SECRETORS AND NONSECRETORS OF GROUP ANTIGENS

L. S. Volkova

Laboratory of Immunology of Embryogenesis (Head, Dr. Med. Sci., O. E. Vyazov),
Institute of Experimental Biology (Head, Professor I. N. Maiskii),
AMN SSSR, Moscow
Presented by Active Member AMN SSSR, N. M. Zhukov-Verezhnikov
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As many authors have shown, group antigens (A, B, O) are found not only in the erythrocytes and tissue cells, but also in certain secretions and excretions [7, 8, 10-13, 15, 16, 18, 22]. Meanwhile it has been shown that group antigens are not present in the body fluids of all persons possessing them in their erythrocytes and tissue cells. For instance, a number of workers have shown [10, 17, 18] that the saliva of roughly 20-30% of persons does not contain group antigens which are present in their erythrocytes. Schiff and Sasaki concluded from this fact that, in accordance with their ability to secrete or excrete the group substances present in the blood, humans may be divided into "secretors" and "nonsecretors" a view now shared by most non-Soviet and many Soviet authorities.

However, this fact has not been confirmed in a series of researches carried out on various test objects [5, 7, 8, 12]. It has been demonstrated quite clearly that certain technical errors made by Schiff and Sasaki may have led them to reach incorrect conclusions regarding the existence of "nonsecretors."

TABLE 1. Group Characteristics of Amniotic Fluid and Blood Sera of Newborn Infants and Mothers

Test object	Number of specimens examined	A and B group antigens not found (in number of specimens)	Group antigens found (in number of specimens)		
			A	B	AB
Amniotic fluid	258	44	109	61	44
Neonatal blood	258	44	109	61	44
Maternal blood	258	71	91	54	42

We were interested in the problem of differentiation of group antigens in amniotic fluid. The purpose of our investigation was not to detect "secretors" or nonsecretors," but our results enable us to make a contribution to this discussion.

Investigtaions of the group specificity of the amniotic fluid have been few in number and their results are contradictory [14, 17, 19, 20, 21]. Moreover, certain workers who have studied amniotic fluid also consider that there are two types of women [19, 21]—"secretors," in whom group antigens are always found in the amniotic fluid, and "nonsecretors," whose amniotic fluid does not contain these substances. The results of our investigations do not confirm these findings.

EXPERIMENTAL METHOD

Group antigens in amniotic fluid were detected by the method of delay of hemagglutination of iso-antibodies of standard sera in the presence of the test fluid. The standard sera were preliminarily tested for agglutinating power, and those were selected for the experiments which, when diluted 1:32, gave an agglutination reaction with the corresponding standard erythrocytes evaluated as + or +(+). The experimental conditions were described previously [3].

Parallel with the investigations of the amniotic fluid, tests were also carried out on the blood serum of the corresponding mothers and newborn infants for the presence of group antigens. Altogether 258 specimens of amniotic fluid and serum were examined.

TABLE 2. Comparative Results of Investigation of Group Antigens of Amniotic Fluid When Using Two Different Methods of Dilution of Standard Sera

Record No.	Blood group		Method of dilution of standard sera	Standard reagent		Hemagglutination reaction				
	Of mother	Of infant		Sera	Erythrocytes	Dilution 1:2	1:4	1:8	1:16	1:32
1771	β, α	β, α	Standard α- and β-sera were mixed in equal volumes with the test amniotic fluid, and after 10-15 min this mixture was serially diluted in tubes containing physiological saline to a final dilution of 1:32	α	A	+++	++(+)	++(+)	++	++
				β	B	++(+)	++(+)	++	+(+)	+
			Standard α- and β-sera were serially (from the first to fifth tubes) diluted with amniotic fluid from the test specimen (method of exhaustion of sera)	α	A	+++	++(+)	++(+)	+(+)	+
				β	B	++	+(+)	+	–	–
			Control of agglutinating power of standard sera	α	A	+++	++(+)	++	+(+)	+(+)
				β	B	+++	++(+)	++	+(+)	+

EXPERIMENTAL RESULTS

The results given in Table 1 show that, of the 258 specimens of amniotic fluid examined, 44 were found not to contain A or B group antigens. In all these cases these antigens also were not found in the blood of the newborn infants, while the maternal blood belonged to various groups. The remaining 214 specimens of amniotic fluid were found to contain A, B, or AB antigens, and complete agreement was observed between the group characteristics of the amniotic fluid and the blood of the newborn infants: in 109 specimens of amniotic fluid and serum from the corresponding infant A antigens were found, in 61 specimens—B antigens, and in 44— AB antigens. In no case were hemagglutinins found in the amniotic fluid that were absent from the neonatal blood, or group antigens absent from the amniotic fluid that were present in the blood of the corresponding infant.

Variations were also found in the ability of different specimens of amniotic fluid to combine specifically with the iso-antibodies of standard sera. Of the 214 specimens of amniotic fluid containing hemogglutinogens and tested in the initial dilution (1:10), 137 combined completely with the corresponding agglutinins from standard sera; 77 specimens did not combine completely, of which 9 (4.7% of the total number of investigated specimens of amniotic fluid) exhibited only very slight power of specific absorption of standard iso-agglutinins. However, further testing of these fluids in a smaller initial dilution (1: 2) or undiluted revealed without the possibility of error that specific group antigens were present, identical with the blood antigens of the corresponding newborn infants.

Hence, the group antigens presents in the infant's blood were always found in the corresponding specimens of amniotic fluid. Consequently, all the infants were "secretors"* and the only question was one of quantiative differences in the content of group antigens in the amniotic fluids of the individual women.

*It is incorrect to speak of women as "secretors" or "nonsecretors" of group antigens in their amniotic fluid. Various Soviet writers [1, 9], including the present authors [2, 3, 4], have shown that the amniotic fluid bears no relationship in its origin with the blood of the pregnant woman, but is the product of the secretory activity of the amnion cells. Consequently, we may speak of differences in the secretory power of the amniotic tissue, which is fetal in origin.

The disagreement between out experimental findings and those of other workers who could not always demonstrate group antigens in the amniotic fluid may evidently be attributed to differences in the methods used to study this fluid.

When the method of successive exhaustion of a standard serum by the same specimen of amniotic fluid* was used in our investigation, the most complete extraction of antibodies from the particular serum took place. This demonstrated that in every case the group antigens found in the amniotic fluid were present, even though their titer was comparatively low.

The difference between the results obtained during investigation of group antigens in the same specimen of amniotic fluid but using different methods of dilution of the standard sera is shown in Table 2. The presentation of the results in this table clearly shows the relationship between the character of the hemagglutination reaction and the method of dilution of the standard sera. When the sera, mixed with test fluid, were diluted with physiological saline, the hemagglutination reaction was similar to the control; when, on the other hand, the sera from the first to the last tube were diluted with the test fluid, the hemagglutination reaction differed appreciably from the control after the first dilution (1:2), and at a dilution of 1:16 the β-isoantibodies of the serum fixed the corresponding group antigens of the tested amniotic fluid completely, indicating that B group antigens were present in this specimen of fluid.

Hence, different methods gave different (opposite) results in the same case: absence and presence of antigens. This example clearly reveals one possible source of error made by those investigators who, in certain cases, were unable to detect the group antigens present in the amniotic fluid. So far as difference in the content of the group antigens in the amniotic fluid (as in other secretions and excretions) in different individuals are concerned, these were purely quantitative and not qualitative in character, and were apparently within the normal range of individual physiological variation.

The first results with a bearing on the elucidation of the physiological mechanisms regulating the "secretion" of group antigens into the surrounding fluid were also obtained by Soviet workers [6]. Unfortunately, no further investigations along these lines have been carried out in the meantime.

The further and more detailed study of the problem of "secretors" and "nonsecretors" of group antigens may be of great importance to biology and medicine. In our view, it is absolutely essential in the first place to verify the existing factual evidence by the use of various methods of investigation. The fundamental aspect of the study of the problem of "secretors" and "nonsecretors" of group antigens is the elucidation of the causes and mechanisms responsible for the differences in the character of the "secretory" power of the tissues and organisms of different individuals.

SUMMARY

Data of different authors on the content of group antigenic substances (A, B) in the body fluids of man are reported.

The author investigated group antigens in the amniotic fluid. In all cases group substances identical to those of fetal blood were revealed in the amniotic fluid, and, group antigens, present in the child's blood were always revealed in the corresponding samples of the amniotic fluid.

Thus, Schiff and Sasaki's conception, which is shared by the majority of the foreign and a number of Soviet authors, on the possibility of dividing all persons into "secretors" and "nonsecretors" was not confirmed experimentally in respect of the amniotic fluid.

Establishment of the fact of the constant presence in the body fluids of group substances, identical to blood hemagglutinogenes of that individual, although those only of theoretical interest, may be of practical significance, particularly in the medicolegal field.

LITERATURE CITED

1. A. V. Vikulov, The origin of amniotic fluid in the light of a new interpretation of the structure and function of the amnion and its possible application to obstetric treatment. Doctorate dissertation, Arkhangel'sk(1945).

* The method was developed by P. N. Kosyakov and Z. I. Rovnova and has given good results in their hands during the investigation of the group antigens of human saliva.

2. L. S. Volkova, The problem of the immunobiological relationships between mother and fetus. Candidate dissertation, Moscow (1955).
3. L. S. Volkova, Byull. éksper. biol., 11, 58 (1956).
4. L. S. Volkova, In Book: Problems in the Immunology of Normal and Malignant Tissues [in Russian], p. 227, Moscow (1956).
5. P. N.Kosyakov and Z. I. Rovnova, Zh. mikrobiol., 11, 11 (1952).
6. P. N. Kosyakov, G. V. Morozov, and V. E. Rozhnov, Zh. vyssh. nervn. deyat., 2, 177 (1954).
7. V. N. Krainskaya-Ignatova, Vrach. delo, 8, 533 (1929).
8. A. A. Malygina, Transactions of the Research Institute of Forensic Medicine [in Russian], p. 169, Moscow (1949).
9. G. V. Moskovkin, Akush. i gin., 5, 50 (1948).
10. R. M. Urinson, Transactions of the Institute of Clinical and Experimental Hematology and Blood Transfusion [in Russian], No. 27, p. 50, Moscow (1952).
11. R. M. Urinson, Transactions of the Institute of Clinical and Experimental Hematology and Blood Transfusion [in Russian], No. 29, p. 114, Moscow (1954).
12. A. G. Usachev, Trudy Permsk. med. inst., 21, 261 (1942).
13. K. E. Boorman and B. E. Dodd, J. Path. Bact., 55, p. 329 (1943).
14. H. Ito, Jap. J. Obstet. Gynec., 21, p. 36 (1938).
15. K. Landsteirer and P. Levine, J. Immunol., 12, p. 415 (1926).
16. D. A. Osborn, Brit. J. exp. Path., 33, p. 513 (1952).
17. T. Putkonen, Über die gruppenspezifischen eigenschaften verschiedener Körperflussigkeiten. Helsinki, S. 82 (1930).
18. F. Schiff and H. Sasaki, Klin. Wschr., Bd. 11, S. 1426 (1932).
19. Stimpfl, Cited by A. V. Vikulov.
20. K. Uchimura, Cited by H. Ito.
21. E. Witebsky and J. Mohn, J. exp. Med., 82, p. 143 (1945).
22. K. Yamakami, J. Immunol., 12, p. 185 (1926).
23. K. Yosida, Z. ges. exp. Med., Bd. 63, S. 331 (1928).

All abbreviations of periodicals in the above bibliography are letter-by-letter transliterations of the abbreviations as given in the original Russian journal. *Some or all of this periodical literature may well be available in English translation.* A complete list of the cover-to-cover English translations appears at the back of this issue.