

FOR THE RECORD

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A Hemizygous Repeat Polymorphism of One STR in Four Population Groups of South India

POPULATION: The allele frequencies have been analyzed at one Short tandem repeat (STR) locus, 3' to the phosphoglycerate kinase (PGK) gene located within Xq11–Xq13 among four anthropologically distinct ethnic groups of South India namely Ezhavas, Nairs, Arayas and Muslims. Muslims are religio-ethnic group while other populations mentioned above belong to distinct section of Hindu religion. All these populations are from Kollam district of Kerala in South India and speak Malayalam, an Indo-Dravidian language. A total of 174 random, healthy individuals for PGK microsatellite were analyzed.

KEYWORDS: forensic science, DNA typing, Indian population, short tandem repeat (STR), hemizygous repeat, PGK, Microsatellite, population genetics

DNA was extracted using rapid, non-enzymatic precipitation method (1).

PCR amplification was carried out using locus specific primers (2), in Eppendorf™ Gradient Master Cycler. The forward primer was fluorescently labeled using Cy5 dye amidite. The amplified products were analyzed on 6% denaturing Polyacrylamide gel containing 7M urea, using Alf Express DNA Fragment Analyzer

(Amersham Pharmacia Biotech). Analysis was carried out using Fragment Analyser software (3) In addition to external standard (107, 228 and 395 bps), internal standards were also used in each lane of the gel to avoid any lane to lane variation.

Allele frequencies and heterozygosities (of females) were calculated using software Popgene ver 1.31 (4). The Polymorphism Information Content (PIC) was calculated as per Bolstein et al. (5) and Power of Discrimination (PD) as mentioned by Fisher (6).

Allele frequencies of Ezhavas and Nairs for PGK microsatellite locus are presented in Table 1 and for Arayas and Muslims in Table 2. Among 174 individuals, a total of eleven distinct alleles

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TABLE 1—Allele-frequency distribution at PGK microsatellite locus in Ezhavas and Nairs populations.

Allele (Repeats)	Ezhavas (n = 98)		Nairs (n = 44)	
	Male (n = 30)	Female (n = 68)	Male (n = 14)	Female (n = 30)
6	...	n.d	0.02 (1)	...
8	...	n.d	...	n.d
9	...	n.d	0.09 (6)	...
9.2	0.10 (3)	...	n.d	...
10	...	n.d	0.06 (4)	0.21 (3)
11	0.17 (5)	0.12 (8)	0.21 (3)	0.27 (8)
12	0.33 (10)	0.31 (21)	0.44 (6)	0.33 (10)
13	0.27 (8)	0.23 (16)	...	n.d
14	0.07 (2)	0.06 (4)	0.07 (1)	0.07 (2)
15	0.03 (1)	0.04 (3)	0.07 (1)	...
16	0.03 (1)	0.07 (5)	...	n.d
h		0.82		0.72
H		0.65		0.60
Exact test		0.274		0.72
PIC	0.81	0.79	0.95	0.80
PD	0.99	0.91	0.95	0.87

n: No of Chromosomes; h: Expected Heterozygosity; H: Observed Heterozygosity; PIC: Polymorphism Information Content; PD: Power Of Discrimination. Number in the parenthesis denotes observed number of each allele.

TABLE 2—Allele frequency distribution at PGK microsatellite locus in Arayas and Muslims Populations.

Allele (Repeats)	Arayas (n = 50)		Muslims (n = 74)	
	Male (n = 16)	Female (n = 34)	Male (n = 22)	Female (n = 52)
6	...	n.d.	...	n.d.
8	...	n.d.	...	n.d.
9	...	n.d.	0.03 (1)	...
9.2	...	n.d.	0.03 (1)	0.09 (2)
10	...	n.d.	0.26 (9)	0.09 (2)
11	0.19 (3)	0.03 (1)	0.22 (5)	0.29 (15)
12	0.31 (5)	0.35 (12)	0.27 (6)	0.38 (20)
13	0.25 (4)	0.12 (4)	0.14 (3)	0.02 (1)
14	0.19 (3)	0.06 (2)	0.05 (1)	0.04 (2)
15	0.06 (1)	0.09 (3)	0.09 (2)	0.08 (4)
16	...	n.d.	0.03 (1)	...
h		0.79		0.74
H		0.65		0.64
Exact test		0.84		0.47
PIC	0.80	0.81	0.84	0.77
PD	0.96	0.89	0.98	0.88

n: No of Chromosomes; h: Expected Heterozygosity; H: Observed Heterozygosity; PIC: Polymorphism Information Content; PD: Power of Discrimination. Number in the parenthesis denotes observed number of each allele.

were observed, including ten based on the variation in terms of number of TATC repeats. Twelve repeat allele was found predominant in all four populations namely Ezhavas, Nairs, Arayas and Muslims in both male and female populations. The Expected and Observed heterozygosity did not show any significant difference at this STR locus for females. Alleles for all four populations were in Hardy Weinberg Equilibrium for female population samples. High PIC ranging from 0.77 to 0.95 and PD value of this STR ≥ 0.87 showed this marker is informative and can be used for forensic DNA genotyping and Paternity Testing.

Access to data: Via electronic mail from Communicating author.

References

1. Lahiri K, Numberger JL. A rapid non enzymatic method for the preparation of HMW DNA from blood for RFLP studies. *Nucleic Acid Res* [PubMed] 1991;19:5444.
2. Riley DE, Cho R, Krieger JN. [A hemizygous short tandem repeat polymor-](#)

- [phism 3' to the human phosphoglycerate kinase gene](#). *Molecular biology reports* 1999;26:159–65. [PubMed]
3. Fragment Analyser Software ver 1.0 U. K: Amersham Pharmacia Biotech, 1998.
4. Yeh FC, Yang R, Boyle T. Popgene ver 1.31. Microsoft Window-based Freeware for population genetic analysis. University of Ulberta and Centre for International Forestry Research, August 1999.
5. Bostein D, White RL, Skolnick M, Davis RW. Construction of genetic linkage map in man using restriction fragment length polymorphism. *Am J Hum Genet* 1980;32:314–31.
6. Fisher R. Standard calculation for evaluating a blood group system. *Heredity* 1951;5:95–102. [PubMed]

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