BRIEF COMMUNICATION

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Allele and Genotype Frequencies for the STR Locus D18S51 in a Western German Population

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ABSTRACT: Genetic marker typing based on DNA amplification by the polymerase chain reaction (PCR) increasingly is being employed in forensic casework and for paternity testing. Allele frequencies were determined using PCR for 102 unrelated Germans (Rhine area) for the locus D18S51. Twelve alleles were observed, with frequencies ranging from 0.005 (allele 11) to 0.191 (allele 14). The observed heterozygosity was 0.867, and the power of discrimination was 0.968. There was no deviation from expectations under Hardy-Weinberg assumptions ($P = 0.451$).

KEYWORDS: forensic science, DNA typing, short tandem repeat, D18S51, allele frequencies, Hardy-Weinberg equilibrium, population genetics, Germany

Human tetrameric repeats are a source of genetic markers that can be useful for identity testing purposes. These short tandem repeat (STR) loci can exhibit a high degree of variability. One of these STR loci, called D18S51, is reasonably polymorphic and has been reported to be rather robust for forensic analyses (4–7). D18S51 is a tetranucleotide repeat (AAAG) located on the long arm of chromosome 18 (1,2). Alleles at the D18S51 locus ranged in size from 271 bp to 343 bp. In this report we present allele and genotype data for D18S51 alleles from a Western German population sample and compare these findings with those observed in other Caucasian populations.

Materials and Methods

Whole venous blood samples were drawn in EDTA-vacutainer tubes from 102 unrelated German Caucasians living in the Rhine area. The DNA was isolated as previously described (3) and quantified by slot-blot analysis using the probe D17Z1 following the suppliers protocol (Perkin Elmer).

The primers were 5′-GAGCCATGTTCATGCCACTG-3′ and 5′-CAAACCCGACTACCAGCAAC-3′ (CY5 labeled) (1). The components of the PCR were 5 ng of genomic DNA, 1 U Taq polymerase (Gold Star, Eurogentec), 0.25 μM each primer, 150 μM dNTP, 1.5 mM $MgCl_2$, 2 μL 10X PCR buffer. The final volume was brought to 25 μL with sterile doubled distilled water.

The PCR was carried out in a Triothermoblock, Biometra. The cycles were 94°C for 1 min, 62°C for 1 min, and 72°C for 2 min. The total number of cycles was 30.

After PCR 1 μL of amplified alleles was loaded on a 6% polyacrylamide gel on an automated DNA sequencer (Pharmacia, A.L.F.express sequencer). Data processing was performed by internal software (AlleleLinks, version 1.00).

TABLE 1—*Observed allele frequency and genotype values for D18S51 in 102 unrelated Western German individuals.*

Genotypes	Number	Proportion	Genotypes	Number	Proportion
A Genotype Frequencies					
10–12	3	0.029	14–16	8	0.078
11–14	1	0.01	14–17	4	0.039
12–12	1	0.01	14–18	3	0.029
12–13	6	0.059	14–22	1	0.01
12–14	7	0.069	15–15	1	0.01
12–15	2	0.02	15–16	4	0.039
12–16	5	0.05	15–17	3	0.029
12–17	3	0.029	15–18	1	0.01
12–18	1	0.01	15–19	4	0.039
12–19	2	0.02	15–20	1	0.01
12–20	1	0.01	16–16	1	0.01
12–22	1	0.01	16–17	2	0.02
13–13	3	0.029	16–18	1	0.01
13–14	1	0.01	16–19	2	0.02
13–15	5	0.05	16–20	1	0.01
13–16	6	0.059	16–22	1	0.01
13–18	1	0.01	17–17	2	0.02
13–20	1	0.01	17–18	1	0.01
14–14	5	0.05	17–19	1	0.01
14–15	4	0.039	18–18	1	0.01
Discrimination power:		0.968			
Heterozygosity:		0.867			
P value:		0.451			
B Allele Frequencies					
10	3	0.015			
11	1	0.005			
12	33	0.162			
13	26	0.127			
14	39	0.191			
15	26	0.127			
16	32	0.157			
17	18	0.088			
18	10	0.049			
19	9	0.044			
20	4	0.02			
22	3	0.015			

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Results and Discussion

The distribution of observed genotypes and allele frequencies for D18S51 are shown in Table 1. There were 12 alleles detected in 102 unrelated German Caucasians, with frequencies ranging from 0.005 (allele 11) to 0.191 (allele 14). In this population sample, 40 out of 77 possible genotypes could be observed with the most frequent genotype 14 to 16. The power of discrimination was 0.968. The observed heterozygosity was 0.867. Using the exact test (8) no deviation from Hardy-Weinberg equilibrium could be observed ($P = 0.451$). D18S51 allele frequencies found in our study are similar to other Caucasian population data (1,4–7).

The sensitivity of D18S51 lies between 100 pg and 50 pg of genomic DNA. DNA mixtures of two heterozygous individuals were amplified in the same PCR reaction. Up to a ratio of 1:10 all four alleles in the mixture could be detected. For higher ratios (1:20 and 1:50) the minor component could not be identified.

In conclusion, D18S51 appears to be an informative genetic marker for identity testing in the German population.

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