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On the microdistribution and sexuality of *Trypanosoma cruzi*

In a recent letter to the Editor, some data of mine (TIBAYRENC, 1984) were considered by CIBULSKIS (1985), who provided an interesting statistical result about *Trypanosoma cruzi* microdistribution. A founder effect was shown for isozyme strains (IS) at the level of individual houses. I agree with this precise fact, but disagree with the author's conclusions. First, I did not claim that "a founder effect is not a *consistent* feature", but rather that it "is not a *constant* feature", which is quite different. I meant that a "constant" founder effect would lead to only one IS being recorded per house. This is not at all the case, and despite the author's statements, my conclusions were not based on "only one observation': in Tupiza, out of 44 houses, nine had two different IS, two had three different IS, and one had four different IS, although the number of different stocks collected in each house was small (maximum: six; average: 2·25). Even if a certain founder effect can be inferred statistically, these data indicate clearly that the probability of finding more than one IS per house is high. In other words, the probability for the inhabitants of a given house to get infected by more than one IS is not negligible. This is not trivial from a medical point of view, and has been confirmed by further work (BRÉNIÈRE *et al.*, 1985) which has shown the presence in three cases of two different IS in the same patient. Moreover, the fact that there is a reduced number of different IS at the level of the individual house can be explained by reasons other than a founder effect. Recent experiments (DEANE *et al.*, 1984) have shown that if two *T. cruzi* strains are put together, there is a tendency for one to be eliminated by the other. It is quite possible that such a factor may interfere at the level of the individual house, considered as a rather independent environmental unit, especially from the point of view of the vertebrate hosts. In this case, the actual number of different IS per house would be the resultant of such a tendency and the increase in IS numbers brought by migrant triatomine bugs. It is worth noting that at the level of the district we (DUJARDIN & TIBAYRENC, 1985) have never been able to evidence deviations from Hardy-Weinberg expectations in *Triatoma infestans* populations: this shows that these populations at the level considered tend to panmixia.

With respect to the problem of sexuality, I do not agree with the author's conclusions. He is right in saying that the founder effect might interfere with random mating of *T. cruzi* IS and so that results of Hardy-Weinberg calculations must be considered with caution. But this does not account for the results obtained since the hypothesis of rare or absent Mendelian sexuality in *T. cruzi* was first proposed (TIBAYRENC *et al.*, 1981). In the paper analysed by CIBULSKIS (1985), the Hardy Weinberg results should not be considered by themselves, but (1) in comparison with the quite different results obtained by TAIT (1980) in *T. brucei*, and (2) in reference to their huge level of significance, which reflects a simple fact: the *total* lack of a lot of possible recombinants. It is not reasonable to attribute this lack to a "low opportunity of zymodemes for mating". The results just recalled show, on the contrary, that different IS are often encountered in the same house. Moreover, more recent results (TIBAYRENC *et al.*, in press) have shown that in about 10% of the *Triatoma infestans* collected in Bolivia, one can observe mixed stocks of two different IS without genetic recombination (and the possible recombinant of the two IS present was *never* observed in spite of more than 400 Bolivian stocks now studied). Again, mixed stocks of two different IS exist also in human patients (BRÉNIÈRE *et al.*, 1985). This shows clearly that in the ecotopes examined, *T. cruzi* IS do not lack opportunities for mating. Of course, these results do not rule out definitively the possibility of occasional sexuality in *T. cruzi*. But they do indicate that, at least in the ecotopes examined, sexual recombination, if any, is at best exceptional, and that the *T. cruzi* population structure is basically clonal.

The attribution of observed correlations (TIBAYRENC *et al.*, in press) between *T. cruzi* IS frequencies and environmental factors like altitude and longitude to a founder effect is a possible hypothesis. In such a case, the geographical dispersion of the vector would account for the cline observed in IS frequencies. Nevertheless, according to this hypothesis, a similar cline would be expected for latitude. This was not the case in our study (in which the explanation of the cline observed by climatic factors was proposed only as a working hypothesis).

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An anonymous referee improved the present manuscript.

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The behaviour of trypanosomes in Liberian tsetse

Elsewhere in this issue (ELLIS & MAUDLIN, 1985: pp. 867-868) two of us (DSE and IM) report on the behaviour of trypanosomes within the midguts of some wild-caught East African tsetse species. This behaviour was found to be the same as that reported previously in infected laboratory tsetse strains, i.e., midgut forms of *trypanosoma brucei* penetrated the peritrophic membrane and then some entered the tsetse gut cells in the central regions of the midgut (EVANS & ELLIS, 1977; EVANS & ELLIS, 1975). Often giant trypanosome forms were seen lying beneath the midgut basement membrane, the significance of which phenomenon has been discussed elsewhere (EVANS & ELLIS, 1983).

With the collaboration of the Liberia Research Unit of the Tropical Institute Hamburg., we have been able to examine some infected West African tsetse, and can report that *T. brucei* spp. trypansomes also penetrate the peritrophic membrane and enter the adjacent midgut cells of specimens of *Glossina nigrofusca* and *G. palpalis gambiensis* that we have now examined. Trypanosome giant forms were also found within their midgut cells.

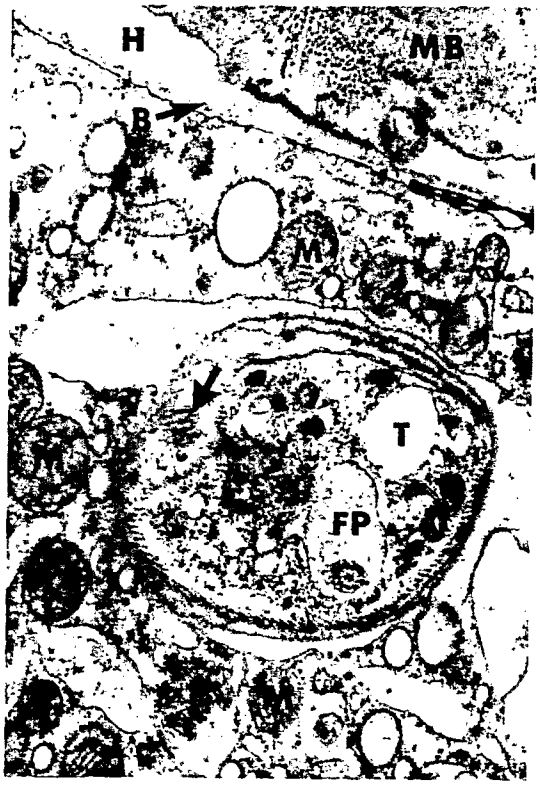

Fig. 1. A *T. brucei* organism lying beneath the midgut basement membrane of *G. nigrofusca*.
MB — a transverse muscle bundle. H — haemocoele. B — midgut basement membrane. T — trypanosome within vacuole in midgut cell. M — some gut cell mitochondria. FP — flagellar pocket containing flagellum. A second flagellar profile is marked by a thick arrow.

While only the mycetome regions of the Zimbabwe tsetse were examined, the whole of the midgut of the Liberian flies was investigated and, as with the previously reported laboratory strains, the areas of maximum midgut cell penetration were found to lie prosterior to the mycetome region (Fig. 1).

Thus it would seem that a possible alternative pathway of trypanosomes within the tsetse fly, first described in laboratory infected flies, may be followed by *T. brucei* trypanosomes in the field in different tsetse species in widely separated areas of Africa.

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