THE DISTRIBUTION OF RED CELL ACID PHOSPHATASE TYPES IN AICHI PREFECTURE

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ABSTRACT

Polymorphism of red cell acid phosphatase types was examined among 573 unrelated residents of Aichi Prefecture. The phenotypic distribution obtained agreed well with the genetic hypothesis. No phenotypes associated with the allele P^c were detected. The frequency of P^a gene in Aichi Prefecture was estimated to be 0.209, which is very similar to those observed in other districts of Japan.

Hopkinson *et al.*[1),2)] first described a genetically determined polymorphism of acid phosphatase of human red cells. They demonstrated five of six possible phenotypes of red cell acid phosphatase, two homozygotes (A and B) and three heterozygotes (BA, CA and CB) by starch gel electrophoresis and postulated the occurrence of three codominant alleles P^a, P^b and P^c at an autosomal locus. Their hypothesis was subsequently confirmed by the finding of the sixth phenotype, homozygous C.[3)] Since the discovery of red cell acid phosphatase polymorphism, the incidence of the phenotypes and the estimates of the gene frequencies have been widely studied in different racial and geographical populations throughout the world,[4)] and it has been found that in the Japanese or even in most Mongoloid populations the P^c gene appears almost completely lacking and only three common phenotypes are observable.[5)] This short communication reports the results of our examination on the distribution of red cell acid phosphatase types among 573 unrelated healthy individuals in Aichi Prefecture.

Blood samples were collected from the Blood Center of Nagoya Red Cross. Hemolysates were prepared by adding one volume of distilled water to one volume of washed red cells, followed by sedimentation of the stromata. Acid phosphatase was separated by means of horizontal starch gel electrophoresis according to the method of Karp and Sutton,[6)] using the citrate-phosphate buffer system (pH 5.9) and 10 % Starch-Hydrolysed (Connaught, Toronto, Canada). Electrophoresis was carried out at a potential gradient of 25 V at 4°C for 18 hours. After the electrophoresis, the gel was horizontally sliced and stained by the original method of Hopkinson *et al.*,[2)] using sodium phenolphthalein

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diphosphate as substrate.

Table 1 shows the distribution of red cell acid phosphatase types obtained from the present samples. All were easily classified into one of the three usual phenotypes A, BA and B. From the data, the gene frequencies of P^a and P^b are estimated as 0.209 and 0.791, respectively. We detected no phenotypes associated with the allele P^c. The observed numbers are in good agreement with the numbers expected on the basis of Hardy-Weinberg equilibrium ($\chi^2 = 1.569$; d.f. = 1; $0.3 > P > 0.2$). The value of P^a gene frequency is very similar to the value previously estimated in the population of Nagoya ($P^a = 0.201$) [7] as well as the mean value in the Japanese population ($P^a = 0.2134$).[5] The virtual lack of the allele P^c in Japan as suggested by previous workers[4] has been further confirmed by the present study.

Table 1. Distribution of red cell acid phosphatase types in Aichi Prefecture

Phenotype	Observed		Expected		Chi square
	No.	%	No.	%	
A	30	5.2	25	4.4	1.000
BA	180	31.4	190	33.1	0.526
B	363	63.4	358	62.5	0.070
Total	573	100.0	573	100.0	1.569

Gene frequencies: $P^a = 0.209$; $P^b = 0.791$
$\chi^2 = 1.596$; d.f. = 1; $0.3 > P > 0.2$

REFERENCES

1) Hopkinson, D. A., Spencer, N. and Harris, H., Red cell acid phosphatase variants: a new human polymorphism. *Nature (Lond.)*, **199**, 969. 1963.
2) Hopkinson, D. A., Spencer, N. and Harris, H., Genetical studies on human red cell acid phosphatase. *Amer. J. Human Genet.*, **16**, 141, 1964.
3) Lai, L., Nero, S. and Steinberg, A. G., Acid phosphatase of human red cells: predicted phenotype conforms to a genetic hypothesis. *Science*, **145**, 1187, 1964.
4) Giblett, E. R., *Genetic Markers in Human Blood*, Blackwell Scientific Publications, Oxford and Edinburgh, 1969, p.424.
5) Ishimoto, G., Kuwata, M. and Kubota, S., Red cell enzyme polymorphism in Japanese populations: a study on distribution of the phenotypes and forensic use in paternity cases. *Jap. J. Legal Med.* 27, 134, 1973 (Japanese with English summary).
6) Karp Jr., G. W. and Sutton, H. E., Some new phenotypes of human red cell acid phosphatase. *Amer. J. Human Genet.*, **19**, 54, 1967.
7) Shinoda, T. and Matsunaga, E., Studies on polymorphic types of several red cell enzymes in a Japanese population. *Jap. J. Human Genet.*, **15**, 133, 1970.