INTRODUCTION

Tsetse flies (Glossina spp.) infest approximately 40% (9.5 million/km²) of the land resources of Tropical Africa covering 37 countries (5). Tsetse belts and therefore the distribution of trypanosomosis often extend beyond national boundaries.

Currently, no effective vaccine against trypanosomosis has been developed and natural infection generally fails to result in protective immunity. The control of animal trypanosomosis therefore relies on vector control, use of trypanocidal drugs and keeping genetically resistant or trypanotolerant breeds of livestock. Effective implementation of chemoprophylaxis and chemotherapy requires accurate diagnosis of trypanosomosis based on modern diagnostic methods (1).

All available control methods have their advantages and disadvantages. Hence, no single control method can be the best.
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Tsetse and trypanosomosis control monitoring

To monitor animal trypanosomosis, 400 cattle from each zone were examined every three months for trypanosomosis by the buffy-coat technique (BCT) (10), and the percentage of animals found positive was determined. The term “prevalence” was used to mean the percentage found positive for trypanosomosis by the buffy-coat technique. Trypanosome species identification was confirmed based on their morphology on thin blood smears.

To monitor the tsetse apparent density, tsetse trapping was performed monthly in each of the zones A, B and C. Twenty biconical traps were set up in the field for 48 h and were checked twice a day. The tsetse apparent density was calculated based on the number of tsetse flies caught per trap per day (F/T/D).

RESULTS

In zone A, an initial reduction of 94% (from 6.7 to 0.4%) and 99.5% (from 0.55 to 0.003 F/T/D) in the trypanosomosis prevalence and tsetse apparent density, respectively, was achieved and maintained from July 1991 to June 1995. From June 1995 to March 1997, the trypanosomosis prevalence increased slightly but the tsetse population was maintained at a low level (figure 1).

In zone B, the trypanosomosis prevalence declined gradually by 89% (from 12 to 1.3%) from July 1991 to June 1996 then rose and remained high until March 1997. The tsetse apparent density dropped by 99.3% (from 0.44 to 0.003 F/T/D) and remained low up to December 1995, when it increased slightly until March 1997 (figure 2).

In zone C, the trypanosomosis prevalence and tsetse apparent density dropped by 79% (from 17 to 3.0%) and 95% (from 0.65 to 0.03 F/T/D), respectively, from July 1991 to December 1992. From December 1992 to March 1993 there was an upsurge in both trypanosomosis and tsetse apparent density. A single application of pour-on followed by reinforced trapping at a rate of 8-10 traps per square kilometer coupled with chemotherapy led to a decline in the detected cases of trypanosomosis and tsetse apparent density from March 1993 to June 1995. The tsetse apparent density remained low but the detected cases of trypanosomosis increased beyond pre-control levels (figure 3).

According to figure 4, Trypanosoma vivax was the predominant species infecting cattle in zone A during the control program. In zone B, both T. vivax and T. congolense were predominant trypanosome species (figure 5). In zone C, all three trypanosome species, T. vivax, T. congolense and T. brucei, were observed throughout the control program (figure 6).

DISCUSSION

Tsetse flies infest about 41% of the entire landmass of Uganda and 70% of the livestock population graze with a risk of developing trypanosomosis, of which 40% are under high challenge (11). Consequently, trypanosomosis severely constrains livestock production causing direct losses such as mortality, chronic effects of the disease, abortions, loss of draft power and lowered fertility.

In an attempt to control tsetse and trypanosomosis in Uganda, vector control was tried using ground spraying (12), tsetse trapping (7, 8), chemotherapy and chemoprophylaxis (4). Reliance on a single control method resulted in few benefits in the past since each method has its own advantages and disadvantages.

MATERIALS AND METHODS

Study area

The project area is located in Tororo district, South-East Uganda, between latitudes 0° and 0° 45’ N and longitudes 34° and 34° 15’ E. It covers an area about 90 km long and 15 km wide. At the beginning of the control program in 1991, the livestock population in the project area was estimated at 50,000 cattle, 40,000 goats, 15,000 sheep and 2000 pigs. The project area receives 1200-1500 mm of rainfall annually. The rainfall pattern is bimodal with two wet seasons (March-May and September-November) and two dry seasons (December-February and June-August). The mean relative humidity is 65% and the daily mean temperature ranges between 15°C (minimum) and 27°C (maximum). The vegetation cover is mainly savannah grassland. Glossina f. fuscipes is the commonest tsetse species infesting the area along the vegetation fringing rivers and streams.

Tsetse and trypanosomosis control

Several tsetse control methods were implemented in the prevention/treatment of trypanosomosis in livestock (cattle, goats, sheep and pigs), depending on which combinations were deemed appropriate for a particular situation. However, the use of deltamethrin impregnated pyramidal traps for tsetse control and chemotherapy were the most applied methods, mainly for maintaining tsetse and trypanosomosis control in the entire project area. The study area was divided into three zones (A, B and C). Different strategies were tried out in these zones at the beginning of the control program with the purpose of obtaining a quick suppression of both tsetse and trypanosomosis.

In zone A, deltamethrin pour-on was initially applied once on 600 head of cattle at a rate of 1 ml per 10 kg body weight in the entire zone in July 1991. This was followed by the use of deltamethrin impregnated pyramidal traps (9) at the rate of 8-10 traps per square kilometer. Then livestock was regularly screened for trypanosomosis and treated as in zone A.

In zone B, deltamethrin impregnated pyramidal traps were used at the rate of 8-10 traps per square kilometer in the entire zone, and the livestock was screened regularly and treated as in zone A.

In zone C, 1791 head of cattle were treated with diminazene acetate at a dosage of 7 mg/kg body weight in July 1991. Then deltamethrin impregnated pyramidal traps were used at a rate of 4-5 traps per square kilometer. Thereafter, the livestock was regularly examined for trypanosomosis and treated as in zone A.

In zone A, an initial reduction of 94% (from 6.7 to 0.4%) and 99.5% (from 0.55 to 0.003 F/T/D) in the trypanosomosis prevalence and tsetse apparent density, respectively, was achieved and maintained from July 1991 to June 1995. From June 1995 to March 1997, the trypanosomosis prevalence increased slightly but the tsetse population was maintained at a low level (figure 1).

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For example, ground spraying is a proven method for large-scale tsetse eradication but it has major logistical problems such as maintaining a fleet of vehicles and spraying equipment (6). Traps and targets have the advantage of being cheap, simple and suitable for community-based tsetse control programs. However, they require regular supervision to prevent damages and thefts. In addition, their effectiveness varies with the species and geographic subspecies of Glossina (6). Live bait technology based on insecticide sprays, dips and pour-on for cattle using synthetic pyrethroids has the advantage of resulting in a rapid reduction of tsetse (2), reducing the number of nuisance flies and ticks and being suitable for community-based tsetse and trypanosomosis control programs. However, the chemicals need to be regularly applied and are relatively expensive for resource-poor farmers. Trypanocidal drugs are the most widespread method of trypanosomosis control, and a number of benefits are associated with livestock treatment. However, this method is limited by the increasing occurrence of drug-resistant trypanosome strains, limited availability of drugs and sale of fake drugs on local markets, as almost 60% of the drugs are fake (3).

In view of the limitations affecting the various control methods, integration of tsetse and trypanosomosis control by combining tsetse trapping, live bait technology and chemotherapy has been applied in Uganda. Initial application of deltamethrin pour-on once, followed by long-term trapping using insecticide impregnated pyramidal traps at the rate of 8-10 traps per square kilometer and regular chemotherapy along the Kenya-Uganda border area led to the best results with a reduction of the detected prevalence of animal trypanosomosis by 94% and tsetse apparent density by 99.5% as compared to trapping (8-10 traps per square kilometer) alone. However, after the initial five years of tsetse eradication but it has major logistical problems such as maintaining a fleet of vehicles and spraying equipment (6). Traps and targets have the advantage of being cheap, simple and suitable for community-based tsetse control programs. However, they require regular supervision to prevent damages and thefts. In addition, their effectiveness varies with the species and geographic subspecies of Glossina (6). Live bait technology based on insecticide sprays, dips and pour-on for cattle using synthetic pyrethroids has the advantage of resulting in a rapid reduction of tsetse (2), reducing the number of nuisance flies and ticks and being suitable for community-based tsetse and trypanosomosis control programs. However, the chemicals need to be regularly applied and are relatively expensive for resource-poor farmers. Trypanocidal drugs are the most widespread method of trypanosomosis control, and a number of benefits are associated with livestock treatment. However, this method is limited by the increasing occurrence of drug-resistant trypanosome strains, limited availability of drugs and sale of fake drugs on local markets, as almost 60% of the drugs are fake (3).

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(1991-1995) the control program was affected by a shortage of control inputs (drugs, materials for trap manufacturing and funds for logistics) as donor support came to an end. The situation required community participation in terms of meeting the costs and implementing the program augmented by government financial and technical back-up support. In general, tsetse and animal trypanosomosis control in the area changed the epidemiology of the disease in cattle in terms of prevalence of the trypanosome species: Trypanosoma vivax became more predominant than T. congolense and T. brucei as the control program went on.

CONCLUSION

Initial large-scale application of pour-on followed by trapping and regular treatment of cattle appeared to be the most effective control strategy. However, the effectiveness of the control program seemed to be influenced by the level of trypanosome challenge in the area, speed of initial reduction in tsetse density and sustainability of tsetse and trypanosomosis control inputs during the campaign. To ensure sustainability of such a control program, the farming community should financially and morally support it.

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Résumé


Palabras clave: Ganado bovino - Glossina fuscipes fuscipes - Trypanosoma - Trypanosomosis - Control de insectos - Equipo para control de plagas - Trampa - Terapeutica mendi- camentosa - Uganda - Kenia.