RESEARCH NOTE

Isoenzymatic Characterization of Colombian Strains of *Trypanosoma cruzi*

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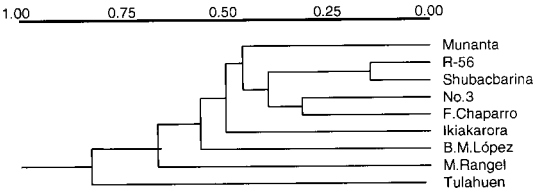
Trypanosoma cruzi, the causative agent of Chagas' disease is a highly pleomorphic parasite with a complex life cycle involving both a vertebrate host and an invertebrate vector. Several studies have been done because of its large biological and genetic variability (M Pereira & R Hoff 1986 *Mol Biochem Parasitol 20:* 183-189, M Tibayrenc & F Ayala 1988 *Evolution 4:* 277-292). One of the methods that has been widely used for characterization of *T. cruzi* strains is isoenzyme analysis. P Ready and M Miles (1980 *Trans R Soc Trop Med Hyg 74*: 238-242) and M Miles et al. (1980 *Trans R Soc Trop Med Hyg 74:* 221-237) defined three zymodemes termed I (Z1), II (Z2) and III (Z3), based on Brazilian strains.

In the present study we have analyzed the isoenzyme profiles of seven *T. cruzi* strains from Colombia (Table I) according to the method described by S Abderrazak et al. (1993 *Meth Mol Biol 21*: 361-368) modified by M Montilla (1997 *Biomédica 17:* 125-126). The 13 enzymatic systems employed were Glucose phosphate isomerase (E.C.5.3.1.9. GPI), Glucose-6-phosphate dehydrogenase (E.C.1.1.1.49. G6PD), Isocitrate dehydrogenase (E.C.1.1.1.42. IDH), Malate dehydrogenase (E.C.1.1.1.37. MDH), Malic enzyme (E.C.1.1.1.40. ME-1, ME-2), Peptidase (E.C.3.4.11.1. PE-1, PE-1,2), 6-phosphogluconate dehydrogenase (E.C.1.1.1.44. 6PGD), Aspartate aminotransferase (E.C.2.6.1.1. ASAT), Glutamate dehydrogenase (NAD/NADP) (E.C.1.4.1.3. GDH), and Phosphoglucomutase (E.C.2.7.5.1. PGM).

In spite of the fact that polymorphism was observed in 8 out of the 11 enzymatic systems analyzed in the *T. cruzi* strains (Table II), the dendrogram based on Nei's genetic distances (1972 *Am Nat 106*: 283-292), showed that all the strains conform only one cluster (Fig.) irrespective of their geographic origin. These results are suggestive of ancient establishment of a population heterogeneity of the parasite in Colombia or of a significant circulation of the invertebrate and/or vertebrate host of *T. cruzi* between the studied areas (Table I).



Dendrogram based on Nei's standard genetic distances (Clusterized with UPMGA/NTSYS Program).

In addition, comparison with isoenzyme profiles of *T. cruzi* Colombian strains previously typed (G Widmer et al. 1985 *Ann Trop Med Parasitol 79:* 253-257, N Saravia et al. 1987 *Am J Trop Med Hyg 36* : 59-69, B Travi et al. 1994 *Am J Trop Med Hyg 50*: 557-565) indicates that all the strains analyzed in the present study belong to zymodeme Z1. Since these isolates were obtained from sylvatic and domestic environments of different geographic regions, the association of zymodeme Z1 to both transmission cycles in Colombia is concluded. Previous reports also indicated the presence of Z1 in domestic and sylvatic environments in some regions in Brazil (T Barret et al. 1980 *Trans R Soc Trop Med Hyg 74:* 84-90).

Finally, in this study we observed the change of the isoenzyme profile of BM López strain after consecutive *in vitro* passages during three years for the enzymes: GPI, PEP-1, GDHNAD and 6PGDH. This *in vitro* variability has been previously reported for other *T. cruzi* strains (A Alves et al. 1994 *J Eukaryot Microbiol 41:* 415-419).

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TABLE I

Names, codes, origins, host and cycle of *Trypanosoma cruzi* Colombian strains

Strain and zymodeme	Strain code	Geographical origin	Host and cycle
M.Rangel ZI	MHOM/CO/86 M.Rangel	Chiriguaná Cesar	Human Domiciliary
B.M.López ZI	MHOM/CO/87 B.M. López	Paratebueno Cundinamarca	Human Domiciliary
Munanta ZI	IRHO/CO/85 Munanta	Munanta Guateque Boyacá	*Rhodnius prolixus* Domiciliary
Shubacbarina ZI	IRHO/CO/95 Shubacbarina	Shubacbarina Catatumbo NorteSantander	*Rhodnius prolixus* Sylvatic
Ikiakarora ZI	IRHO/CO/95 Ikiakarora	Ikiakarora Catatumbo Norte Santander	*Rhodnius prolixus* Sylvatic
No.3 ZI	MDID/CO/87 No.3	Astilleros Zulia Norte Santander	*Didelphis marsupialis* Sylvatic
R-56 ZI	MDID/CO/88 R-56	Callejón Ricaurte Cundinamarca	*Didelphis marsupialis* Sylvatic
F.Chaparro[a] ZI	MHOM/CO/92 F.Chaparro	Tibu Norte Santander	Human Domiciliary
Tulahuen[a] ZII	ITRI/CHI/82 Tulahuen	Tulahuen Chile	*Triatoma infestans* Domiciliary

a: strains used as reference in isoenzyme analysis.

TABLE II

Genotypes of the Colombian strains identified by assaying 13 loci (for each locus, allele 1 codes for the fastest electromorph)

	Enzyme						
Strains	GPI	GOT	MDH	IDH	PGM	GDnad	GDnadP
Munanta	4/ 4	4/ 4	2/ 2	2/ 2	Absent	Absent	3/ 3
R-56	3/ 3	4/ 4	2/ 2	2/ 2	5/ 8	3/ 3	3/ 3
Shubacbarina	3/ 3	4/ 4	2/ 2	2/ 2	5/ 8	3/ 3	3/ 3
B. M. López	3/ 3	4/ 4	2/ 2	2/ 2	5/ 8	Absent	3/ 3
Ikiakarora	3/ 3	2/ 2	2/ 2	2/ 2	5/ 8	Absent	3/ 3
No. 3	7/ 7	4/ 4	2/ 2	2/ 2	5/ 8	4/ 4	3/ 3
M.Rangel	7/ 7	4/ 4	2/ 2	2/ 2	5/ 8	5/ 5	3/ 3
F. Chaparro [a]	7/ 7	4/ 4	2/ 2	2/ 2	5/ 8	Absent	3/ 3
Tulahuen [a]	4/ 6	2/ 2	2/ 2	2/ 2	9/ 9	3/ 3	3/ 3

	Enzyme					
Strains	ME-1	ME-2	G6PDH	PEP-1	PEP1,2	6PGDH
Munanta	2/ 2	2/ 2	3/ 3	4/ 4	1/ 1	6/ 6
R-56	2/ 2	2/ 2	3/ 3	5/ 5	2/ 2	6/ 6
Shubacbarina	2/ 2	2/ 2	3/ 3	4/ 4	1/ 1	6/ 6
B. M. López	2/ 2	5/ 5	3/ 3	4/ 4	2/ 2	Absent
Ikiakarora	2/ 2	2/ 2	2/ 2	6/ 6	2/ 2	6/ 6
No. 3	2/ 2	2/ 2	3/ 3	2/ 2	Absent	6/ 6
M.Rangel	3/ 3	5/ 5	4/ 4	5/ 5	2/ 2	6/ 6
F. Chaparro [a]	2/ 2	2/ 2	3/ 3	5/ 5	2/ 2	6/ 6
Tulahuen [a]	1/ 1	3/ 3	3/ 3	5/ 5	2/ 2	6/ 6

a: strains used as reference.