

Allele frequencies of 15 STR loci in a Spanish population

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Abstract. Genetic analysis of 15 STR loci, including the 13 CODIS core STR loci (D3S1358, vWA, FGA, D8S1179, D21S11, D18S51, D5S818, D13S317, D7S820, TH01, TPOX, CSF1PO, and D16S539) and the 2 pentameric STRs (Penta D and Penta E) present in the Powerplex 16™ system (Promega, Madison, WI, USA) were carried out. Blood and/or buccal swab samples were obtained from 341 unrelated Spanish individuals and DNA was extracted using phenol/chloroform and ethanol precipitation.

The 15 STR loci plus de Amelogenin locus were electrophoresed using the ABI Prism 310 Automatic DNA Sequencer and alleles were typed using GeneScan and Genotyper software (Applied Biosystems).

Allele frequencies for each locus were calculated and the exact test and the homozygosity test were performed to evaluate Hardy–Weinberg equilibrium (HWE). The Expected Heterozygosity (He), the Observed Heterozygosity (Ho), the Polymorphic Information Content (PIC), the Power of Discrimination (PD) and the Power of Exclusion (PE) were also calculated.

The results indicate that these 15 loci are useful genetic markers for forensic personal identification and paternity testing in the Spanish population. © 2003 Elsevier B.V. All rights reserved.

Keywords: Short tandem repeat (STR); DNA polymorphism; Spanish population database; Powerplex 16

1. Introduction

STRs are today one of the most effective tools for individual and populational genetic characterization. In routine forensic casework, it is important to establish a populational database for further reliable statistical analyses. Genetic analysis of 15 STR loci, including the 13 CODIS core STR loci (D3S1358, vWA, FGA, D8S1179, D21S11, D18S51, D5S818, D13S317, D7S820, TH01, TPOX, CSF1PO, and D16S539) and the 2 pentameric STRs (Penta D and Penta E) present in the Powerplex 16™ system (Promega) were carried out.

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2. Material and methods

Blood and/or buccal swab samples were obtained from 341 unrelated Spanish individuals and DNA was extracted using phenol/chloroform and ethanol precipitation. PCR amplification was performed with Powerplex 16™ System Amplification Kit (Promega) according to the user's manual provided by the manufacturer [1].

The 15 STR loci plus de Amelogenin locus were electrophoresed using the ABI Prism 310 Automatic DNA Sequencer and alleles were typed using GeneScan v.2.1 and Genotyper v.2.5 Analysis Software (Applied Biosystems).

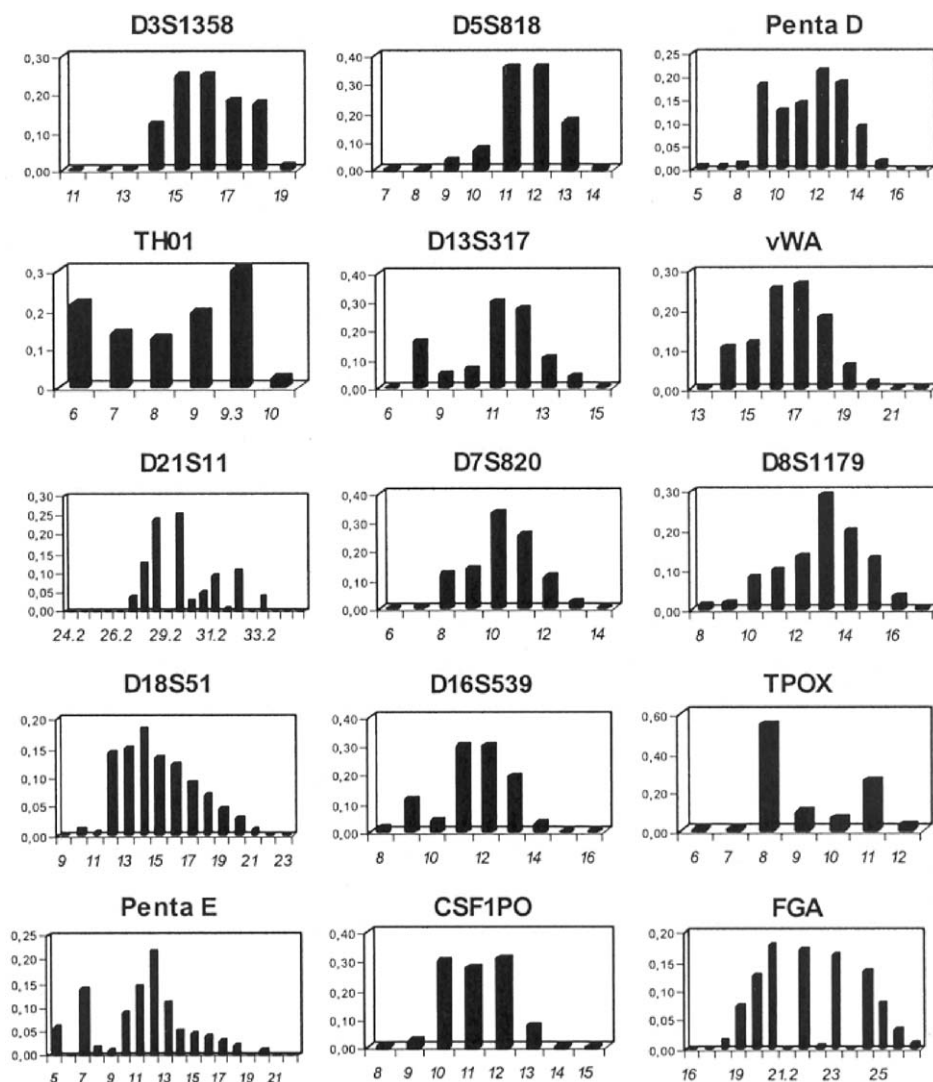


Fig. 1. Allele frequencies of 15 STR loci analyzed.

Table 1
Statistical parameters for the 15 STR loci in Spanish

	<i>N</i>	No. of alleles	He	Ho	PIC	PD	PE
D3S1358	341	8	0.7966	0.7830	0.7600	0.9250	0.5680
vWA	341	9	0.8043	0.7771	0.7700	0.9320	0.5570
FGA	341	16	0.8650	0.8504	0.8500	0.9650	0.6960
D8S1179	341	10	0.8212	0.7947	0.8000	0.9450	0.5890
D21S11	341	17	0.8375	0.8182	0.8200	0.9520	0.6330
D18S51	341	15	0.8740	0.8563	0.8600	0.9690	0.7070
D5S818	341	8	0.7146	0.7390	0.6600	0.8670	0.4910
D13S317	340	9	0.7877	0.7941	0.7600	0.9240	0.5880
D7S820	341	9	0.7765	0.7595	0.7400	0.9170	0.5260
TH01	341	6	0.7914	0.7977	0.7600	0.9220	0.5950
TPOX	341	7	0.6251	0.6276	0.5700	0.8100	0.3250
CSF1PO	341	8	0.7334	0.7361	0.6800	0.8790	0.4860
D16S539	341	9	0.7654	0.7449	0.7300	0.9090	0.5010
Penta D	340	12	0.8404	0.8176	0.8200	0.9520	0.6320
Penta E	341	18	0.8827	0.8944	0.8700	0.9730	0.7840

Allele frequencies for each locus were calculated and the exact test and the homozygosity test were performed to evaluate Hardy–Weinberg equilibrium (HWE) [2,3]. The Expected Heterozygosity (He), the Observed Heterozygosity (Ho), the Polymorphic Information Content (PIC), the Power of Discrimination (PD) and the Power of Exclusion (PE) were also calculated [4].

3. Results and discussion

Fig. 1 shows the allelic classes for every STR and his respective frequencies in the population sample object of study. The allelic range changes among the 6 alleles that presents HUMTH01 and the 18 alleles detected in case of Penta E. Nevertheless (Table 1), the degree of polymorphism of every STR, expressed in Heterozygosity and PIC terms, show HUMTPOX like the fewer polymorphic STR (He = 0.6251; PIC = 0.5700) and Penta E like the more polymorphic STR (He = 0.8827; PIC = 0.8700). Results for the Exact Test for the analysis of deviations of genotype frequencies from Hardy–Weinberg Equilibrium proportions (HWE) do not show significant differences for any STR.

The results indicate that these 15 loci are useful genetic markers for forensic personal identification and paternity testing in the Spanish population.

References

- [1] Powerplex 16™ system. Promega, Madison, WI, USA. Part#TMD012.
- [2] S.W. Guo, E.A. Thomson, Performing the exact test of Hardy–Weinberg proportions for multiple alleles, *Biometrics* 48 (1992) 361–372.
- [3] GDA v.1.0.
- [4] PowerStats v.1.2.