

GENETIC SYSTEMS AND BIOLOGICAL TRAITS IN NORMAL AND CHAGASIC INDIVIDUALS FROM A BRAZILIAN SAMPLE

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ABSTRACT

The distribution of the phenotypes of 11 Genetic Systems (ACP1, ADA, ESA, PEPA, Hp, Hb, ESD, ABO, Rh, CAII and GLO) were studied in relation to Chagas's disease in a sample from Bambuí, Minas Gerais state. None of the polymorphism seemed to be related to *Trypanosoma cruzi* infection or serious forms of Chagas's disease. Analyses of the association between sex or race and both *T. cruzi* infection and EKG alterations, revealed a possible biological effect of sex on the individual's susceptibility. Previously postulated association between race and *T. cruzi* infection could not be confirmed in the present study.

INTRODUCTION

Chagas's disease, a Brazilian nosologic endemic entity was described in 1909 by Carlos Chagas in a manificent work, since just one research identified the parasite, the vector and the disease in the human host.

Chagas's disease appears to be influenced by the genetic constitution of the human host as a result of a series of host-parasite interactions, as suggested by Krieger *et al.* (1981, 1982) and Feitosa (1985).

The interest in a better understanding of the genetic factors influencing susceptibility or resistance to Chagas's disease and its indeterminate forms includes the study of the biological significance of genetic polymorphisms, since it is well known that intracellular parasitism may be influenced by genetic traits of the host.

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A systematic search for an association between genetic polymorphism and clinical manifestations essentially began with AIRD *et al.* (1953) who observed a significant association between blood group A and gastric cancer. Moreover, the well established association between abnormal hemoglobins and falciparum malaria demonstrates the importance of this type of approach on the study of the causes of human variability.

MATERIALS AND METHODS

Biological assessment was carried out in 1978 at Bambuí, an endemic area for Chagas' disease, located in the western part of the state of Minas Gerais, Brazil.

A total of 390 individuals, as well as eleven genetic systems (ACP1, ADA, ESA, PEPA, Hp, Hb, ESD, ABO, Rh, CAII and GLO) and four biological traits were studied. These data have been published *in extenso* elsewhere (Krieger *et al.*, 1981, 1982; Nogueira, 1981; Azevedo *et al.*, 1983; Engracia *et al.*, 1990).

Data were arranged in contingency tables and chi-square statistics were used for independence tests, with Yates' correction for continuity applied to all 2x2 contingency tables. The adopted significance level was 5%.

Individuals were grouped according to an arbitrary scale from 1 to 6 for racial classification purposes, as follows: White (1), Indian Mixed (2), Light Mulato (3), Mulato (4), Dark Mulato (5) and Black (6).

RESULTS AND DISCUSSION

Table I shows the polymorphism-disease association results of independence tests. As can be seen, only the Rh locus seems to significantly affect the development of the disease. However, it should be kept in mind that out of 22 independence tests (although with different degrees of freedom), it is expected that around one would be significant at the 5%, by chance alone. Therefore, it seems reasonable to conclude that the 11 studied genetic systems did not show any type of association with Chagas' disease nor with *T. cruzi* infection.

Although there is an excess of females in the present sample, indicating some sort of bias in favour of a low sex-ratio, the severeness of *T. cruzi* infection seems to be greater among males ($p = 0.0025$, Table II). These results agree with those of Dias (1979), Widmer and Azevedo (1972), Lopes *et al.* (1982) and Coura *et al.* (1984), among others.

The above cited bias towards a low sex-ratio could be the consequence of differential mortality among infected individuals, since males seem to be prone to a more severe form of the disease.

Table I - Independence tests between some genetic polymorphisms and *Trypanosoma cruzi* infection and the chronic cardiac form of Chagas' Disease.

Genetic system	<i>T. cruzi</i> infection		Chagas' disease	
	χ^2	DF	χ^2	DF
EsA	1.14	1	0.003	1
PEPA	1.96	2	2.37	2
ADA	1.69	1	0.76	1
ACP1	0.59	3	4.24	3
Hp	4.31	5	11.03	5
Hb	0.55	1	0.10	1
EsD	1.82	2	0.29	2
GLO	0.06	1	0.14	1
CAII	0.57	2	1.10	2
ABO	4.61	3	1.14	3
Rh (D)	3.35	1	3.92**	1

**Significant at the 5% level.

Table II - Chagas' disease distribution among sexes.

EKG	Individual's sex		χ^2	DF	Significance
	Male	Female			
Normal	76	165	9.15	1	0.0025
Affected	68	75			
Total	144	240			

The data shown in Table III suggest a dependence on race of the distribution of *T. cruzi* infection. However, when classes 4, 5 and 6 were pooled, since they showed expected values lower than 5, the independence test was non-significant ($\chi^2 = 3.35$). This last result is in accordance with that of Feitosa (1985), based on a large sample from Northeastern Brazil. Although Nunes-Maia and Azevedo (1973) suggested a

greater susceptibility of Black individuals to *T. cruzi* infection, the present results and those of Feitosa (1985) indicate that the race-infection association, when significant, is probably due to social stratification strongly suggesting, therefore, that race and *T. cruzi* infection are independent phenomena.

Table III - Association between race (skin color) and MG test in a Brazilian sample. In parenthesis, the expected number of individuals.

	Skin color					
	1	2	3	4	5	6
MG +	218 (223.8)	17 (16.7)	23 (21.2)	12 (9.8)	1 (3.0)	18 (14.4)
MG -	77 (71.2)	5 (5.3)	5 (6.7)	1 (3.1)	3 (0.9)	1 (4.5)
χ^2		12.51			3.35 (4, 5, 6 pooled)	
DF		5			3	
Significance		0.028			0.30 < P < 0.50	

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RESUMO

Estudou-se a distribuição de fenótipos de 11 sistemas genéticos (ACP1, ADA, ESA, PEPA, Hp, Hb, ESD, ABO, Rb, CAII and GLO) em relação à doença de Chagas. Não foi encontrada associação significativa entre esses polimorfismos e a infecção por *T. cruzi*, como também não se verificou alterações no eletrocardiograma (ECG). Foi detectado um possível efeito biológico do sexo sobre ECG. Por outro lado, um efeito racial na infecção, postulado em outro estudo, não foi confirmado no presente material, indicando ser espúria, essa associação.

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