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AFRICAN BLOOD GROUP MARKERS IN ETI-TURKS*

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Sickle cell hemoglobin (Hb S) in the white population is considered to be either African or Arabian in origin[1-3]. The studies related to blood group phenotypes, such as Fy (a-b-), Rh_o, hr^v and Js^a mostly favor the presence of an African admixture among the people with S hemoglobin[4-7].

Recently two papers have documented the presence of direct African blood group markers in some populations in Israel[8] and Sicily[9], where the prevalence of Hb S is frequent. Therefore some of the blood group markers frequently found in Africans were studied in the Eti-Turk population living in Southern Anatolia, in whom the frequency of Hb S is known to be high[10]. Although once they were not considered of African origin due to the low frequency of Rh_o phenotype[1,11], in our study on 87 Eti-Turks, the African admixture in these people is strongly supported by the high frequency of Fy (a-b-), Rh_o, Le (a-b-), P, Jk^a and a low prevalence of K antigen.

Material and Methods

Blood specimens were tested from 87 Eti-Turks, representing 18 families and some unrelated people, selected from a group previously examined for hemoglobin S and some other hemoglobinopathies in the Pediatric Hematology Department of Hacettepe University[12].

About 5 ml of clotted blood was obtained from each of the 87 persons, all living in Tarsus, a small city in Southern Anatolia, or nearby. The specimens were shipped to the Hacettepe Children's Hospital the same day. Using blood group anti-sera from Dade Reagent Inc. and from Gamma Biologicals, Houston, Texas, all the specimens were tested for M, N, S, s, Fy^a, Fy^b, Jk^a, Jk^b, K, k, Le^a, Le^b, and P antigens in addition to routine ABO and Rh phenotyping. All the tests were performed by standard tube methods, in accordance with the manufacturer's recom-

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mendations, and negative results were confirmed by microscopic examination. For the distribution of Rh_0 695; Jk^a, P, K, and Fy (a-b-) 150; and Le (a-b-) frequency 115, clotted blood samples were obtained from native Turks.

Results

Since Rh_0 and Duffy (a-b-) blood group phenotypes are the most reliable indicators of African ancestry[6,7], primarily these groups were evaluated in the study group people. Rh_0 phenotype was present in 6 (6.89%), and Fy (a-b-) in 7 (8.04%) of the 87 Eti-Turks; both were encountered in 13 (14.9%) of them (Table I). The frequencies of these blood groups in native Turks were 0.71% and 0% respectively, which were quite different from the study group. In addition, Le (a-b-) was shown in 17.3% of the study group and 0% in native Turks[13,14]. Fy (a-b-) and Le (a-b-) were both present in one patient with sickle-cell anemia who was also in our study group. The distributions of these phenotypes related to the presence of Hb S are shown in Table I.

TABLE I

Relationship of Specific Blood Group Phenotypes and Hemoglobin (Hb) Types in 87 Eti-Turks

Hb Types	Specific Blood Group Phenotypes			
	Fy (a-b-)	Rh_0	Le (a-b-)	Fy (a-b-) Le (a-b-)
SS	3/18 (16.6%)	3/8 (16.6%)	2/7 (28.6%)	1
SA	1/34 (2.9%)	3/34 (15.4%)	2/13 (15.4%)	—
AA	3/32 (9.4%)	0/35		—
Total	**7/87* (8.04%)**	**6/87 (6.89%)**	**4/23* (17.3%)**	

Fy (a-b-) in Rh_0
13/87 (14.9%)

* = Includes: 1 case of HbS-β-thalassemia
1 case of Δβ-thalassemia
1 case of Hb Hacettepe

P and Jk^a positive phenotypes were shown in 85 (97.8%) and 72 (92.3%) of the 87 people in the study group, while the K blood group was present only in 1 (1.1%) (Table II).

TABLE II

Comparison of Frequencies of Some Significant Markers Between Eti-Turks and Native Turks

Markers	Eti-Turks (%)	Native Turks (%)
Rh_o	6.89	0.71
Fy (a-b-)	8.04	0
Le (a-b-)	17.3	0
Jk^a	92.3	72.7
P_1	97.8	75.7
K	1.1	5.2

Discussion

Genes which are frequent in some races may be less frequent or rare in others; differences between Negroes and Caucasians are particularly marked. For example the phenotype Fy (a-b-) has been found in 90% of West African Negroes, and in 60% of American Negroes, but has not been encountered in Caucasians[15]. Rh_o phenotype is found in 50-90% of African clans and only 2-3% of Caucasians[16]. Therefore the presence of Rh_o (cDe) and Fy (a-b-) are considered to be diagnostic of African origin, and the combination of these markers without evidence of African ancestry has not been reported[7,17].

In our study the prevalence of Rh_o phenotype is at least 6.89%. Because of the inadequacies in the analysis of family pedigrees in the study group the differentiation between R_1r (CDe/cde) and R_1R_o (CDe/cDe) could not be done. Therefore in the analysis of the phenotypes only first guesses have been taken into consideration in our study. In addition to a high frequency of Rh_o blood groups among Eti-Turks, Fy (a-b-) phenotype was found to be much higher when compared with native Turks. When Rh_o and/or Fy (a-b-), which are considered to be specific for African genetic markers, are both taken into consideration, the Eti-Turk population appears to have African origins. Unfortunately, saliva studies for Le (a-b-) people could not be performed since the people live some distance from Ankara.

There are some additional blood group specificities that are significant in supporting the above belief for this population. It is known that P_1 antigen positivity occurs in more than 95% of West Africans while negativity in Caucasians varies from 18 to 30%[13]. P_1 antigen was present in 97.8% of the Eti-Turks, as in West Africans, but it was present in less than 76% of the native Turkish population (Table II). The prevalence of Jk^a antigen in Negroes is very high, being about 95% in West Africans[18].

The frequency of this antigen in Eti-Turks (92.3%) was found to be much higher than in the native Turks (72.7%). K antigen, which is almost absent or very rare in Africans[19], was also shown to be rare (1.1%) in Eti-Turks compared with native Turks (5.2%).

Aksoy et al[1] reported previously that both Turks and Eti-Turks living around Mersin share the blood group characteristics of the people of southern and eastern Europe, rather than of Asia, and African blood group markers were apparently absent. The Rh_o results were low in their study, but they tested the specimens only for the antigen Fy^a, which showed that Fy (a-) frequency in Eti-Turks is higher than in native Turks. Since anti-Fy^b had not been used in that study, the necessary data about the presence of Fy (a-b-) phenotype in these people are not available.

The results of African blood group markers from Israel[8] and Sicily[9] are given comparatively with our findings in Table III. The evidence of African admixture is stronger in Eti-Turks than in the people studied in Sicily. All these studies may indicate that Hb S around the Mediterranean basin originated from Africa. They also illustrate once more the importance of blood group anthropology in the study of Hb S, in populations and in individuals without physical or known historical evidence of African ancestry.

TABLE III

Percentages of African Blood Group Markers Fy (a-b-) and Rh_o in Israel, Sicily and Eti-Turks

	Fy (a-b-)	Rh_o	Number	Total %
Israel (Hulah Valley, Acre)	62%	7%	132	68
Sicily	1.5%	4.6%	64	6.2
Turkey (Eti-Turks)	8.04%	6.89%	87	14.9

In conclusion, the presence of phenotypes Fy (a-b-) and Rh_o in Eti-Turks, which are completely absent or very rare in the native populations of Turkey, strongly suggest direct African admixture of this population. In addition, the presence of phenotype Le (a-b-) and significant differences in the frequencies of some African markers between Eti-Turk and native Turkish populations, support the above conclusion.

Summary

Blood group phenotypes Fy (a-b-) and Rh_o, which are considered to be specific African genetic markers, have been sought in 87 Eti-Turks. Overall prevalence of

Fy (a-b-) and Rh_0 has been found to be 14.9%. This finding, completely different from that of the general population, documents the African admixture in this ethnic group.

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