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ABH ANTIGENS IN NORTH INDIANS*

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ABSTRACT

The gene frequencies of the ABH secretor character and the average quantity of such substances in saliva were estimated in 166 male individuals of North Indian origin. These subjects were characterized as secretors, non secretors and aberrant secretors by using a quantitative method of agglutination inhibition. On this basis, 64.45% were defined as secretors, 21.08% as non secretors and 14.45% as aberrant secretors. The gene frequencies calculated were *se* = .4592 and *Se* = .5408.

Quantitative assessment of the blood group substances in saliva shows that 50% of group A individuals are strong H secretors, however, most of them are also strong A secretors. Most of group B individuals were weak H secretors and strong B secretors. Salivary antigen A was secreted more strongly in group A then in group AB, while substance B was secreted almost equally in both B and AB blood groups. Aberrant secretion index (ASI) was calculated and compared with the other available published literature on the Indian populations.

INTRODUCTION

The presence of ABH substances is not confined to erythrocytes only. They occur as cell surface antigens on probably all endothelial cells and many epithelial cells (Holborow *et al.*, 1960; Szulman, 1962, 1966) and the specificities are associated with water-soluble substances in various body secretions and are inherited as a dominant character (Schiff and Sasaki, 1932). The existence of these antigens in water-

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soluble form has been valuable for demonstrating their nature, biochemistry and biosynthesis. Substance H is a precursor which is found in all secretors along with A, B and AB substances depending on the blood group of the individual. It has been seen that there are some individuals who may not have substance H in their saliva, or they may have substance H but not A and B substances. McNeil *et al.* (1957) coined the term aberrant secretors for such individuals and also illustrated the significance of aberrant secretion in spontaneous abortions.

On the basis of quantitative differences, Clarke *et al.* (1960) formulated another definition according to which an individual should be called an aberrant secretor when this A:H or B:H ratio decreases by more than a given number of standard deviations from the mean of the control group.

The discrimination between secretors and non-secretors is made with the help of anti-A and anti-B sera for classifying A, B and AB group persons and of an anti-H reagent for classifying O group persons. In the present study we have reported the incidence of secretors, non-secretors and aberrant secretors in a North Indian population belonging to the Uttar Pradesh (North India) region.

MATERIAL AND METHODS

About 5 ml of saliva was obtained from randomly chosen normal healthy boys from Uttar Pradesh ranging in age from 10 to 15 years. ABO grouping was done by the slide test technique. The inhibition test for ABH secretion in saliva and the quantitative assessment of secreted blood group substances were carried out by preparing serial dilutions of inactivated saliva and testing these against (1:4) anti-A and anti-H reagents. Tests were carried out by the techniques of Dunsford and Bowley (1967).

RESULTS AND DISCUSSION

A total of 166 saliva samples were screened for secretor, non-secretor and aberrant secretor status (Table I). The total incidence of non-secretors was 21.07% and of aberrant secretors, 14.45%. The rate of aberrancy appeared to be higher in A_2 (5/12) than in AB (5/14). However, these differences are not statistically significant. Two types of aberrancies, A-/H+,H-/A+, B+/H-,H+/B-, were found in the present series of A and B individuals and the A+H+B- and A+H-B- types of aberrancy were found among AB individuals (Table I).

An attempt was made to study the quantitative nature of blood group substances in saliva. Individuals with an inhibition titer of 1:16 and higher were classified as strong secretors, subjects with less than 1:16 inhibition titer were classified as week secretors and individuals whose salivas did not inhibit anti-A, anti-B or anti-H were

Table I - Blood group distribution of the secretor types.

Blood group	No. of persons	Secretors	Non-secretors	Aberrant secretors (Secretors = +; Non-secretors = -)
O	36	24	12	
A1	26	17	2	7 A- H+
A2	12	7	0	5 A+ H-
B	78	52	19	4 B+ H-; 3B- H+
A1B	10	5	0	3 A+ H+ B-; 2 A+ H- B-
A2B	4	2	2	0
Total	166	107	35	24 (14.4%)

Gene frequency estimates: $se = 0.4592$: $Se = 0.5408$.

considered non-secretors of ABH substances. Table II shows that 50% of group A individuals are strong H secretors; however, most of them are also strong A secretors. Most group B individuals were weak H secretors and strong B secretors.

The scarcity of blood group AB secretors did not permit us to compare them

Table II - Quantitative assessment of ABH substances in secretors.

Blood group	ABH antigens in saliva	Level of secretion (Number of individuals)	
		Strong	Weak
O	H	21	3
A	H	12	12
	A	19	5
B	H	15	37
	B	40	12
AB	H	4	3
	A	2	5
	B	5	2

with the other secretors but it seems that salivary antigen A was secreted more strongly in group A than in group AB, while substance B was secreted almost equally in both B and AB blood groups. Information on the incidence of aberrant secretion in Indian populations is scanty and limited to few published reports (Roy and Chatterjea, 1962; Bhatia and Randeria, 1970; Randeria and Bhatia, 1971; Bhalla and Bhasin, 1976). In the reports by Bhatia and Randeria (1970) and Randeria and Bhatia (1971) the scope was limited to reporting the incidence and types of aberrancies in salivary secretion, whereas Bhalla and Bhasin (1976) attempted to assess quantitatively ABH substances in saliva.

Quantitative assessment of blood group substances reveals that there may exist population variation in the secretion of blood groups substances. For example, the study by Bhalla and Bhasin (1976) showed that substance H is secreted more strongly among group-A and group-AB secretors, whereas the present study showed an equal distribution of weak and strong substance H secretors in both groups. Also, in our sample, B group substances were equally secreted in groups B and AB, whereas Bhalla and Bhasin (1976) observed stronger secretion of B group substances among blood group-AB secretors than among group-B secretors. In both studies, blood group substance A was strongly secreted more frequently among group-A secretors than among group-AB secretors.

The results of quantitative assessment of blood group substances reported here are tentative and subject to revision when larger samples are tested. Variations in the inhibition titer of blood group substances secreted in saliva, however, can be interpreted as the result of some kind of competition among blood group genes to utilize the precursor substance for conversion into substances A, B and H.

Populations differ in terms of blood group frequencies and of secretor status. Bhalla and Bhasin (1976) calculated an aberrant secretion index (ASI) as follows:

$$\text{Aberrant secretion index (ASI)} = \frac{\text{No. of aberrant secretors}}{\text{No. of A,B and AB secretors}} \times 100$$

It has been suggested that his index should be applied only to those populations which have been studied under the same experimental conditions, i.e. antisera of the same specificity and titer, *Ulex europeus* as a source of anti-H, same time of incubation, temperature, etc. When we compared the ASI values for some North Indian populations, all of them tested with anti-H prepared from *Ulex europeus* (Table III), considerable variation was detected in the index values, ranging from 14.0 in Rajputs from Banjar to as high as 29.3 in Rajputs from Rampur Bushahr.

Clarke *et al.* (1960) consider the amount of A, B and H substances secreted in saliva to be partially inherited. However, the extent to which the A:H B:H ratios can be altered by environmental agents should be determined before the trait can be assessed for its usefulness in the study of ethnic variations.

Table III - Incidence of aberrant secretion in some North Indian populations.

Population, reference	No. tested	No. of secretors	No. of A+B+AB secretors	Aberrant secretors	Aberrant secretion index
Jats of Khanpur (Bhalla and Bhasin, 1976)	122	93	68	13	19.1
Rajputs from Rampur Bushahr (H.P.) (Bhalla and Bhasin, 1976)	128	94	75	22	29.3
Rajputs from Banjar, (H.P.) (Bhalla and Bhasin, 1976)	146	104	93	13	14.0
Kolis from Banjar (H.P.), (Bhalla and Bhasin, 1976)	142	87	65	12	18.5
Mixed population from Uttar Pradesh, Present study	166	107	83	24	28.9

H.P. = Himachal Pradesh (India).

RESUMO

As freqüências gênicas do caráter secretor ABH e da quantidade média de tais substâncias na saliva foram estimadas em 16 indivíduos do sexo masculino originários do Norte da Índia. Tais indivíduos foram caracterizados como secretores, não secretores e secretores aberrantes utilizando um método quantitativo de inibição da aglutinação. Assim, 64,45% foram caracterizados como secretores, 21.98% como não secretores e 14.45% como secretores aberrantes. As freqüências gênicas calculadas foram *se* = .4592 e *Se* = .5498.

Uma avaliação quantitativa das substâncias dos grupos sangüíneos na saliva mostrou que 50% dos indivíduos do grupo A são secretores H fortes. Entretanto, a maioria deles são também secretores A fortes. A maioria dos indivíduos do grupo B foram secretores H fracos e secretores B fortes. O antígeno salivar A foi secretado mais fortemente no grupo A do que no grupo AB, enquanto a substância B foi secretada quase igualmente tanto no grupo B como no grupo AB. O índice de secreção aberrante (ASI) foi calculado e comparado com os disponíveis na literatura sobre populações da Índia.

REFERENCES

Bhalla, V. and Bhasin, S. (1976). A study of blood group antigens in saliva. *Indian J. Med. Res. 64*: 1245-1249.

Bhatia, H.M. and Randeria, K.J. (1970). Studies on blood group antigens in saliva: Incidence and type of aberrant secretors. *Indian J. Med. Res. 58*: 194-201.

Clarke, C.A., McConnell, R.B. and Shepperd, P.M. (1960). A genetical study of the variations in ABH secretions. *Ann. Hum. Genet. 24*: 295-307.

Dunsford, I. and Bowley, C.C. (1967). *Techniques in Blood Grouping.* Vol. II. Oliver and Boyd, Edinburgh and London.

Holborow, E.J., Brown, P.C., Glynn, L.E., Hawes, M.D., Gresham, G.A., Brien, T.F. and Commbs, R.R.A. (1960). The distribution of the blood group A antigens in human tissues. *Br. J. Exp. Pathol. 41*: 430-437.

McNeil, C., Trentelman, E.F., Kreutzer, V.O. and Fullmer, C.D. (1957). Aberrant secretion of salivary A, B, and H group substances in human beings. *Am. J. Clin. Pathol. 28*: 145-151.

Randeria, K.J. and Bhatia, H.M. (1971). Quantitative inhibition studies on the ABH and Lewis antigens in saliva. *Indian J. Med. Res. 59*: 1737-1753.

Roy, M.N. and Chatterjee, J.B. (1962). Aberrant secretion of blood group substances in human saliva. *Ind. J. Med. Res. 50*: 191-194.

Schiff, F. and Sasaki, H. (1932). Der Ausscheidungstypus, ein auf Serologischem Wege nachweisbares Mandelndes Merkmal. *Klin. Wochenschr.* 11: 1426-1429.

Szulman, A.E. (1962). The histological distribution of the blood group substances in man is disclosed by immunofluorescence. II. The H antigen in its relation to A and B antigens. *J. Exp. Med. 115*: 977-996.

Szulman, A.E. (1966). Chemistry, distribution and function of blood group substances. *Annu. Rev. Med. 17*: 307-322.

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