Frequency of the New Blood Group Antigen Js^a among South American Indians

THE NEW blood group antigen Js^a was discovered by Giblett¹. Families carrying this antigen showed independent segregation from ABO, MNSs and Rh blood systems. Recently, Layrisse, Sanger and Race² studying families of hybrid populations of Venezuela added proof of its independence of Duffy, Kidd and Diego, and also confirmed its independence of MNSs and Rh.

The distribution of the Js^a antigen suggests that it is a Negro antigen. It has been found to be positive in 19 per cent of Negroes in the United States while not a single positive case was observed in 500 white donors³. No other ethnical human divisions have yet been tested.

Table 1 shows the incidence of Diego and Js blood group antigens in four Indian tribes from the western part of Venezuela. The Paraujano and Goajiro belong to the Arawak Indian stock and the Irapa and Macoita are classified as Carib.

Table 1. FREQUENCY OF THE DIEGO AND JS BLOOD GROUPS IN FOUR SOUTH AMERICAN INDIAN TRIBES

Tribes	Number tested	Diego				Js			
		Phenotypes (per cent)		Genes (per cent)		Phenotypes (per cent)		Genes (per cent)	
		Di (a+)	Di (a-)	Di ^a	Di	Js (a+)	Js (a-)	Js ^a	Js
Paraujano	120	10.00	90.00	5.14	94.86	2.50	97.50	1.23	98.74
Goajiro	119	10.08	89.99	5.18	94.82	0.84	99.15	0.44	99.56
Irapa	138	2.17	97.82	1.10	98.90	0.00	100.00	0.00	100.00
Macoita	57	19.29	80.70	10.17	89.83	0.00	100.00	0.00	100.00

The incidence of the Di^a in Paraujano, Goajiro and Macoita was in accordance with previous studies⁴; however, the low frequency for the Irapa Indians was not expected, since in all Carib tribes tested so far the incidence of the gene Di^a has been between 10 and 24 per cent.

Both Carib tribes show negative incidence of the Js^a, while the Arawak tribes show three positive cases out of 120 Paraujano, and one positive case out of 120 Goajiro, Indians. The studies of other blood group antigens, which will be published in detail elsewhere, demonstrated that both Carib tribes had no Negro admixture, while a Negro gene flow into both Arawak tribes was found; this is in agreement with the physical features and historical tradition.

The results presented here indicate that the Js^a is negative or has a very low frequency in the Indian tribes studied. If in future investigations this finding should be confirmed among other Indian tribes, and perhaps in Asiatic Mongoloids, the antigen will be of great value for studying Negro gene flow into hybrid populations.

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¹ Giblett, E. R., *Nature*, **181**, 1221 (1958).

² Layrisse, M., Sanger, R., and Race, R. R., *Amer. J. Hum. Genet.*, (in the press).

³ Giblett, E. R. (personal communication).

⁴ Layrisse, M., Arends, T., and Dominguez Sisco, R., *Acta. Med. Venez.*, **3**, 132 (1955). Nunz Montiel, A. E., and Nunz Montiel, J. T., *Sangre*, **3**, 38 (1958).

A Terminal Peptide Sequence of Human Hæmoglobin?

IT was reported recently^{1,2,3} that the chemical difference between the normal human hæmoglobin A and the abnormal hæmoglobins S and C resides in a tryptic peptide, called peptide 4, to which the following structure was assigned: histidyl-valyl-leucyl-leucyl-threonyl-prolyl-*glutamyl*-glutamyl-lysine. In hæmoglobins S and C the glutamic acid residue which is in italics is replaced by a valine and a lysine residue, respectively. Although the evidence available at the time of publication made the above structure appear likely, repeated attempts to confirm it by the Edman stepwise degradation method⁴ have not agreed with this formulation. We now wish to report that the sequence of peptide 4 in the hæmoglobins A and C is as indicated in Table 1, with histidine in position 2 and valine as the N-terminal amino-acid. Furthermore, this peptide is likely to be N-terminal in one of the hæmoglobin chains. The structure of peptide 4 from hæmoglobin S is still under investigation, but it seems likely—especially in the light of the work of Hill and Schwartz (following communication) that its structure is as shown. It should be noted that the sequence around the amino-acid which changes and the changes themselves in these mutational alterations are not affected by the new structure.

The first suspicion arose when one of us (J.A.H.) found that application of Sjöquist's modification⁴ of the Edman stepwise degradation yielded valine as the N-terminal amino-acid for peptide 4 from hæmoglobin A^{1,2} and peptide 4b from hæmoglobin C³. Only traces of histidine could be obtained at this step. Histidine, or rather its phenylthiohydantoin, was tested for by removing *in vacuo* the acid used in the method and extracting a slightly alkaline solution with ethyl acetate. On the other hand the second step did give histidine, but in poor yield, and the third step yielded mainly leucine in reasonable yield. These amino-acids were identified by two-dimensional paper chromatography after hydrolysis of their phenylthiohydantoins with hydriodic acid⁵. Qualitative analysis⁶ of the two peptides after one and two steps of the Edman degradation showed that valine was much reduced after one step and that after two steps both valine and histidine were absent from the residue. It appears that the peptide 4 begins with the sequence valyl-histidyl-leucyl-. However, repeated attempts to obtain dinitrophenyl-valine after reaction with fluoro-2 : 4-dinitrobenzene⁷ were unsuccessful. Quantitative amino-acid analyses⁶ after paper chromatography indicated that there is only a single leucine residue in the peptides 4.

At this point a Spinco automatic amino-acid analyser, modelled on Moore and Stein's equipment⁸, became available. Analysis of hæmoglobin A peptide 4 showed at once and unequivocally that only one instead of two leucines is present together with the other amino-acids in their expected quantities.

Hæmoglobin A peptide 4 was submitted (V.M.I.) once again to one step of the Sjöquist degradation⁴, but both the N-terminal amino-acid derivative and the remaining peptide were analysed quantitatively⁹, the latter on the automatic amino-acid analyser. The results were clear. After cyclization of the phenylthiocarbonyl peptide under Sjöquist's conditions, an extract of the diluted acid solution showed the spectrum typical of a phenylthiohydantoin⁴. After removal of the acid, the slightly alkaline solution did