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SHORT COMMUNICATION

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Evaluation of 7 DNA markers (D1S80, HLA-DQα, LDLR, GYPA, HBGG, D7S8 and GC) in a Japanese population

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Abstract A Japanese population was tested for the 7 DNA markers D1S80, HLA-DQα, low-density lipoprotein receptor (LDLR), glycophorin A (GYPA), hemoglobin G gammaglobin (HBGG), D7S8 and group specific component (GC). Each of these 7 markers was found to be useful for paternity testing and individual identification in a Japanese population.

Key words D1S80 · D7S8 · GC · GYPA · HBGG · HLA-DQα · LDLR

Introduction

Electrophoretic polymorphism D1S80 (Budowle et al. 1991) and reverse dot blot polymorphism HLA-DQα (Comey et al. 1993) and the 5 marker systems LDLR, GYPA, HBGG, D7S8 and GC (Herrin et al. 1994) were tested in a Japanese population to provide more data for forensic applications.

Materials and methods

Blood samples were from unrelated volunteers living in Gunma Prefecture. After extraction (Sambrook et al. 1989) typing of the D1S80 was carried out using an AmpliFLP D1S80 PCR kit (Perkin Elmer, Norwalk, CT) followed by polyacrylamide gel electrophoresis and silver staining. Typing of HLA-DQα and the other five markers (LDLR, GYPA, HBGG, D7S8 and GC) was performed using AmpliType HLA-DQα and AmpliType PM PCR amplification and typing kits (Perkin Elmer).

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Results and discussion

A total of 26 alleles were observed (Table 1) with sizes ranging from 14 to ≧ 42 repeats. Alleles 18, 24, 28 and 30 were common (Table 1) respectively. We observed a new

Table 1 Distribution of D1S80 alleles in a Japanese population

Allele	Japanese (n = 320)	χ^2 test[a] in this study
14	0.002	
15	0.000	
16	0.033	
17	0.025	
18	0.155	
19	0.013	
20	0.027	
21	0.020	
22	0.011	$\chi^2 = 0.619$
23	0.002	(df = 5)
24	0.198	$0.99 > P > 0.98$
25	0.013	
26	0.006	
27	0.052	
28	0.111	
29	0.031	
30	0.161	
31	0.088	
32	0.011	
33	0.009	
34	0.003	
35	0.003	
36	0.008	
37	0.005	
38	0.000	
39	0.002	
40	0.002	
41	0.000	
≧ 42	0.013	

[a] Twenty-nine alleles were classified into three groups, I (alleles 14–23, 0.287), II (allele 24, 0.197), III (alleles 25–≧ 42, 0.516)

Table 2 Distribution of HLA-DQα alleles in a Japanese population

Allele	Japanese (n = 110)	χ^2 test in this study
1.1	0.127	
1.2	0.164	
1.3	0.227	$\chi^2 = 6.053$
2	0.005	(df = 6)
3	0.354	$0.5 > P > 0.3$
4	0.123	

Table 3 Distribution of LDLR, GYPA, HBGG, D7S8 and GC alleles in a Japanese population

Allele		Japanese (n = 74)	χ^2 test in this study
LDLR	A	0.162	$\chi^2 = 0.061$ (df = 2)
	B	0.838	$0.99 > P > 0.98$
GYPA	A	0.595	$\chi^2 = 0.773$ (df = 2)
	B	0.405	$0.5 > P > 0.3$
HBGG	A	0.311	$\chi^2 = 4.422$ (df = 2)
	B	0.689	$0.2 > P > 0.1$
	C	0.000	
D7S8	A	0.608	$\chi^2 = 2.708$ (df = 2)
	B	0.392	$0.3 > P > 0.2$
GC	A	0.284	$\chi^2 = 3.339$ (df = 5)
	B	0.473	$0.5 > P > 0.3$
	C	0.243	

allele, which probably had ≧ 42 repeats. The heterozygosity was 88.3%. Several laboratories have found similar results (e.g. Sugiyama et al. 1993; Nagai et al. 1994). Several rare alleles with over 42 repeats have been reported (Sugiyama et al. 1993; Klintschar et al. 1995; Sepulchre et al. 1995). The allele and genotype frequencies of HLA-DQα in DNA samples derived from 110 unrelated subjects were determined (Table 2). The heterozygosity of HLA-DQα was 76.5%. The frequencies of HLA-DQα alleles 3 and 1.3 were higher than that of allele 2 similar to previous reports (Helmuth et al. 1990; Tamaki et al. 1991).

The five systems LDLR, GYPA, HBGG, D7S8 and GC (Table 3) showed heterozygosities of 27.2%, 48.2%, 42.9%, 47.7% and 63.7%, respectively. All donors with GC phenotypes 2, 2–1F, 2–1S, 1F, 1F-1S and 1S, which were determined from serum samples by isoelectric focusing electrophoresis on polyacrylamide gels (IEF-PAGE), showed genotypes AA, AB, AC, BB, BC and CC, respectively. However, genotype B as determined using the PM kit contained four phenotypes 1A2 as determined by IEF-PAGE. GC*1A2 was observed in 1–2% of a Japanese population, but the PM kit may be unable to discriminate GC*1A2 and *1F.

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