ABO INCOMPATIBILITY BETWEEN HUSBAND AND WIFE AND ITS RELATION TO Rh IMMUNIZATION

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During the past 2½ years the blood of 74,240 pregnant women has been examined in this centre for the presence of erythrocyte antigens and antibodies. It is the practice to determine the Landsteiner blood group and Rh genotype of the husbands of all women with Rh antibodies and, in the case of some antenatal clinics, those of all Rh-negative women whether Rh antibodies have been detected or not. The present series comprises 3,079 married couples, the wives being Rh-negative (C, D, and E negative) with one or more pregnancies, and the husbands Rh-positive (D positive). None of the wives has given a history of previous transfusion or intramuscular injection of blood.

The distribution of the blood groups in this population of 6,158 persons is shown in Table I, and the matings are set out in Table II.

In this series of 3,079 couples, there were 373 wives whose serum contained Rh antibodies, and

2,706 without Rh antibodies. The distribution of the blood groups in these matings is shown in Table III.

Where Rh antibodies are absent the distribution of the blood groups of both husbands and wives approximates to that of a random population, but where Rh antibodies are present there is an excess of Group O and a deficiency of Group A, B, and AB husbands, the position being reversed in the case of the wives. This suggests that where immunization of the wife against the A or B factor is possible, owing to the presence of either of these factors in the husband and its absence in the wife, the chances of Rh immunization are reduced, but that where this is not possible the chances are increased (Table IV).

TABLE I
DISTRIBUTION OF BLOOD GROUPS

Group	Number	Percentage of Total
O	2,767	44.9
A	2,705	43.9
B	509	8.3
AB	177	2.9
All Groups	6,158	100.0

TABLE II
MATINGS OF HUSBANDS AND WIVES DISTRIBUTED
BLOOD GROUPS

Husband's Group	Wife's Group					
	O	A	B	AB	Total	%
O	629	631	119	48	1,427	46.3
A	558	615	107	38	1,318	42.8
B	120	100	25	9	254	8.3
AB	33	41	4	2	80	2.6
Total	1,340	1,387	255	97	3,079	—
%	43.5	45.1	8.3	3.1	—	100.0

TABLE III
Rh-POSITIVE HUSBANDS × Rh-NEGATIVE WIVES

Husband's Group	Wife's Group (Rh antibodies present)						Wife's Group (Rh antibodies absent)					
	O	A	B	AB	Total	%	O	A	B	AB	Total	%
O	83	102	17	10	212	56.9	546	530	102	38	1,216	45.0
A	41	81	11	4	137	36.7	517	534	96	34	1,181	43.6
B	10	5	4	0	19	5.1	110	95	21	9	235	8.7
AB	0	3	1	1	5	1.3	34	36	3	1	74	2.7
Total	134	191	33	15	373	—	1,207	1,195	222	82	2,706	—
%	35.9	51.2	8.9	4.0	—	100.0	44.6	44.2	8.2	3.0	—	100.0

TABLE IV
A OR B IMMUNIZATION

POSSIBLE				NOT POSSIBLE			
Husband × Wife	Rh antibodies			Husband × Wife	Rh antibodies		
	Present	Absent	Total		Present	Absent	Total
A × O	41	517	558	O × O	83	546	629
A × B	11	96	107	O × A	102	530	632
B × O	10	110	120	O × B	17	102	119
B × A	5	95	100	O × AB	10	38	48
AB × O	0	34	34	A × A	81	534	615
AB × A	3	36	39	A × AB	4	34	38
AB × B	1	3	4	B × B	4	21	25
				B × AB	0	9	9
				AB × AB	1	1	2
Total	71	891	962	Total	302	1,815	2,117
%	7.4	92.6	100.0	%	14.3	85.7	100.0

The same facts may also be expressed in the form of a four-fold table (Table V), showing the number of wives with and without antibodies. Here the figures in brackets represent the expected numbers, on the hypothesis that Rh immunization is unrelated to the ABO system. The percentage difference in the incidence of Rh antibodies between (a) and (b) is 6.9 and the standard error of the difference 1.27; when the χ^2 test is applied, $P = < 0.001$.

TABLE V
WIVES WITH AND WITHOUT ANTIBODIES

Immunization to the A or B factor	Rh antibodies		Total	% of wives with Rh antibodies
	Present	Absent		
(a) Possible	71 (117)	891 (846)	962	7.4
(b) Not possible	302 (257)	1,815 (1,859)	2,117	14.3
Total	373	2,706	3,079	12.1

Levine and Wong observed this phenomenon in 1943, and more recently Van Loghem and Spaander (1948) have published a summary of their observations and those of other workers (Table VI).

In the present series of 373 cases with Rh antibodies, 81.0 per cent. occurred in "compatible" and 19.0 per cent. in "incompatible" matings, whilst in the 2,706 cases without Rh antibodies the corresponding figures are 67.1 per cent. and 32.9 per cent., which approximate closely to the proportions expected in a random population.

TABLE VI
FINDINGS OF VARIOUS WORKERS

Workers	No. of Cases with Rh Antibodies	Matings	
		ABO Compatibility %	ABO Incompatibility %
Bessis ..	48	89.5	10.5
Levine ..	215	75	25
Race ..	247	84	16
Wiener ..	96	71	29
Broman ..	33	81	19
Van Loghem	240	87	13

CONCLUSIONS

Examination of the blood of 3,079 married couples shows that there is a significant difference in the incidence of Rh antibodies amongst Rh-negative women mated with Rh-positive men, the incidence being much lower where A or B "incompatibility" between husband and wife exists than where it does not.

Where immunization to the A or B factor is possible on account of blood group "incompatibility" between husband and wife, the probability of Rh immunization is greatly reduced.

REFERENCES

- Levine, P., and Wong, H. (1943). *Amer. J. Obstet. Gynaec.*, **45**, 832.
Van Loghem, J. J., and Spaander, J. (1948). *Rev. Hemat.*, **3**, 276.