

## FOR THE RECORD

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# A Study on Four Short Tandem Repeat Systems: African Immigrant, Portuguese, and Spanish population data

**POPULATION:** Portuguese, Spaniards from the southwest of Spain, Spaniards of Caucasian origin from North Africa (Ceuta), immigrants from Morocco and immigrants from West Africa.

**KEYWORDS:** forensic science, DNA typing, PCR, short tandem repeats, population genetics

Specimens were collected from unrelated volunteer blood donors. The DNA was extracted using Chelex 100 protocol (1). Five  $\mu\text{L}$  aliquots of the extracts with a DNA content of approximately 5 ng/ $\mu\text{L}$  were used for amplification. The TH01, VWA, F13A1 and FES/FPS locus was amplified as described by Corte Real (2). Electrophoresis was carried out on 4% polyacrylamide denaturing sequencing gels on a 377 automated system (Applied Biosystems). Data were analyzed using the exact test for Hardy-Weinberg equilibrium (3,4), the chance of exclusion (CE) for paternity (5) and the discrimination power (6).

Sample populations of Caucasian Spaniards from North Africa (Ceuta) and of African immigrants from West Africa (Table 2), were observed to be in Hardy-Weinberg equilibrium for almost all the analyzed markers ( $p > 0.01$  in the four systems), except for the HUMVWA31A system. Possible reasons include inbreeding, population substructure and selection (7). In the specific case of the population of Spaniards of Caucasian origin from North Africa, the disequilibrium observed for this marker (HUMVWA31A) may be the consequence of the migratory movements that constantly take place in the zone. Likewise, given the influence on the genepool of the structure or composition of the West African black immigrant population in the south and center of Europe, currently made up of individuals from different geographical areas of West Africa, population substructure appears to be the most likely explanation for this deviation for HUMVWA31A loci.

The complete dataset is available to any interested researcher upon request made to Joaquin-Jose Gamero, Ph.D., Dpto. Medicina Legal, Facultad de Medicina, Universidad de Cadiz, Plaza Fragela s/n, 11003, Cadiz, Espana. Email: [joaquin.gamero@uca.es](mailto:joaquin.gamero@uca.es)

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TABLE 1—Allele frequency distribution for four STR loci in five populations investigated.

Locus	Allele	Portugal <i>n</i> = 344	Moroccan Im. <i>n</i> = 108	North African (Spain) <i>n</i> = 110	S.W. Spain <i>n</i> = 201	W. African Black Im. <i>n</i> = 110
HUMTH01	5					0.0045
	6	0.2311	0.1157	0.1636	0.2363	0.0995
	7	0.1265	0.2037	0.1863	0.1617	0.4091
	8	0.1352	0.1805	0.1363	0.1269	0.2136
	9	0.1933	0.3240	0.2182	0.2015	0.1955
	9,3	0.3052	0.1342	0.2763	0.2662	0.0682
	10	0.0087	0.0370	0.0182	0.0074	0.0136
HUMFES	11		0.0046			
	8	0.0189	0.0324	0.0182	0.0050	0.1111
	9		0.0509	0.0318	0.0025	0.1065
	10	0.3110	0.3611	0.3182	0.3184	0.2269
	11	0.3881	0.3148	0.3455	0.3682	0.3009
	12	0.2471	0.1759	0.2409	0.2487	0.1667
	13	0.0349	0.0648	0.0454	0.0572	0.0833
HUMVWA31/A	14					0.0046
	4					0.0046
	5					0.0046
	6					0.0046
	8					0.0046
	12					0.0046
	13	0.0014	0.0046		0.0050	0.0091
	14	0.1221	0.1343	0.1045	0.0920	0.0773
	15	0.1148	0.1991	0.1273	0.1070	0.2182
	16	0.2224	0.2222	0.2364	0.2264	0.2318
	17	0.2762	0.2037	0.2409	0.3134	0.2227
	18	0.1817	0.1389	0.2000	0.1368	0.1227
	19	0.0669	0.0741	0.0682	0.0945	0.0500
20	0.0102	0.0231	0.0182	0.0224	0.0364	
21	0.0043		0.0045	0.0025	0.0091	
HUMF13A1	3,2	0.0843	0.1620	0.0818	0.0721	0.1667
	4	0.0291	0.0602	0.0454	0.0299	0.1435
	5	0.1817	0.2500	0.2136	0.2338	0.3426
	6	0.3052	0.1805	0.2364	0.3109	0.0972
	7	0.3575	0.2731	0.3818	0.3259	0.1157
	8	0.0116	0.0046	0.0136	0.0149	0.0880
	9			0.0091		
	10					0.0046
	11		0.0046			0.0046
	12		0.0092			0.0046
	13			0.0045	0.0025	0.0139
	14	0.0102		0.0091	0.0025	0.0093
	15		0.0278		0.0025	0.0046
16	0.0160	0.0093	0.0045	0.0025		
17	0.0044			0.0025	0.0046	

TABLE 2—Statistical parameters of medico-legal interest.

	Locus	CE	PD	H	P
Portugal	TH01	0.5616	0.9145	0.7764	0.8600
	FES	0.4216	0.8436	0.6900	0.8200
	VWA	0.6219	0.9365	0.8086	0.8400
	F13A1	0.5078	0.8885	0.7375	0.2400
	Comb	0.9528	0.9999		
Moroccan Im.	TH01	0.5881	0.8903	0.7881	0.2500
	FES	0.4987	0.8599	0.7317	0.4100
	VWA	0.6508	0.9359	0.8261	0.2200
	F13A1	0.6058	0.9185	0.7991	0.0400
	Comb	0.9761	0.9999		
North African (Spain)	TH01	0.5923	0.9216	0.7951	0.7700
	FES	0.4672	0.8742	0.7180	0.4100
	VWA	0.6303	0.9208	0.8140	0.0002
	F13A1	0.5209	0.8911	0.7435	0.2000
	Comb	0.9615	0.0999		
S.W. Spain	TH01	0.5750	0.9229	0.7864	0.1500
	FES	0.4315	0.8499	0.6979	0.7310
	VWA	0.6176	0.9348	0.8024	0.1400
	F13A1	0.4978	0.8843	0.7361	0.0700
	Comb	0.9536	0.9999		
West African Black Im.	TH01	0.5120	0.8910	0.7350	0.8661
	FES	0.6080	0.9316	0.8000	0.1083
	VWA	0.6340	0.9404	0.8150	0.0004
	F13A1	0.6260	0.9379	0.8030	0.0127
	Comb	0.9740	0.9999		

CE: chance of exclusion; PD: power of discrimination; H: heterozygosity values; *P* values for the exact test for Hardy-Weinberg equilibrium.