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SHORT COMMUNICATION

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Allele distribution of three STRs in a population from Mozambique

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Abstract The short tandem repeat systems (STRs) D12S391, HUMFIBRA/FGA and HUMACTBP2 (SE33) were studied in a population of unrelated individuals from the Maputo area of south Mozambique.

Key words STR · D12S391 · HUMFIBRA/FGA · HUMACTBP2 · Population genetics

Introduction

D12S391 (Lareu et al. 1996), HUMFIBRA/FGA (Mills et al. 1992) and HUMACTBP2 (Moos and Gallwitz 1983; Polymeropoulos et al. 1992; Möller and Brinkmann 1994) are highly variable tetranucleotide polymorphisms. The interpretation of the results from the analysis of genetic markers and the assessment of these genetic markers in forensic cases requires the existence of databases for the appropriate populations where the systems are going to be used.

Materials and methods

Blood stains were made on cotton fabric from peripheral blood (and air dried) taken from unrelated individuals from the Maputo area in the south of Mozambique. DNA was extracted from 3 mm^2 of the stain using the Chelex procedure (Walsh et al. 1991). Singleplex PCR amplifications used 0.25 μM of each primer (Oswell DNA Service, UK) for D12S391 (Lareu et al. 1996), HUMFIBRA/FGA (Gill et al. 1997) and HUMACTBP2 (Wiegand et al. 1993). PCR cycling conditions were: D12S391 and HUMFIBRA/FGA: 30 cycles of 94 °C – 45 s, 60 °C – 1 min, 72 °C – 1 min; HUMACTBP2 (SE33): 30 cycles of 94 °C – 45 s, 60 °C – 30 s, 72 °C – 30 s. Detection employed 6% polyacrylamide denaturing gel electrophoresis on an ABI 373 DNA sequencer using the internal standard Genescan 350 labelled with ROX (6-carboxyrhodamin) – ABD GS350.

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Table 1 Allele frequencies of the D12S391, HUMFIBRA/FGA and HUMACTBP2 systems

Alleles	D12S391 $n = 103$	HUMFIBRA/FGA $n = 99$	HUMACTBP2 $n = 98$
11			0.0051 ± 0.0051
12			0.0102 ± 0.0072
13			0.0051 ± 0.0051
13.2			0.0051 ± 0.0051
14			0.0255 ± 0.0113
15	0.1456 ± 0.0246		0.0357 ± 0.0133
15.2			0.0051 ± 0.0051
16	0.0777 ± 0.0187		0.0612 ± 0.0171
16.2		0.0101 ± 0.0071	0.0051 ± 0.0051
17	0.1262 ± 0.0231		0.0918 ± 0.0206
18	0.2913 ± 0.0317	0.0051 ± 0.0051	0.1122 ± 0.0225
18.2		0.0051 ± 0.0051	0.0051 ± 0.0051
19	0.1311 ± 0.0235	0.0808 ± 0.0194	0.1225 ± 0.0234
19.2		0.0152 ± 0.0087	
20	0.0971 ± 0.0206	0.0606 ± 0.0170	0.1020 ± 0.0216
21	0.0437 ± 0.0142	0.0808 ± 0.0194	0.0918 ± 0.0206
22	0.0194 ± 0.0096	0.1212 ± 0.0232	
22.2			0.0306 ± 0.0123
23	0.0437 ± 0.0142	0.1869 ± 0.0277	
24	0.0146 ± 0.0084	0.1970 ± 0.0283	
24.2			0.0102 ± 0.0072
25	0.0049 ± 0.0049	0.1212 ± 0.0232	
25.2			0.0204 ± 0.0101
26	0.0049 ± 0.0049	0.0758 ± 0.0188	
26.2			0.0357 ± 0.0133
27		0.0354 ± 0.0131	
27.2			0.0969 ± 0.0211
28		0.0051 ± 0.0051	
28.2			0.0663 ± 0.0178
29.2			0.0510 ± 0.0157
32.2			0.0051 ± 0.0051
Exact test	$P =$ 0.9726 ± 0.0014	$P =$ 0.4794 ± 0.0083	$P =$ 0.8812 ± 0.0074

Table 2 Comparison between Mozambique population and other populations

Population compared	Exact test (P ± se)		
	D12	FGA	ACTBP2
Zimbabwe-Mashonaland/Black (Budowle et al. 1997)	–	0.752 ± 0.007	–
Egypt-Cairo (Klintschar et al. 1998)	0.004 ± 0.002	–	–
Yemen-Sanaa (Klintschar et al. 1998)	0.002 ± 0.002	–	–
Portugal-Madeira (Corte-Real et al. in press)	0.005 ± 0.001	0.000 ± 0.000	–
Portugal-central area (Souto and Vide 1996)	–	–	0.618 ± 0.005
Portugal-south area (Ribeiro et al. 1998)	0.000 ± 0.000	–	–
Spain-Valencia (Pestoni et al. 1998)	–	–	0.000 ± 0.000
Spain-Galicia (Lareu et al. 1996)	0.000 ± 0.000	–	–
Spain Galicia (Pestoni et al. 1998)	–	–	0.000 ± 0.000
Spain-Catalonia (Gené et al. 1996)	–	–	0.476 ± 0.007
Spain-Catalonia (Gené et al. 1998)	0.000 ± 0.000	–	–
Italy-Tuscany (Klintschar et al. 1998)	0.001 ± 0.001	–	–
Italy/Caucasians (Garofano et al. 1998)	–	0.000 ± 0.000	–
Germany-Münster (Lareu et al. 1996)	0.000 ± 0.000	–	–
Germany-South western (Waiyawuth et al. 1998)	0.000 ± 0.000	–	–
Netherlands/Caucasians (Ovington et al. 1997)	–	0.000 ± 0.000	–
Austria-Vienna (Glock et al. 1997)	0.000 ± 0.000	–	–
Austria-Salzburg/Caucasians (Neuhuber et al. 1998)	–	0.000 ± 0.000	–
UK/Caucasians (Phillips et al. 1998)	0.000 ± 0.000	–	–
Hungary-Baranya/Caucasians (Kozma et al. 1998)	–	0.000 ± 0.000	–
China-Han (Liu et al. 1997)	–	–	0.000 ± 0.000
China-Chengdu (Waiyawuth et al. 1998)	0.000 ± 0.000	–	–
Japan (Liu et al. 1997)	–	–	0.000 ± 0.000
Japan-Miyazaki (Waiyawuth et al. 1998)	0.000 ± 0.000	–	–
Thailand-Bangkok (Waiyawuth et al. 1998)	0.000 ± 0.000	–	–

Results and discussion

There was good agreement between the observed genotype values and those expected under Hardy-Weinberg equilibrium (Table 1). Interpopulation comparisons showed that this population sample from Mozambique was statistically different from Caucasoid and Asiatic populations, on the systems compared (Table 2). However, for the ACTBP2 system, our results were similar to two south European populations (Portugal and Spain) where there was an important African colonization.

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References

Budowle B, Nhari LT, Moretti TR, Kanoyangwa SB, Masuka E, Defenbaugh DA, Smerick JB (1997) Zimbabwe black population data on the six short tandem repeat loci – CSF1PO, TPOX, TH01, D3S1358, VWA and FGA. Forensic Sci Int 90:215–221

Corte-Real F, Souto L, Anjos MJ, Carvalho M, Vieira DN, Carracedo A, Vide MC (1999) Population distribution of six PCR-amplified loci in Madeira Archipelago (Portugal). Forensic Sci Int (in press)

Garofano L, Pizzamiglio M, Vecchio C, Lago G, Floris T, D'Errico G, Brembilla G, Romano A, Budowle B (1998) Italian population data on thirteen short tandem repeat loci: HUMTH01, D21S11, D18S51, HUMVWFA31, HUMFIBRA, D8S1179, HUMTPOX, HUMCSF1PO, D16S539, D7S820, D13S317, D5S818, D3S1358. Forensic Sci Int 97:53–60

Gené M, Huguet E, Luna M, Moreno P, Lareu MV, Carracedo A (1996) Study of HUMACTBP2 STR polymorphism, performed by PCR and automated laser fluorescence (ALF) sequencer in a population sample of Catalonia. In: Carracedo A, Brinkmann B, Bär W (eds) Advances in forensic haemogenetics 6. Springer, Berlin Heidelberg New York, pp 535–536

Gené M, Carracedo A, Huguet E, Pérez-Pérez A, Moreno P (1998) Population genetics of the D12S391, CSF1PO and TPOX loci in Catalonia (Northeast Spain). Int J Legal Med 111:52–54

Gill P, d'Aloja E, Anderson J, Dupuy B, Jangblad M, Johnsson V, Kloosterman AD, Kratzer A, Lareu MV, Meldegaard M, Phillips C, Pfitzinger H, Rand S, Sabatier M, Scheithauer R, Schmitter H, Schneider P, Vide MC (1997) Report of the European DNA profiling group (EDNAP): an investigation of the complex STR loci D12S11 and HUMFIBRA (FGA). Forensic Sci Int 86:25–33

Glock B, Dauber EM, Schwartz DWM, Mayr WR (1997) Additional variability at the D12S391 STR locus in an Austrian population sample: sequencing data and allele distribution. Forensic Sci Int 90:197–203

Klintschar M, Ricci U, Al Hammadi N, Reichenpfader B, Ebner A, Uzielli MLG (1998) Genetic variation at the STR loci D12S391 and CSF1PO in four populations from Austria, Italy, Egypt and Yemen. Forensic Sci Int 97:37–45

Kozma Z, Nagai A, Woller J, Füredi S, Sétáló J, Ohya I, Nishi K (1998) Fluorescence based co-amplification and automated detection of the STR loci HUMFIBRA and HUMD21S11 in a Hungarian Caucasian population sample. Int J Legal Med 111:103–104

Lareu MV, Pestoni C, Schürenkamp M, Rand S, Brinkmann B, Carracedo A (1996) A highly variable STR at the D12S391 locus. Int J Legal Med 109:134–138

Liu C, Harashima N, Katsuyama Y, Ota M, Arakura A, Fukushima H (1997) ACTBP2 gene frequency distribution and sequencing of the allelic ladder and variants in the Japanese and Chinese populations. Int J Legal Med 110:208–212

Mills KA, Even D, Murray JC (1992) Tetranucleotide repeat polymorphism at the human alpha fibrinogen locus (FGA). Hum Mol Genet 1:779

Möller A, Brinkmann B (1994) Locus ACTBP2 (SE33). Sequencing data reveal considerable polymorphism. Int J Legal Med 106:262–267

Moos M, Gallwitz D (1983) Structure of two human beta-actin-related processed genes one of which is located next to a simple repetitive sequence. EMBO J 2:757–761

Neuhuber F, Klintschar M, Radacher M (1998) A collaborative genetic study on the STR system FGA in two Austrian population samples. Forensic Sci Int 91:1–6

Ovington A, Daselaar P, Sjerps M, Kloosterman A (1997) A Dutch population study of the STR loci D21S11 and HUMFIBRA. Int J Legal Med 110:14–17

Pestoni C, López-Gómez J, Aler M, Lareu MV, Rodríguez-Calvo MS, Carracedo A (1998) Complex STRs (ACTBP2, D21S11 and FIBRA/FGA) in two Spanish populations: new intermediate alleles and population genetic peculiarities in ACTBP2. In: Olaisen B, Brinkmann B, Lincoln PJ (eds) Progress in forensic genetics 7. Elsevier, Amsterdam Lausanne New York Oxford Shannon Singapore Tokyo, pp 324–325

Phillips CP, Syndercombe Court D, Lareu MV, Hasskamp J, Carracedo A (1998) Band shift analysis of three base-pair repeat alleles in the short tandem repeat locus D12S391. Forensic Sci Int 93:79–88

Polymeropoulos MH, Rath DS, Xiao H, Merril CR (1992) Tetranucleotide repeat polymorphism at the human beta-actin related pseudogene H-beta-Ac-psi-2 (ACTBP2). Nucleic Acids Res 20:1432

Ribeiro T, Brito RM, Espinheira R, Geada H (1998) New alleles of D12S391 STR locus in a Portuguese population. In: Olaisen B, Brinkmann B, Lincoln PJ (eds) Progress in forensic genetics 7. Elsevier, Amsterdam Lausanne New York Oxford Shannon Singapore Tokyo, pp 275–277

Souto L, Vide MC (1996) Allele frequency distribution of the STR system ACBP2 (SE33) in a population of Portugal (central area). In: Carracedo A, Brinkmann B, Bär W (eds) Advances in forensic haemogenetics 6. Springer, Berlin Heidelberg New York, pp 650–651

Waiyawuth W, Zhang L, Rittner C, Schneider PM (1998) Genetic analysis of the short tandem repeat system D12S391 in the German and three Asian populations. Forensic Sci Int 94:25–31

Walsh PS, Metzger DA, Higuchi R (1991) Chelex100 as a medium for simple extraction of DNA for PCR-based typing from forensic material. Biotechniques 10:506–513

Wiegand P, Budowle B, Rand S, Brinkmann B (1993) Forensic validation of the STR systems SE33 and TC11. Int J Legal Med 105:315–320