The Pan African Tsetse and Trypanosomiasis Eradication Campaign

Presented by:
Dr John P. Kabayo,

Introduction
It is common knowledge that Africa is plagued by a variety of problems, many of which are critical and urgent. But the most tragic of all of these problems are the preventable ones, the stoppable ones, the totally needless ones that continue to kill, debilitate and impoverish, condemning the continent to perpetual misery. Problems which persist in spite of our extensive knowledge about their causes and in spite of the availability and feasibility of their solutions. Among such problems, is the problem of trypanosomiasis that is recognised as as both a serious health problem and a severe constraint to Africa's socio-economic development, which every year claims the lives of over 50,000 people and kills more than 3 million livestock, causing huge economic losses and untold human misery.

1.1 The tsetse and trypanosomiasis problem
Trypanosomiasis is a devastating disease of humans and domestic animals caused by unicellular protozoan blood parasites called trypanosomes, which is transmitted by blood-feeding insects called tsetse flies. Trypanosomiasis, is also known as sleeping sickness when it affects people and as nagana when it afflicts livestock; it occurs in 37 countries in Sub-Saharan Africa where it causes death, debility and diminished productivity in man and livestock and is responsible for massive economic losses. The limitations and negative impact imposed by trypanosomiasis continue to severely hamper progress in development initiatives, frustrating efforts aimed at improving livelihoods and perpetuating Africa's vicious circle of disease, diminished productivity and poverty.

Attempts to control tsetse and trypanosomiasis date back to around 1900, when colonial governments mounted extensive programmes in different African countries. Initially the methods of tsetse control involved clearing the bush and vegetation where the tsetse flies rest, and killing wild game animals on which the flies fed. During the 1940s, 1950s and 1960s campaigns involving habitat destruction and ground spraying of residual insecticides, notably DDT and dieldrin, succeeded in rendering large areas in many African countries tsetse-free. These campaigns were
extensive area-wide "roll-up-the-carpet" operations conducted in a military style and performed on a protracted, self-sustaining basis. Several other methods, including the use of traps, baits and aerial application of insecticides were also applied. Until the late 1960s, the problem of trypanosomiasis commanded the interest and attention of 5 imperial powers. There were massive disease surveys and treatments, large-scale evacuations from affected areas and military style tsetse control operations in many parts of the continent. All these activities illustrated the extent to which the seriousness of the problem of trypanosomiasis was appreciated and the commitment of the governments in those days to do something about it. Trypanosomiasis commanded considerable attention throughout the period of the colonial governments, leading up to the early 1970s, when the various tsetse and trypanosomiasis control intervention initiatives succeeded to virtually eliminate the disease from many parts of the continent.

1.2 Events in tsetse and trypanosomiasis control since the 1960s
Since the late 1960s, the majority of the countries on the continent were involved in the process of state formation, with various experiences of civil disturbances and political transformation, which greatly reduced the priority and attention devoted to the problem of trypanosomiasis. This led to the present situation of increased tsetse infestation, even in areas that had been cleared of tsetse flies, and resulted in the unprecedented high incidences of the disease, currently seen in many parts of the continent. In addition to the deteriorated situation of tsetse-transmitted diseases today, a number of other observations can be made:

- Under the pressure of increasing environmental safety consciousness and concern for the consequences of tsetse control activities, many residual insecticides used in tsetse control were banned. This stimulated considerable research into the development of more environmentally acceptable techniques and resulted in the large number of viable alternative options in tsetse control, including traps, screens, targets, SIT and SAT, which are available today.
- The principal purpose and emphasis of most activities devoted to tsetse and trypanosomiasis, since the 1970s, were on research and study and not on actual tsetse and trypanosomiasis control or eradication, as was the case during the period leading up to 1970.
- Most of the initiatives, whether in research or on actual intervention action, were inspired, planned, financed and executed by foreign partners, with the conspicuous absence of local stakeholders.
- The use of trypanocidal drugs became increasingly frustrated by the phenomenon of drug resistance, and while no new drugs were being developed, the continued availability of trypanocidal drugs was thrown into doubt by the declared threat of the drug manufacturers to discontinue production.
- Various studies conducted during the 1980s and 1990s provided evidence showing that tsetse-transmitted diseases were severe constraints to Africa's socio-economic development, closely linked to the causes of rural poverty.
- The successful eradication of tsetse flies from Zanzibar, which was accomplished in 1997, came at a time when most of the continent was discouraged from pursuing the objective of tsetse elimination as a means of trypanosomiasis control, believing that tsetse eradication was neither achievable nor desirable. Many had settled down to the option of living with the disease.

1.3 The impact of tsetse and trypanosomiasis on Africa's history and development
During the past number of centuries in Africa's recorded history, periodic epidemic outbreaks of sleeping sickness wiped out entire communities in villages and settlements in various parts of the
continent and caused massive depopulation of many areas. Pastoralists suffered heavy livestock mortality and diminished productivity, because of nagana, and they were prevented from making use of large areas of grazing land. Many communities lost their domestic animals to trypanosomiasis and gave up livestock production altogether. They concentrated on crop production, preferring to settle in more elevated areas where they were comparatively safe from the diseases, most of which are commonly found in low-lying areas. Other communities persisted with livestock production and settled in areas, e.g. savanna plains, where the limited vegetation cover was relatively tsetse-free. Over the years, this pattern of settlement and separation of crop production from livestock production changed little. Significant mixed farming is only found in areas where tsetse and trypanosomiasis no longer exit. The disease and its threat caused depopulation of large areas of good pasture and agricultural land and led to overcrowding in the limited tsetse-free areas, creating a variety of problems ranging from competition for land to overgrazing, land degradation and a variety of ecological disruptions. Ironically, immense expanses of Africa's potential farming lands remain uninhabited and undeveloped, because of the presence of the tsetse fly. The uninhabited areas in between settled areas, often known as Africa’s green desert, are usually home to wildlife which not only provide a source of blood on which tsetse flies feed but also serve as a trypanosome reservoir, and source of new trypanosome infections to man and his livestock.

The threat of trypanosomiasis forced most of Africa to stock the low - producing, local livestock breeds, which are relatively trypanotolerant and are generally more capable of surviving infections of trypanosomiasis, compared to the more productive exotic breeds, which easily succumb to the disease. Trypanosomiasis also hindered the development and spread of draught animal power-based technologies, and prevented the realisation of their potential and use to increase food production and relieve drudgery. The consequences of tilling land with the hand hoe (in the absence of draught-power technology); the absence of mixed farming (limiting the availability of protein and manure); the ever-impending threat of disease and death; the futility of working barren soils and herding unproductive livestock; and their combined impact on the history and socio-economic development of the African people, is difficult to exaggerate.

1.4 The effects and consequences of trypanosomiasis

While trypanosomiasis had virtually been eliminated from many areas by the end of the 1960s, the deterioration in tsetse and trypanosomiasis control activities, reflecting the changed national priorities and reduced vigilance against the disease in post-independence Africa, led to the resurgence of tsetse infestation and increased incidences of the disease. Throughout the affected countries, trypanosomiasis is the greatest cause of mortality, morbidity and low productivity in domestic animals. Areas that are infested with tsetse flies are virtually devoid of cattle and other domestic livestock. Of the estimated 165 million cattle found in Africa only about 10 million are found within the tsetse fly belt, and these are mostly low producing breeds, which are relatively trypanotolerant. To maintain the 10 million cattle of mostly unproductive breeds within the tsetse belt, the affected African countries consume over 35 million doses of trypanocidal drugs every year to treat the disease, and engage in various activities to control the tsetse flies.

The prevalence of trypanosomiasis makes it both difficult and uneconomical to raise productive livestock breeds because they are highly susceptible to the disease. While mixed farming is commonly practised in other parts of the world, where tsetse flies are absent, in most of Sub-Saharan Africa, livestock production is separated from crop production. In addition, avoidance of tsetse infested areas causes people and livestock to crowd into the few, often environmentally fragile, tsetse-free areas available. The Organisation International des Epizooties (OIE) estimates
that 50% of all crop production across Asia is realised through the use of draught animal power. According to the Food and Agriculture Organization of the United Nations (FAO) this percentage for sub-Saharan Africa ranges from 5–10%. If draught animals were available the income of rural families from agricultural work could increase by 45% per unit of land and 143% per unit of labour.

The burden of living with trypanosomiasis among livestock-keepers or small-scale mixed farmers are multiple and diverse, because of the multiple functions of livestock in Africa's rural livelihood systems. This includes the cost of treatment with trypanocidal drugs, the losses related to livestock mortality, abortions, reduced weight, reduction in milk production, loss of draught power, the inability to graze in certain areas and the lower prices obtained for trypanosomiasis-affected animals. The FAO estimates that every year Africa loses about $1.2 billion in lost milk and meat production, and in costs connected with the efforts to treat or prevent the disease. Africa loses over 3 million domestic animals every year to causes directly traceable to tsetse-transmitted diseases. These losses can be as much as $4.5 billion every year if the lost opportunities in agriculture and related areas, traceable to the presence and effect of the tsetse fly are considered. And these estimates do not include the cost of the effect of the disease on human health and productivity.

Over 65 million people, most of them in rural areas, are at risk of catching sleeping sickness. The World Health Organisation (WHO) has reported that more than 500,000 people are infected with sleeping sickness and that about 50,000 die from the disease every year; the situation is rapidly deteriorating as increasingly more new cases are being registered every year.

Of all of Africa's plagues and problems, few have had greater influence in shaping the Continent's present economic and ecological circumstances than trypanosomiasis. The burden and consequences of trypanosomiasis continue to constrain progress in all areas where effective and sustainable tsetse control has not been achieved, preventing entire communities from improving their livelihoods. The limitations imposed by trypanosomiasis continue to frustrate efforts and hamper progress in various development activities, and remain the greatest single cause of hunger, poverty and suffering to entire communities in the affected African countries.

2. Attempts to cope with / control trypanosomiasis

Before the development of the means to control trypanosomiasis, including the use of insecticides and trypanocidal drugs, livestock-owners developed various methods to minimise the probability of tsetse flies biting their animals. Methods such as avoidance of areas where tsetse flies are abundant, e.g. by concentrating livestock in highland areas or keeping their livestock in areas with limited vegetation cover, where tsetse populations do not persist, are still used to this day. A number of repellents, including wood smoke, rancid butter, camel fat, mud and other materials have also been used to protect herds of livestock from tsetse flies with varying degrees of success. On a limited scale farmers in some areas have more recently reportedly used nets to protect zero-grazed cattle.

No vaccine against the disease is available and there are no new drugs being developed. The few drugs still in production are highly toxic or have been rendered largely ineffective by the widespread phenomenon of drug-resistance. Further, the future availability of these drugs is uncertain, since their production is threatened with discontinuation for commercial reasons: the only market being in Africa, where the purchasing power of the affected consumers is poor and rapidly deteriorating.
Attempts to control trypanosomiasis date back since about 1900, when colonial governments mounted programmes in different African countries, notably Benin, Cameroon, Gambia, Ghana, Ivory Coast, Kenya, Nigeria, Senegal, South Africa, Uganda, Zambia and Zimbabwe. The trypanosomiasis control campaigns that were mounted in the 1930s, 1940s, 1950s and 1960s were extensive operations, which were usually conducted military style and which succeeded in eliminating tsetse and trypanosomiasis from large expanses of land in many countries.

While tsetse eradication had been achieved in large parts of the continent, most of these areas became re-infested because they were not sufficiently protected from re-invasion and they lacked the necessary post-eradication surveillance. In countries such as Zimbabwe where an effective tsetse control capability has existed for a long time and where large areas have been reclaimed, the long border perimeter with neighbouring countries demands regular maintenance of target barriers and other precautions to control re-infestation. Experience has shown that protection of even small areas, located within a major fly belt by regular application of insecticides or by any other method or combination of methods is uneconomical, especially considering the escalating costs of labour and materials. The only viable approach therefore is to tackle entire tsetse populations or infestations which are isolated from each other, e.g. by natural boundaries, such as mountain ranges, lakes or desert areas, so that no re-invasion is possible, and/or and to be able to initiate roll-back-the-carpet approaches against tsetse infestations. This proposal of an area-wide approach to tsetse control would represent a significant departure from current practice, where control is confined to within the political boundaries of individual countries.

Africa's tsetse belt comprises a combination of discrete populations of particular species or sub-species of tsetse flies, which are confined in specific areas in form of islands of tsetse infestations, whose limits are set by a variety of physical and environmental factors. The factors include mountain ranges, water bodies, deserts, limitations in the fly's tolerance of temperature, humidity, natural cover, food availability, etc. The individual zones of tsetse infestation are not always confined within the same national boundaries. Therefore the application of the principles of the area-wide approach in tackling such trans-boundary infestations will often demand the involvement and close collaboration of two or more countries, and may entail the creation of one programme or a set of closely co-ordinated control programmes, which are planned and implemented under one regional initiative. An example of a group of countries, which share a common tsetse belt and could work together to achieve the objectives of a tsetse eradication campaign, through employing an area-wide approach could be provided by Angola, Botswana, Namibia and Zambia.

2.1 Lessons from past approaches to solve the trypanosomiasis problem

- With a few exceptions, trypanosomiasis has since the 1970s received limited attention in the affected countries and, until the decision adopted by the African Heads of State and Government, it was listed among Africa's neglected diseases.
- In most cases the activities that were undertaken to address the tsetse and trypanosomiasis problem, since the 1970s, were of a research nature only, often concerning the development or testing of new methods of control.
- In many instances, where intervention protocols were mounted, a single control technique was used to tackle the tsetse fly, regardless of the ecological situation; however, the technique applied was not necessarily the most efficient or appropriate for the particular situation. To optimize the efficiency of each intervention, it is necessary to combine the
capabilities and specific attributes of each control technique through integrating the different methods.

- The approach and involvement of international agencies and other actors with a mandate in tsetse and trypanosomiasis intervention (notably FAO, WHO and IAEA) has largely been subjective, i.e. according to each agency's area of specialisation, rather than objective, i.e. aimed at solving the problem. Thus the WHO has focused attention on treating sleeping sickness; FAO has put emphasis on the effects of the disease on livestock, while the IAEA's mandate has been related to the development and application of the Sterile Insect Technique arising from the use of nuclear energy in sterilizing the flies.

- There are several areas, from which tsetse flies had successfully been eliminated, but which subsequently became re-infested, demonstrating the need for an area-wide approach, designed to guard against fly re-invasion from relic fly populations in the control area or from neighbouring areas. Experience has shown that protection of small areas located within a major tsetse belt by regular control interventions is uneconomical and difficult to sustain. The most viable option is to employ the area-wide approach, targeting to eliminate the entire tsetse fly population in a given area and ensuring that the possibilities for re-infestation and re-invasion are minimised. If a controlled area is subject to invasion from all sides, then a treated block of 100 km$^2$ is completely re-infested within a year and a large-scale area of 10,000 km$^2$ is lost within two years. Traps and targets can be deployed around treated areas to prevent re-invasion.

- Attention has been drawn to the use of 'low cost technologies', such as traps and targets, especially in the context of the participation of farmer communities. While the participation of farmer communities in tsetse control operations is valuable, tsetse and trypanosomiasis intervention campaigns are best conceived and organized as public good initiatives. While traps and targets are effective low technologies for intervention against tsetse species in small areas, their efficiency is limited when fly catches drop to low numbers and often the maintenance of these devices presents formidable difficulties. To achieve tsetse eradication, the use of traps and targets would need to be supplemented with other methods, such as the Sterile Insect Technique, whose efficiency increases with reducing fly population.

- The majority of tsetse intervention programmes in the past were donor-driven, and usually collapsed when the donors left, leading to re-infestation in treated areas and negating the investments made. While many countries need donor support in their tsetse eradication programmes, the donors should only help to push what the countries are doing and are committed to complete. There is need for the affected countries to translate their declared political commitment into the reality of intervention policy through inclusion of tsetse eradication activities among national development priorities.

- Over the years new technologies, including GIS, which make planning of tsetse control operations easier; genetic methods, to determine extent of isolation of tsetse populations; the development and application of environmentally friendly methods, including more efficient traps, to enhance monitoring operations; the Sterile Insect Technique (SIT) and the Sequential Aerial Technique (SAT), have increased the options available for use in the war against tsetse and trypanosomiasis.

- Experience has shown that campaigns against insect-borne diseases, embarking on a reactive approach of control measures, involving treatment of the disease and limited intervention against the vector is costly, since control operations recur indefinitely and often have limited success. The most viable approach to stop disease transmission is by
eradicating the insect vector. Eradication of the vector is a time-limited once-and-for-all cost.

3. The need for urgent action

When the African Heads of State and Government met during their Summit held in July 2000, in Lome, Togo, they considered the deteriorating situation concerning the problem of trypanosomiasis, in view of the lack of action of many governments and the need for urgent concerted action. They decided that tsetse flies must be eradicated. Following this important historical decision a number of activities were subsequently engaged:

- The Commission of the African Union was assigned the task of initiating, mobilising and coordinating the activities of a Pan African Tsetse and Trypanosomiasis Eradication Campaign (PATTEC).
- A Plan of Action to guide the process of implementing the Decision of the African leaders to rid the continent of the scourge of trypanosomiasis in the shortest time possible was prepared
- Year 2001 was declared the Year of the Tsetse Fly, to mark the beginning of the PATTEC initiative, in a campaign dedicated to the single objective of ridding the continent of tsetse-transmitted diseases, once and for all.
- Although war was officially declared against the tsetse fly through the collective decision of African countries, we have, unfortunately still been talking peace, trying to organise the war machine and its command structure, looking for allies and support mechanisms, planning battle formations, identifying the requirements and creating programmes of work.
- The consensus of mandated international organisations, including FAO, IAEA and WHO, was sought and obtained: each of these organisations passed resolutions in favour of supporting the PATTEC initiative and its implementation and have become our principal partners in the campaign

4. International cooperation in tsetse and trypanosomiasis control / eradication

In July 2000, the African Heads of State and Government meeting at their Summit in Lome, Togo decried the effects and consequences of trypanosomiasis, recognising it as one of Africa's greatest constraints to socio-economic development and passed a Decision to eliminate the scourge of trypanosomiasis from Africa. Within the framework of this Decision, the Commission of the African Union was assigned the task of initiating and co-ordinating a Pan African Tsetse and Trypanosomosis Eradication Campaign (PATTEC). Coming after a period of about 40 years of persistent lack of government action on the tsetse and trypanosomiasis, the decision signalled both the acceptance of the ownership of the problem as well as the obligation and determination to solve it. In December 2000, a Task Force of experts formulated a Plan of Action for the implementation of the Decision by the African leaders and a campaign to inspire commitment and action in each affected country was subsequently engaged. Within the framework of the assignment of the Commission of the African Union, a PATTEC Co-ordination Office was established at the African Union Headquarters in Addis Ababa, to help drive, organise and co-ordinate the activities of the campaign. The vision of African Heads of State and Governments within the PATTEC initiative is to eliminate (in the shortest possible time) the threat, effects and consequences of trypanosomiasis on the health, food security and livelihood of the African population.
5. Activities within the PATTEC Initiative

The following is a list of the activities and recent developments in Africa's war against the tsetse fly:

- An office known as the PATTEC Coordination Office, has been established at the Commission of the African in Addis Ababa, to coordinate the activities of the tsetse eradication campaign.

- A PATTEC Policy and Mobilisation Committee, which comprises representatives of Africa's regions at different levels of expertise as well as representatives of other stakeholders and partners, serves to oversee, guide and supervise the activities of the campaign.

- A number of countries, including Botswana, Mali, Burkina Faso, Ethiopia, Kenya, Uganda and Tanzania have initiated tsetse eradication programmes; others, including Nigeria, Rwanda, Sudan, Zambia, Zimbabwe, Angola, Guinea and Senegal have published their national strategies on trypanosomiasis intervention, declaring plans to initiate projects aimed at tsetse eradication. Cameroon, Congo (Brazzaville), Chad, Equatorial Guinea, Gabon and Central African Republic have, with the assistance of the WHO, planned to conduct extensive sleeping sickness surveys and treatments, but are also planning to implement the objectives of PATTEC as a lasting solution.

- Several groups of countries, which share a common tsetse belt, including various ECOWAS countries; countries of the Kwando/Zambezi region; South Africa and Mozambique; and Sudan and Ethiopia have met and discussed modalities of cooperation in managing intervention activities in areas of their common tsetse belt under the auspices of the African Union (PATTEC Coordination Office). Similar meetings are being planned for other groups of countries, including countries in the Central African region, the Lake Victoria Basin in East Africa and the Cotton Belt in West Africa, to discuss modalities of cooperation in tackling joint activities in areas of a common tsetse belt.

- Following a request from the Commission of the African Union, the African Development Bank is in the process of formulating a proposal to create a PATTEC Implementation Programme Framework with the support of the Bank and other partners, through which countries active in the tsetse eradication campaign can source soft loans and grants to support their tsetse eradication programmes.

- The PATTEC Coordination Office has conducted a number of training courses to increase knowledge on the principles and practices relevant to the objectives of the PATTEC initiative and to build the technical capacity of personnel involved in executing the activities of the tsetse eradication campaign.

- In the interest of creating synergy, harmonising approaches and avoiding problems of duplication and economies of scale, the creation of regional centres is being promoted. A number of countries, including Ethiopia, Burkina Faso, Nigeria and Zambia have already offered to invest in the establishment of such centres and making their facilities and services available to countries in their region at no profit.

- The implementation of the PATTEC initiative will be harmonised with, and included in, other programmes and activities of the African Union, including NEPAD, the Peer Review Mechanism, the Regional Economic Communities (RECs), etc.

- The PATTEC Coordination Office and the office (ECLAT) that coordinates research and control activities on the Latin American form of trypanosomiasis, Chagas disease, have jointly registered a charitable Foundation known as the Trypanosomiasis Vector Reserach and Control (TVRC) Foundation. The foundation will have a tax-exempt status in the USA, legally empowered to ensure that donors to the foundation would be able to claim their donations against their own tax liability: US 501 (c) 3 IRS.
6 What now needs to be done

- Those countries which have not yet prepared their national strategy and Plan of Action for the implementation of PATTEC should do so. In this connection there is need to define the activities and identify the requirements for executing the objectives of the tsetse and trypanosomiasis eradication campaign. Those countries, which have not yet appointed national PATTEC Focal points should do so.
- There is need to include the objectives of the PATTEC initiative in the national development priorities of each affected country.
- Appropriate sections of the tsetse belt in each affected country should be selected and delineated as project areas for each intervention; the required inputs, approaches and methods should be determined for each project, evaluated and programmed in form of a bankable project document.
- Mobilisation of the resources required for executing each project as defined.
- Selection of effective management teams to manage and supervise the process of executing each project.
- Sustainable exploitation of tsetse-free land.
- There is need to be vigilant and to ensure that efforts are effectively engaged and sustained.
- Countries are urged not to rely entirely on external financial or technical support in the war against trypanosomiasis; they should be prepared to design a programme of work and initiate the necessary action, and only seek support in order to enhance what they are actually already doing.
- The Commission of the African Union (PATTEC Co-ordination Office) is mandated to remind member states about their individual and collective obligations to the requirements of the campaign and is required to report every year, to the Summit of the African leaders, on the progress made and any problems encountered.

7. The benefits of tsetse and trypanosomiasis eradication campaign

Communities in Africa's tsetse-free areas are able to stock higher productivity breeds of livestock and practise mixed farming. Contrary to the fears propagated by opponents of tsetse eradication, tsetse-free areas invariably show no signs of land degradation or other evidence of ecological disruption often predicted to accompany tsetse eradication. Stocking higher productivity breeds of livestock in these areas makes it unnecessary to maintain large herds; a consequence of mixed farming is the possibility to produce manure, improve soil fertility and lead to increased crop yields, and at the same time improve the nutrition of the community. Farmers in tsetse-free areas are not only relieved of the costs of treating or preventing trypanosomosis, but they also experience gains in increased productivity, especially if the possibility for the use of draught animals in agricultural production and transportation is considered. Coping with trypanosomosis in livestock accounts for over 90% of the expenses in animal husbandry care costs, and therefore the absence of tsetse flies represents a major saving indeed. Many communities whose areas have been rendered tsetse-free have witnessed the combination of savings and increased livestock production with consequent dramatic improvements in the quality of their lives and livelihood. No other development scheme or policy can generate the same evidence of success in guaranteeing sustainable development and alleviation of poverty. The recent example of Zanzibar is a vivid illustration of the proposition that tsetse eradication should be a primary component of every development policy in affected areas.
8. *How our partners in the USA can help with the PATTEC initiative*
- Popularisation of the PATTEC initiative and increasing awareness on the effects of the disease and the urgency, feasibility and necessity for its removal
- Contribution to the TVRC Foundation and support to PATTEC activities, including the PATTEC Coordination Office.