Tsetse fly control and Trypanosomiasis in Africa, quo vadis?

Lutte contre la mouche tsé-tsé et la trypanosomiase en Afrique : où va-t-on ?

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Abstract National and international efforts to eradicate tsetse fly-borne human and animal trypanosomiasis are critically evaluated, and possible reasons for their failure in many cases are discussed. Some formerly performed campaigns in specific areas with positive results cannot be taken as examples to solve the main problems. In future, a significant reduction of trypanosomiasis cases will be possible to achieve only if a concerted long-term Pan-African approach, based on financial security, the continuity of expert staff, and a well-planned, ecologically sound land use, is generally accepted.

Keywords Human sleeping sickness · Investigation · Control · Trypanosomiasis · 1930–1940 · Zanzibar · Botswana · West Africa

Introduction

Dr. GFT. Saunders [12], who worked in the 1930s and 40s in West Africa on human sleeping sickness, described the history of tsetse fly investigations and control with a quotation from Mary Kingsley, the intrepid lady traveller, who journeyed through western and equatorial Africa in the 19th century: “Coma, interrupted by convulsions”.

That was 80 years ago. Is it not applicable today?

During the 70s, I was engaged in the field of trypanosomiasis research and tsetse fly control. I investigated the prevalence of T. brucei, T. congolense and T. vivax in cattle and wildlife in the Ngamiland and Chobe districts of Botswana. I also participated in the first attempts to eradicate tsetse from the Okavango Delta, using fixed wing aircraft spraying ultra low volumes (ULV) of nonpersistent insecticides, now called sequential aerosol technique (SAT) [2]. After seven years in Botswana, I spent two years in West Africa working as a project manager of a large-scale tsetse fly distribution survey of Northern Ghana, but also taking part in control projects in Cameroon, Burkina Faso and Ivory Coast. All this work resulted in scientific papers, programmes, reports to the government and sets of detailed maps of tsetse fly distribution [3,4,5].

In order to keep up to date with all the various aspects in this field, I subscribed in 1978 to the new Tsetse and Trypanosomiasis Information Quarterly released by the Centre for Overseas Pest Research in London. The first volume contained 156 relevant abstracts and listed 31 involved international organisations. The latest 2009 edition, Vol. 32, is now produced by the FAO under the Programme against African Trypanosomiasis (PAAT). Since 1978, the number of abstracts has risen to 14,800, and of listed organisations to 82! Much of the content is often devoted to reports on meetings and programmes of these organizations, resulting in vast numbers of resolutions, guidelines, proposals and future programmes and projects.

The application of all this knowledge and technology has so far resulted only in two successful tsetse fly control
campaigns leading to permanent eradication in Africa. In Unguja Island, Zanzibar, *G. austeni* was eradicated by the sterile insect technique (SIT) [15] and *G. morsitans* in Botswana by SAT [10]. The first is an island, and in the second, the fly distribution is restricted to the Okavango Delta, with only the narrow panhandle at the Caprivi Strip as possible entry port for reinvasion. Another successful campaign was carried out in the late 1940s in Zululand [6] using ground and aerial applications of persistent insecticide like DDT and BHC. It cleared the fly from South Africa for a long period until re-invasion occurred from neighbouring territories. And this latter example is typical for the rest of Africa. Over the last 80 years, vast stretches of land have been cleared by various methods only to be re-invaded.

A graphic published in a PAAT information pamphlet by Hursey [8] shows that in 1930, 65,000 deaths from sleeping sickness were recorded; by 1960, the number had dropped to almost none, while in 1998, the number of deaths had again increased to about 45,000, according to WHO estimates.

In West and Central African countries, where chronic sleeping sickness, caused by *Trypanosoma gambiense* had been endemic for a long time, the disease was controlled successfully in the 1920s and 1930s by the colonial governments by a combination of extensive medical surveys, chemotherapy and the reduction of the riverine tsetse fly habitat. The latter was done very effectively by removing dense bush from the riparian vegetation leaving only the larger clean bole trees [12,13]. The eventual drastic reduction of sleeping sickness cases in the late 1950s can also be attributed to dedicated, long-serving and highly trained senior and junior staff and a long relatively peaceful period. Since independence, strictly organized control programmes were slowly abandoned, leading to a steady increase of sleeping sickness cases [11].

In the last 60 years, many Tsetse and Trypanosomiasis (T&T) projects were started by African governments in the affected countries and mainly financed by First World agencies. The early pre-insecticide efforts relied on game destruction and the far more effective vegetation clearing, followed by various types of traps. Eventually, the spraying of fly resting sites with DDT took over until the severe and unacceptable ecological side effects become apparent. Overseas experts were engaged to supervise tsetse surveys and control measures with more environmentally friendly insecticides, establish laboratories and tsetse fly breeding centres and engaged in the training of local specialist staff. Eighty-two organizations, mainly from Europe and Africa, are now involved. Due to tribal wars, civil unrest, lack of funds or different priorities and subsequent improper land use policies, most projects were either severely interrupted or had to be completely abandoned and areas cleared of fly were then soon re-invaded.

To counteract this deteriorating trend, major initiatives and programmes were launched in the mid 1990s, aiming at a co-ordinated Pan-African strategy. Initiated by the Organization of African Unity (OAU), supported by FAO and WHO and financed by local governments, foreign aid and the African Development Bank (AfDB), the Programme against African Trypanosomiasis (PAAT) and the Pan-African Tsetse and Trypanosomiasis Eradication Campaign (PATTEC) founded in 2001 have made significant progress in a number of countries. Aiming to eradicate T&T from the African continent is an ambitious plan. It requires the full political commitment of individual governments, a step-by-step strategy, making full use of the resources and the latest technology [9].

Fly control measures can now rely on proven methods, like SAT with relatively environmentally friendly insecticides, excellent traps with effective attractants, removal of vegetation essential for tsetse survival, pour-on formulation for cattle and SIT. For recording distribution patterns of T&T, GIS and GPS are perfect tools. A number of very effective curative drugs are available for the treatment of human and animal trypanosomiasis. Every aspect of fly biology, ecology and behaviour has been investigated. The epidemiology, pathology, immunology and tolerance of human and animal trypanosomiasis have been studied, and a vast array of diagnostic tests are now available. Even the genome of *Trypanosoma brucei* has been described in a paper by 103 (!) authors [1]. Yet, there appears to be a startling discrepancy between the huge wealth of knowledge accumulated in every sector in this field and the slow progress in the control of disease and vector.

Many programmes and action plans for new control projects appear to place too much emphasis to the sterile insect technique. It is doubtless the most ecologically friendly method of tsetse control, but the rearing of sufficiently large numbers of radiated, sterile males is a sophisticated and very expensive process. The method also requires the initial significant reduction of the existing fly population by other means like SAT and an effective barrier against re-invasion of fertile males. Vale and Torr [14] have shown that this measure of control is far less cost effective when compared with the use of insecticide-treated cattle (ITC). To reduce the trial populations by 99%, it took 187 days with ITC and 609 days with SIT, while the costs for the latter are up to 40% greater.

Another prerequisite to insure eradication is the sufficiently long-term monitoring of cleared areas, which seems to be difficult: it has been shown that, when even very small numbers of flies are left alive in a large control campaign, eradication cannot be achieved [7], as it happened in the Okavango Delta in Botswana at the first total eradication attempt by SAT in the early 1990s.

Many countries are also lacking the continuity of dedicated, long-serving members of expert senior and junior
staff. During the colonial period, staff remained in their posts for many years, as for instance in Ghana, where between 1909 and 1949, only two senior veterinary officers with their staff dealt with animal T&T problems. The reduction of sleeping sickness cases during this period can be attributed to medical officers using mobile teams, which conducted extensive medical campaigns [12]. All this information was captured in meticulous annual reports and maps, showing the prevalence of trypanosomiasis and fly distribution. Unfortunately, such reports were often lost or never utilized by the relevant departments. From my own experience and that of several colleagues, who worked in similar fields, this applies even to our maps and records. This has often led to wasting time and money—duplication of projects.

Finally, there is the ecological question. Is it really necessary to get rid of tsetse flies countrywide? Shouldn’t certain important biomes rather be left without livestock and crops and saved for endemic vegetation and wildlife, including tsetse flies? For instance, during my survey of Northern Ghana, the only place where I found any significant numbers of endemic large herbivore species was in the then marginally functional Mole Game Reserve, which also was the last strong hold of Glossina morsitans. In the rest of this vast area, where only riverine flies (G. tachinoides & palpalis) were spotted, wild mammal populations, down to rodents, had been reduced to almost nil, in the ever present search for “bush meat”.

Is not the main problem the pressure of an ever increasing human population, which will lead to politically favourable, rather than ecologically sound, decisions?

The only way to achieve long-lasting success in the age-old battle against tsetse fly, nagana and human sleeping sickness is good governance, peace and the continuity of expert staff, using the most appropriate scientific methods for long-term projects, followed by well-planned land use. Otherwise, the tsetse and Trypanosomiasis problem will remain a stop-go affair or “Coma, interrupted by convulsions”.

Conflit d'intérêt : aucun

References

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