

CARACTERISATION ANTHROPO-GENETIC BY ABO AND RHESUS BLOOD GROUP IN AROUND THE TLEMCEEN REGION (NORTHWEST ALGERIA)

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Abstract: To characterize genetically the population of the west of Algeria, we have analysed 92964 individuals from 18 population samples in and around the Tlemcen region (northwest Algeria) for their polymorphism of the ABO and Rhesus blood systems.

A high significant variability was observed between the samples. The gene frequencies varied between 0.19 to 0.292 for gene A, 0.073 to 0.135 for gene B, 0.62 to 0.73 for gene O and 0.166 to 0.375 for gene d. Genes A and d appeared thus to beat intermediate frequency between negroids and caucasoids, while gene B was at intermediate or negroid frequency, and gene O at intermediate or caucasoid frequencies. The population in and around the Tlemcen region of Algeria appears to result from admixture with Africans by south, Europeans by north and Arabs by east.

Key words : Polymorphism – blood groups – ABO system – Rh system – Population - Western Algeria.

INTRODUCTION

Algeria, among North Africa countries, has been submitted to a serie of invasion by several ethnic groups during its history. The influence of these invaders and the importance of their contribution to the genetic constitution of the Algerian population are, however, not yet fully established, although the effects of Berbers and Arabs had much significance on the genetic and cultural characteristics of present day Algeria (Julien, 1951 ; Mears *et al.*, 1981 ; Camps, 1987). The use of genetic markers has revealed evident similarities between Algerians and other populations of the mediterranean regions like Morocco and Tunisia (Chaabani and Cox, 1988 ; Aireche and Benabadji, 1988, 1990 , 1994 ; Fernadez-Santander *et al.*, 1999).

Several studies of the Algerian population were based on the ABO system and Rhesus factor. These studies mainly focused on regions in the center of Algeria,

some Northern oases of the Sahara, few open village populations, or on small samples from militaries (Benabadji and Chemla, 1971 ; Excoffier *et al.*, 1987 ; Aireche and Benabadji, 1994 ; Merghoub *et al.*, 1997). The repartition of the ABO and Rhesus blood groups in the populations of western and southwestern Algeria has not yet been established. We report here the data on frequencies and distribution of blood alleles of the ABO and Rhesus systems in samples of Northwestern Algerian communities (region of Tlemcen), some of them characterized by high level of consanguinity (Benallègue and Kedj, 1984).

MATERIAL AND METHODS

92964 unrelated subjects of both sexe born in Algeria, were tested for the ABO and Rhesus systems. They came from 18 villages located on the west part of Algeria (region of Tlemcen)(see **carte 1**). The data were collected from laboratories and hospitals (**Table 1**).

Blood samples were collected by vein puncture in EDTA vials. The analysis of the red cell systems ABO and Rhesus was performed with commercial antisera using standard methods by agglutination .

Populations	Women	Men	Total
Honaine	2512	1885	4397
Sidi-Driss	551	428	979
Souk-el-Khemis	1123	798	1921
Sidi-Bediaf	565	606	1171
Remchi	2310	2553	4863
Maghnia	11712	8728	20440
Bab-El-Assa	396	649	1045
Marsa Ben-Mhidi	513	610	1123
Ghazaouet	3738	4071	7809
Sidi-Ali-Benzemra	264	141	405
Ain-Youcef	1210	816	2026
Fehoul	557	447	1004
Tlemcen	11006	8994	20000
Ain-EL-Kebira	417	290	707
Hamri	166	67	233
Zaouia Sidi Benamar	120	79	199
Nedroma	6555	7567	14122
Ouled-Mimoun	6873	3647	10520
Total	50588	42376	92964

Table 1. Populations and Samples

RESULTS AND DISCUSSION

The observed phenotypic and allelic frequencies of the examined blood markers in the populations analysed are presented in **table 3 and 4**. Allele frequencies vary from 0.19 to 0.292 (mean = 0.225) for A allele, from 0.073 to 0.135 (mean = 0.109) for B and from 0.62 to 0.73 (mean = 0.665) for O allele (**table 3 and 4**).

The frequencies of the A allele show a pattern of distribution with an intermediate frequency between values characterizing negroids and caucasoids (Aireche and Benabadji, 1994). As seen **table 2** the highest value is seen in Sidi Driss a village located northwest and extrem northwest (**fig 2**). This value was higher than A gene frequency observed usually in Maghreb countries and caucasoid populations like France, Danemark, Germany, Ireland, Italy, and USA (Serre et al., 1987 ; Zain et al., 1988 ; Bittles and Smith, 1991 ; Grunnet et al., 1994 ; Vona et al., 1994, Scheil and Strunz, 1996). The lowest frequency is observed in Fehoul (**fig 2**). This low value is however higher than frequencies found in African countries like Gabon and Mozambic (Bergstom et al., 1994 ; Languillat et al., 1980), but as lower as than gene A frequencies in Maghreb countries and Egypt (Benabadji and Aireche, 1994; Hmida et al., 1994 ; Vona et al., 1994).

The regional distribution of B allele is somewhat different. The lowest frequency is seen in Hamri Benamar, located in extrem northwest (fig 2, 3) and the highest frequency in Sidi Bediaf (northwestern). This high frequency is similar to that observed in Lybia, but higher to that found in Gabon and, remained lower than those in Egypt (Languillat *et al.*, 1980 ; Vona *et al.*, 1994). For the majority of the populations sampled, gene B frequencies are close to those observed in Maghreb population (Benabadji and Aireche, 1994 ; Hmida *et al.*, 1994 ; Vona *et al.*, 1994).

For the O allele, the highest values are in Hamri Benamar (extrem northwestern). These values were lower than in African populations like Mozambic and Gabon (Languillat *et al.*, 1980 ; Bergstrom *et al.*, 1994). The lowest value is in Sidi Driss and Sidi Ali Benzemra. These results indicate that these populations are generally characterized by a A gene frequency intermediate between those of caucasoides (0.27 in European populations) and negroids (0.173 in black African populations) (fig 2, 4). However, some exceptions exist, mainly for Sidi Driss, which shows A frequencies very close to those noted in European populations (caucasoid)(table 2). Indeed, half of the populations studied are characterized by a B gene frequency close to that of negroids , and the second half by an intermediate frequency (0.06 for European and 0.114 for black African populations) (Fig 2,4).

However, we noted that O allele frequency was caucasoid (0.660 in European populations) in half of the studied populations (Honaine, Sidi Driss, Souk El Khemis, Sidi Bediaf, AinYoucef, Sidi Ali Benzemra, Tlemcen, Ain Kebira, Ouled Mimoun). In contrast, Ain

Safra and Hamri Benamar were negroids (0.713 in black African populations) and the other were characterized by an intermediate O allele frequencies (Fig 4) .

It will be apparent from the foregoing presentation that the distribution of ABO blood groups among the different groups were in agreement with findings reported earlier (Aireche and Benabadji, 1994) .

For the rhesus blood group, our population samples were more homogeneous. The distribution was intermediate between caucasoid (d allele frequency of 0.40) and negroid (0.20) frequencies (Fig 2, 5). However, the highest d frequency seen in Zaouia Sidi Benamar (0.375) is lower than frequencies of caucasoid countries like Germany, Sweden and Australia (Bergstrom *et al.*, 1994 ; Scheil and Strunz, 1996 ; Lai, 1986), but higher than than frequencies of African countries like Egypt, Lybia, Morroco and Tunisia (Vona *et al.*, 1994 ; Jhonson, 1963 ; Ranque *et al.*, 1961). The lowest value observed in Bab El Assa (0.166) was lower than that found in Mozambic, which were negroid populations for the Rhesus system (Bergstrom *et al.*, 1994).

The populations of western Algeria (wilaya of Tlemcen) appear thus characterized by A and d alleles of frequency intermediate between those of caucasoids and negroids, B allele of intermediate or negroid frequencies, and O allele of intermediate or caucasoid frequencies.

This regional heterogeneity in allele frequencies could reflect genetic admixture with other populations (European, Arabic ,....)

Population	f (A)	f (B)	f (O)	f (d)	References
Algerian	0,209	0,123	0,668		[1]
Cacausoid	0,279	0,061	0,660	0,40	[1][2]
Négroïd	0,173	0,114	0,713	0,20	[1][2]
Our results	0,214	0,112	0,674		

Table 2. Allele frequencies . Comparison

[1] Benabadji and Aireche, 1988

[2] Benabadji and Aireche, 1994

Populations	A	B	AB	O	p	q	r	X ²	P
Honaine	40,36	12.76	4,52	42,35	0.258	0.091	0.651	0,287	>0.05
Sidi Driss	45,66	11.75	4,19	38,40	0.292	0.083	0.620	1,405	>0.05
Souk El khemis	42,11	10.67	4,58	42,63	0.269	0.079	0.653	0,589	>0.05
Sidi Bediaf	32,37	17.50	7,77	42,36	0.226	0.135	0.651	9,312	<0.05
Remchi	35,80	15.30	5,18	43,72	0.232	0.108	0.661	0,4096	>0.05
Maghnia	33,33	16.20	4,81	45,65	0.210	0.111	0.676	2,77	>0.05
Bab El Assa	34,93	17.70	2,39	44,98	0.210	0.110	0.670	14,80	<0.01
Marsa Ben Mhidi	32,23	14.34	4,36	49,06	0.204	0.098	0.700	0,522	>0.05
Ghazaouet	34,93	14.10	2,92	48,05	0.210	0.090	0.693	23,87	<0.01
Sidi Ali Benzemra	38,76	17.28	5,18	38,76	0.251	0.120	0.622	0,781	>0.05
Ain youcef	32,58	14.41	9,77	43,24	0.240	0.129	0.657	73,98	<0.01
Fehoul	30,98	17.63	2,69	48,70	0.190	0.110	0.700	6,1852	>0.05
Tlemcen	34,24	17.64	5,88	42,24	0.230	0.125	0.650	6,062	>0.05
Ain El kebira	39,46	13.86	5,37	41,30	0.260	0.101	0.643	0,115	>0.05
Hamri Benamar	32,62	11,59	2,57	53,22	0.200	0.073	0.730	0,194	>0.05
Zaouia sidi Benamar	31,66	15,07	3,52	49,74	0.200	0.098	0.705	0,1746	>0.05
Nedroma	35,09	14,20	3,78	46,93	0.220	0.094	0.690	6,89	>0.05
Ouled Mimoun	36,54	17,90	5,18	40,38	0.240	0.123	0.640	12,79	<0.01
mean	35.08	15.81	4.85	44.26	0.225	0.109	0.665		

Table 3. Phenotypic and allele frequencies of the ABO system in the Algerian populations sampled

Populations	Rh(+)	Rh(-)	D	d
Honaine	92,27	7,73	0,722	0,278
Sidi Driss	96,02	3,98	0,800	0,199
Souk El khemis	95,73	4,27	0,793	0,206
Sidi Bediaf	93,94	6,06	0,753	0,246
Remchi	90,38	9,62	0,689	0,310
Maghnia	89,65	10,35	0,678	0,321
Bab El Assa	97,22	2,78	0,833	0,166
Marsa Ben Mhidi	94,75	5,25	0,770	0,229
Ghazaouet	90,59	9,41	0,693	0,306
Sidi Ali Benzemra	94,57	5,43	0,767	0,233
Ain youcef	90,22	9,77	0,687	0,312
Fehoul	92,43	7,57	0,722	0,275
Tlemcen	90,74	9,26	0,696	0,304
Ain El kebira	95,76	4,24	0,794	0,205
Hamri Benamar	88,41	11,59	0,659	0,340
Zaouia Sidi Benamar	85,93	14,07	0,625	0,375
Nedroma	92,54	7,46	0,727	0,273
Ouled Mimoun	91,00	9,00	0,700	0,300
mean	90.66	9.34	0.694	0.306

Table 4. Phenotypic and allele frequencies of the Rh system in the Algerian populations sampled

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Countries	f (A)	f (B)	f (O)	References
Algeria	0,224	0,116	0,660	Benabadji and Airêche, 1994
Australia (Victoria)	0,244	0,071	0,685	Mitchell <u>et al.</u> , 1988
Danemark	0,183	0,183	0,707	Grunnet <u>et al.</u> , 1994
Egypt	0,260	0,147	0,593	Vona <u>et al.</u> , 1994
France	0,280	0,062	0,662	Serre <u>et al.</u> , 1987
Gabon	0,128	0,112	0,760	Languillat <u>et al.</u> , 1980
Germany	0,278	0,086	0,638	Scheil and Strunz, 1996
India	0,17	0,214	0,611	Chondhury <u>et al.</u> , 1994
Iran	0,222	0,169	0,608	Walter <u>et al.</u> , 1991
Irlande	0,233	0,076	0,692	Bittles and Smith, 1991
Italia	0,258	0,068	0,674	Vona <u>et al.</u> , 1994
Lybia	0,225	0,132	0,643	Vona <u>et al.</u> , 1994
Morocco	0,253	0,117	0,626	Benabadji and Aireche ;1994
Mozambic	0,128	0,081	0804	Bergstrom <u>et al.</u> , 1994
Pakistan	0,179	0,227	0,596	Parveen, 1987
Tunisia	0,192	0,121	0,686	Hmida <u>et al.</u> , 1994
Turkey	0,286	0,149	0,565	Vona, 1994
USA (virginia)	0,244	0,070	0,680	Zain <u>et al.</u> , 1988
Tlemcen (West Algeria)	0,214	0,112	0,674	Our results

Table 5. Allele frequencies of the allele of the ABO system in some countries of the World

Countries	f (D)	f (d)	References
Australia	0,60	0,40	Lai, 1986
Egypt	0,65	0,35	Voná et al., 1994
Germany	0,563	0,436	Scheil and Strunz, 1996
Lybia	0,655	0,345	Vona et al., 1994
Morocco	0,77	0,23	Jhonson, 1963
Mozambic	0,827	0,173	Bergstrom et al., 1994
Spania	0,611	0,389	Vona et al., 1994
Sweedden	0,574	0,425	Bergstrom et al., 1994
Tunisia	0,74	0,26	Ranque et al., 1961
Tlemcen (Western Algeria)	0.694	0.306	Our results

Table 6. Allele frequencies of the allele of the Rh system in different countries

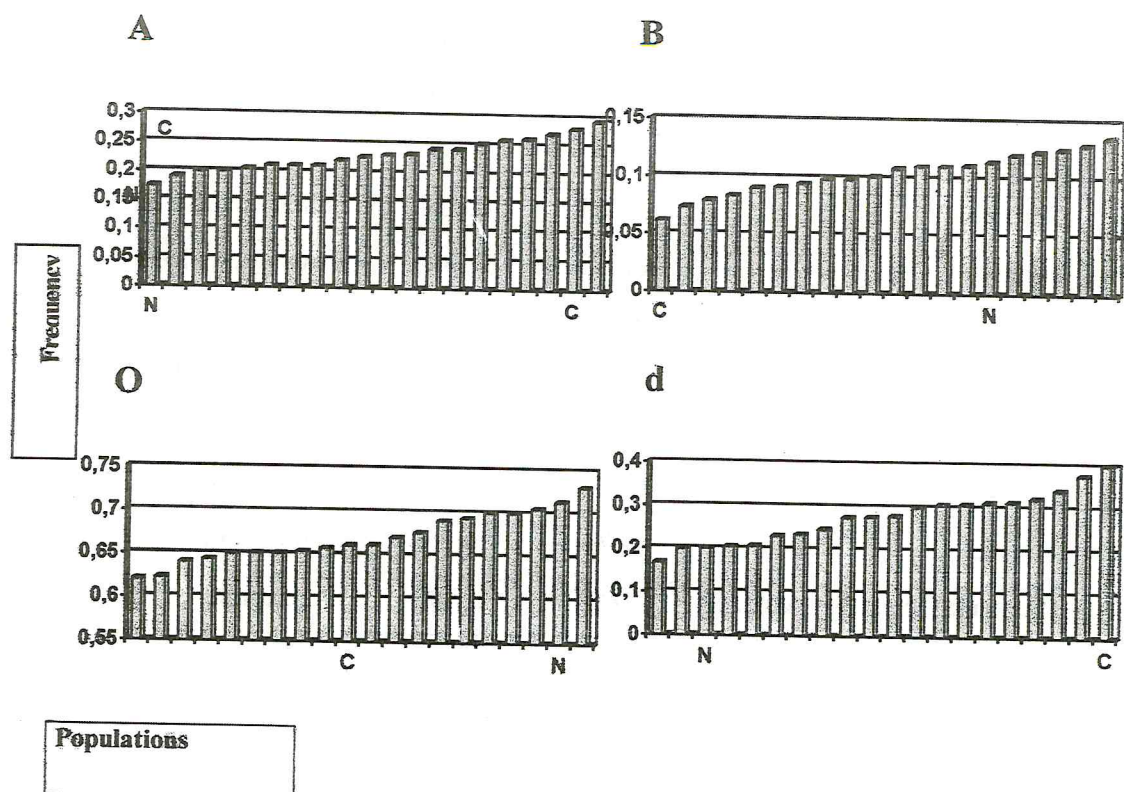


Fig 2. Distribution of A, B, O and d alleles in the sampled populations with comparison of caucasoid and negroid populations.

Figure 3 Distribution of B allele

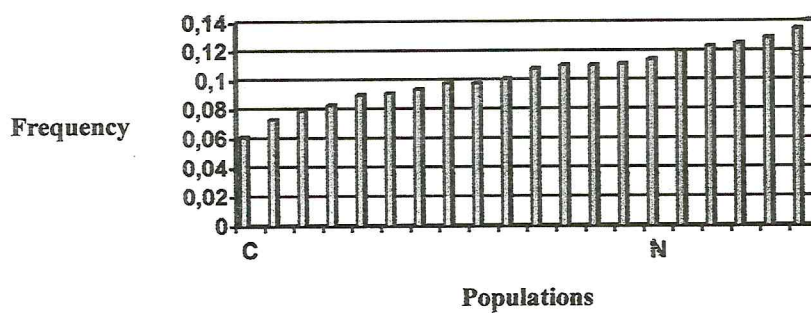


Figure 4 Distribution of O allele

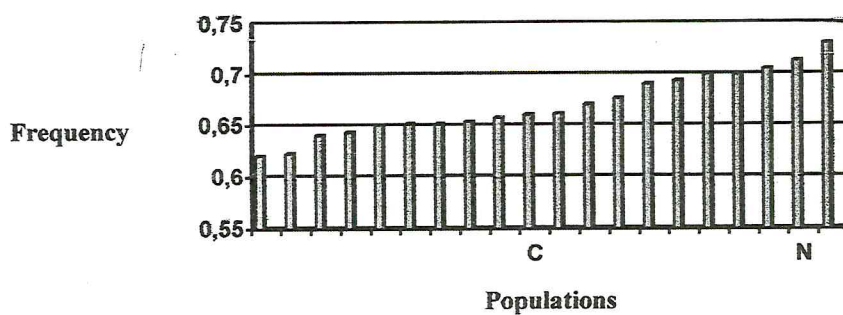


Figure 5 Distribution of d allele

