation.

With the above experiment, the authors have come to a conclusion that anti-C agglutinin is a hereditary character and the anti-C agglutinin is recessively inherited.

Table II
Heredity of anti-C agglutinin.

Combination of parents	Number of families	Observed number and frequency of children and its calculated value				
		0		r	Total	
1 0×0	90	186 Calculated	95.4% (95.6%)	9 4.6% (4.4%)	195	0.019
2 $0 \times r$	9	17 Calculated	77.3% (79.1%)	5 22.7% (20.9%)	22	0.043
3 $r \times r$	1	Calculated		3 100.0% (100.0%)	3	0
Total	100	203		17	220	0.062

$n=2$. Pr. > 0.95