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FOR THE RECORD

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Haplotype Frequencies of Eight Y-Chromosome Short Tandem Repeats Loci in Four Amerindian Populations (State of Hidalgo, Mexico)

POPULATION: Amerindian populations: Huastecos ($n = 97$), Otomies de la Sierra ($n = 41$), Otomies del Valle ($n = 40$), and Tepehuas ($n = 13$).

KEYWORDS: forensic science, DNA typing, population genetics, Hidalgo State, Mexico, Huastecos, Otomies, Tepehuas, DYS19, DYS385, DYS389 I/II, DYS390, DYS391, DYS392, DYS393

The Huasteco population lives in "La Huasteca," an area located in Sierra Madre Oriental in Hidalgo State (Northeast Mexico) (1).

Two different Otomi Amerindian population groups were studied. One group lives in Sierra Madre Oriental and the other lives in Ixmiquilpan Valley. They consider themselves to be of different origins (1).

The Tepehua population comprises of around 2000 individuals located in northeast Hidalgo (Huehuetla). They share the state with other Amerindian ethnic groups: Otomies, Nahuas, and Totonacas. However, despite sociopolitical pressures, the Tepehua population preserves its culture, language, and even appearance. There are very few marriages with people from other ethnic groups (Universidad Veracruzana, Arte popular Tepehua http://www.uv.mx/popularte). It is for this reason that the sample size for this population is so small (only 13 individuals).

The aim of this study is to report a haplotype frequency database for DYS19, DYS385, DYS389 (I and II), DYS390, DYS391, DYS392, and DYS393 loci, useful for forensic genetic diagnosis. The establishment of well-defined local databases is essential for using Y-chromosomal short tandem repeats (STR) in forensic routine practice (2–5). The results could also be useful for anthropology studies.

DNA was extracted from hair samples from healthy unrelated individuals (males) living in Hidalgo State. PCR amplifications were carried out following the recommendations for the Y-PLEX5™ and Y-PLEX6™ kits (Reliagene, New Orleans, LA). Our laboratory has successfully passed Reliagene quality control. Genotypes from DNA amplified products were analyzed in capillary gel electrophoresis using an ABI Prism™ 310 Genetic Analyser device (Applied Biosystems, Foster City, CA) (6). Alleles were scored following the nomenclature described by Kayser et al. (7) based on the number of repeat units, according to the recommendations of the International Society for Forensic Genetics (8,9).

The gene diversity (10,11) and the discrimination capacity were calculated using the SPSS 11.0 program.

More than two alleles per locus at the DYS385 Y-STR have been observed in two individuals (Tables 1 and 3). We have duplicated the typing of this polymorphism using manual methods, which have, like the Reliagene kits, passed the GEDNAP quality controls since 2001 for Y-STR, to be able to remove any possibility of error. This observation is in concordance with the Y-HRD database results (http:/www.yhrd.org) as well as recent articles that describe the existence of triallelic patterns for this marker (12).

As shown in Tables 1–4, complete eight Y-chromosomal STR haplotypes could be obtained for 192 individuals (Huastecos $n = 97$; Otomies Valle $n = 40$; Otomies Sierra $n = 41$ and Tepehuas $n = 13$).

From a forensic point of view, the theoretical values obtained (Table 5) revealed that the eight combined systems have a high diagnostic efficiency. The Tepehua results agree with this group's cultural differences. It could be more informative to raise the Tepehua sample size, trying to type more male unrelated individuals. However, in practice, this is very difficult because the small closed population leads to high rates of endogamy.

The complete data are available by accessing http://www.ub.edu/spublica/legal/database.html

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TABLE 1—*Y-chromosomal short tandem repeats (STR) haplotypes from 97 Huastecos individuals (n, number of subjects).*

n	DY S19	DYS 385	DYS 389I	DYS 389II	DYS 390	DYS 391	DYS 392	DYS 393
1	13	12–16	14	32	22	8	11	13
1	13	13–15	13	30	24	10	15	13
1	13	13–16	14	31	22	10	13	13
1	13	13–17	13	30	25	10	13	13
1	13	14–14	13	32	24	10	16	13
1	13	14–14	14	33	24	10	15	14
1	13	14–15	13	31	24	10	16	13
1	13	14–16–17	13	29	25	10	14	14
1	13	14–16	13	29	22	10	15	13
1	13	14–16	13	29	24	10	14	13
1	13	14–17	12	28	23	10	13	14
1	13	14–17	13	29	24	10	16	13
1	13	14–17	13	30	25	10	14	13
3	13	14–17	13	31	25	10	14	13
1	13	14–17	14	32	24	10	14	13
1	13	14–18	12	28	23	10	13	13
9	13	14–18	12	28	23	10	13	14
1	13	14–18	12	29	23	10	13	14
2	13	14–18	13	29	24	9	13	13
1	13	14–18	13	29	24	10	16	13
1	13	14–19	13	31	25	10	15	14
2	13	14–19	14	31	24	10	15	13
1	13	15–10	13	30	24	11	16	12
1	13	15–10	13	31	24	10	16	12
2	13	15–15	13	30	23	10	14	13
1	13	15–15	13	30	23	10	15	13
1	13	15–16	14	30	24	10	15	13
1	13	15–17	12	28	26	9	13	13
7	13	15–17	14	30	24	11	14	14
1	13	15–17	15	31	24	11	14	14
2	13	15–18	12	28	24	9	13	13
2	13	15–18	12	29	24	9	13	13
3	13	15–18	13	30	24	11	16	12
1	13	15–18	13	30	25	11	16	12
1	13	15–18	13	31	24	11	16	12
1	13	15–18	13	32	24	10	15	13
1	13	15–19	12	28	23	9	13	13
1	13	16–16	14	31	24	9	14	13
1	13	16–18	13	29	23	10	17	13
1	13	16–18	13	30	23	10	17	13
2	13.2	15–16	14	30	23	11	15	13
1	13.2	16–16	14	30	23	11	15	13
1	14	11–13	13	29	24	11	13	13
1	14	11–14	13	30	24	11	13	12
5	14	11–14	13	30	24	11	13	13
3	14	13–15	13	30	24	10	15	13
1	14	13.2–13.2	14	30	24	10	14	13
1	14	13.2–13.2	14	31	24	10	14	13
1	14	14–16	13	29	24	11	14	13
2	14	14–19	12	28	24	10	13	13
1	14	15–18	12	28	24	10	13	13
3	14	15–18	14	30	24	11	16	13
2	14	15–18	14	30	24	12	16	13
1	14	15–20	13	29	23	10	14	12
2	15	11–14	12	28	24	11	13	14
1	15	12–12	13	33	23	11	11	14
2	15	14–18	13	31	23	10	14	13
1	16	13–14	12	26	24	11	14	14
2	17	14–17	13	27	24	11	14	13

TABLE 2—*Y-chromosomal short tandem repeats (STR) haplotypes from 40 Otomies del Valle individuals (n, number of subjects).*

n	DYS 19	DYS 385	DYS 389I	DYS 389II	DYS 390	DYS 391	DYS 392	DYS 393
2	13	13–17	14	32	22	10	14	13
1	13	14–15	12	28	23	10	14	13
3	13	14–16	12	28	23	10	14	13
1	13	14–16	12	30	24	10	16	13
3	13	14–16	12	31	24	10	16	13
1	13	14–17	12	28	22	10	16	13
1	13	14–17	12	29	22	10	16	13
1	13	14–17	12	30	24	10	13	13
1	13	14–17	13	29	23	10	16	14
4	13	14–18	12	28	22	10	13	14
1	13	14–18	12	28	24	10	13	14
1	13	14–18	12	29	25	11	15	13
1	13	15–16	13	30	24	11	14	14
1	13	15–17	12	29	22	10	15	13
1	13	15–17	12	29	24	9	13	13
1	13	15–17	13	30	24	10	16	13
1	13	15–18	12	29	24	9	13	13
1	13	15–19	13	30	24	11	14	13
2	13	16–17	13	30	23	10	17	13
1	13	17–19	13	29	24	10	11	13
1	14	11–13	14	30	23	11	13	14
2	14	11–14	13	29	24	10	13	13
1	14	13–18	13	30	23	10	11	12
1	14	15–17	12	28	24	9	12	13
1	14	15–17	14	31	24	10	15	13
1	14	16–17	13	31	24	10	14	13
1	14	18–19	13	29	24	10	11	13
1	15	14–16	13	30	24	10	12	15
1	17	12–13	13	28	23	10	11	13
1	17	13–13	13	28	23	10	11	13

TABLE 3—*Y-chromosomal short tandem repeats (STR) haplotypes from 41 Otomies de la Sierra individuals (n, number of subjects).*

n	DYS 19	DYS 385	DYS 389I	DYS 389II	DYS 390	DYS 391	DYS 392	DYS 393
1	13	11–14	14	30	25	10	13	13
1	13	12–16	13	30	22	8	11	14
1	13	13–14–17	13	30	24	11	15	14
1	13	13–14	13	29	24	9	11	13
7	13	13–19	14	32	25	10	16	13
1	13	13–20	14	32	25	10	16	13
1	13	14–15	13	30	24	11	16	14
1	13	14–16	12	28	23	10	14	13
3	13	14–17	12	28	23	10	13	14
2	13	14–17	13	30	24	11	16	14
2	13	14–17	13	30	25	10	14	13
5	13	14–18	12	28	23	10	13	14
1	13	14–19	13	32	25	10	16	13
1	13	15–18	13	30	24	10	11	13
1	13	15–19	13	30	24	11	14	12
1	13	16–18	13	30	24	10	11	14
1	13	16–20	12	28	24	9	13	14
1	14	11–14	13	28	24	11	13	13
1	14	11–14	13	29	24	10	13	13
1	14	11–14	13	29	24	11	13	13
1	14	11–15	14	30	23	11	13	14
1	14	14–17	13	30	25	11	14	14
1	14	15–17	13	30	23	10	15	13
1	14	15.2–17	13	30	24	10	15	13
1	14	17–18	13	30	23	10	11	13
1	15	14–18	13	30	24	10	14	13
1	16	11–14	13	29	24	10	13	12

TABLE 4—*Y-chromosomal short tandem repeats (STR) haplotypes from 13 Tepehuas individuals (n, number of subjects).*

n	DYS19	DYS385	DYS389I	DYS389II	DYS390	DYS391	DYS392	DYS393
1	13	13–14	13	29	24	9	11	13
1	13	14–15	10	28	25	11	15	13
1	13	14–16	12	30	24	10	14	13
1	13	14–16	13	30	25	11	14	13
1	13	14–16	13	31	24	11	14	13
1	13	15–15	13	30	25	10	14	12
1	13	15–15	13	30	26	10	14	12
1	13	15–19	13	30	24	11	14	13
1	14	11–14	13	29	24	11	13	13
1	14	11–15	13	29	24	11	13	13
1	14	15–19	12	28	24	9	13	13
1	15	11–14	13	29	25	10	13	12
1	15	14–18	13	30	24	10	14	13

TABLE 5—*Forensic values for four populations.*

Population	Gene Diversity	Discrimination Capacity	Different Haplotypes	% Most Frequent Haplotype
Huastecos	0.9803	0.6146	59	9.3
Otomies Sierra	0.9561	0.6585	27	17.1
Otomies Valle	0.9808	0.7500	30	10.0
Tepehuas	1.0000	1.0000	13	7.7

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