Trypanosoma cruzi – Vector-vertebrate Hosts Interactions

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This round table emerged from ideas shaped during the preparation of the meeting to commemorate the 90 years of the discovered of Chagas disease, held 11-16 April 1999, at Rio de Janeiro, Brazil. It was planned with a proper, depth, and accuracy necessary to summarize the exciting and fast-paced progress in the area. Four very important papers were presented, two of them related to the vector, *Rhodnius prolixus*, and its interaction with parasites like *Trypanosoma cruzi* and *T. rangeli*, and the other two presentations discussed the variability of the triatomine populations. All four speakers tried to bridge the gulfs that separated us by paradigms, scientific tools, and priorities, focusing aspects on morphology, immunology, biochemistry, physiology and molecular biology of triatomine vectors, without neglecting the interaction between parasite – insect and different approaches on biology, ecology and genetic. However, it can never be complete and a certain amount of overlapping and redundancies could not be avoided on the presentations.

The invited speakers shared with the participants ideas and intellectual energy. And yet, the discussion escaped any conventional format or structure, and each one of them persuasively argued, and also exposed, to the gaps in our own knowledge and experience. It is hoped that this round table will provide useful information on a fascinating subject and intellectual excitement related to vectors of Chagas disease and cannot ignore the important questions debated in these four papers.

The primary goal attained in the round table was to advance the understanding of the reactions involved in the infection of the triatomine vector with trypanosomatids, new ways to approach the field of immune and neuroendocrine systems and their involvement in the development of parasites in the vectors, and the adaptations of different species of triatomine in the transition from sylvatic to domestic habitat as well.

Dr P Azambuja et al. presented the paper entitled "Immunity in *Rhodnius prolixus*: trypanosomatid-vector interactions". Due to restriction of time, some topics, such as properties of the lectins or more detailed biochemistry of the proteases involved in the trypanosome infection had not been dealt with. However, many new findings still under publication by Dr Azambuja's group were included in her presentation. She described many factors affecting the vulnerability of the *T. cruzi* infection, for example, some molecules produced by the digestive tract potentially led the gut microenviroment hostile to the parasites. Therefore, hemolytic peptide, gut lectins and parasite surface carbohydrates can be important for the *T. cruzi* infection. It was also discussed the interaction between *R. prolixus* and *T. rangeli* and the involvement of the prophenoloxidase (proPO) system of the vector. It was presented experiments *in vivo* and *in vitro* demonstrating that factor(s) in the hemolymph as well as in the fat body were released by the infection with short epimastigotes of *T. rangeli* activating the proPO system. However, clearly the presence of long epimastigotes did not stimulate this system in culture medium or even in the vector. Taken facts on the change of lysozyme levels in the hemolymph, hemocyte and nodule numbers, number of short or long epimastigotes in the hemocoele and the PO activity, Dr Azambuja delineated a mechanism involved in *T. rangeli* infection of the vectors which was correlated with humoral and cellular immune defense reactions of the triatomine insect.

Dr ES Garcia et al. focused the presentation in a new approach to study the interaction between *T. cruzi* and its vector, *R. prolixus*, in the digestive tract. The importance of factors such hemoglobin and fragments of th $\propto$-^{D}- globin on the growth and transformation of epimastigotes into metacyclic trypomastigotes and differentiation in the insect's intestine obtained when hemoglobin and some peptides corresponding to residues 30-49 and 35-73

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of $\propto$-^{D}- globin were added to the diet with plasma were presented. Also, Dr Garcia did provide an overview on the importance of the endocrine system in the gut organization and its influence in the parasite development. He demonstrated that azadirachtin, an antihormonal compound obtained from the Neem Tree, *Azadirachta indica* A. Juss and other Meliaceous plants, blocked the development of *R. prolixus* due to the inhibition of ecdysteroid production by prothoracic glands (PG). It was discussed from *in vitro* experiments that azadirachtin did not have a direct effect on the isolated PG. In fact, it was clearly shown using head transplantation experiments that azadirachtin inhibited the release of the brain prothoracicotropic hormone (PTTH) which stimulated the PG. Interestingly, a single dose of a minute amount of the drug if fed through a blood meal to *R. prolixus*, completely inhibited growth of *T. cruzi*. It was ruled out a toxic effect on the parasite by azadirachtin as well as an indirect effect by intoxication of the intestine. Furthermore, decapitation of the insect drastically decreased the trypanosome infection in the gut and also changed the ultrastructural organization of the epithelial cells in the stomach and intestine. Ecdysone therapy and head implantation could reversed both the parasite infection and the ultrastructural changes of the epithelial cells as induced by decapitation or treatment with azadirachtin . For the first time it was demonstrated the importance of the endocrine system in the gut organization and delineated a mechanism to explain how *T. cruzi* develops in the gut of the invertebrate host.

Dr JP Dujardin et al. devoted the presentation to "Triatominae as a model of morphological plasticity under ecological pressure" and stated that vector morphology may be changed before detecting reproductive or genetic barriers. In fact, the use of isoenzyme electrophoresis and genetic characters applied to species and populations were presented as appreciable tools for combining morphological and ecological studies. Dujardin et al. discussed ecological forces and morphological plasticity of *Triatoma* in different genetic units which could reflect the biological way of species formation especially between related species competing with the same ecological niche. Also, it was presented evolutionary implications related to ecological species, morphological plasticity and polyphyletism and sibling species. Applying to Triatominae in the process of domestication, the model in which loss of ecological plasticity and spread of the insect combine their effects to produce an obligate domestic habit. Dujardin focused his discussion on (i) to what extent is the classification by morphological changes valid for studying phylogenetic interactions and (ii) what are the main mechanism related to Triatominae speciation. Thus, phenetic and genetic findings suggested that speciation in these insects may be a rapid process driven mainly by ecological factors.

Dr FA Monteiro et al. discussed the paper "Mitochondrial DNA variation of *Triatoma infestans* populations and its implication on the specific status of *T. melanosoma*". Using allozyme and cytogenetic analyses, Dr Monteiro et al. did not found significant differences to separate the two species. The mitochodrial DNA sequence analysis not only demonstrated close similarity between *T. infestans* from Paraná, Brazil, and *T. melanosoma* from the northeast of Argentine but also between these and all other populations of *T. infestans* from other regions from Brazil, Argentine and Bolivia. Infertility and morphology presented no difference to distinguish *T. infestans* and *T. melanosoma* species. The main concerning about the data presented by Dr Monteiro was that they were obtained with a very small number of insects to represent a real field population. Furthermore, with the number of insects used it could not be used any statistical analysis to validate the taxonomic questions and geographical analysis of populations discussed in this paper.