

ISOENZYMIC STUDIES AND EPIDEMIOLOGICAL DATA OF *TRYPANOSOMA CRUZI* FROM AREQUIPA (PERU), PACIFIC SIDE

by

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Summary — The authors present some epidemiological data (infestation rates for houses and triatomine vectors) concerning Chagas' disease in Arequipa region (Peru).

Isoenzymic analysis of 39 *Trypanosoma cruzi* stocks from this region shows a predominance of stocks related to Miles' zymodeme 1 and to isoenzymic strain 1e. Four stocks were mixtures of isoenzymic strains 1e and 2. Low isoenzymic variability of the stocks from this region can be explained by a founder effect.

KEYWORDS : *Trypanosoma cruzi*; Isoenzymes; Arequipa, Peru.

Introduction

Chagas' disease is known among populations living on the Pacific side in valleys around Arequipa (Peru), but epidemiological data concerning this region have not yet been published, and there does not exist any isoenzymic data concerning Pacific side *T. cruzi* stocks.

We present here epidemiological and isoenzymic data on *T. cruzi* stocks from the Arequipa region.

Material and Methods

Triatomine bug sampling places : Triatomine bugs (all of them *Triatoma infestans*) were collected from 3 valleys with different altitudes (2000 m, 1500 m, and 600 m), and 35, 60 and 110 km far from Arequipa town (Fig. 1). We collected the Triatomine bugs from at least 10 houses in each valley.

Sample preparation of T. cruzi stocks : Parasite isolation was carried out according to Tibayrenc *et al.* (1982). Sample preparation for isoenzymic studies was performed according to Tibayrenc and Le Ray (1984).

Isoenzymic electrophoresis : 5 enzymes, corresponding to 7 genetic loci, were considered : malate deshydrogenase (oxaloacetate decarboxylating) (Nadp+) (E.C.1.1.1.40, ME), malate deshydrogenase (E.C.1.1.1.37, MDH), phosphoglucomutase (E.C.2.7.5.1, PGM), phosphogluconate deshydrogenase (E.C.1.1.1.44, 6PGD), and glucose phosphate isomerase (E.C. 5.3.1.9, GPI). Cellulose acetate electrophoresis recipes are described elsewhere (Tibayrenc and Le Ray, 1984). We used as reference stocks the

Tehuentepec (isoenzymic strain 1e) and Tulahuen strains (isoenzymic strain 2a) (Tibayrenc and Le Ray, 1984).

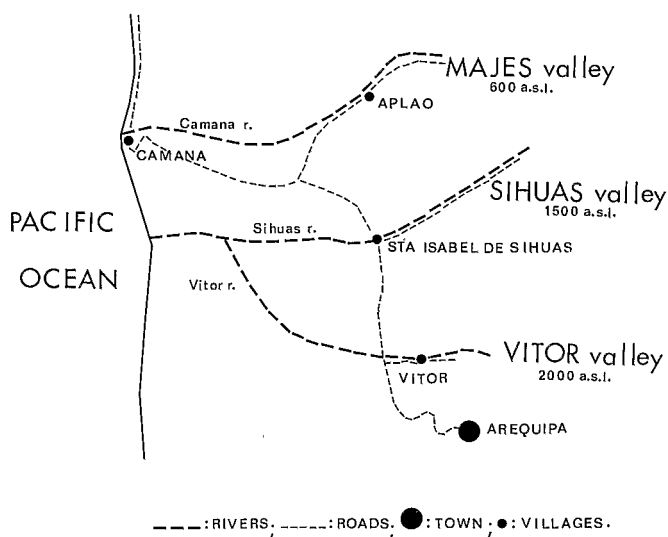


Figure 1.
Sampling places of Triatomine bugs : Vitor, Sihuas and Majes valleys.

Results

Table 1 presents the epidemiological data. The same number of houses was visited in each valley, and the total number of collected triatomine bugs in each valley was roughly the same. The rate of infected houses was higher in Sihuas valley (60 per cent), corresponding to the highest rate of infected triatomine bugs (54.8 per cent). In these regions, the Health Ministry organized fumigation campaigns and this may account for the low infestation rates in some places.

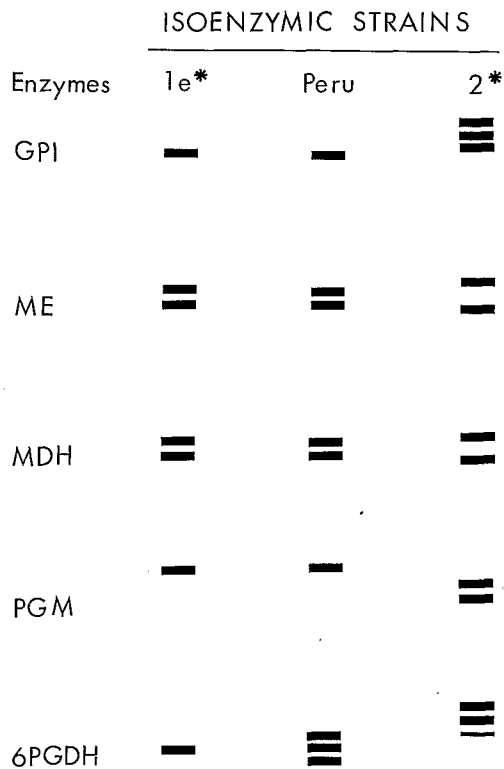
TABLE 1
Epidemiological data of *Trypanosoma cruzi* infestation in 3 valleys from Arequipa region (Peru)

Valleys	Number of houses examined	Positive houses		Number of triatomes examined	Positive triatomes	
		Number	%		Number	%
Vitor 2000 m	14	4	28.5	181	21	11.6
Sihuas 1500 m	10	6	60.0	195	107	54.8
Majes 600 m	15	4	26.6	182	17	9.3

Thirty-nine *T. cruzi* stocks have been studied for isoenzymic patterns, 4 from the Vitor valley, 31 from the Sihuas valley and 4 from the Majes valley. All stocks showed patterns similar to these of the Tehuentepec strain, except for 6PGD which exhibited a 3-banded pattern. Four stocks (10 per cent) were a mixture of isoenzymic strains 1e and 2, as revealed by GPI patterns (see Table 2 and Fig. 2).

TABLE 2
Isoenzymic data of *Trypanosoma cruzi* stocks
from Arequipa region (Peru)

Valleys	Number of <i>T. cruzi</i> stocks	Zymostrains	
		1*	mixture 1* & 2
Vitor 2000 m a.s.l.	4	4	0
Sihuas 1500 m a.s.l.	31	29	2
Majes 600 m a.s.l.	4	2	2



* Classification according to Tibayrenc and Le Ray (1984).

Figure 2.
Isoenzymic patterns of *T. cruzi* stocks collected in the Arequipa region (Peru)
compared to isoenzymic strains 1e and 2 (Tibayrenc and Le Ray, 1984).

Discussion

Despite fumigation campaigns, the infestation rates remain high in some places of Arequipa region, making Chagas' disease a real problem in this area. All stocks but 4 mixed ones are related to the Tehuentepec strain, which is closely related to Miles' zymodeme 1 (Miles *et al.*, 1977,

1980; Tibayrenc and Le Ray, 1984). This low isoenzymic variability can be explained by a founder effect: Peruvian *T. cruzi* populations on the Pacific side would be more recent than their Bolivian counterparts, which usually exhibit a higher variability (Tibayrenc *et al.*, in press).

The frequent mixture of different isoenzymic strains in the same Triatomine bug was also observed in Bolivia (Tibayrenc *et al.*, submitted).

Heterozygous strains seem to be more frequent at low altitude in Bolivia (Tibayrenc *et al.*, submitted). Though it is impossible to perform a statistical test (too small effective number), our data are consistent with this fact. The highest frequency of isoenzymic strain 2 (the most heterozygous one) was in Majes valley, at the lowest altitude (600 m).

Additional studies are in progress to establish the taxonomical significance of Peruvian stocks.

Etudes isoenzymatiques et données épidémiologiques concernant *Trypanosoma cruzi* dans la région d'Arequipa, Pérou.

Résumé — Les auteurs présentent certaines données épidémiologiques (taux d'infestation des maisons et des triatomés vecteurs) concernant la maladie de Chagas dans la région d'Arequipa (Pérou). L'analyse isoenzymatique de 39 stocks de *Trypanosoma cruzi* de cette région montre la prédominance de stocks apparentés au zymodème 1 de Miles et à la souche isoenzymatique 1e. 4 stocks se sont révélés être un mélange de souches isoenzymatiques 1e et 2. Un effet fondateur peut expliquer la faible variabilité isoenzymatique des stocks de cette région.

REFERENCES

- Miles, M. A., Lanham, P. M., Souza, A. A. de, & Pova, M. (1980) : Further enzymic characters of *Trypanosoma cruzi* and their evaluation for strain identification. *Trans. R. Soc. Trop. Med. Hyg.*, **74** : 221-237.
- Miles, M. A., Toyé, P. J., Oswald, S. C. & Godfrey, D. G. (1977) : The identification by isoenzyme patterns of two distinct strain-groups of *Trypanosoma cruzi*, circulating independently in a rural area of Brazil. *Trans. R. Soc. Trop. Med. Hyg.*, **71** : 217-225.
- Tibayrenc, M., Echalar, L. & Desjeux, P. (1982) : Une méthode simple pour obtenir directement des isolats de *Trypanosoma cruzi* à partir du tube digestif du triatome vecteur. *Cah. ORSTOM sér. Ent. méd. Parasitol.*, **20** : 187-188.
- Tibayrenc, M., Echalar, L., Dujardin, J. P., Poch, O. & Desjeux, P. (1984) : The microdistribution of isoenzymic strains of *Trypanosoma cruzi* in Southern Bolivia; new isoenzyme profiles and further arguments against Mendelian sexuality. *Trans. R. Soc. Trop. Med. Hyg.* : **78**, 519-525.
- Tibayrenc, M., Poch, O., Echalar, L., Le Pont, F., Lemesre, J. L. & Desjeux, P. : The geographical and temporal distribution of the isoenzymic strains of *Trypanosoma cruzi* in Bolivian domestic transmission cycles. *Trans. R. Soc. Trop. Med. Hyg.* : submitted for publication.
- Tibayrenc, M. & Le Ray, D. (1984) : General classification of the isoenzymic strains of *Trypanosoma (Schizotrypanum) cruzi* and comparison with *T. (S.) c. marinkellei* and *T. (Herpetosoma) rangeli*. *Ann. Soc. belge Méd. trop.*, **64**, 239-248.