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FOR THE RECORD

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Allele Frequencies and Haplotypes of the 12 Y-STR Loci Using the PowerPlex® Y System in Japanese Population*

POPULATION: Unrelated Japanese males ($n = 153$).

KEYWORDS: forensic science, DNA typing, Y-chromosome, short tandem repeat, PowerPlex® Y System, population genetics, Hiroshima prefecture Japan, DYS19, DYS385a/b, DYS389I/II, DYS390, DYS391, DYS392, DYS393, DYS437, DYS438, DYS439

Blood or buccal cell samples were collected from 153 unrelated healthy Japanese males from Hiroshima prefecture in Japan. DNA was extracted from these samples using a QIAamp® DNA Mini Kit (Qiagen, Valencia, CA). In this study, 92 out of 153 samples are the same DNA samples that were used in the previous validation study (1). The use of these samples was approved by the Human Ethics Committee of Japanese Association of Forensic Science and Technology for Identification.

The commercial Y-STR typing kit PowerPlex® Y System (Promega, Madison, WI) was used to simultaneously amplify 12 Y-STR loci by PCR amplification, using 0.2–0.5 ng of DNA in a total volume of 12.5 μL. The Y-STR loci are DYS19, DYS385a/b, DYS389I/II, DYS390, DYS391, DYS392, DYS393, DYS437, DYS438, and DYS439. The amplification was carried out following the conditions recommended by the manufacture's instruction (2) in a GeneAmp® PCR System 9700 thermal cycler (Applied Biosystems, Foster City, CA). The number of PCR cycles was 10+20.

The amplified products were detected using the ABI PRISM™ 310 Genetic Analyzer (Applied Biosystems). The results were analyzed using GeneScan® Analysis v3.1 software (Applied Biosystems) and genotypes were determined by Genotyper® v2.5 software (Applied Biosystems) with the PowerTyper™ Y Macro (Promega). The numerical allele designations were obtained by comparison of the sample fragments with those of allelic ladders provided with the kit. Gene and haplotype diversities were calculated according to Nei (3).

Allele frequencies and gene diversity values of the 12 Y-STR loci are shown in Table 1. An intermediate allele (23.1) was observed for DYS390. Sequence analysis showed that this allele

TABLE 1—*Allele frequencies and gene diversity of the 12 Y-STR loci.*

Allele	DYS391	DYS389I	DYS439	DYS389II	DYS438	DYS437	DYS19	DYS392	DYS393	DYS390	Genotype	DYS385
8	0.0065										9–15	0.0065
9	0.0131				0.0065						10–16	0.0065
10	0.8693				0.5752						10–17	0.0065
11	0.1111	0.0458	0.2092		0.1111			0.3856	0.0327		10–18	0.0784
12		0.1373	0.5621		0.0131			0.1111	0.2484		10–19	0.0850
13		0.3203	0.1961		0.2941	0.0065	0.0588	0.4314	0.6013		10–20	0.0850
14		0.4706	0.0327			0.8366	0.0784	0.0588	0.0850		10–21	0.0196
15		0.0261				0.1569	0.4837	0.0131	0.0327		11–11	0.0065
16							0.1961				11–14	0.0065
17							0.1830				11–16	0.0131

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TABLE 1—*Continued.*

Allele	DYS391	DYS389I	DYS439	DYS389II	DYS438	DYS437	DYS19	DYS392	DYS393	DYS390	Genotype	DYS385
18											11–17	0.0131
19											11–18	0.0131
20											11–19	0.0261
21											11–20	0.0131
22										0.2614	11–21	0.0065
23										0.2353	12–12	0.0065
23.1										0.0065	12–13	0.0196
24										0.1569	12–14	0.0196
25										0.2484	12–16	0.0065
26										0.0719	12–16–17	0.0065
27				0.0654						0.0196	12–17	0.0523
28				0.1111							12–18	0.0261
29				0.2680							12–19	0.0131
30				0.3529							12–20	0.0131
31				0.1503							13–13	0.0131
32				0.0327							13–14	0.0131
33				0.0196							13–15	0.0196
											13–16	0.0261
											13–17	0.1373
											13–18	0.0196
											13–19	0.0392
											13–20	0.0131
											13–24	0.0065
											13–25	0.0065
											14–16	0.0196
											14–17	0.0261
											14–18	0.0131
											14–19	0.0392
											14–20	0.0131
											15–16	0.0065
											15–17	0.0131
											15–20	0.0131
											16–17	0.0065
											20–20	0.0065
G	0.2333	0.6587	0.6047	0.7680	0.5739	0.2773	0.6890	0.6535	0.5711	0.7896		0.9531

G, gene diversity.

was due to the insertion of a A residue in the polymorphic tetranucleotide TCTA region (data not shown). One individual had a three allele profile at the DYS385 locus (12-16-17). The haplotypes of the 12 Y-STR are shown in Table 2. A total of 144 different haplotypes were observed, of which 135 of them were unique and nine were found in two individuals. The haplotype diversity of the 12 Y-STR loci was 0.9993.

The complete data set is available to any interested researcher upon request from corresponding author Toshio Morikawa at kasouken@police.pref.hiroshima.jp

TABLE 2—*The 144 haplotypes obserbed in 153 unrelated Japanese males.*

H	DYS391	DYS389I	DYS439	DYS389II	DYS438	DYS437	DYS19	DYS392	DYS393	DYS390	DYS385	*N*
1	8	14	13	31	10	14	15	11	13	25	12–17	1
2	9	13	11	29	10	14	15	11	15	23	12–13	1
3	9	13	11	29	10	14	17	11	13	25	13–19	1
4	10	11	11	27	10	14	17	13	12	27	14–19	1
5	10	11	12	27	11	15	14	13	12	23	14–19	1
6	10	11	12	27	11	15	14	14	12	22	14–19	1
7	10	11	12	27	11	15	14	14	12	23	14–19	1
8	10	11	12	28	10	14	17	13	12	26	14–19	1
9	10	12	11	28	10	14	15	11	15	23	11–16	1
10	10	12	11	28	10	14	17	13	12	27	14–20	1
11	10	12	11	28	11	14	14	14	12	24	13–19	1
12	10	12	11	28	11	15	15	14	12	24	13–19	1
13	10	12	11	29	10	14	17	13	12	25	13–20	1
14	10	12	11	30	10	15	15	12	12	23	11–19	1
15	10	12	12	28	10	14	16	13	12	24	14–20	1
16	10	12	12	28	10	15	15	12	13	23	12–12	1
17	10	12	12	28	11	15	13	14	12	24	13–17	1
18	10	12	12	29	10	14	15	13	12	26	11–20	1
19	10	12	12	29	10	14	16	13	12	25	12–20	1
20	10	12	12	29	10	14	17	13	12	25	12–20	1
21	10	12	12	29	10	15	15	12	13	23	13–17	1
22	10	12	12	31	10	15	15	13	12	22	12–17	1

TABLE 2— *Continued.*

H	DYS391	DYS389I	DYS439	DYS389II	DYS438	DYS437	DYS19	DYS392	DYS393	DYS390	DYS385	*N*
23	10	12	13	27	11	15	14	13	12	23	13–19	1
24	10	12	13	29	10	15	15	12	13	23	12–18	2
25	10	12	13	30	10	14	15	12	12	23	11–16	1
26	10	13	11	28	10	14	16	11	14	23	11–18	1
27	10	13	11	28	10	15	16	13	12	25	12–19	1
28	10	13	11	29	10	14	13	15	13	23	12–13	1
29	10	13	11	29	10	14	15	11	13	24	11–14	1
30	10	13	11	29	10	15	14	15	13	23	12–13	1
31	10	13	11	30	9	14	17	11	13	26	13–19	1
32	10	13	11	30	10	14	15	11	13	25	15–17	1
33	10	13	11	30	10	14	17	11	13	25	13–17	1
34	10	13	12	27	13	14	15	13	13	23	10–17	1
35	10	13	12	28	13	14	15	13	13	22	10–19	1
36	10	13	12	28	13	14	15	13	14	22	20–20	1
37	10	13	12	29	10	14	13	11	13	24	13–15	1
38	10	13	12	29	10	14	15	11	12	24	13–17	1
39	10	13	12	29	10	14	16	13	12	24	12–18	1
40	10	13	12	29	10	15	15	12	12	23	12–16	1
41	10	13	12	29	13	14	15	13	13	22	10–19	1
42	10	13	12	29	13	14	17	13	13	22	10–18	1
43	10	13	12	30	10	14	13	11	13	23	13–16	1
44	10	13	12	30	10	14	15	11	13	25	14–17	2
45	10	13	12	30	10	14	15	11	13	25	16–17	1
46	10	13	12	30	10	14	16	11	13	25	13–18	1
47	10	13	12	30	10	14	16	11	13	26	14–17	1
48	10	13	12	30	10	14	17	11	13	25	13–17	1
49	10	13	12	30	10	14	17	11	13	26	13–19	1
50	10	13	12	30	10	14	17	13	12	25	12–19	1
51	10	13	12	30	10	15	15	13	11	24	13–25	1
52	10	13	12	30	11	14	15	11	13	25	12–14	1
53	10	13	12	30	11	14	15	11	14	23	12–17	1
54	10	13	12	30	11	14	16	11	13	25	12–14	1
55	10	13	12	31	10	14	14	14	13	22	11–17	1
56	10	13	12	31	10	14	15	11	13	25	13–17	1
57	10	13	13	28	11	15	14	14	12	24	13–20	1
58	10	13	13	29	10	14	13	11	14	24	13–14	1
59	10	13	13	29	10	14	13	11	14	24	13–16	1
60	10	13	13	29	11	14	15	11	11	24	12–17	1
61	10	13	13	30	10	14	13	11	13	23	13–15	1
62	10	13	13	30	10	14	15	13	11	24	13–24	1
63	10	13	13	30	11	14	15	12	14	23	12–17	1
64	10	13	14	29	10	14	13	11	14	24	15–17	1
65	10	13	14	29	10	14	14	11	14	24	13–15	1
66	10	14	11	29	13	14	14	13	12	22	10–19	1
67	10	14	11	30	10	14	14	11	15	22	11–11	1
68	10	14	11	30	10	14	15	11	15	22	11–18	1
69	10	14	11	30	10	14	15	13	13	24	12–18	1
70	10	14	11	30	13	14	15	12	13	22	10–18	1
71	10	14	11	30	13	14	15	13	13	22	10–19	1
72	10	14	11	30	13	14	15	13	13	22	10–21	2
73	10	14	11	30	13	14	15	13	13	23	11–19	1
74	10	14	11	31	10	14	16	11	13	25	13–17	1
75	10	14	11	31	10	14	16	11	15	23	11–17	1
76	10	14	12	28	13	14	14	13	13	22	10–18	1
77	10	14	12	29	10	14	16	11	14	24	10–20	1
78	10	14	12	29	10	15	16	12	11	25	15–20	1
79	10	14	12	29	13	14	15	13	13	22	10–18	1
80	10	14	12	29	13	14	15	13	13	22	10–19	2
81	10	14	12	29	13	14	15	13	13	22	10–20	2
82	10	14	12	29	13	14	15	13	13	23	10–18	2
83	10	14	12	29	13	14	16	13	12	23	10–18	1
84	10	14	12	29	13	14	16	13	13	23	10–18	1
85	10	14	12	30	10	14	15	13	14	23	13–17	1
86	10	14	12	30	10	14	17	11	13	25	13–17	2
87	10	14	12	30	10	15	17	13	12	25	11–20	1
88	10	14	12	30	10	15	17	13	13	25	14–19	1
89	10	14	12	30	13	14	15	13	13	22	10–18	1
90	10	14	12	30	13	14	15	13	13	22	10–19	1
91	10	14	12	30	13	14	15	13	13	22	10–20	2
92	10	14	12	30	13	14	15	13	13	22	10–21	1
93	10	14	12	30	13	14	15	13	13	22	11–21	1
94	10	14	12	30	13	14	15	13	13	23	10–19	1
95	10	14	12	30	13	14	15	14	13	22	10–19	1

TABLE 2—*Continued.*

H	DYS391	DYS389I	DYS439	DYS389II	DYS438	DYS437	DYS19	DYS392	DYS393	DYS390	DYS385	*N*
96	10	14	12	30	13	14	16	13	13	22	10–20	2
97	10	14	12	31	10	13	17	11	13	25	14–16	1
98	10	14	12	31	10	14	15	11	13	25	13–17	1
99	10	14	12	31	10	14	16	11	13	25	13–17	1
100	10	14	12	31	10	14	16	12	13	27	13–17	1
101	10	14	12	31	10	14	17	11	13	25	14–16	1
102	10	14	12	31	10	14	17	11	13	26	13–17	1
103	10	14	12	31	11	14	15	11	12	26	12–17	1
104	10	14	12	31	13	14	15	13	13	22	10–19	1
105	10	14	12	32	10	14	15	11	13	25	13–17	1
106	10	14	12	32	11	14	15	13	12	23	13–17	1
107	10	14	12	32	13	14	15	13	13	22	11–19	1
108	10	14	13	29	12	14	15	13	13	22	10–19	1
109	10	14	13	29	13	14	15	13	13	22	11–19	1
110	10	14	13	29	13	14	15	13	13	23	10–19	1
111	10	14	13	29	13	14	16	13	13	24	10–16	1
112	10	14	13	30	10	14	16	11	13	25	13–16	1
113	10	14	13	30	13	14	15	13	13	22	10–18	1
114	10	14	13	30	13	14	15	13	13	22	10–19	1
115	10	14	13	30	13	14	15	13	13	22	10–20	1
116	10	14	13	30	13	14	17	13	13	22	10–20	1
117	10	14	13	31	10	14	16	11	13	25	13–17	1
118	10	14	13	31	10	14	17	11	13	24	13–17	1
119	10	14	13	31	10	14	17	11	13	25	13–13	1
120	10	14	13	31	10	14	17	12	13	25	9–15	1
121	10	14	14	31	10	14	15	11	13	25	13–17	1
122	10	14	14	31	11	14	15	11	12	26	12–17	1
123	10	14	14	33	10	14	16	11	13	23	14–18	1
124	10	15	12	30	13	14	15	13	13	22	10–20	1
125	10	15	12	31	13	14	15	13	14	22	10–20	1
126	10	15	12	33	10	14	17	11	13	25	13–17	1
127	10	15	12	33	10	15	16	12	11	25	15–20	1
128	11	11	12	27	10	15	16	12	12	23	12–14	1
129	11	11	12	27	10	15	16	12	12	24	12–16–17	1
130	11	12	11	27	10	14	17	13	12	25	14–18	1
131	11	12	12	27	10	14	16	13	12	24	13–18	1
132	11	12	13	28	10	15	15	12	12	23	13–13	1
133	11	13	11	28	13	14	15	12	13	22	10–20	1
134	11	13	11	30	10	14	17	11	13	25	13–16	1
135	11	13	12	28	13	14	16	13	13	23	10–18	1
136	11	13	12	30	10	14	15	11	13	25	14–17	1
137	11	13	12	30	10	14	17	11	13	23	13–17	1
138	11	13	13	29	10	14	13	11	14	24	13–14	1
139	11	14	11	31	10	14	17	11	14	26	14–16	1
140	11	14	12	30	12	14	16	14	12	23	10–20	1
141	11	14	12	32	10	14	15	11	12	23.1	15–16	1
142	11	14	13	29	13	14	16	13	13	24	10–18	1
143	11	14	13	31	10	14	16	11	13	26	13–18	1
144	11	14	13	32	11	14	15	11	12	26	12–17	1

H, haplotype number; *N*, number of individuals observed for each haplotype.

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