

## Blood Groups, Serum Proteins and Hemoglobins of Brazilian Tiriyo Indians

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### ABSTRACT

A population living in the border of Brazil and Surinam was studied with regard to 21 genetic markers from 13 independent systems. No marked heterogeneity was observed among this group and two others from the same tribe investigated by other researchers. The frequencies of genes  $L^M$ s,  $Fy^a$  and  $Hp^1$  are in the upper third of the distribution range observed among South American Indians; those for  $R^1$  and  $R^2$  are in the middle, while  $L^M$ s,  $L^N$ s,  $L^S$ ,  $R^2$ ,  $D^i$ s, and especially  $P^1$  and  $Gc^2$  present low values. All individuals were apparently homozygous for genes  $k$ ,  $Tf^c$ ,  $Hb^A$ ,  $A1A$ , and lacked  $W^r$ . Some evidence was obtained of limited admixture but for the most part this population appears to retain an unmodified Amerindian gene pool.

The Tiriyo Indians (called Trio in Surinam) speak a Carib language and presently number some 800 individuals who live in the savannahs of the Brazil-Surinam border. Their population seems to have remained stable and relatively isolated during the last 70 years. Figueiredo (1963) gives a useful summary about the situation of the group living in Brazil; general information about the Surinam populations can be found in Colson (1971). A detailed demographic study of the Brazilian Tiriyo was undertaken by Frikel and Cortez (1972); Frikel (1970, 1971) analyzed the situation of the Kaxúyana, a Carib group who now lives with and has intercrossed with the Tiriyo in Brazil, examining also the acculturation process to which both tribes have been submitted in the past 10 years.

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Few biological investigations of the Tiriyo have been performed up to the present time. Van Loghem *et al.* (1969), Glanville and Geerdink (1969, 1970), and Geerdink *et al.* (1973) studied the Gm and Inv types, blood groups, dermatoglyphics, skinfold thickness and other body measurements of individuals from the Surinam groups; the latter were also subjected to a series of medical and epidemiological observations by Schaad (1960), and Glanville and Geerdink (1972). Black *et al.* (1969, 1970), on the other hand, studied the prevalence of antibodies against viruses and the measles vaccine reactions of the Tiriyo living in Brazil.

The present communication furnishes data on 21 genetic markers from 13 independent systems obtained among these Indians and tries to relate them to these previous findings.

#### MATERIALS AND METHODS

The Brazilian Tiriyo live around a Franciscan mission located at the margins of the river Paru de Oeste ( $1^{\circ}57'N$ ,  $55^{\circ}49'W$ ). The group is relatively isolated, since access by land is made difficult by the forest and many rapids of the rivers. Flights into the mission occur about once a month, but are restricted to members of the Brazilian Air Force or authorized persons. The Tiriyo have traditionally traded with the Bush Negroes of Surinam, but these contacts have decreased in recent years. The unusually low rate of serologic reactions against several of the common acute viral infections observed among them (Black *et al.* 1970) provides another indication of their isolation. Consanguineous marriages are frequent among the Tiriyo; their fertility and mortality are moderate and within levels found previously in groups living at this cultural stage (Frikel and Cortez, 1972). Also present at the mission are some Kaxúyana and Ewarhoyána, descendants of what seem to have been two other Carib tribes. Since, however, their number is small and they have crossed in the past and continue to intermarry with the Tiriyo, results concerning all of them were pooled in a single sample.

Blood collections were made on two occasions, in 1966 and 1970. The sera from the first excursion were separated in Belém, Brazil and kept frozen there until they were transported under refrigeration to Porto Alegre and Ann Arbor. In the latter city they were studied for haptoglobin, Gc, transferrin and albumin types, the techniques used being those described by Weitkamp *et al.* (1972). Specimens from the 1970 trip were collected in 10 ml vacutainers with ACD and sent

by air in an ice box to Porto Alegre, where they arrived one week afterwards. There they were tested for blood groups, hemoglobin, haptoglobin and albumin types with methods already described elsewhere (Salzano, 1964; Salzano and Tondo, 1968; Schwantes et al. 1967; Weitkamp et al. 1967).

RESULTS AND DISCUSSION

Tables 1 and 2 show the phenotypes observed in the several genetic systems studied, the corresponding gene frequencies being presented

Table 1\*

*Blood Group Phenotypes Observed among the Tiriyo Indians*

MNSs <sup>1</sup>			Rh <sup>2</sup>			Several		
Phenotypes	N	%	Phenotypes	N	%	Phenotypes	N	%
MS	2	2	CDE	1	1	O	125	98
MSs	30	23	CDEe	15	12	B	2	2
Ms	36	28	CDe	34	26	P <sub>1</sub>	23	18
MNS	2	2	CcDE	2	2	Fy(a+)	126	99
MNSs	16	13	CcDEe	35	27	Di(a+)	20	17
MNs	32	25	CcDe	19	15	K(-)	127	100
NS	1	1	cDE	13	10	Wr(a-)	29	100
NSs	3	2	cDEe	6	5			
Ns	5	4	cEe	1	1			
			ce	1	1			
	127			127				

<sup>1</sup> Thirty-four samples were tested with anti-M<sup>s</sup>, giving negative results.

<sup>2</sup> All bloods were C<sup>w</sup>(-).

in Table 3. Since Geerdink et al. (1973) have studied the blood groups of two populations from Surinam, an opportunity arose to ascertain the degree of genetic heterogeneity present in different Tiriyo groups. In only seven of 25 comparisons the gene frequencies observed in Brazil and Surinam showed differences higher than 10% and only in relation to R<sup>2</sup> and P<sup>1</sup> they were relatively large and consistent (the Surinam populations showing higher values). The amount of differentiation present between the two Surinam communities is not much at variance with these results: in three of 12 comparisons the dissimilarities were also higher than 10%, and one of these involved the P<sup>1</sup> gene.

If we compare now the results presented here with the range of values observed in South American Indians (reported in Salzano et al.

Table 2

*Serum Protein and Hemoglobin Phenotypes Observed among the Tiriyo Indians*

Haptoglobins			Gc			Several		
Phenotypes	N	%	Phenotypes	N	%	Phenotypes	N	%
1-1	61	41	1-1	81	83	TfC	97	100
2-1	64	44	2-1	15	15	HbA	127	100
2-2	6	4	2-2	2	2	Alb-A <sup>1</sup>	185	100
0	16	11						

<sup>1</sup> Two of the samples collected in 1966 had a pattern resembling that of albumin Makiritare, but due to the scarcity of serum and its poor quality at the time of typing a definite determination could not be made. Polymorphism for this albumin type has been reported for various tribes in northern South America, including the Trio of Surinam (cf. Weitkamp *et al.* 1973). None of the 127 samples collected in 1970, however, presented any indication of this dimer variant.

Table 3

*Gene Frequency Estimates Obtained from the Data Presented in Tables 1 and 2*

MNSs		Rh		Other Blood Group Genes		Serum Protein and Hb Genes	
Gene	Freq.	Gene	Freq.	Gene	Freq.	Gene	Freq.
<i>L<sup>MS</sup></i>	0.12	<i>R<sup>1</sup></i>	0.49	<i>I<sup>a</sup></i>	0.99	<i>Hp<sup>1</sup></i>	0.71
<i>L<sup>Ms</sup></i>	0.61	<i>R<sup>2</sup></i>	0.19	<i>I<sup>B</sup></i>	0.01	<i>Gc<sup>2</sup></i>	0.10
<i>L<sup>NS</sup></i>	0.11	<i>R<sup>Z</sup></i>	0.12	<i>P<sup>1</sup></i>	0.10	<i>Tf<sup>C</sup></i>	1.00
<i>L<sup>Ns</sup></i>	0.16	<i>r<sup>+</sup></i>	0.04	<i>Fy<sup>a</sup></i>	0.72	<i>Hb<sup>A</sup></i>	1.00
		<i>r</i>	0.16	<i>D<sup>i<sup>a</sup></sup></i>	0.09	<i>Al<sup>A</sup></i>	1.00
				<i>K</i>	0.00		
				<i>W<sup>r<sup>a</sup></sup></i>	0.00		

1972a, b) we see that the frequencies of genes *L<sup>MS</sup>*, *Fy<sup>a</sup>* and *Hp<sup>1</sup>* (respectively 0.61, 0.72 and 0.71) are in the upper third of this distribution range; *R<sup>1</sup>* (0.49) and *R<sup>2</sup>* (0.12) are in the middle; while *L<sup>MS</sup>* (0.12), *L<sup>NS</sup>* (0.11), *L<sup>Ns</sup>* (0.16), *R<sup>2</sup>* (0.19), *P<sup>1</sup>* (0.10), *D<sup>i<sup>a</sup></sup>* (0.09) and *Gc<sup>2</sup>* (0.10) present values which are low in relation to previous studies. In accordance with the latter, all individuals were apparently homozygous for genes *k*, *Tf<sup>C</sup>*, *Hb<sup>A</sup>*, *Al<sup>A</sup>* and did not show *W<sup>r<sup>a</sup></sup>*. The presence of gene *I<sup>B</sup>* is due to two sibs issued from a marriage of an Indian with a mixed

Neo-Brazilian woman; that of  $r$  also indicates admixture, probably with the Bush Negroes of Surinam; more difficult to explain is the detection of  $r''$ , since it occurs mainly in Caucasians. The relative isolation of the Tiriyo makes the latter route of introduction likely for this gene, through previous White/Negro crosses.

Especially low values were obtained among the Tiriyo for the  $P^1$  and  $Ge^2$  markers. In relation to the former the difficulty of obtaining strictly comparable antisera makes hazardous any comparison of results from different laboratories (Gershowitz and Neel, 1965). However, the data for the group specific component are interesting, since its gene frequency can be estimated with reproducible methods and since only two South American Indian groups have been found with lower prevalences, the Peruvian Cashinahua (0.08—Johnston et al. 1969) and the Chipaya of Bolivia (0.07—Quilici et al. 1970).

With the exceptions noted above, the general pattern which emerges from this study does not differ much from those observed previously in other genetic surveys of South American Indians. This is in accordance with the dermatoglyphic data obtained from members of this tribe living in Surinam (Glanville and Geerdink, 1969) which also showed typical results. As a matter of fact, all the biological investigations mentioned in the introduction indicated that we are dealing with an essentially undisturbed Amerindian group. Further studies in similar tribal populations are important not only for the establishment of a meaningful taxonomy for the original inhabitants of our continent but also for the understanding of the main features of the genetic structure of populations living at this cultural stage.

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