FOR THE RECORD

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Allele Frequency Distribution at Five Y-Chromosomal Short Tandem Repeat Loci Among Five Distinct Ethnic Groups of India

POPULATION: We have analyzed the distribution of allele frequencies at five Y-chromosomal short tandem repeat (STR) loci (DYS19, DYS389I, DYS389II, DYS391 and DYS393) among five anthropologically distinct ethnic groups of India, namely, Konkanasthas, Marathas, Nairs, Ezhavas and Muslims. Konkanasthas and Marathas belong to the state of Maharashtra in Western India and both the population groups speak "Marathi", an Indo-European language. Nairs, Ezhavas and Muslims belong to Kollam district of Kerala state in South India and all the three population groups speak "Malayalam", an Indo-Dravidian language. About 220 random, healthy and normal male volunteers were studied at these loci.

KEYWORDS: forensic science, Y-chromosomal STRs, DYS19, DYS389I, DYS389II, DYS391, DYS393, allele frequency, Indian population

Genomic DNA was extracted using a rapid non-enzymatic method (1). The PCR primers and the parameters for PCR amplification of all the five Y-chromosomal STRs were as described by Kayser et al. (2) and de Knijff et al. (3). The forward primer of each locus was labeled with flourescent CY5™ dye amidite (Amersham Pharmacia Biotech) and PCR was carried out in a Hybaid™ thermal cycler using Taq polymerase (Roche Molecular Biochemicals). Amplimers were electrophoresed in 6% denaturing urea gel (7M) and analyzed by fragment manager using ALF Express DNA Sequencer (Amersham Pharmacia Biotech). Internal ladders were used for the accurate size determination. Allelic ladders were prepared for each locus and used as external standards in addition to CY5™ labelled 50 to 500 bp DNA ladder (Amersham Pharmacia Biotech). At each locus, the amplimers were compared with the standards, kindly supplied by Dr. Chris Tyler-Smith from Oxford University, Oxford, UK, for confirmation.

Access to Data—Via electronic mail from communicating author, Birajalaxmi Das, M. Phil, msesh@apsara.bare.ernet.in.

Analysis of Data—Allele frequencies and gene diversities were calculated by using the software ARLEQUIN ver. 1.1 (4). The nomenclature of the allele sizes were as described by Kayser et al. (2) except for DYS389I and DYS389 II, which was according to Cooper et al. (5).

Allele frequencies and the gene diversities observed at five Y-chromosomal STRs among Konkanasthas, Marathas, Nairs, Ezhavas, and Muslims are given in Tables 1 to 5, respectively. At DYS19 locus, the predominant allele was found to be allele 15 in all the groups except Ezhavas where allele 14 was predominant. At DYS389I and DYS39I loci, the predominant allele was allele 10 among all the five population groups. At DYS389II locus, allele 16 was observed to be predominant among Konkanasthas, allele 17 was among Marathas, Nairs, and Ezhavas and allele 18 was among Muslims. At DYS393 locus, allele 12 was predominant among Konkanasthas, Nairs, and Muslims whereas allele 11 was found to be predominant among Marathas and Ezhavas. Highest gene diversity was observed at DYS389II locus and the lowest at DYS391 across all the five Indian population groups.

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TABLE 1—*Allele frequency distribution at five Y-chromosomal STRs among Konkanasthas.*

Allele (repeats)	DYS19 ($N = 52$)		DYS389I ($N = 41$)		DYS389II ($N = 41$)		DYS391 ($N = 40$)		DYS393 ($N = 42$)	
	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq
8	…	…	4	0.098	…	…	…	…	…	…
9	…	…	9	0.220	…	…	…	…	…	…
10	…	…	23	0.561			28	0.700	9	0.214
11	…	…	5	0.122	…	…	12	0.300	8	0.190
12	…	…	…	…	…	…	…	…	20	0.476
13	…	…	…	…	…	…	…	…	5	0.119
14	11	0.212	…	…	…	…	…	…	…	…
15	22	0.423	…	…	5	0.122	…	…	…	…
16	17	0.327	…	…	17	0.415	…	…	…	…
17	2	0.038	…	…	9	0.220	…	…	…	…
18	…	…	…	…	7	0.171	…	…	…	…
19	…	…	…	…	3	0.073	…	…	…	…
Gene diversity	0.66		0.65		0.73		0.42		0.68	

No. Obs. = Number of alleles observed, Freq = frequency.

TABLE 2—*Allele frequency distribution at five Y-chromosomal STRs among Marathas.*

Allele (repeats)	DYS19 ($N = 83$)		DYS389I ($N = 61$)		DYS389II ($N = 57$)		DYS391 ($N = 52$)		DYS393 ($N = 60$)	
	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq
8	…	…	…	…	…	…	…	…	…	…
9	…	…	17	0.279	…	…	…	…	…	…
10	…	…	36	0.590	…	…	46	0.885	3	0.050
11	…	…	8	0.131	…	…	6	0.115	24	0.400
12	…	…	…	…	…	…	…	…	19	0.317
13	1	0.012	…	…	…	…	…	…	14	0.233
14	16	0.193	…	…	1	0.018	…	…	…	…
15	39	0.470	…	…	4	0.070	…	…	…	…
16	19	0.229	…	…	17	0.298	…	…	…	…
17	8	0.096	…	…	18	0.316	…	…	…	…
18	…	…	…	…	9	0.158	…	…	…	…
19	…	…	…	…	8	0.140	…	…	…	…
Gene diversity	0.68		0.56		0.76		0.20		0.68	

No. Obs. = Number of alleles observed, Freq = frequency.

TABLE 3—*Allele frequency distribution at five Y-chromosomal STRs among Nairs.*

Allele (repeats)	DYS19 ($N = 22$)		DYS389I ($N = 24$)		DYS389II ($N = 22$)		DYS391 ($N = 22$)		DYS393 ($N = 22$)	
	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq
9	…	…	4	0.167	…	…	…	…	…	…
10	…	…	16	0.667	…	…	17	0.772	2	0.091
11	…	…	4	0.167	…	…	5	0.228	6	0.273
12	…	…	…	…	…	…	…	…	11	0.500
13	1	0.045	…	…	…	…	…	…	3	0.136
14	3	0.136	…	…	…	…	…	…	…	…
15	14	0.636	…	…	1	0.045	…	…	…	…
16	2	0.091	…	…	5	0.227	…	…	…	…
17	2	0.091	…	…	8	0.364	…	…	…	…
18	…	…	…	…	7	0.318	…	…	…	…
19	…	…	…	…	1	0.045	…	…	…	…
Gene diversity	0.56		0.52		0.71		0.35		0.65	

No. Obs. = Number of alleles observed, Freq = frequency.

TABLE 4—*Allele frequency distribution at five Y-chromosomal STRs among Ezhavas.*

Allele (repeats)	DYS19 (N = 37)		DYS389I (N = 40)		DYS389II (N = 37)		DYS391 (N = 37)		DYS393 (N = 37)	
	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq
9	…	…	5	0.125	…	…	…	…	…	…
10	…	…	29	0.725	…	…	30	0.811	6	0.162
11	…	…	6	0.150	…	…	7	0.189	14	0.378
12	…	…	…	…	…	…	…	…	13	0.351
13	0	0.0	…	…	…	…	…	…	4	0.108
14	15	0.406	…	…	3	0.081	…	…	…	…
15	10	0.270	…	…	3	0.081	…	…	…	…
16	11	0.297	…	…	8	0.216	…	…	…	…
17	1	0.027	…	…	9	0.243	…	…	…	…
18	…	…	…	…	8	0.216	…	…	…	…
19	…	…	…	…	6	0.162	…	…	…	…
Gene diversity	0.67		0.44		0.81		0.31		0.70	

No. Obs. = Number of alleles observed, Freq = frequency.

TABLE 5—*Allele frequency distribution at five Y-chromosomal STRs among Muslims.*

Allele (repeats)	DYS19 (N = 27)		DYS389I (N = 28)		DYS389II (N = 27)		DYS391 (N = 27)		DYS393 (N = 27)	
	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq	No. Obs.	Freq
9	…	…	5	0.179	…	…	…	…	…	…
10	…	…	18	0.643	…	…	23	0.852	…	…
11	…	…	5	0.179	…	…	4	0.148	8	0.296
12	…	…	…	…	…	…	…	…	13	0.481
13	0	0.0	…	…	…	…	…	…	6	0.222
14	8	0.296	…	…	1	0.037	…	…	…	…
15	12	0.444	…	…	2	0.074	…	…	…	…
16	5	0.185	…	…	5	0.185	…	…	…	…
17	2	0.074	…	…	7	0.259	…	…	…	…
18	…	…	…	…	9	0.333	…	…	…	…
19	…	…	…	…	3	0.111	…	…	…	…
Gene diversity	0.68		0.48		0.77		0.25		0.63	

Obs. No. = Observed number of alleles, Freq = frequency.