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X-chromosomal haplotype frequencies of four linkage groups in a population of Argentina

G. Martinez[a,b,*], C. Schaller[a], P. Nazar[a], A. Brondani[a], N. Gomez del Rio[a], M. Bolea[b], B. Martinez-Jarreta[b]

[a] Servicio de Genetica Forense, Poder Judicial de Entre Rios, Parana, Argentina
[b] Departamento de Medicina Legal y Forense, Universidad de Zaragoza, Spain

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ABSTRACT

DNA samples of hundred ten unrelated anonymized male individuals living in province of Entre Rios, Argentina, were genotyped using Investigador Argus X-12 system (Qiagen) for 12 STRs in four haplogroups. The frequency of most common haplotype was 0.02727, 0.06364, 0.03636, and 0.03636 for haplogroups 1, 2, 3, and 4, respectively. The Match Probability was 6.0E-08 and the mean exclusion chance was 0.999999936. This work presents the first haplotype frequency data for Investigator Argus X-12 system in a population of Argentina.

1. Introduction

A large number of short tándem repeat markers (STR) on the X chromosome have been described in the past and they have proven to provide useful tools in paternity disputes with female off spring in the absence of the alleged father, or identification cases [1]. In the present study we analyzed 110 unrelated male individuals with the aim of establishing the haplotype frequencies of the markers included in the Investigator Argus X-12 (Qiagen, Hilden, Germany) commercial kit and evaluate their effectiveness for forensic purposes in the province of Entre Rios, Argentina.

2. Material studied, methods, techniques

Genomic DNA was extracted using Chelex-100 procedure from whole blood [2]. PCR was performed in a Veriti 96-Well Thermal Cycler (Life Technologies) using Investigator Argus X-12 system (Qiagen) according to manufacturer's recommendations. Linkage groups included in Argus X-12 are DXS10148, DXS10135, DXS8378 (Hap1), DXS7132, DXS10079, DXS10074 (Hap2), DXS10103, HPRTB, DXS10101 (Hap3), DXS10146, DXS10134 and DXS7423 (Hap4). Typing was performed by capillary electrophoresis (ABI 3130 Genetic Analyzer, Applied Biosystems) and statistical parameters were calculated using Power Marker v3.25 [3] and an Excel spread sheet according to Desmarais et al. [4].

3. Results

Statistical parameters for linkage groups and allelic frequencies for the 12 STRs were calculated (Table 1). The combined PD value was 0.99999994, and the MEC for all linkage groups was 0.999999936 in trios. PIC was greater than 0.97 for all haplotypes.

4. Discussion

The mayor adventage of X chromosome markers arises in deficiency patyernity cases [1], and Argus X-12 kit (Qiagen) offer the posibility to solve complex kinship cases were autosomal STR markers do not provided the information needed. Our work present the first haplotype frequencies database for an Argentinian population in four linkage groups present in this kit.

5. Conclusion

The study of one hundred ten male individuals in the population of Entre Rios (Argentina), allowed us to obtain allele frequencies of twelve STR systems and haplotype frequencies for

* Corresponding author.
E-mail address: gustavo_g_martinez@outlook.com (G. Martinez).

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Table 1
Allele frequencies and statistical parameters for 12 STRs and 4 haplotypes presents in Argus X-12 kit (Qiagen), in population of Entre Rios, Argentina. MF, minimum frequencies; PIC, polymorphism information content; PDm, power of discrimination in males; MECt, median exclusion chance in trios; MECd, median exclusion chance in duos (motherless).

Allele	DXS10148	DXS10135	DXS8378	DXS7132	DXS10079	DXS10074	DXS10103	HPRTB	DXS10101	DXS10146	DXS10134	DXS7423
7						0.05455						
8						0.11818						
9			0.00909									
10			0.27273					0.00909				
11			0.35455			0.00909		0.10909				
12			0.32727	0.05455				0.22727				
13			0.03636	0.24545	0.01818			0.31818				0.01818
13.3	0.00909											
14				0.37273	0.04545			0.20000				0.28182
15				0.26364	0.03636	0.12727		0.10000				0.48182
15.1		0.00909										
16				0.04545	0.03636	0.17273	0.25455	0.03636				0.12727
16.2						0.00909						
17	0.00909	0.02727		0.00909	0.06364	0.19091	0.14545					0.09091
17.1		0.00909										
17.2						0.00909						
18	0.25455	0.03636		0.00909	0.10000	0.20000	0.26364					
19	0.03636	0.04545			0.22727	0.10000	0.26364					
19.1		0.00909										
20		0.02727			0.29091	0.00909	0.07273					
20.1		0.01818										
21		0.11818			0.10909							
21.1		0.00909										
22		0.08182			0.04545							
23	0.02727	0.09091			0.00909					0.00909		
23.1	0.02727											
24	0.01818	0.12727			0.01818							
24.1	0.17273											
25		0.06364								0.12727		
25.1	0.23636											
25.2		0.00909										
26		0.06364								0.10000		
26.1	0.11818											
26.2									0.01818			
27		0.06364								0.18182		
27.1	0.03636											
27.2									0.01818			
28		0.07273							0.01818	0.14545		
28.1	0.04545											
28.2									0.06364			
29		0.02727							0.04545	0.12727		
29.1	0.00909											
29.2									0.05455			
30		0.01818							0.06364	0.10000		
30.1		0.00909										
30.2									0.17273			
31		0.03636							0.09091	0.00909	0.00909	
31.2									0.17273			
32		0.00909							0.10000	0.02727		
32.2									0.05455	0.00909		
33		0.01818							0.08182	0.01818	0.01818	
34									0.04545		0.10909	
35											0.16364	
36											0.22727	
36.3											0.00909	
37											0.19091	
37.2											0.00909	
38											0.10000	
38.2										0.00909		
38.3											0.02727	
39											0.02727	
39.3											0.00909	
40											0.02727	
40.2										0.02727	0.00909	
40.3											0.02727	
41.2										0.02727		
41.3											0.02727	
42.2										0.00909		
43.2										0.01818		
43.3											0.00909	
44.2										0.02727		
46.2										0.01818		
47.2										0.00909		

Table 1 (*Continued*)

Allele	DXS10148	DXS10135	DXS8378	DXS7132	DXS10079	DXS10074	DXS10103	HPRTB	DXS10101	DXS10146	DXS10134	DXS7423
MF	0.02273	0.02273	0.02273	0.02273	0.02273	0.02273	0.02273	0.02273	0.02273	0.02273	0.02273	0.02273
PIC	0.80785	0.92453	0.62898	0.67888	0.81153	0.83221	0.73107	0.75182	0.88748	0.87886	0.84366	0.61103
PDm	0.82876	0.92893	0.69140	0.72612	0.83025	0.85025	0.76975	0.78380	0.89620	0.88893	0.85868	0.66364
MECt	0.80785	0.92453	0.62898	0.67888	0.81153	0.83221	0.73107	0.75182	0.88748	0.87886	0.84366	0.61103
MECd	0.69426	0.86429	0.48276	0.53738	0.69971	0.72548	0.59611	0.62190	0.80605	0.79317	0.74284	0.46433

Hap.	Haplotype 1	Haplotype 2	Haplotype 3	Haplotype 4
Maj. Hap. Freq.	0.02727	0.06364	0.03636	0.03636
PIC	0.98762	0.97963	0.98287	0.98525
PD	0.98777	0.98000	0.98314	0.98545
MECt	0.98762	0.97963	0.98287	0.98525
MECd	0.97571	0.96063	0.96664	0.97119

four linkage groups present on X chromosome using Argus X-12 kit (Qiagen). The statistical analysis confirms its usefulness in paternity and forensic cases in the population studied.

Conflict of interest

None.

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