Blood Group Antibodies in Old Age (36943)

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Naturally occurring anti-A and anti-B agglutinins may be absent from the blood under certain conditions. If so, direct and reverse blood typing of such specimens may be characterized by discrepancies on the reverse or serum type. Thus, when hemagglutinins are missing, an individual designated as A, B or O on direct typing may be incorrectly called group AB on the reverse type.

This finding is commonplace when blood samples from the newborn are tested (1, 2) due to the inability of the human fetus to form IgM immunoglobulins. In view of reports that low levels of blood group immunoglobulins were not uncommon in senescence, the authors felt it to be of importance to confirm such findings and relate them to the performance of blood bank tests (3–7). Thus, ABO direct and reverse typing discrepancies might be expected in old age if naturally occurring anti-A or anti-B were low or absent.

Materials and Methods. The individuals for this study comprised trauma cases, patients with cardiac or metabolic disease and structural problems requiring surgical correction. They included persons of various ages to facilitate comparisons between age groups with respect to the incidence of blood typing discrepancies and titers of anti-A and anti-B isoagglutinins. The patients were grouped according to age as follows: 197 patients from 15 to 50 yr; 91 patients from 51 to 69 yr and 90 patients from 70 to 98 yr of age. The composition was similar in regard to ABO type, age and sex distribution. Routine ABO direct and reverse groupings and antibody screening tests were carried out by the tube method (8). Reactions were observed following admixture of patients cells with serum with the corresponding reagent antisera and red blood cells and a brief spin at low speed in the centrifuge. Discrepancies between direct and reverse blood groupings were noted and confirmed using two additional sets of commercial reagent antisera and cells.

Anti-A and anti-B titers were measured by the technique of twofold serial dilutions of serum in normal saline (8). Incubation was at room temperature for 1 hr and this was followed by low speed centrifugation. Titers were expressed as the reciprocal of the highest dilutions which yielded a distinct (1+) positive reaction under macroscopic examination. When negative results were obtained by this method, titers were repeated

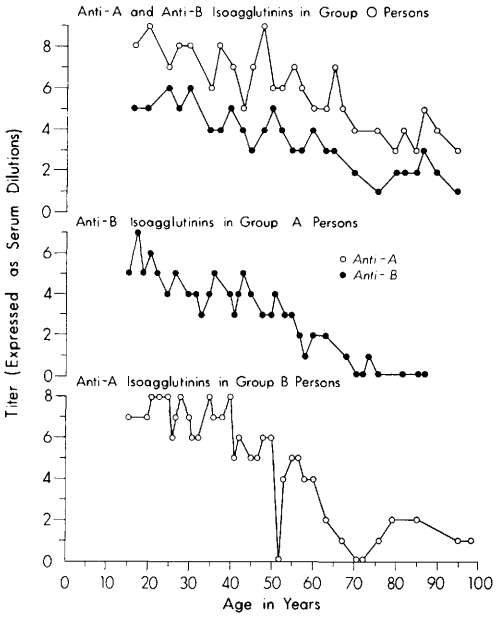

FIG. 1. Relationship of anti-A and Anti-B isoagglutinin titers to age.

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TABLE I. Discrepancies Between ABO Direct and Reverse Blood Grouping in Relation to Age.

Age group	Total	No. of discrepancies	Individual studies						
				Blood group			Antibody titer		
			Age	Dir.	Rev.	Sex	Anti-A	Anti-B	Disease
15–50	197		No discrepancies				1/32 to 1/256	1/8 to 1/128	None
51–69	91	5(5.5)[a]	52	B	AB	F	1/1	—	Dislocated head of femur
			54	O	AB	M	—	—	Repair of multiple leg lacerations
			55	O	B	F	1/16	—	Fracture—humerus
			58	A_1	AB	M	—	—	Ruptured inverted disc
			68	A_1	AB	M	—	—	Gouty arthritis
70–98	90	9(10))	71	B	AB	F	—	—	Diverticulosis
			72	B	AB	F	1/1	—	Diabetes
			74	A_1	AB	F	—	1/1	Fracture of cervical vertebra
			76	O	B	F	1/16	1/1	Myocardial infarction
			76	A_1	AB	F	—	1/1	Multiple rib fracture
			80	A_1	AB	M	—	—	Fracture femur
			82	A_1	AB	M	—	1/1	Urinary tract infection
			86	A_1	AB	F	—	1/1	Tendon repair
			87	A_1	AB	M	—	1/1	Cholelithiasis

[a] Values in parenthesis refer to percentages.

with a 2 hr incubation at 5° and a microscopic examination of all cell serum mixtures.

Results. Figure 1 summarizes the results of 734 titers of anti-A and anti-B antibodies carried out on blood specimens from 378 persons who ranged in age from 15 to 98 yr. Of this series, 174 patients were group O, 150 group A and 54 group B. Each point on each graph depicts an average titration value from sera derived from individuals of the same age belonging to the corresponding blood group (a number from 0 to 9 is assigned to indicate serial dilutions). Average titers of isoagglutinins were observed to decline with increasing age. In general, anti-A titers were higher than anti-B titers in most age groups examined. Titers in group O individuals appeared to be maintained over a longer age span than titers in groups A and B persons.

Table I summarizes clinical information and serological data on 14 elderly patients in whose blood specimens ABO typing discrepancies were observed. Trauma cases comprised the majority of patients along with cases of myocardial infarction, cholecytsitis and diabetes. No discrepancies between direct and reverse types were noted in 197 persons in the 15 to 50 year age group. Discrepancies between direct and reverse types occurred in 5 of 91 (5.5%) samples from persons aged 51 to 69 years of age, and in 9 of 90 (10%) specimens from persons aged 70 to 98 years. In 12 of 14 cases, a negative reverse blood group was interpreted as AB, despite findings to the contrary when direct typing was carried out. In two group O individuals, a reverse type of B was interpreted due to the presence of only anti-A agglutinins or insufficient amount of anti-B agglutinins. The isoagglutinins which would have been anticipated based upon erythrocyte typings were not demonstrated upon reverse typing or by titer in 5 of 14 cases. Differences between reverse typing and titer results in eight patients appeared to reflect poorly avid antibodies not reactive under the conditions of reverse typing in which results are determined following an immediate spin in the centrifuge. However, the conditions of incubation which accompanied titers caused enhancement in these cases, and the appearance of low titered antibodies.

Discussion. The practical importance of these results deserve comment. Confirmation of ABO grouping, ordinarily carried out by means of direct and reverse typing would be dependent only upon the former method in the instances described above. In these situations, an acceptable alternative is the use of two separate sources of reagent antisera for direct testing of erythrocytes.

A decrease in naturally occurring blood group agglutinins with advancing age has been described by others, and thus parallels the findings described herein (1, 3). It is difficult to assign a specific cause to account for a correlation of low titered antibodies with senescence. Seasonal factors have been said to be associated with blood group antibody alterations (9) but all age groups in the present study were tested during the months of June to August and were thus not variable in this respect. The nature of disease processes in the patients under study did not appear to represent forms capable of interfering with the immune response. Nutrition in some, but not all, persons above 80 yr of age was felt to be inadequate, but no correlations could be established between this factor and low antibody production. The striking changes in titers between individuals from the younger and older groups may in the case of younger females implicate a recent child bearing history and in males, immunization procedures as possible causes for the observed differences, although detailed histories were not taken in younger persons to evaluate this possibility. No known environmental exposures could be established upon detailed questioning in the elderly patients in whom ABO discrepancies were found.

Apart from the possibility that a lack of environmental exposure to antigenic stimuli may account for the results observed herein, it is also conceivable that old age is accompanied by a refractoriness to immune stimuli (3, 6). This in turn might result in a decrease in levels of blood group isoagglutinins. Antigen stimulation studies in carefully selected elderly persons may be of use in evalu-

ating immunological incompetence as a possible cause for low or absent antibody titers.

Summary. Correlations between age and naturally occurring anti-A and anti-B antibodies were determined in a comparative study carried out on blood samples from 378 Bellevue Hospital patients ranging in age from 15 to 98 yr. Of this total, 90 persons were 70 or more years of age. Decrements in anti-A and anti-B antibody titers were correlated with increasing age. Discrepancies between direct and reverse techniques for ABO typing could be accounted for by loss of anti-A and anti-B immunoglobulin in senescent persons. Such losses will result in a failure of performance of reverse ABO typing which depends upon the presence of circulating anti-A and anti-B antibodies. In these circumstances, confirmation of ABO type may be achieved by repeating the direct or red cell type using an alternate source of reagent anti-A and anti-B typing sera.

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