Distribution of HNA alleles across the Brazilian territory

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BACKGROUND

Brazil has a population of 213 million inhabitants, with an ethnic composition from indigenous, Africans and Europeans. Investigating the distribution of HNA alleles in representative regions becomes an important tool to assess the risks of alloimmunization in such a mixed population.

Aim: To investigate the distribution of HNA alleles in blood donors from northern, northeastern and southeastern Brazil, who have indigenous, african and caucasian ancestry, respectively (Figure 1).

Figure 1. Map of the geoeconomic regions of Brazil, and representative states.

METHODS

Blood donors from northern (Pará, 50 samples), northeastern (Alagoas, 50 samples), and southeastern Brazil (São Paulo, 300 samples) were included in the study. Genotyping of the HNA-1 and HNA-4; HNA-3 and HNA-5 were performed using PCR-SSP and PCR-RFLP respectively.

RESULTS

HNA-1 and HNA-5 alleles presented a statistically significant difference between the studied regions (Table 1):

- The *FCGR3B*01* and **02* alleles showed an inverse distribution in the northern (0.554 and 0.376) when compared to southeastern and northeastern country (0.315 and 0.637; and 0.336 and 0.572, respectively. P<0.0001 in both comparisons).
- The presence of the *FCGR3B*03* allele, more frequent in Africans, was remarkable in the northeast region: 0.090 *versus* 0.048 (P=0.0002) and 0.069 (P=0.0459) in the southeast and north regions, respectively.
- *FCGR3B*null* was only identified in the northern Brazil.
- There was a large difference in the frequency of the HNA-5 alleles in the southeast and northeast regions.

Table 1. Frequency of HNA alleles in Brazilian's blood donors according to region and ancestry

Region (*n*)	**Predominant Ancestry**	***FCGR3B* (HNA-1)**				***SLC44A2* (HNA-3)**		***ITGAM* (HNA-4)**		***ITGAL* (HNA-5)**		***References***
		**01*	**02*	**03*	**null*	**01*	**02*	**01*	**02*	**01*	**02*	
Southeast (121-500)	Caucasians	0.315†	0.637¥	0.048*	0.000	0.810	0.190	0.822	0.178	0.711‡	0.289	Santos V, 2011; Lopes L, 2013; Cardone J, 2006
North (50)	Indigenous	0.554†	0.376¥	0.069*	0.029	0.840	0.160	0.870	0.130	-	-	Jala A, 2021
Northeast (50)	Africans	0.336	0.572	0.090#	0.000	0.800	0.200	0.850	0.150	0.397‡	0.602	Jala A, 2021
P *value*		<0.0001†	<0.0001¥	0.0459* 0.0002#						<0.0001‡		

-, not tested.

CONCLUSIONS

The influence of ancestry on the distribution of HNA alleles was striking in the studied regions. The proportion of *FCGR3B*01 and *02* alleles in the northern Brazil was similar to that described in indigenous tribes (Brazil and Argentina) and Asian countries, evidencing the indigenous influence. The highest frequency of the *FCGR3B*03* allele in the northeast region is comparable to that described in Africans. The results for the southeast region are close to those observed in Caucasians. The distinct distribution of the HNA-5 alleles in the northeast may resemble the African population, however data are scarce in the literature (Table 2).

Table 2. Distribution of HNA aleles in different populations

Population (n)	**HNA -1**				**HNA - 2**		**HNA - 3**		**HNA -4**		**HNA – 5**		**References**
	1a	**1b**	**1c**	**null**	**Pos**	**Neg**	**3a**	**3b**	**4a**	**4b**	**5a**	**5b**	
Brazil													
Southeastern (121 - 500)	0.315	0.637	0.048	-	0.970	0.030	0.810	0.190	0.822	0.178	0.711	0.289	Lopes LB, 2003; Jala A 2021
Northern (50)	0.554	0.376	0.069	0.029	-	-	0.933	0.066	0.870	0.130	-	-	Jala A, 2021
Northeastern (50)	0.336	0.572	0.090	-	-	-	0.800	0.200	0.850	0.150	0.397	0.602	Jala A 2021
Indian Xicrin (60 - 120)	0.850	0.140	0.000	-	-	-	1.000	0.000	1.000	0.000	0.855	0.145	Lopes L, 2013; Covas D, 2005; Cardone J, 2006
Argentina													
Argentina (192)	0.443	0.557	0.023	-	-	-	-	-	-	-	-	-	De La Veja Elena, 2008
Indian (26)	0.769	0.231	0.000	-	-	-	-	-	-	-	-	-	De La Veja Elena, 2008
USA (90-151)	0.370	0.630	0.000	-	0.970	0.030	0.770	0.230	-	-	-	-	Hessner MJ, 1996; Matsuo K, 200
Germany (260 – 398)	0.373	0.627	0.025	-	-	-	0.792	0.207	0.903	0.097	0.659	0.341	Reil A, 2011; Sachs UJ, 2005
England (140)	0.318	0.668	0.014	-	-	-	0.768	0.232	0.882	0.118	0.736	0.264	Cardoso SP, 2003
Korea (101 - 110)	-	-	-	0.000	0.620	0.380	-	-	0.996	0.041	0.959	0.041	Han TH,2006; Han SK, 1997
Thailand													
Southern (427)	0.619	0.365	0,012	0.005	-	-	0.808	0.192	0.973	0.027	0.656	0.344	Intharanut K, 2019
Central (500)	0.548	0.452	0,004	0.000	-	-	0.718	0.282	0.975	0.025	0.771	0.229	Intharanut K, 2019
Northeastern (400)	0.696	0.301	0,000	0.002	-	-	0.785	0.215	0.972	0.028	0.676	0.324	Intharanut K, 2019
China (83 – 493)	0.667	0.333	0,000	-	1.000	0.000	0.738	0.262	0.996	0.004	0.854	0.146	Xia W, 2011
Zambia (126-200)	0.390	0.432	0,143	0.010	-	-	0.974	0.026	0.892	0.108	0.500	0.500	Kissel K, 2000; Nielsen KR, 2012

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