

## WHO Global Health Histories Lunchtime Seminar on Chagas disease, October 2009

### Presentation by Professor Gabriel Adrián Schmunis

(Edited version)

(Slide 1)

This is the culprit – a microscopic protozoa swimming and dancing among red cells.

(Slide 2)

This is the victim – at the beginning, with a characteristic romanha sign. Unilateral bipalpebral oedema, with a retroauricular. This happens only in a minority of cases. Most of them only have fever.

(Slide 3)

In 20 – 30% of cases, 10 or more years later, the patient will develop heart lesions, which shows in the increases size of the heart, as in this X-ray.

(Slide 4)

With time, the patient will progress to cardiac insufficiency – the beginning of the end.

(Slide 5)

This is the end – an enlarged heart. Compare the thickness of the walls with the much thinner apex. If the patient survived longer, an aneurism might develop here. However, only a few of patients reach this stage.

(Slides 6 and 7)

This is said to be Berenice, the first of Dr Chagas's patients, and here she is at age 72. She died two years later, and her death could not be related to Chagas disease.

(Slide 8)

This is the enemy, a triatomine insect, the vector, of which there are more than 120 species in the Americas, from Lake Michigan in the north to the south of Argentina and Chile.

(Slide 9)

This is the distribution of the six most important vectors and of human infection, from the north of Mexico to the south of Argentina and Chile. Of these, the most important is *Triatoma*

*infestans*. It is present from the middle of Brazil to the Pacific coast in Peru, down to central Argentina and Chile. With proper insecticide spraying, it can be eliminated from most areas. Control activities have greatly increased in the last 10 years.

(Slide 10)

Transfusion is the second enemy. In urban areas, when there is no vector transmission, infected people continue to have *T.cruzi* in their blood, years after becoming infected. Up to 20% of individuals receiving an infected blood transfusion would become infected themselves.

(Slide 11)

A huge body of scientific evidence has been gathered since 1909, but only three countries in Latin America decided to combat the vector in the 1960s and 1970s. Often, vector control activities were not sustained. This changed after 1990 with the creation of the Southern Cone Initiative, involving Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay. Apart from \$4 million from USAID to Bolivia, these countries financed their own programmes or used loans from the Inter-American Development Bank and the World Bank.

(Slide 12)

Even without outside aid, the countries were well prepared. There had been vector control in Argentina and Brazil since the 1960s, involving 1000 and 9000 field workers respectively – virtually an army. On the other hand, activities in Chile and Uruguay were limited, and only occasional in Bolivia and Paraguay. For the first time, treatment of acute cases with Nifurtimox was successfully tested in all Southern Cone countries in the late 1960s and early 1970s.

For diagnosis, the complimentary fixation test was used for years and diagnostic re-agents were locally produced. However, it was not a good test, and a difficult one to standardize. The situation improved with the development of indirect haemagglutination in Argentina in the 1960s, and the IFA in Brazil in the 1970s. The ELISA test began to be used in the 1980s, and serology with *T.cruzi* recombinant antigens in the 1990s. In fact, Chagas disease diagnosis promoted an industrial and manufacturing base for re-agents in the Southern Cone.

Epidemiological studies in Chile, Paraguay and Uruguay in the 1980s were the basis for subsequent control activities in those countries.

Studies in Argentina and Brazil in the early 1990s indicated that infected children under 13 years of age can be found negative when treated with Metronidazol – proving for the first time that chronic and sub-acute infections in children could be cured when treated.

The support of the PAHO epidemiologist in Paraguay, and later of the WHO representatives in Bolivia, Paraguay and Uruguay, was crucial to the launch of the Initiative, as was the Tropical Disease research special programme, and its counterpart programme in WHO. At the first meeting of government delegates of the Initiative, in Argentina in 1992, the intermediate goal was set to interrupt vector and transfusion transmission, with elimination of the vector the ultimate goal. Countries defined the number of houses in geographical areas that needed to be sprayed.

(Slide 13)

More than 6.5 million houses had to be sprayed in 1992. By 1995, 1.5 million had been sprayed with 2 million more planned for 1996. Evaluations showed the quality of spraying had to be improved. The worst situation was in Bolivia, where data from USAID in 1990-1992 indicated that 15% of the total population of 7.6 million were infected. There were 400 000 chronic cases, 2000 congenital infections and 86 000 new infections per year.

(Slide 14)

If all those infected were to be treated, the cost would be \$21 million, and the direct and indirect costs for loss of life would be \$101 million, making a total annual cost of Chagas for Bolivia was \$123 million – more than the whole budget of the Ministry of Health.

(Slide 15)

The momentum of the Initiative was sustained by World Bank comparisons of the burden of different diseases, using Disability-Adjusted Life Years (DALYs).

(Slide 16)

In 1993, according to the World Bank, the Chagas disease burden in the Americas around 1990 was four times higher than the combined burden of all other tropical diseases. Only acute respiratory infections, diarrhoeal diseases and HIV had a greater burden. This information was repeatedly provided to health ministers at Initiative meetings over the years.

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The total costs of Chagas control in Brazil from 1975-1995 was \$516 million, with 77.5% spent on vector control. Between 1975-1980, 3.1% of the population were infected; this was reduced to 1.3% by 1995. Vector control prevented 277 000 new infections and 85 000 deaths, and also prevented the loss of 1.62 million DALYs (41% from deaths and 59% from disabilities). For every dollar spent on vector control, there was a saving of \$2.01.

(Slide 19)

After more than \$300 million invested by Southern Cone countries up to the year 2000, vector transmission by *Triatoma Infestans* was interrupted in Uruguay, Chile and Brazil in 1997, 1999 and 2006 respectively. The vector has not been eliminated in those countries but their number is so low that it is unlikely they will be able to transmit *T. cruzi* to humans. Guatemala interrupted vector transmission by *Rhodnius prolimus* in 2008.

(Slide 20)

An evaluation of DALYs in 2001 shows that the biggest decrease was in *T. cruzi*.

(Slide 21)

Improvement in transfusion safety and reduced infections as a result were achieved because of the political importance of the issue and media reports of it. The problem was relatively easy to quantify and prevention could be achieved through serology.

(Slide 22)

This shows the endemic countries with *T. cruzi* screening in the Americas in 1993-1995. No official information on the status of blood supply for infectious diseases was available in Latin American countries before 1993, and at that time only four countries screened for *T. cruzi* in 100% of blood donors.

(Slide 23)

This shows data from 1993-1997 provided by the Andean countries, comparing how many infections of HIV, HBV, HCV and *T. cruzi* originated in transfusions in that sub-region.

(Slide 24)

In the year 2000, only seven countries screened 100% of donors for *T. cruzi*.

(Slide 25)

In 2005, one more country has achieved 100% screening, and only two countries are below 50% screening.

(Slide 25)

Sylvatic triatomines are abundant in the United States, but social conditions in rural areas make it transmission to humans unlikely. The danger in the US is that infected immigrants from Latin America can transmit the infection when they donate blood or organs.

(Slide 26)

This shows immigration flows at different times. The destination countries at highest risk are those receiving the largest number of immigrants from high-prevalence countries, including those of the Southern Cone.

In conclusion, progress has been impressive. If someone told me 20 years ago that a serological survey for *T. cruzi* in Brazil would find only a few positives among more than 100 000 children, I would have considered it a joke. I feel Dr Chagas would have been very proud of such a result. Still, much remains to be done in both vector control and transfusion control – the former, because of decentralization, presents new challenges. I am sure that Jose Da Silva (and hundreds like him – the people who really did it) will, after 25 years of experience in spraying, contribute to developing answers to those challenges.