

SHORT COMMUNICATION

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Autosomal STR genetic variation in negroid Chocó and Bogotá populations

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Abstract Genetic data for eight autosomal STRs were obtained from two different population samples from Colombia: the European Mestizo population of Bogotá and the African descent population of the Chocó region. The STRs were analysed in a multiplex system that includes the STR markers CSF1PO, TPOX, TH01, VWA, D13S317, D7S820, D16S539 and D5S818. Separation of the fragments and fluorescent detection was carried out in an ABI 310 DNA sequencer and the typing was made by comparison with sequenced allelic ladders. Exact tests were used for testing linkage between the loci and for Hardy-Weinberg equilibrium. Significant differences were found between both populations for all the loci.

Keywords STRs · Colombia population · Negroid population

Introduction

Only a few autosomal STR studies have been performed on South American Caucasian Mestizo populations (Yunis et al. 2000a, 2000b; Lleonart et al. 2000). However, the genetic admixture processes that have occurred in these countries during the last few centuries, requires an extensive genetic study in order to determine the necessity to implement population-specific databases for forensic purposes.

In this work eight STRs were investigated in two different Colombian populations, the European Mestizo population of Bogotá and the African descent population of the Chocó region (see MS Encarta World Atlas). The for-

mer represents the majority in the Colombian population (almost all are of Spanish descent), but the predominant group in the Chocó prefecture is of African origin. STR population data from Spain are abundant and can be consulted in the web of the Spanish and Portuguese Working Group of the International Society for Forensic Genetics (<http://www.usc.es/gep-isfh/>). The origin of the Chocó population is from slaves brought from Africa in the middle of the seventeenth century, mainly from Mauritania, Mozambique, the Guinea Gulf area, Sao Tomé, South Congo and Angola (Cuesta 1986). STR population data from these areas can be found in Gamero et al. (2000), Gusmao et al. (2001) and Corte-Real et al. (1999). The aim of this paper is to contribute to the establishment of a Colombian database for the polymorphisms of forensic interest.

Material and methods

Samples were obtained from 170 unrelated individuals of African descent from the Chocó region and 700 unrelated individuals from Bogotá with a similar proportion of male and females. Genomic DNA was extracted by a salt precipitation extraction procedure (Miller et al. 1988). The PCR strategy, primer sequences and cycling conditions were as recommended in the PowerPlex 1.2 fluorescent STR kit (Promega Corporation, Madison, Wis.; Micka et al. 1999) which includes the systems CSF1PO (5q33.3–34), TPOX (2p23–2pter), TH01 (11p15.5), vWA (12p12–pter), D13S317 (13q22–q31), D7S820 (7q), D16S539 (16q24–qter) and D5S818 (5q21–q31).

Separation and detection of the amplified products were carried out in an ABI 310 (Applied Biosystems, Foster City, Calif.). Typing was made by comparison with the sequenced allelic ladders provided in the kit and carried out in the laboratory of the University of Antioquía (Colombia). Statistical analysis of data was carried out in the Institute of Legal Medicine, University of Santiago de Compostela (Spain).

The power of discrimination (PD) was calculated following Fisher's method (Fisher 1951), heterozygosity values (H) and chance of exclusion (CE) were calculated as described by Nei and Roychoudhury (1974) and Ohno et al. (1982), respectively. Independence of the loci in both populations was tested using an exact test with the Genetic Data Analysis (GDA) software (P.O. Lewis and D. Zaykin, Genetic Data Analysis software for the analysis of discrete genetic data, computer programme distributed by the authors and available at <http://chee.unm.edu/gda/>). Hardy-Weinberg equilibrium was checked using an exact test (Guo and Thompson 1992).

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Results and discussion

Allele frequencies from the two populations are shown in Table 1 and complete data can be obtained from the authors on request. No deviations from Hardy-Weinberg equilibrium were observed in any of the systems.

The exact test used for testing independence of the loci showed that there is no evidence of association between loci. The comparison of each locus in both populations by mean of an exact test showed significant differences in all the loci analysed. A comparison of allele frequencies in the population under study has been performed with a population of Caucasian Mestizo individuals from other studies (Yunis et al. 2000a, 2000b) except for the system D5S818 where no data were available. The comparison revealed no differences with the Caucasian Mestizo database but statis-

tically significant differences with the Chocó population (data not shown). A comparison between the Promega Afro-Caribbean data for the PowerPlex loci (Promega manual) revealed no significant differences except for the locus D13S317 where the differences are statistical significant ($p < 0.0001$).

Differences in STR frequencies in different African populations have been observed and in general, differences among African populations are higher than within European ones (Jorde et al. 1997). Even for populations of the Bantu culture (where most of the slaves who colonised the Chocó area come from) differences among populations have been observed (Corte-Real 1999). Since the African slaves brought to the different parts of America have different geographic origins, this fact would explain the different frequencies observed for the D13S317 system in the population of Chocó and in general African-American

Table 1 Allele frequencies for 8 STRs in the population of Bogotá (number of individuals 700) and Chocó (number of individuals 170)

Allele	CSF1PO	TPOX	TH01	VWA	D16S539	D7S820	D13S317	D5S818
Caucasian Mestizos from Colombia								
5	—	—	0.0071	—	—	—	—	—
6	0.0007	0.0043	0.3971	—	—	—	—	—
7	0.0057	0.0036	0.2243	—	—	0.0100	0.0007	0.0329
8	0.0107	0.4486	0.0743	—	0.0029	0.0957	0.0139	0.0064
9	0.0179	0.0750	0.1279	—	0.0335	0.0714	0.1099	0.0821
9.3	—	—	0.1036	—	—	—	—	—
10	0.2271	0.0357	0.0657	—	0.1429	0.2772	0.1551	0.0536
11	0.2971	0.2971	—	0.0056	0.2036	0.2943	0.0932	0.4157
12	0.3651	0.1250	—	—	0.2757	0.2064	0.2038	0.2950
13	0.0650	0.0107	—	0.0083	0.2228	0.0371	0.2622	0.1021
14	0.0100	—	—	0.0730	0.1050	0.0071	0.1064	0.0107
15	0.0070	—	—	0.0960	0.0136	0.0007	0.0548	0.0014
16	—	—	—	0.3317	—	—	—	—
17	—	—	—	0.2650	—	—	—	—
18	—	—	—	0.1599	—	—	—	—
19	—	—	—	0.0514	—	—	—	—
20	—	—	—	0.0070	—	—	—	—
21	—	—	—	0.0021	—	—	—	—
African descent population from Chocó								
6	—	0.0529	0.2059	—	—	—	—	—
7	0.0647	0.0118	0.4088	—	—	0.0029	—	—
8	0.0882	0.3529	0.1676	—	0.0088	0.2118	0.0118	0.0265
8.3	—	—	0.0029	—	—	—	—	—
9	0.0471	0.2118	0.1147	—	0.1765	0.1206	0.0676	0.0588
9.3	—	—	0.0529	—	—	—	—	—
10	0.2294	0.0735	0.0471	—	0.1265	0.3206	0.0353	0.0559
11	0.2382	0.2294	—	0.0029	0.2382	0.2206	0.1588	0.2794
12	0.2706	0.0618	—	—	0.2294	0.0971	0.3029	0.3441
13	0.0412	0.0059	—	0.0324	0.1588	0.0264	0.2765	0.2206
14	0.0176	—	—	0.0471	0.0559	—	0.1294	0.0118
15	0.0029	—	—	0.1735	0.0059	—	0.0176	0.0029
16	—	—	—	0.3206	—	—	—	—
17	—	—	—	0.2118	—	—	—	—
18	—	—	—	0.1000	—	—	—	—
19	—	—	—	0.0853	—	—	—	—
20	—	—	—	0.0235	—	—	—	—
21	—	—	—	0.0029	—	—	—	—

Table 2 Statistical parameters showing the forensic usefulness of the systems

	CSF1PO	TPOX	TH01	vWA	D16S539	D7S820	D13S317	D5S818
Bogotá population								
H obs	0.7343	0.6743	0.7329	0.7955	0.7814	0.7943	0.8095	0.7429
H exp	0.7226	0.6883	0.7555	0.7774	0.8007	0.7787	0.8310	0.7194
SD	± 0.0167	± 0.0177	± 0.0167	± 0.0152	± 0.0156	± 0.0153	± 0.0148	± 0.0165
PD	0.8738	0.8537	0.9078	0.9182	0.9306	0.9170	0.9499	0.8795
CE	0.4773	0.4466	0.5492	0.5746	0.6050	0.5706	0.6638	0.4940
<i>P</i> exact test for Hardy-Weinberg equilibrium (runs: 3000)	0.1347	1.0000	0.3350	0.1177	0.1793	1.0000	0.8293	1.0000
Chocó population								
H obs	0.8294	0.7647	0.7294	0.8176	0.7764	0.7588	0.7353	0.7529
H exp	0.8036	0.7680	0.7464	0.8035	0.8174	0.7813	0.7859	0.7496
SD	± 0.0288	± 0.0325	± 0.0341	± 0.0296	± 0.0319	± 0.0328	± 0.0338	± 0.0331
PD	0.9326	0.9108	0.8999	0.9348	0.9395	0.9178	0.9217	0.8950
CE	0.6119	0.5558	0.5307	0.6175	0.6302	0.5707	0.5824	0.5206
<i>P</i> exact test for Hardy-Weinberg equilibrium (runs: 3000)	0.7297	0.5856	0.6147	0.6903	0.0269	0.8978	0.0272	0.0425

databases. This finding highlights the importance of local databases.

Some statistical parameters showing the forensic usefulness of these eight systems are shown in Table 2. The combined power of discrimination was of 0.99999 in both populations and the chance of exclusion was 0.998 and 0.999 in the populations of Bogotá and Chocó, respectively.

In conclusion, two population databases have been established for the Caucasian Mestizo population and African descent population from Chocó for the eight STR loci CSF1PO, TPOX, TH01, vWA, D13S317, D7S820, D16S539 and D5S818. The high combined power of discrimination for these loci shows their usefulness for forensic purposes.

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