# 218 - ROUTES OF TRANSMISSION OF TRYPANOSOMA CRUZI IN BRAZIL

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## 1 INTRODUCTION

In its overall context and facing political and social evolution of the continent, Chagas disease is an example particular characteristic in Latin America, it reflects and suffer the consequences of social history and the issue of equity in the region. It is estimated that there are between 12 and 14 million infected in Latin America, with more than 60 million people at risk of transmission by about 18 endemic countries. Of these, about 25% have symptoms and 14,000 die annually (DIAS, 2007; WHO, 2002). It is one of the most important endemic diseases in Brazil and Latin America, with annual record of 810,000 new cases. Based on data from national serological survey, conducted between 1975-1980, was estimated at 4.2% prevalence of Chagas disease (MASSARO, REZENDE, CAMARGO, 2008).

Chagas disease is a chronic disease, parasitic, whose etiological agent is Trypanosoma cruzi, a protozoan order Kinetoplastida and the family Trypanosomatidae (WHO, 2002; DIAS, 2007).

According to Dias (2007), this is a typical rural disease that traditionally affects people of provincial and lower socioeconomic status, being frequently associated with poor quality housing, especially those built with mud and roofs of palm leaves (stick-to-peak), where the insect vector can accommodate and colonize. In recent decades, with increasing prevalence of infected individuals in urban areas, the risk of transmission through blood transfusions increased, leading to a more rigorous selection of donors in endemic regions (DIAS, 2007). Currently, in Brazil, it is estimated that about 70% of "Chagas" already living in urban areas, a proportion that is lower in countries like Bolivia and Paraguay.

The dispersion of Chagas disease to new regions, among them the Amazon, has occurred due to opening of new agricultural, from populations originating from endemic areas. In this region, colonization poorly planned can result in the input of individuals already infected and vector alien adduced passively, as well as by rampant deforestation, invasion can occur (and even colonization) of vectors and reservoirs natives infected with T. cruzi (DIAS, 2007).

American trypanosomiasis can manifest in three phases: acute, indeterminate and chronic. The acute phase may be asymptomatic or not, when infection is characterized by high parasitemia and localized edema signal called "Roman-Mazza," What happens when the injection occurs near the eye socket. In the indeterminate phase, the individual may persist a lifetime with parasitemia baseline (when the number of parasites is low and can not detect them in diagnostic tests) and in the chronic phase, there is involvement of the heart or digestive system and can lead the individual to sudden death (FERREIRA, 2007).

There are several routes of transmission described for Chagas disease and the detailed study of these pathways is of utmost importance to combat them. Therefore, the objectives of this study was to search the main routes of transmission of the disease and its epidemiological.

## 2. ROUTES OF TRANSMISSION OF CHAGAS DISEASE

Among the various recognized forms of transmission are the transmission vector, considered classical, via blood transfusion, congenital, transplantation, oral and other rare ones, such as accidents.

### 2.1 Vectorial transmission

The classic form of transmission is via a vector which represents 80% of cases of Chagas disease, and the best known insects belonging to the order Hemiptera, the subfamily Triatominae. Besides the ability to adjust to home, the vectorial capacity is related to other variables such as distribution of vectors in a given area, specific characteristics, degree of anthropophilic, numbers of parasites expelled with faeces and urine, and human action in the environment (SILVEIRA, 2000).

In endemic areas treated with chemical control and improve housing, there is reduction and elimination of the natural cycle arrest of vectors generating reduced contact of insect vectors of T. cruzi to man. In the opposite situation is the city of Mulungu do Morro, which was added in northeastern Brazil, a region lacking in social resources, with the highest capture vector of the country (69.2%), where there is an association of non-periodic application of insecticides the absence of housing policies and inadequate control trays (ARAS et al., 2003). The absence of effective actions to change this reality in areas of risk may allow the introduction of new vectors (Triatoma infestans) or the reappearance of species difficult to control (T. brasiliensis and T. pseudomaculata), causing the resurgence of Chagas disease.

According to Silva et al. (2003), in a study of data from the Control Program of Chagas Disease (Control Program) developed by SUCEN in Sao Paulo for the period 1990 to 1999, the species most frequently found in the studies was the T. sordida predominantly outside the home. Your eating habits shows marked ornithophily present in bird nests, dry wood or artificial ecotopes, such as chicken, and when the food supply is depleted in these habitats, the vector can invade and colonize houses (ALMEIDA et al., 2008). This makes peridomicile an excellent area for proliferation of T. sordida, especially when the food supply is abundant, and in this study, from 97.6% in households visited had the presence of chicken and 100% were cleaning. It should be noted that this space is usually large, with natural refuges that serve as shelter for insects and are not always within reach of pesticides and human action (SILVA et al., 2003).

The last issue of Triatoma infestans infected with T. cruzi found in the state of São Paulo was in 1978 (SILVA, GOLDENBERG, 2008). In São Paulo the epidemiological information to ensure interruption of natural transmission, amplifying a new order of structure of surveillance is adopted to maintain the control achieved by avoiding the risk of infestation / re-introduction of indigenous transmission.

In 2006, Brazil received the Pan American Health Organization a certificate of control T. infestans. Parallel to this, there was reduction in the risk of disease transmission by this route in the country. There was also a decrease in pregnant women and blood donors infected with the parasite, which contributed to the reduction in transmission by blood transfusion and congenital (FERREIRA, SILVA, 2006).

### 2.2. Oral transmission

The transmission of Trypanosoma cruzi orally is through ingestion by mammals capable of infected vectors and

reservoirs. In the case of man, this transmission occurs sporadically and circumstantial, through food contaminated with the parasite, mainly from bugs or excreta (DIAS, 2006a). It can also occur by eating raw or undercooked game or food contaminated by urine or anal secretion of marsupials infected by laboratory accidents, or by early habits of eating bugs.

Oral transmission is one of the most important and permanent mechanisms of outbreaks of micro-epidemics in Brazil today (YOSHIDA, 2007). One hypothesis is that Chagas disease has been maintained over several years only in wild or enzootic cycle (one in which the causative agent, T. cruzi, circulating only among animals in a natural and frequent, with no major damage man) (DIAS, 2006a). In this cycle, the animals feed on small insects, possibly infected naturally with T. cruzi, promoting the oral transmission of the disease. With the devastation of natural ecotopes, the man has made it easier for wildlife to the region at home and then proceeded to participate in the transmission cycle as one of its hosts and the clinical manifestation, making the disease a new anthropozoonosis (LEATHER, 2007).

In the North, in 2007, Chagas disease has a number of casualties associated with consumption of food (BRAZIL, 2008b), especially the açai. Thus, ANVISA developed a plan of action (BRAZIL, 2008a) that focuses primarily on the training of Health Surveillance Organs local population and the beaters of açai. Recommendations contained in this document the Pan American Health Organization (PAHO), such as the inclusion of Chagas disease as DTA (Foodborne Diseases); set of protocols for efficient heat treatment, with the goal of eliminating T. cruzi açai juice, realization of registration and licensing of establishments carrying out processing bodies açai health surveillance, training of handlers in practice, and the development of educational training and social mobilization in accordance with the reality of the local community (BRAZIL, 2008a).

**2.3 Transfusion transmission**

The main mode of transmission of Chagas disease in urban areas is through transfusion of contaminated blood, the risk is 20%. Dias (2006b) stated that in the 50's, a disease endemic areas was considered a serious public health problem, and that in the 80's, reached 20 thousand new cases. However, only in the 80 years that the surveillance program in Blood Products have been deployed in most Latin American countries, due to the outbreak of AIDS (Acquired Immune Deficiency Syndrome) (PIRON et al., 2008).

Cases of transmission of Chagas disease via blood transfusion have been rare and difficult to detect, usually spread over the year, mostly in adults, but did not specify gender (BRAZIL, 2004). Clinical manifestations may be similar to those observed in patients who contract the disease via the vector, however, this route of transmission was not identified the presence of chagoma inoculation and fever is a recurrent symptom. The disease can evolve naturally to the indeterminate or chronic phase which may be symptomatic heart failure and / or gastrointestinal (NEVES, 2007).

In Brazil, in 2000, there were approximately 2,800,000 blood donations. Within this total, high rates (20-30%) of blood bags and / or blood products were considered unfit for the seropositivity for T. cruzi. This inability tests can vary among regions, for example, in the Southeast is about 9.25% and in the northern reaches 26.77%. It is assumed that these rates vary according to the low specificities of the methods used. The transfusion tends to be controlled by the development of more sensitive techniques and batch processing of blood samples for donor screening and transfusion services. The coverage has been progressively expanded (SILVEIRA, 2000). The incubation period ranges from 5 to 10 days on the road vector, can reach up to 3 months or more in transfusion (BRAZIL, 2004).

**2.4 Transmissions Congenital via transplants and other ways**

The route congenital or vertical is one in which the Trypanosoma cruzi can be transmitted through the placenta during pregnancy (REY, 2002). The transmission of Chagas' disease occurs when there are nests of amastigotes in the placenta that may hatch releasing trypomastigotes blood, the latter being able to reach the fetal circulation (NEVES, 2007). It can occur at any time during pregnancy, even in childbirth, more frequent occurrence between the fourth and ninth months, through the placenta (BRAZIL, 2004). Despite the congenital transmission of T. cruzi may be prevented in women already pregnant, treatment with benznidazole (Roche) has shown good results when started in the acute phase or as soon as possible after infection. When used by children, has shown more effective response than adults (SILVEIRA, 2000). It is advisable to make routine investigation of chagasic pregnant women in prenatal care and ensure the treatment of infected newborns. Estimates are that transplacental transmission is responsible for the occurrence of 9 to 10 thousand new cases per year in the Americas (SILVEIRA, 2000).

Although there is strict control of organ transplants by making diagnoses prior to detection of infectious diseases, errors occur and contribute to disease transmission, especially in non-endemic regions in which, in general, serology is not performed for this form infection. Ferraz and Figueiredo (1993) report two cases of acute Chagas' disease, caused by a kidney transplant from the same donor, who did not undergo a diagnostic test for the disease. Both receivers had tested negative for T. cruzi and after the transplant began to have fever, progressive weakness and hepatomegaly. Two months after transplantation, was detected T. cruzi in peripheral blood. Thus, one can see that the kidney transplant was responsible for the transmission of the parasite.

The cases of transmission of laboratory accidents involving its occurrence is sporadic and have occurred from contaminated materials (feces of triatomines, cultures of T. cruzi, handling of animals in experiments, centrifugation of different infected materials, etc.) (BRAZIL, 2004).

**3. FINAL CONSIDERATIONS (FUTURE OF CHAGAS DISEASE IN THE COUNTRY)**

In Brazil is less and less significant the incidence of Chagas' disease because of the continued control of triatomines resident and rigorous selection of blood donors, combined with the facts emptying demographic and modernization of rural areas. As a result, more and more rare and exceptional will be the detection of the acute form of the disease among the population over the next few years it is expected that it is confined to possible cases of congenital transmission and sporadic cases of vector transmission or oral areas surveillance and wild environments.

An important vehicle to spread of Chagas' disease, now is the poor management of green areas and human activity that leads to withdrawal of wild flora and to replace it by agricultural activities, transforming the natural environment and modifying the behavior of various animals. The destruction of the natural environment contributes to the bugs can be passively brought to the regions close to home with the changes caused by human action. This process becomes increasingly possible food contamination by wild reservoirs that invade the home perimeter, increasing the risk of acquiring Chagas' disease by the oral route.

In the field of investigative research, stands out as an important development in social studies that aim to identify sustainable actions of information, education and training for the population in different age groups that support the actions of the program by changing practices in the use and maintenance of dwellings, as well as investigations to select measures that encourage people to carry out entomological surveillance and reorganization of the home environment as a whole, for implementing the monitoring and reduce the possibility of resettlement housing by the vector.

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**ROUTES OF TRANSMISSION OF TRYPANOSOMA CRUZI IN BRAZIL**

**ABSTRACT**

Chagas disease is one of the most important endemic diseases in Brazil and Latin America, whose causative agent is Trypanosoma cruzi. Within this context, the objectives of this study was to research and discuss the main routes of transmission of the disease and its epidemiology. The classic form of transmission is via a vector, corresponding to 80% of cases of the disease, the main insect vectors to the order Hemiptera, the subfamily Triatominae. In endemic areas treated with chemical control and improve housing, there is reduction and elimination cycle arrest. In the case of man, transmission of T. cruzi occurs orally through food contaminated with the parasite. Today is one of the most important and permanent mechanisms of outbreaks of micro-epidemics in Brazil. In the North, in 2007, Chagas disease has a number of casualties associated with consumption of food, especially the açaí. The main mode of transmission of Chagas disease in urban areas is through transfusion of contaminated blood, the risk is 20%, recent cases have been rare and difficult to detect. The way disease is one in which the T. cruzi can be transmitted through the placenta during pregnancy, can occur at any time, including during delivery. Thus, it is found that in Brazil is less and less significant the incidence of Chagas disease, especially because of the continued control of triatomines resident and rigorous selection of blood donors, combined with the facts emptying demographic and modernization of rural areas. It is expected that it is confined to possible cases of congenital transmission and sporadic cases of congenital

transmission or orally in areas under surveillance and wild environments.

**KEYWORDS:** T. cruzi, Chagas disease, transmission.

**VOIES DE TRANSMISSION DE TRYPANOSOMA CRUZI AU BRÉSIL**

**RÉSUMÉ**

La maladie de Chagas est l'une des plus importantes maladies endémiques au Brésil et en Amérique latine, dont l'agent causal est Trypanosoma cruzi. Dans ce contexte, les objectifs de cette étude était à la recherche et de discuter des principales voies de transmission de la maladie et son épidémiologie. La forme classique de la transmission se fait via un vecteur, correspondant à 80% des cas de la maladie, les vecteurs principaux insectes à l'ordre des hémiptères, la sous-famille des Triatominae. Dans les zones endémiques traités avec la lutte chimique et à améliorer le logement, il ya la réduction et l'arrêt du cycle d'élimination. Dans le cas de l'homme, la transmission de T. cruzi se produit par voie orale par des aliments contaminés par le parasite. Aujourd'hui est l'un des mécanismes les plus importants et permanents de foyers de micro-épidémies au Brésil. Dans le Nord, en 2007, la maladie de Chagas a un certain nombre de victimes liées à la consommation de denrées alimentaires, en particulier les açaí. Le principal mode de transmission de la maladie de Chagas dans les zones urbaines est à la transfusion de sang contaminé, le risque est de 20%, les cas récents ont été rares et difficiles à détecter. La maladie chemin est celui dans lequel le T. cruzi peut être transmis par le placenta pendant la grossesse, peuvent survenir à tout moment, y compris pendant l'accouchement. Ainsi, il se trouve qu'au Brésil, est de moins en moins importante de l'incidence de la maladie de Chagas, surtout en raison du contrôle continu de triatomes résident et une sélection rigoureuse des donneurs de sang, combinée avec les faits démographiques de vidange et de modernisation des zones rurales. On s'attend à ce qu'elle se limite à des cas possibles de transmission congénitale et de cas sporadiques de transmission congénitale ou oralement dans les zones sous surveillance et des milieux sauvages.

**MOTS-CLÉS:** T. cruzi, transmission, maladie de Chagas.

**VÍAS DE TRANSMISIÓN DE TRYPANOSOMA CRUZI EN BRASIL**

**RESUMEN**

La enfermedad de Chagas es una de las enfermedades endémicas más importantes en Brasil y América Latina, cuyo agente causal es el Trypanosoma cruzi. Dentro de este contexto, los objetivos de este estudio era investigar y discutir las principales vías de transmisión de la enfermedad y su epidemiología. La forma clásica de transmisión es a través de un vector, que corresponde al 80% de los casos de la enfermedad, los principales vectores de insectos del orden Hemiptera, la subfamilia Triatominae. En las zonas endémicas tratados con control químico y mejorar la vivienda, es la reducción y eliminación de la detención del ciclo. En el caso del hombre, la transmisión de T. cruzi se produce por vía oral a través de alimentos contaminados con el parásito. Hoy es uno de los mecanismos más importantes y permanentes de los brotes de micro-epidemias en Brasil. En el Norte, en 2007, la enfermedad de Chagas tiene un número de víctimas asociadas con el consumo de alimentos, especialmente la del açaí. El principal modo de transmisión de la enfermedad de Chagas en zonas urbanas es a través de la transfusión de sangre contaminada, el riesgo es del 20%, casos recientes han sido escasas y difíciles de detectar. La enfermedad es una forma en la que el T. cruzi puede transmitirse a través de la placenta durante el embarazo, puede ocurrir en cualquier momento, incluso durante el parto. Así, se comprueba que en Brasil es cada vez menos significativa la incidencia de la enfermedad de Chagas, especialmente debido a la continuación del control de los triatominos residentes y rigurosa selección de donantes de sangre, combinado con los hechos vaciamiento demográfico y la modernización de las zonas rurales. Se espera que se limita a los posibles casos de transmisión congénita y casos esporádicos de la transmisión congénita o por vía oral en las zonas bajo vigilancia y los ambientes silvestres.

**PALABRAS CLAVE:** T. cruzi, transmisión, enfermedad de Chagas.

**VIAS DE TRANSMISSÃO DO TRYPANOSOMA CRUZI NO BRASIL**

**RESUMO**

A doença de Chagas constitui uma das mais importantes endemias do Brasil e da América Latina, cujo agente etiológico é o Trypanosoma cruzi. Dentro deste contexto, os objetivos do presente trabalho foram pesquisar e discutir as principais vias de transmissão da doença e seus aspectos epidemiológicos. A forma clássica de transmissão é via vetorial, correspondendo a 80% dos casos da doença, sendo os principais insetos vetores à ordem Hemiptera, da subfamília Triatominae. Em áreas endêmicas tratadas com controle químico e melhoria habitacional, observa-se redução e eliminação do ciclo domiciliar. No caso do homem, a transmissão do T. cruzi por via oral ocorre através de alimentos contaminados com o parasita. Atualmente, é um dos mais importantes e permanentes mecanismos de surtos de micro-epidemias no Brasil. Na região Norte, no ano de 2007, a doença de Chagas fez inúmeras vítimas associadas ao consumo de alimentos, principalmente o açaí. A principal forma de transmissão da doença de Chagas em áreas urbanas é através da transfusão de sangue contaminado, cujo risco é de 20%; os casos recentes têm sido raros e de difícil detecção. A via congênita é aquela na qual o T. cruzi pode ser transmitido através da placenta, durante a gestação, podendo ocorrer em qualquer momento, inclusive na hora do parto. Assim, pode-se verificar que no Brasil é cada vez menos expressiva a incidência da doença de Chagas principalmente em razão do continuado controle de triatomíneos domiciliados e de rigorosa seleção de doadores de sangue, fatos aliados ao esvaziamento demográfico e à modernização das zonas rurais. Espera-se que a mesma se restrinja a eventuais casos de transmissão congênita e a esporádicas situações de transmissão congênita ou oral em áreas sob vigilância e ambientes silvestres.

**PALAVRAS-CHAVE:** T. cruzi¸ doença de Chagas, transmissão.

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