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SHORT COMMUNICATION

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Bosnian population data for the 15 STR loci in the Power Plex 16 kit

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Abstract The PowerPlex 16 amplification kit was used for the analysis of allele frequencies for the 15 STR loci (D3S1358, TH01, D21S11, D18S51, Penta E, D5S818, D13S317, D7S820, D16S539, CSF1PO, Penta D, VWA, D8S1179, TPOX and FGA) in unrelated, autochthonous healthy adults from Bosnia (*n*=123 for TH01, Penta E, D16S539, CSF1PO, Penta D and TPOX, *n*=210 for D3S1358, D21S11, D18S51, D5S818, D13S317, D7S820, VWA, D8S1179 and FGA). The agreement with HWE was confirmed for all loci with the exception of Penta D (based on the χ^2-test only). The combined power of discrimination (PD) and the combined power of exclusion (PE) for the 15 studied loci were 0.999999999999999997 and 0.999999, respectively.

Keywords STRs · PowerPlex 16 · Population genetics · Bosnia

Introduction

This population study was carried out in order to establish a forensic database for the Bosnian population. Population data were obtained for the 15 STR loci included in the PowerPlex 16 kit (Promega, Madison, WI) that co-amplifies the 13 CODIS STR loci in addition to Penta D, Penta E and amelogenin. In recent years commercially available multiplex systems have been frequently used in forensic practice [1, 2, 3, 4, 5], and PowerPlex 16, as an example of a multilocus amplification system, has been successfully evaluated [4]. In this report we present the allelic frequencies and statistical parameters for forensic testing of the 15 STR loci D3S1358, TH01, D21S11, D18S51, Penta E, D5S818, D13S317, D7S820, D16S539, CSF1PO, Penta D, VWA, D8S1179, TPOX and FGA in a Bosnian population.

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Materials and methods

Unrelated, autochthonous healthy adults from Bosnia (*n*=123 for TH01, Penta E, D16S539, CSF1PO, Penta D and TPOX, *n*=210 for D3S1358, D21S11, D18S51, D5S818, D13S317, D7S820, VWA, D8S1179 and FGA) participated in this study and gave their informed consent. Whole blood samples were obtained by venipuncture, collected into EDTA tubes and stored at –40°C. Aliquots of 10 µl whole blood were used for DNA extraction using the salting-out procedure [6]. PCR amplification and capillary electrophoresis on an ABI PRISM 310 (ABI, Foster City, CA) was performed following the recommendations from the manufacturer's manual (PowerPlex 16, Promega). Allele frequencies (since autosomal co-dominant) were computed using the gene counting method. The agreement with the Hardy-Weinberg expectations (HWE) of genotype frequencies was determined using the χ^2-test based on the number of observed and expected heterozygotes and the exact test based on the number of observed and expected genotypes [7]. Forensic parameters were calculated using the software package PowerStats (Promega, Madison, WI). Interpopulation comparisons were carried out with locus by locus AMOVA as implemented in the Arlequin package version 2.0. (Geneva, Switzerland).

Results and discussion

The observed allele frequencies and statistical parameters for forensic testing based on the 15 STR loci in Bosnian population are summarized in Table 1. The agreement with Hardy-Weinberg expectations, tested by the exact test based on the number of observed and expected genotypes and the χ^2-test based on the number of observed and expected heterozygotes, was confirmed for all studied loci with the exception of Penta D. A slight departure from HWE was registered only by the χ^2-test due to the excess of the observed heterozygotes, whereas the exact test showed similar number of observed and expected genotypes. Con-

Table 1 Observed allele frequencies and statistical parameters for forensic testing at the 15 STR loci in a Bosnian population

Allele	D3S1358	TH01	D21S11	D18S51	Penta E	D5S818	D13S317	D7S820	D16S539	CSF1PO	Penta D	VWA	D8S1179	TPOX	FGA
n	210	123	210	210	123	210	210	210	123	123	123	210	210	123	210
5					0.093										
6		0.276												0.004	
7		0.134			0.126			0.017						0.004	
8		0.126			0.024		0.126	0.193	0.008		0.012		0.021	0.581	
9		0.203			0.008	0.038	0.069	0.110	0.085	0.028	0.264		0.017	0.061	
9.3		0.240													
10		0.020		0.007	0.150	0.081	0.043	0.279	0.093	0.297	0.102		0.055	0.069	
11	0.002			0.012	0.077	0.276	0.390	0.231	0.215	0.301	0.220	0.002	0.069	0.252	
12				0.124	0.130	0.414	0.279	0.129	0.329	0.293	0.163	0.005	0.174	0.028	
13	0.002			0.138	0.142	0.181	0.055	0.031	0.244	0.073	0.150	0.002	0.290		
13.2															
14	0.112			0.162	0.057	0.005	0.031	0.012	0.020	0.008	0.057	0.126	0.219		
14.2				0.002											
15	0.257			0.126	0.069	0.005	0.007		0.004		0.028	0.105	0.124		
15.2															
16	0.257			0.167	0.033							0.207	0.026		
16.2															
17	0.193			0.105	0.049						0.004	0.276	0.005		
17.2															
18	0.162			0.069	0.024							0.210			0.001
19	0.014			0.050	0.004							0.067			0.055
20				0.019	0.012										0.107
20.2															
21				0.010											0.190
21.2															0.002
22				0.005											0.226
22.2															0.012
23				0.005											0.176
23.2															0.002
24															0.110
25															0.076
25.2			0.002												
26			0.007												0.031
27			0.052												0.002
28			0.140												
29			0.190												
29.2			0.005												
30			0.212												
30.2			0.062												
31			0.074												
31.2			0.110												
32			0.012												
32.2			0.098												
33			0.002												
33.2			0.031												
34.2			0.002												
35.2															
H_{obs}[a]	0.790	0.748	0.867	0.876	0.878	0.700	0.776	0.848	0.821	0.724	0.894	0.786	0.790	0.634	0.819
H_{exp}[b]	0.792	0.790	0.864	0.877	0.897	0.711	0.743	0.802	0.769	0.730	0.818	0.806	0.813	0.589	0.848
χ^2-test	0.002	1.097	0.000	0.006	0.285	0.081	1.019	2.476	1.591	0.002	4.272	0.408	0.554	0.848	1.153
Exact test (*p*)	0.898	0.611	0.953	0.345	0.758	0.309	0.641	0.007	0.238	0.328	0.667	0.873	0.390	0.635	0.489
PM[c]	0.077	0.075	0.035	0.032	0.024	0.139	0.111	0.080	0.108	0.124	0.067	0.066	0.060	0.220	0.044
PD[d]	0.923	0.925	0.965	0.968	0.976	0.861	0.889	0.920	0.892	0.876	0.933	0.934	0.940	0.780	0.956
PE[e]	0.581	0.506	0.728	0.747	0.751	0.428	0.556	0.690	0.639	0.466	0.784	0.573	0.581	0.334	0.635
PIC[f]	0.76	0.76	0.85	0.86	0.89	0.66	0.71	0.77	0.73	0.68	0.79	0.78	0.79	0.54	0.83

[a] H_{obs} Observed heterozygosity.
[b] H_{exp} Expected heterozygosity.
[c] *PM* Probability of match.
[d] *PD* Power of discrimination.
[e] *PE* Power of exclusion.
[f] *PIC* Polymorphism information content.

Table 2 Interpopulation comparison (*P*-value) between Bosnian and three Balkan populations

Locus	Bosnia vs. Croatia	Bosnia vs. Kosovo	Bosnia vs. Serbia
D3S1358	0.272	0.179	0.747
VWA	0.539	0.400	0.886
FGA	0.576	0.707	0.789
TH01	0.257	0.378	0.471
TPOX	0.603	0.006*	0.436
CSF1PO	0.081	0.016*	0.318
D5S818	0.621	0.699	0.647
D13S317	0.314	0.040*	0.474
D7S820	0.677	0.365	0.003*

*Statistically significant.

sidering the fact that only one test registered departure from HWE for one locus, this finding does not represent a basis for rejection of HWE. The combined power of discrimination (PD) and the combined power of exclusion (PE) for the 15 studied loci were 0.999999999999999997 and 0.999999, respectively.

Table 2 lists interpopulation comparisons between Bosnians and three other populations from the west Balkan peninsula – Croatians [8], Kosovo Albanians [8] and Serbians [9]. Locus by locus AMOVA did not show any statistically significant differences between populations from Bosnia and Croatia, whereas statistically significant differences were observed between populations from Bosnia and Kosovo with respect to the three loci TPOX, CSF1PO and D13S317 and between Bosnia and Serbia with respect to one locus, D13S317.

In summary, based on presented allelic frequencies and statistical parameters for forensic testing for the PowerPlex 16 multiplex detection system, it may be suggested that the combination of these 15 STR loci presents a powerful tool for individual identification and parentage analysis in the Bosnian population.

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