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Short population report

HLA genes in Barranquilla (North Colombia): Searching for cryptic Amerindian genes

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ABSTRACT

America First Inhabitants population (Amerindians, Na Dene and Eskimos) underwent a drastic population reduction and gene exchange after Europeans and Africans arrival after 1492 AD. Barranquilla population may be a good model to study present day population admixture in South America. HLA-A, -B and -DRB1 DNA typing has been performed in 188 unrelated individuals originated in the area and speak Spanish language; they showed apparent European/African and mixed characters. HLA genetic European/African features were found and only 1.85% Amerindian one. This contrasts with neighboring Cuban population where 10% HLA Amerindian characters appear.

Amerindians tend to group together and separate from other World populations regarding to HLA and other genes profile [1–3]. Amerindians and Pacific Islanders extensively share high frequency and rare (in other parts of World) HLA alleles and haplotypes and also cultural traits that suggest a Pacific-Amerindian gene and cultural flow in ancient times [1–4].

Barranquilla city is the coastal capital of Atlantic Department-Caribbean Region, Colombia. Barranquilla is the most populated town in Caribbean Region and the fourth most populated one in Colombia. 13.2% of Barranquilla population is from African origin and 0.1% from Amerindian origin according to the 2005 official Census [5]; the rest of population is considered as admixed of Europeans, Africans and Amerindians [5]. This Census information about apparent physical characters suggests that Amerindian individuals are almost lacking in Barranquilla city [6]. Africans to this area were brought by Spaniards after 1492 AD [7].

Population sampling: 188 unrelated individuals from Barranquilla were HLA class I (-A and -B) and HLA class II (-DRB1) genotyped. They were unrelated and included into a kidney transplantation list at Clinica General del Norte. These individuals are patients and there could be some skewing of the frequencies owing to the presence of alleles associated with disease that lead to renal failure. A writing consent was given by present study participants; they were born in this area and their four grandparents had been born in the same area. Spanish language is spoken in all Colombian urban cities including Barranquilla, as it is official Colombian language.

HLA typing and DNA sequencing: Generic HLA class I (-A and -B) and high resolution HLA class II (-DRB1) was performed by PCR-SSOP Luminex technique [8] (Luminex Corporation, Austin, TX, USA). Typing was done following standard techniques [1,2,7,9]. Typing ambiguities were sorted out by standard HLA DNA sequencing.

Statistical analysis: Statistical analysis was performed with Arlequin v3.0 software [10]. In summary, this program calculated HLA-A, -B and -DRB1 allele frequencies, Hardy–Weinberg equilibrium and the linkage disequilibrium between alleles.

The expected and observed gene frequency values for HLA-A, -B, and -DRB1 loci do not differ significantly and the population is found in Hardy–Weinberg equilibrium (data not shown). Table 1 from Supplementary Material shows the HLA allele frequencies found in the studied population. Nineteen different HLA-A and twenty-nine different HLA-B alleles were found in our Barranquilla sample. However, only ten HLA-A alleles and eight HLA-B alleles (A*01, A*02, A*03, A*23,

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A∗24, A∗29, A∗30, A∗31, A∗33, A∗68, B∗07, B∗14, B∗15, B∗35, B∗39, B∗44 and B∗51) had frequencies higher than 4%. With regard to the HLA class II alleles, twenty-four different HLA-DRB1 alleles were found. Only six HLA-DRB1 alleles have frequencies higher than 4% (DRB1∗01:01, DRB1∗03:01, DRB1∗04:01, DRB1∗07:01, DRB1∗13:01 and DRB1∗15:01).

Table 2 from Supplementary Material depicts all found HLA-A/HLA-B/HLA-DRB1 haplotypes and the most frequent five ones are commented: four of them (A∗24/B∗35/DRB1∗04:01, A∗29/B∗44/DRB1∗07:01, A∗33/B∗14/DRB1∗01:01 and A∗02/B∗51/DRB1∗04:01) are also found in Mediterraneans (Eurafricans). A∗24/B∗40/DRB1∗03:02 may be of African origin. All genotype data included in this paper is held in www.allelefrequencies.net under the population name Colombia (Barranquilla) and identifier number 3412.

Barranquilla city population bears only 2 quasi-specific Amerindian HLA-DRB1 alleles [4,11]: HLA-DRB1∗09:01 (1.35%) and HLA-DRB1∗14:02 (0.55%). One specific Amerindian HLA allele is found in the studied population (HLA-DRB1∗14:02, 0.55%). In addition, most frequent extended HLA haplotypes show a substantial admixture with non-Amerindian populations. Amerindian genes may be present in individuals with African, European or intermediate character, as in the case of Cubans [6], but in a lower frequency (see also [12]).

These genetic data complement Census data, i.e.: external anthropological features are mostly African (see also [7]), Caucasoid or intermediate and only 0.1% seems to be Amerindians and HLA genetics discovers that a small population percentage (1.85%) shows HLA Amerindian genes, but up to nearly 20% might also be Amerindian genes: HLA-DRB1∗03:01 (4%) and HLA-DRB1∗04:01 (9.30%) [4].

Notwithstanding, Amerindians have usually retired from urban to more secluded areas. This may have a bearing to our results that may be mostly from a group of urban non-Amerindian individuals. This information may also be useful to establish a Preventive Medicine based in Epidemiology (HLA linked to disease) and in Pharmacogenomics (HLA and adverse effect to drugs) in Barranquilla population.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.humimm.2017.11.003.

References

[1] A. Arnaiz-Villena, J. Palacio-Gruber, E. Muñiz, C. Campos, J. Alonso-Rubio, E. Gomez-Casado, et al., HLA genes in Chimila Amerindians (Colombia), the peopling of America and medical implications, Int. J. Mod. Anthrop. 9 (2016) 91–116.
[2] A. Arnaiz-Villena, E. Muñiz, J. Palacio-Gruber, C. Campos, J. Alonso-Rubio, E. Gomez-Casado, et al., Ancestry of amerindians and its impact in anthropology, transplantation, HLA pharmacogenomics and epidemiology by HLA study in wiwa colombian population, Open Med. J. 3 (2016) 3–20.
[3] A. Arnaiz-Villena, C. Parga-Lozano, E. Moreno, C. Areces, D. Rey, P. Gomez-Prieto, The origin of Amerindians and the peopling of the Americas according to HLA genes: admixture with Asian and Pacific People, Curr. Genomics 11 (2010) 103–114.
[4] A. Arnaiz-Villena, C. Areces, M. Enriquez-de-Salamanca, S. Abd-El-Fatah-Khalil, J. Marco, E. Muñiz, et al., Pacific Islanders and Amerindian relatedness according to HLA autosomal genes, Int. J. Mod. Anthrop. 7 (2014) 44–67.
[5] DANE. Boletín. Censo General 2005. Perfil Barranquilla - Atlántico. In: Departamento Administrativo Nacional de Estadística (ed). Gobierno de Colombia. (2005). https://www.dane.gov.co/files/censo2005/perfiles/atlantico/barranquilla.pdf Accessed July 2017.
[6] R. Alegre, J. Moscoso, J. Martinez-Laso, M. Martin-Villa, J. Suarez, A. Morenoa, et al., HLA genes in Cubans and the detection of Amerindian alleles, Mol. Immunol. 44 (2007) 2426–2435.
[7] A. Arnaiz-Villena, R. Reguera, C. Parga-Lozano, S. Abd-El-Fatah, L. Monleon, L. Barbolla, et al., HLA genes in Afro-American Colombians (San Basilio de Palenque): the first free Africans in America, Open Immunol. J. 2 (2009) 59–66.
[8] Y. Itoh, N. Mizuki, T. Shimada, F. Azuma, M. Itakura, K. Kashiwase, et al., High-throughput DNA typing of HLA-A, -B, -C, and -DRB1 loci by a PCR-SSOP-Luminex method in the Japanese population, Immunogenetics 57 (2005) 717–729.
[9] A. Arnaiz-Villena, J. Martinez-Laso, E. Gomez-Casado, N. Diaz-Campos, P. Santos, A. Martinho, et al., Relatedness among Basques, Portuguese, Spaniards, and Algerians studied by HLA allelic frequencies and haplotypes, Immunogenetics 47 (1997) 37–43.
[10] S. Schneider, D. Roessli, L. Excoffier, ARLEQUIN: A Software for Population Genetics Database Analysis, 2.0 ed., Genetics and Biometry Laboratories, Department of Anthropology, University of Geneva, Switzerland, 2000.
[11] A. Arnaiz-Villena, C. Areces, P. Gomez-Prieto, C. Parga-Lozano, E. Moreno, S. Abd-El-Fatah-Khalil, et al., The peopling of the Americas: a complex issue for Amerindian, Na-dene, Aleut and Eskimo first inhabitants, Int. J. Mod. Anthrop. 3 (2010) 65–79.
[12] F.F. Gonzalez-Galarza, L.Y.C. Takeshita, E.J.M. Santos, F. Kempson, M.H.T. Maia, A.L.S. da Silva, et al., Allele frequency net 2015 update: new features for HLA epitopes, KIR and disease and HLA adverse drug reaction associations, Nucl. Acids Res. 43 (2015) D784–8, http://dx.doi.org/10.1093/nar/gku1166.