Lale DÖNBAK[1]
Serpil SALAÇİN[2]

Allele Frequencıes of the HumF13B Str Locus in the Çukurova Region

[1]Department of Biology, Faculty of Science and Art, Kahramanmaraş Sütçü İmam University, Karacasu/Kahramanmaraş, [2]Department of Forensic Medicine, Medical School, Dokuz Eylül University, İzmir - TURKEY

Abstract: In this study, the STR system HumF13B polymorphism and forensic efficiency values were investigated in a population sample from the Çukurova region. The F13B phenotypes were analysed using polyacrylamide gel electrophoresis (PAGE) following a polymerase chain reaction (PCR) and were visualised by silver staining. Allele frequencies were calculated by the gene counting method. Forensic efficiency values were estimated using the obtained gene frequencies of F13B.

In this population sample, a total of five alleles, 6, 7, 8, 9 and 10 of F13B, were observed. The calculated frequencies of these alleles were as follows: 6=0.0910; 7=0.0045; 8=0.3273; 9=0.2045; 10=0.3727. In the Çukurova region, the forensic efficiency values H-obs, MEC, pM and pD of F13B locus were estimated to be 0.69092, 0.44507, 0.14032 and 0.85968 respectively.

According to these values, the HumF13B STR locus may be useful in criminal and paternity cases in the Çukurova region.

Key Words: DNA, STRs, HumF13B, Allele frequencies, Turkey

Introduction

The forensic usefulness of STRs has been demonstrated in various studies (1-3). Before introducing STRs into forensic casework, allele frequency distributions in the relevant population must be known for statistical evaluation of the evidence. However, our knowledge about the allelic distributions of STRs routinely used in forensic applications is limited in Turkey to a few studies. This paper presents the allele frequency data of the HumF13B STR locus (4) in a Turkish population sample.

Materials and Methods

DNA was extracted from bloodstains (200 µl blood, air-dried on filter paper) from 110 healthy unrelated individuals residing in the Çukurova region of Turkey, using the Chelex-100 and Proteinase K method (5). The reaction assay amplifications were carried out according to the commercially available Gene Print STR system-F13B (Promega USA). The PCR products were separated in 6% non-denaturing polyacrylamide gels with the locus specific allelic ladder and visualised by silver staining (6). F13B alleles were typed by comparison with the allelic ladder components.

Allele frequencies were calculated by the gene counting method. Possible divergence from the Hardy-Weinberg equilibrium was determined using the conventional χ^2-test. From the forensic efficiency values, the expected heterozygosity rate (H-exp)(7), the mean exclusion change (MEC)(8), the probability of match (pM) and the power of discrimination (pD) (9) were calculated. The allele frequency comparisons of different populations were performed by RxN contingency tables calculating χ^2.

Results

In this population sample, 5 alleles and 10 F13B genotypes (3 homozygotes and 7 heterozygotes) were determined. Microvariant alleles were not observed. The calculated allele frequencies of F13B are shown in Table 1, together with frequencies in the other Asian and European populations. As shown in Table 1, the most common alleles were 10 (f=0.3727), 8 (f=0.3273) and 9 (f=0.2045). The results were in good agreement with the Hardy-Weinberg equilibrium (χ^2=0.9593, df=7, p=0.9955). The forensic efficiency values determined for this locus are listed in Table 2.

Table 1.   Allele frequencies of F13B in the Turkish population and in other European and Asian populations.

Allele	Allele frequency							
	Turks* n:110	Turks[10] n:200	Italians[11] n:200	Hungarians[12] n:223	Austrians[13] n:216	Egyptians[14] n:100	Yemenians[14] n:100	Japanese[15] n:367
6	0.0910	0.0750	0.1000	0.0920	0.0900	0.1700	0.1450	-
7	0.0045	0.0300	0.0175	0.0040	0.0160	0.0400	0.0500	0.0030
8	0.3273	0.3150	0.2625	0.2780	0.2450	0.3050	0.2200	0.0650
9	0.2045	0.2450	0.2450	0.2170	0.2250	0.2250	0.3100	0.2030
10	0.3727	0.3350	0.3725	0.4010	0.4190	0.2600	0.2750	0.7250
11	-	0.0030	0.0025	0.0070	0.0050	-	-	0.0040

* The results of this study

Table 2.   The forensic efficiency values of HumF13B in the Çukurova region.

Statistical parametres	F13B
H-obs	0.69092
H-exp	0.70386
MEC	0.44507
pM	0.14032
pD	0.85968

Discussion

STR typing of medicolegal evidence in forensic applications requires knowledge of the suspect's ethnic group and the allele frequencies in that population.

Meyer et al. (16) investigated the allele frequencies distribution of 6 STR systems (THO1, VWA, ACTBP2, FES, F13B, D21S11) in 7 human populations (Germans, Turks, Moroccans, Japanese, Chinese, Papuans and Ovambos). Depending on the statistical data, they stated that significant allele frequency differences existed between major ethnic groups. They also showed that the most discriminative STRs between major ethnic groups are THO1, F13B and FES.

The allele frequency distribution of F13B in this Turkish population residing in the southern part of Turkey are compared with that of some European and Asian populations in Table 1. Depending on interpopulation comparisons, the allele frequency distribution in this Turkish population was found to be similar to that in an Italian (Tur.-Ita.: χ^2= 5.61, df=5, p=0.3450), a Hungarian (Tur.-Hun.: χ^2= 5.61, df=5, p= 0.6821), and an Austrian population (Tur.-Aus.: χ^2=7.26, df= 5, p= 0.2022). Furthermore, the frequency profile was similar to that of an Adana area population (χ^2= 6.92, df=5, p= 0.2265). However, the statistical data revealed significant differences from those in an Egyptian (Tur.-Egy.: χ^2= 15.78, df= 4, p= 0.0033), a Yemenian (Tur.-Yem.: χ^2= 22.90, df= 4, p<0.0001) and a Japanese population (Tur.-Jap.: χ^2= 192.69, df= 5, p<0.00001) mainly due to alleles 8 and 10 (10-15).

The obtained forensic efficiency values demonstrated that the HumF13B STR locus may be used in personal identification and paternity cases in the Çukurova region.

Correspondence author:

Lale DÖNBAK

Kahramanmaraş Sütçü İmam University,

Science and Art Faculty, Department of Biology,

Karacasu/Kahramanmaraş, Turkey

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413