

Haptoglobins, Transferrins, and Hemoglobin B₂ in Indonesians

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Although surveys on haptoglobins and transferrins have been carried out and gene frequencies determined for various areas in Southeast Asia, we know of no available data on frequencies of different haptoglobin and transferrin types in Indonesians. Abnormal hemoglobins have been studied extensively in Indonesia but only by means of paper electrophoresis, which is incapable of detecting some of the abnormal hemoglobins. Thus we carried out a preliminary study in Djakarta using starch-gel electrophoresis to detect hemoglobin variants as well as to determine the haptoglobin and transferrin phenotypes.

MATERIAL AND METHODS

Blood samples were obtained from a total of 459 persons, 368 Indonesians (275 males and 93 females) and 91 Indonesian Chinese (62 males and 29 females). Of these, 406 were students from various areas of Indonesia (mostly from West Java) who were studying in Djakarta, and a few were doctors who studied in San Francisco. Fifty-three were patients admitted to the surgical wards in the General Hospital, Djakarta. For haptoglobin and transferrin study, the serum was obtained from clotted blood. For hemoglobin study, the blood was preserved in acid-citrate-dextrose-inosine. All blood and serum samples were packed in ice and immediately air-shipped to San Francisco.

To determine haptoglobin types, we used the method of discontinuous starch-gel electrophoresis (Smithies, 1959); in one serum sample in which haptoglobin was not detected the sample was run more than three times to confirm the finding. We used benzidine to stain the hemoglobin-haptoglobin complex, and transferrin types were determined on the supernatant of serum treated with rivanol as developed by Sutton (Matson *et al.*, 1966). For study of abnormal hemoglobins, hemolyzates prepared by lysing washed erythrocytes in water and toluene were subjected to starch-gel electrophoresis using tris-EDTA-borate buffer, pH 8.6, and stained with *o*-dianisidine.

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RESULTS AND DISCUSSION

Haptoglobins

In 393 sera examined Hp 1-1 was found in 32, Hp 2-1 in 158, and Hp 2-2 in 202; no haptoglobin was detected in one. The person without detectable haptoglobin was a Chinese-Indonesian student who, as far as we know, was healthy at the time of study. The gene frequencies for $H\phi^1$ and $H\phi^2$ for the whole group (excluding the one who was haptoglobin-negative) were, respectively, 0.28 and 0.72. The phenotype frequencies of the different groups are listed in Table 1. The gene frequency for $H\phi^1$ is within the range found in different areas in Southeast Asia, reportedly between 0.23 and 0.29 (Barnicot, 1961).

Transferrins

Of 393 sera examined, 370 contained Tf C only; in 21 samples, a slower-migrating variant was found in addition to Tf C. In two of these samples sent to Dr. H. E. Sutton of the University of Texas, the transferrin was identified as Tf D_{Chi}. One additional sample contained only Tf D_{Chi} and another had a Tf D definitely slower than Tf D_{Chi}. It resembled Tf D₃, but electrophoretically it was very slightly faster. This variant is tentatively designated Tf D Indonesia until positive structural identity is established. The gene frequencies for Tf^c and $Tf^{D_{Chi}}$ are, respectively, 0.92 and 0.08.

Abnormal Hemoglobins

Of the 454 blood samples examined for abnormal hemoglobins, 16 (3.7%) contained Hb E. This frequency for Hb E is somewhat higher than the 2.5% previously reported (Lie-Injo, 1959) for West Javanese (Sudanese) but was lower than the 4.5% reported for East and Central Javanese (Lie-Injo, 1959). Our results may reflect the fact that many persons examined originated in East and Central Java and came to Djakarta to study.

The blood of four persons had a hemoglobin component that was more cathodic than Hb A₂. In these instances, the Hb A₂ component was smaller than usually found in normal samples. The slow-moving abnormal component therefore probably contained a delta-chain variant. All four carriers of this variant originated from Sumatra (in a total of 84 Sumatrans examined in this survey). The slow-moving component had the same electrophoretic mobility as Hb B₂ in tris-EDTA-borate buffer, pH 8.6, and in tris-borate buffer, pH 9.5, and is therefore designated as Hb B₂. However, Hb B₂, a mutant of Hb A₂, is characteristic of Negroes, and Negro traits are rare in Indonesia. For example, in 5,600 Indonesians examined for abnormal hemoglobins, only two had Hb S (Lie-Injo, 1959). Therefore, the Hb B₂ may not be identical in Indonesians and in Negroes, even though its electrophoretic mobility is the same. Structural and immunological studies are in progress, and preliminary results indicate that the Hb B₂ from Indonesia differs from the Hb B₂ found in Negroes. Pending final results of these studies, we suggest that this abnormal hemoglobin type be designated as Hb B₂ Indonesia. Because all four examples of Hb B₂ Indonesia were found among 84 Sumatrans examined, it seems probable that the frequency of this mutant is higher in Sumatra. Arrangements, therefore, are being made to carry out a more extensive

TABLE 1
HAPTOGLOBINS, TRANSFERRINS, AND HEMOGLOBIN TYPES IN INDONESIANS

RACIAL GROUP	HAPTOGLOBIN PHENOTYPES*				TRANSFERRINS				HEMOGLOBIN TYPES				
	N Ex- amined	1-1	2-1	2-2	N Ex- amined	C	CD _{Chi}	D _{Chi}	CD _{Indonesia}	N Ex- amined	A+A ₂	A+E	A+A ₂ +B ₂
Indonesians.....	307	26	130	151	308	290	16	1	1	363	343	16	4
Indonesian Chinese.....	85	6	28	51	85	80	5	0	0	91	91	0	0
Total.....	392	32	158	202	393	370	21	1	1	454	434	16	4

* Excluding one sample not containing haptoglobin.

survey on hemoglobins by starch-gel electrophoresis in Sumatra to determine the frequency of this hemoglobin in different areas of the Island.

SUMMARY

Surveys on haptoglobins, transferrins, and hemoglobins by starch-gel electrophoresis were carried out on Indonesians. In 392 sera examined, the gene frequencies for $H\beta^1$ and $H\beta^2$ were, respectively, 0.28 and 0.72. In 393 sera studied for transferrins, 370 were classified as Tf C, one as Tf D_{Chi}, and 21 as Tf CD_{Chi}. One sample had a slow-moving transferrin, tentatively designated Tf D Indonesia, combined with Tf C. In 454 blood samples examined for hemoglobin, 16 contained Hb E in addition to normal Hb A and four showed a small hemoglobin component with an electrophoretic mobility similar to Hb B₂. It is suggested that this hemoglobin be designated Hb B₂ Indonesia.

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