

Polymorphism of AmpFISTR Identifiler of the North Poland population

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Abstract. This paper presents the results of a population study of 15 STR loci included in AmpFISTR® Identifiler™ (Applied Biosystems): D8S1179, D21S11, D7S820, CSF1PO, D3S1358, TH01, D13S317, D16S539, D2S1338, D19S433, VWA, TPOX, D18S51, D5S818 and FGA. Blood samples were obtained from adult unrelated individuals living in the north part of Poland. DNA was extracted from blood using a non-enzymatic method and QIAamp® DNA Mini Kit (Qiagen). The loci were amplified together in one multiplex reaction. Products of PCR were separated on an ABI 310 sequencer and genotyped. The allele distribution was in accordance with Hardy–Weinberg equilibrium. High values of heterozygosity, polymorphic information of content, power of discrimination, power of exclusion and paternity index demonstrate that the AmpFISTR® Identifiler™ system is a valuable tool for both paternity testing and routine forensic casework. © 2003 Elsevier B.V. All rights reserved.

Keywords: AmpFISTR Identifiler; PCR; Short tandem repeats (STRs); Population genetics; North Poland

1. Introduction

Multiplex PCR systems, which allow simultaneous amplification of several STR loci, are a rapid and powerful method for personal identification.

Allele frequency data were investigated in the North Poland population using AmpFISTR® Identifiler™ kit (Applied Biosystems) [1,2]. For all loci, the Hardy–Weinberg equilibrium was tested, and several statistical parameters of forensic interest were calculated.

2. Materials and methods

Blood samples were obtained from 145 adult unrelated individuals. Genomic DNA was extracted using a non-enzymatic method and QIAamp® DNA Mini Kit (Qiagen) [3]. The amplification of the AmpFISTR Identifiler was carried out using 0.1 ng of template

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Table 1
Allele frequencies for AmpFISTR® Identifier™ in North Polish population ($n=145$)

Locus allele	D8S1179	D21S11	D7S820	CSF1PO	D3S1358	THO1	D13S317	D16S539	D2S1338	D19S433	VWA	TPOX	D18S51	D5S818	FGA
5	–	–	–	–	–	0.007	–	–	–	–	–	–	–	–	–
6	–	–	–	–	–	0.238	–	–	–	–	–	–	–	–	–
7	–	–	0.014	–	–	0.138	–	–	–	–	–	–	–	–	–
8	0.014	–	0.148	–	–	0.097	0.141	0.007	–	–	–	0.576	–	0.003	–
9	0.014	–	0.128	0.034	–	0.228	0.093	0.103	–	–	–	0.117	–	0.055	–
9.3	–	–	–	–	–	0.290	–	–	–	–	–	–	–	–	–
10	0.072	–	0.328	0.348	–	0.003	0.052	0.041	–	–	–	0.045	–	0.093	–
10.2	–	–	–	–	–	–	–	–	–	–	–	–	0.003	–	–
11	0.086	–	0.224	0.245	–	–	0.359	0.307	–	–	–	0.234	0.041	0.310	–
12	0.016	–	0.131	0.283	0.010	–	0.214	0.341	–	0.072	–	0.028	0.110	0.388	–
12.2	–	–	–	–	–	–	–	–	–	0.007	–	–	–	–	–
13	0.352	–	0.024	0.086	–	–	0.093	0.172	–	0.193	–	–	0.066	0.172	–
13.2	–	–	–	–	0.007	–	–	–	–	0.014	–	–	–	–	–
14	0.200	–	0.003	0.003	0.138	–	0.045	0.028	–	0.379	0.107	–	0.176	0.021	–
14.2	–	–	–	–	–	–	–	–	–	0.038	–	–	–	–	–
15	0.093	–	–	–	0.255	–	0.003	–	–	0.176	0.103	–	0.145	0.007	–
15.2	–	–	–	–	–	–	–	–	–	0.034	–	–	–	–	–
16	0.003	–	–	–	0.248	–	–	–	0.045	0.034	0.217	–	0.121	–	–
16.2	–	–	–	–	–	–	–	–	–	0.024	–	–	–	–	–
17	0.003	–	–	–	0.214	–	–	–	0.275	0.007	0.266	–	0.152	–	–
17.2	–	–	–	–	–	–	–	–	–	0.010	–	–	–	–	–
18	–	–	–	–	0.124	–	–	–	0.090	0.003	0.224	–	0.110	–	0.021

18.2	–	–	–	–	–	–	–	–	–	0.007	–	–	–	–	–
19	–	–	–	–	0.003	–	–	–	0.076	–	0.076	–	0.028	–	0.059
20	–	–	–	–	–	–	–	–	0.155	–	0.007	–	0.028	–	0.159
20.2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.100
21	–	–	–	–	–	–	–	–	0.052	–	–	–	0.014	–	0.207
21.2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.007
22	–	–	–	–	–	–	–	–	0.014	–	–	–	0.007	–	0.183
22.2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.017
23	–	–	–	–	–	–	–	–	0.079	–	–	–	–	–	0.128
24	–	–	–	–	–	–	–	–	0.083	–	–	–	–	–	0.110
25	–	–	–	–	–	–	–	–	0.117	–	–	–	–	–	0.090
26	–	0.003	–	–	–	–	–	–	0.014	–	–	–	–	–	0.007
27	–	0.038	–	–	–	–	–	–	–	–	–	–	–	–	0.003
28	–	0.231	–	–	–	–	–	–	–	–	–	–	–	–	–
29	–	0.179	–	–	–	–	–	–	–	–	–	–	–	–	–
29.2	–	0.007	–	–	–	–	–	–	–	–	–	–	–	–	–
30	–	0.217	–	–	–	–	–	–	–	–	–	–	–	–	–
30.2	–	0.031	–	–	–	–	–	–	–	–	–	–	–	–	–
31	–	0.048	–	–	–	–	–	–	–	–	–	–	–	–	–
31.2	–	0.079	–	–	–	–	–	–	–	–	–	–	–	–	–
32	–	0.007	–	–	–	–	–	–	–	–	–	–	–	–	–
32.2	–	0.131	–	–	–	–	–	–	–	–	–	–	–	–	–
33	–	0.007	–	–	–	–	–	–	–	–	–	–	–	–	–
33.2	–	0.021	–	–	–	–	–	–	–	–	–	–	–	–	–
H_{ob}	0.710	0.876	0.697	0.724	0.745	0.710	0.766	0.772	0.876	0.848	0.800	0.621	0.862	0.745	0.821
H_{cx}	0.790	0.842	0.789	0.733	0.796	0.780	0.786	0.749	0.857	0.781	0.807	0.599	0.881	0.750	0.860
P	0.744	0.752	0.055	0.968	0.586	0.585	0.917	0.242	0.455	0.157	0.508	0.294	0.076	0.749	0.411

Table 2
Statistical parameters of the usefulness of AmpFISTR® Identifiler™ in forensic medicine

Statistical parameters locus	Power of discrimination (PD)	Polymorphism information of content (PIC)	Power of exclusion (PE)	Matching probability (pM)	Paternity index (PI)
D8S1179	0.926	0.760	0.444	0.074	1.730
D21S11	0.952	0.820	0.746	0.048	4.030
D7S820	0.923	0.760	0.423	0.077	1.650
CSF1PO	0.880	0.680	0.467	0.120	1.810
D3S1358	0.924	0.760	0.501	0.076	1.960
TH01	0.917	0.740	0.444	0.083	1.730
D13S317	0.923	0.760	0.537	0.077	2.130
D16S539	0.885	0.710	0.549	0.115	2.200
D2S1338	0.956	0.840	0.746	0.044	4.030
D19S433	0.918	0.750	0.691	0.082	3.290
VWA	0.928	0.780	0.599	0.072	2.500
TPOX	0.791	0.550	0.316	0.209	1.320
D18S51	0.963	0.870	0.719	0.037	3.630
D5S818	0.887	0.710	0.501	0.113	1.960
FGA	0.958	0.840	0.638	0.042	2.790

DNA, according to the manufacturer's instruction. Products of PCR were analyzed on an ABI Prism 310 sequencer and genotyped.

3. Results and discussion

The distribution of observed allele frequencies for the 15 loci in North Poland is shown Table 1. All loci were highly polymorphic. The observed (H_{ob}) and expected (H_{ex}) heterozygosity rates showed similar values (Table 1). The population data revealed no significant deviation from the Hardy–Weinberg equilibrium (P values shown in Table 1).

The statistical parameters are presented in Table 2 [4,5]. The cumulative power of exclusion for the 15 loci was calculated as 0.99999.

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