Different Expression of Blood Group A Antigen in the Secretory Cells of Salivary Glands from German and Japanese Nonsecretor Individuals

K. Nishi, N. Ito, T. Hirota, G. Fechner*, S. Rand* and B. Brinkmann*

Department of Legal Medicine, Nara Medical University, Kashihara Nara 634, Japan
*Institut für Rechtmedizin der Universität Münster, Von-Esmarch-Straße 86, D-4400 Münster, B.R.D.

INTRODUCTION

In a previous study(Ito et al. 1988), we compared the staining properties of several blood group A specific lectins in different human tissues and found that in submandibular glands from blood group A nonsecretors, Dolichos biflorus agglutinin(DBA), Bandeiraea simplicifolia agglutinin I(GSA-I), and Sophora japonica agglutinin(SJA) did not react with mucous cells, whereas Helix pomatia agglutinin(HPA) and Helix aspersa agglutinin(HAA) reacted with them. In a preliminary study, we found that these two snail lectins cannot react with mucous cells of salivary glands from German Blood group A nonsecretors, suggesting the existence of racial difference in the expression of blood group antigens. As to the racial difference in antigenicity of erythrocytes, Gibbs et al.(1961) reported that the reactivity of blood group B erythrocytes with anti B serum was strongest among Negroes, weakest among Mongoloids and intermediate among Whites. Wiener et al.(1972) also showed that the racial difference in the reactivity of the red blood cells with anti H lectin. These observation led us to suggest that it might be possible to exist the racial difference in the expression of ABH antigens in human secretory organs.

In the present study, we systematically compared the histochemical properties of secretory cells of various salivary glands obtained from blood group A and AB German nonsecretor individuals with those from Japanese nonsecretors.

MATERIALS AND METHODS

Tissue specimens of the submandibular glands, sublingual glands and tongues were collected at autopsies. ABO and Lewis grouping of the donors were performed by routine heamaggulutination test. The secretor status of the donors was determined by the presence or absence of H antigen in the serous cells of submandibular glands. The distribution of the blood groups of the specimens examined in this study is listed in Table 1. Tissue specimens were fixed with 10% formalin and embedded in paraffin. Serial sections were used to detect blood group A antigen by the blood-group-specific lectins and monoclonal antibodies as well as the reactivity with PAS, alcian blue pH 2.5 and aldehyde pararosanilin stainings. Staining procedures with labeled lectins and monoclonal antibodies as well as conventional histochemical methods were described in our previous papers(Ito et al. 1986, Ito et al. 1987; Nishi et al. 1989). Monoclonal anti-A antibodies were purchased from four companies; Biotest(West Germany), Ortho(USA), Dakopatts (Denmark) and BioCarb(Sweden). Blood group A and AB specific lectins were purchased from Sigma Chemical Co(USA) or E.Y. Laboratories(USA).

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RESULTS

In all the cases of blood group A and AB Japanese nonsecretors examined, HPA and HAA moderetely or strongly reacted with the mucous cells of submandibular glands, sublingual glands, anteriol and posteriol lingual glands and the serous cells of von Ebner gland in tongues. On the other hand, other blood group A or AB specific lectins such as DBA, VVA, GSA-I and SJA did not bind to these cells. Monoclonal anti-A antibodies used in this study showed good reactivity with these secretory cells of salivary glands. No difference was recognized in the staining specificities among the monoclonal antibodies provided from four different sources.

In contrast, in the case of German nonsecretors, the mucous cells of salivary glands and the serous cells of the von Ebner glands showed no or feeble reactivity with HPA and HAA as well as other blood-group-specific lectins. The majority of these secretory cells likewise showed no reactivity with the monoclonal antibodies. Among the specimens examined in this study, the secretory cells from A_2 nonsecretor individuals showed lowest reactivity with these reagents. In fact, it was difficult to find the cells reactive with these reagents in the tissue sections from A_2 nonsecretor individuals.

Endothelial cells of the blood vessels and erythrocytes from individuals of both races showed good reactivity with HPA, HAA and the monoclonal antibodies whereas these cells hardly reacted with other blood-group-specific lectins.

As to the staining patterns of the secretory cells of salivary glands with conventional histochemical stainings, no observable difference was recognized between Japanese and German nonsecretor individuals. Hence, except the cases of HPA, HAA and the monoclonal anti-A antibody stainings, any histochemical difference of the secretory cells was not observed between Japanese and German nonsecretors.

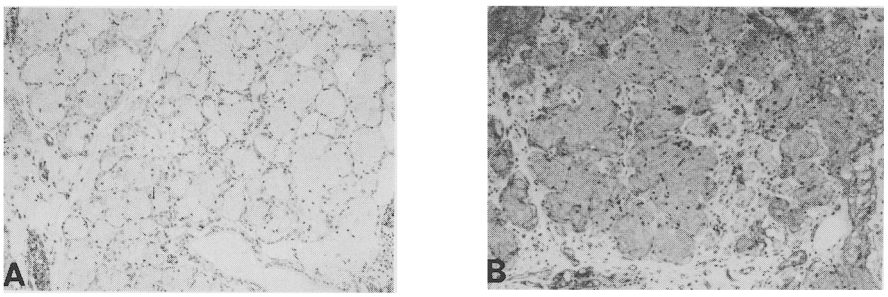
Discussion

Recent development of biochemical methods for analyzing blood group substances has provided definite information as to the complexity and heterogeneity of back bone structures carring the blood group determinants(Hakomori 1984). Observed differences in the reactivity of lectins and antibodies with secretory cells and vascular endothelia may be explained in part by the differnces in the back bone structues carring A antigens. It may be assumed that the number of species of A antigens recognized by lectins other than HPA and HAA is restricted. Torres et al.(1988) reported that HPA could detect all A active glycolopids in human blood group A erythrocytes regardless of the type of precursor chains. Since HPA and HAA did not react with the secretory cells from blood group B and O secretor and nonsecretor individuals and these cells from blood group A Japanese nonsecretors reacted with monoclonal anti-A antibodies, it is reasonable to assume that these two snail lectins can recognize terminal GalNAc residues of certain kind of A antigen in these cells from Japanese nonsecretors. The results obtained in this study therefore suggest that certain kinds of A antigen which is recognized by HPA, HAA and monoclonal anti-A antibodies is secreted in the secretory cells of salivary glands from blood group A and AB Japanese nonsecretors, whereas such kind of A antigen is scarcely secreted in the cells from German nonsecretors.

Table 1. Blood groups of specimens tested in this study

German		cases	Japanese		cases
A_1	Le(a-b-)	2	A_1	Le(a-b-)	2
A_2	Le(a+b-)	1	A_1	Le(a+b-)	9
A_1	Le(a+b-)	2	A_1B	Le(a+b-)	5
A_1B	Le(a+b-)	1			
A_2B	Le(a-b-)	1			

Fig. 1 Immunocytochemical staining with monoclonal anti-A antibody of sublingual gland from a blood group A_1 German(A) and A_1 Japanese(B) nonsecretor. The antibody reacts well with blood vessels and red blood cells from both individuals whereas it reacts with mucous cells only from a Japanese nonsecretor.



References

Gibbs MS, Akeroyd JH, Zapf JJ,(1961) Quantitative subgroups of the B antigen in man and their occurence in three racial groups. Nature 192:1196-1197

Hakomori SI(1984) Blood group glycolipid antigens and their modification as human cancer antigens. Am J Clin Path 82:635-648

Ito N, Nishi K, Nakajima M, Matsuda Y, Ishitani A, Mizumoto J, Hirota T(1986) Localization of blood group antigens in human pancreas with lectin-horseradish peroxidase conjugates. Acta Histochem Cytochem 19:205-218

Ito N, Nishi K, Ishitani A, Nakajima M, Okamura Y, Matsuda Y, Hirota T(1987) Aldehyde pararosanilin staining of acinar cells in the human sublingual and submandibular glands. Jpn J Legal Med 41:109-114

Ito N, Nishi K, Nakajima M, Okamura Y, Ishitani A, Okumura H, Hirota T(1988) Histochemical specificity of labeled lectins with or without blood group specificity in human tissues. Jpn J Legal Med 42:235 (supplement)

Nishi K, Fechner G, Rand S, Brinkmann B(1989) Light-microscopic examination of ABH and Lewis antigens in human tracheal and epiglottic glands using the avidin-biotin-peroxidase complex technique. Z Rechtmed 102:255-262

Torres BV, Mccrum DK, Smith DF(1988) Glycolipid-lectin interactions: Reactivity of lectins from Helix pomatia, Wisteria floribunda, and Dolichos biflorus with glycolipids containing N-acetylgalactosamine. Arch Biochem Biophys 261:1-11

Wiener AS, Socha WW, Gordon EB(1972) The relationship of the H specificity to the ABO blood groups. II. Observations on Whites, Negrose and Chinese. Vox Sang 22:97-106