29 - The use of chemoprophylaxis in East African Zebu village cattle exposed to trypanosomiasis in Muhaka, Kenya

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Introduction

This paper reports the results of a four year study, the objective of which was to assess the efficacy of chemoprophylaxis for the improvement of the health and productivity of East African Zebu village cattle exposed to trypanosomiasis. The study also assessed the cost-effectiveness of the chemoprophylactic intervention. The results of the economic assessment are reported in a companion paper, Itty et al., article 35 in these Proceedings. A description of the project has been given by Maloo et al. (1985).

Materials and methods

Study area

The study was carried out in Muhaka situated 35 km south of Mombasa and about 10 km from the Indian Ocean. The study covered an area of approximately 100 km^2 in the vicinity of Muhaka forest. The vegetation is coastal forest with savanna mosaic. During the period of the study, 1982 to 1986, the area received an annual rainfall ranging from 1192 to 1339 mm. *Glossina pallidipes*, *G. brevipalpis* and *G. austeni* infest the area and were caught in and around the Muhaka forest using biconical Challier traps. Two tribes, the Digo and Wakambas, inhabit the area and practice subsistence mixed farming, including cattle keeping. Their cattle graze private and communal pastures, often in groups of two or more herds. At the homesteads cattle are kept in *bomas* or tethered. Predators were not a problem.

Study description

The study began in June 1982 with the estimation of the baseline productivity of some 700 double-ear-tagged East African Zebu cattle in 17 village herds belonging to 31 owners. The baseline productivity, estimated during the first 18 months of the study, has been reported by ILCA (1986). Trypanosomiasis was shown to be the main cattle disease.

In April 1984, approximately 2/3 of adults and 2/3 of young-stock within each herd were identified as joining trypanocidal drug treatment groups, with 1/3 of each age group within each herd remaining as controls. A system of allocation of newly born calves was implemented, with those selected for prophylaxis receiving the treatment once they had reached 60 kg body weight (at approximately 9 months of age). The prophylactic drug was

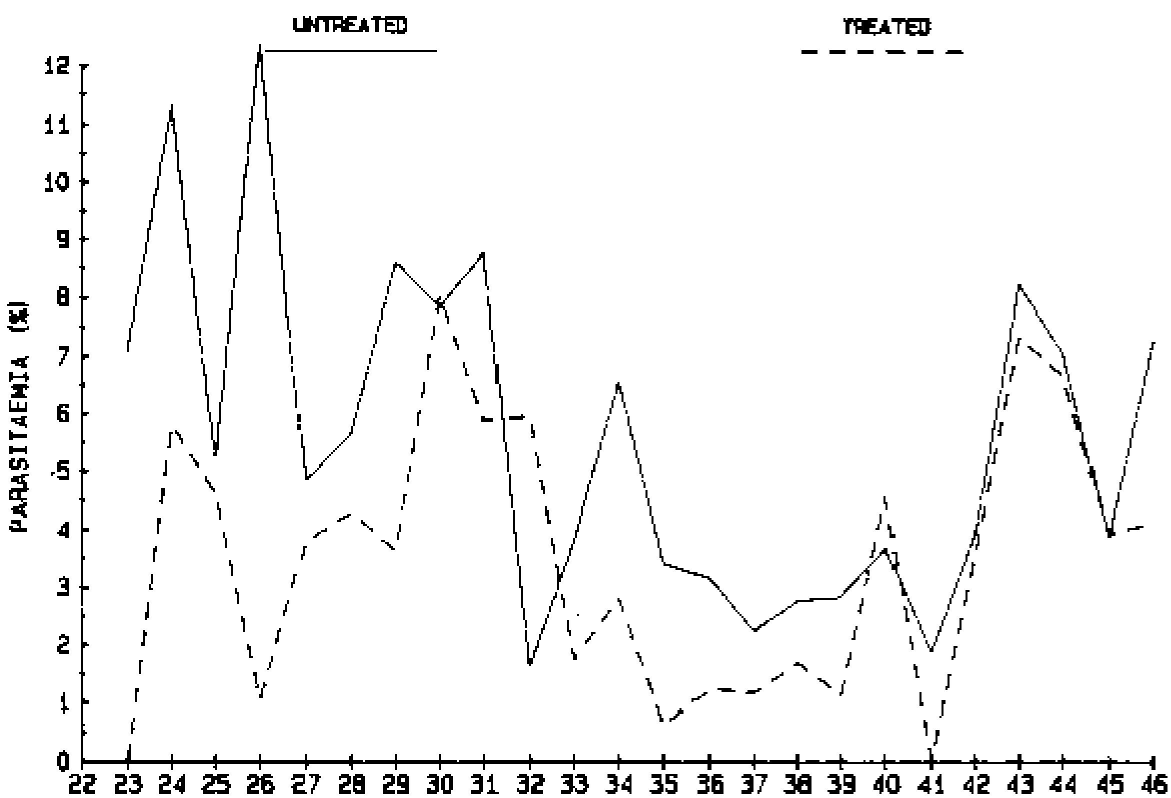
Samorin (isometamidium chloride) which is manufactured by May and Baker Ltd. (Dagenham, England): the same drug is sold in francophone countries of Africa as Trypamidium by Rhone Merieux (Paris, France). Samorin treatments at 0.5 mg/kg took place in April, July and October each year. The prophylactic group also received Berenil (diminazine aceturate) at 3.5 mg/kg each January, the period of lowest trypanosomiasis risk. Any animal detected as parasitaemic or showing clinical symptoms was therapeutically treated with Berenil. Berenil is manufactured by Farbwerke Hoechst (Frankfurt, West Germany). Regular trypanocidal drug intervention continued for 30 months with the final Samorin treatment being given in October 1986. In December 1986, at the end of the study, pregnancy diagnosis was carried out on all breeding females.

Data collection and analysis

Sequential monthly recording provided data from which to estimate animal health and production parameters including number of detected trypanosome parasitaemias, number of therapeutic treatments, blood packed cell volume per cent (PCV), cow, post-weaner and pre-weaner liveweights and liveweight changes, calving intervals, quantities of milk extracted, the periods over which milk was extracted and the viabilities of cows and their progeny. Concurrently tsetse relative densities (flies/trap/day) and trypanosome infection rates in tsetse were estimated.

The prophylactic groups were compared with their contemporary controls for monthly prevalence of trypanosome parasitaemia, PCV, number of therapeutic treatments and cow and progeny production traits. The latter were combined in productivity indices to estimate the effect of prophylaxis on cow productivity. The health and productivity traits were analysed by least-squares means (Harvey, 1977).

Figure 1. Monthly prevalences (%) of trypanosome parasitaemia, May 1984 to April 1986, in the prophylactic and non-prophylactic groups.



Results

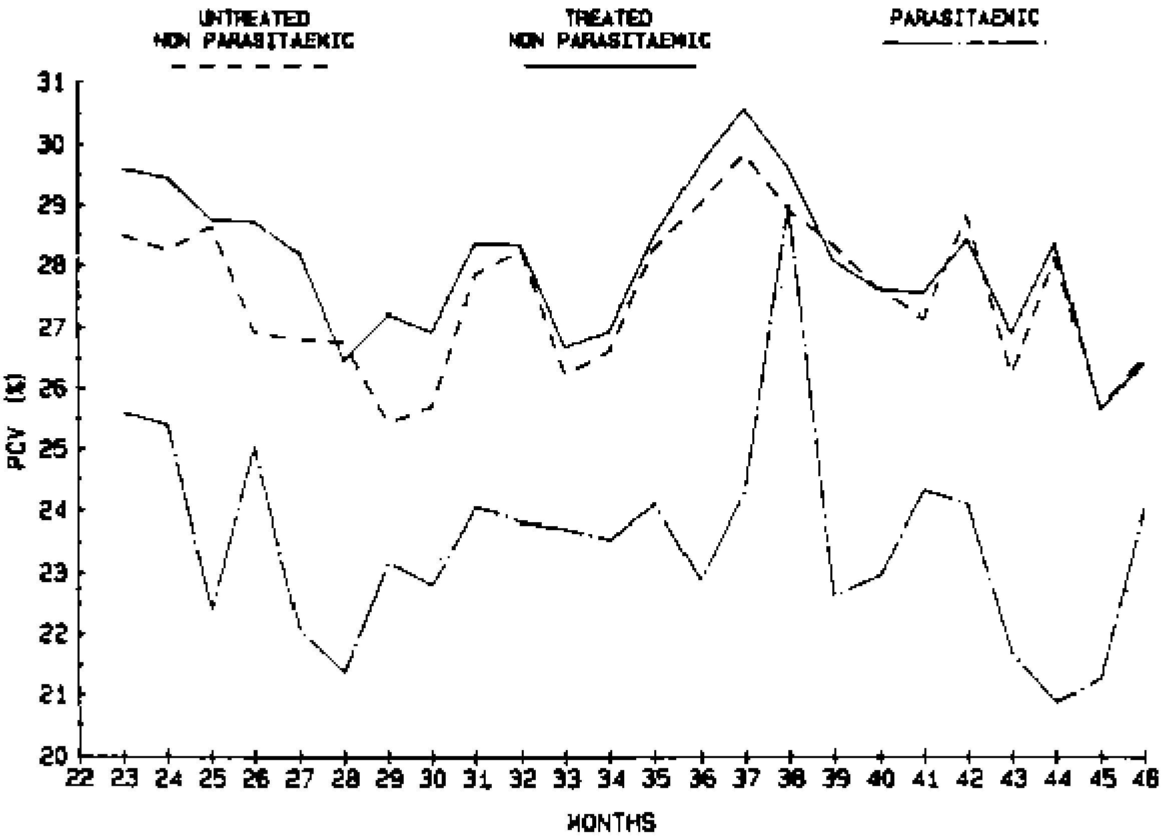
Effect of prophylaxis on detectable parasitaemia

Figure 1 shows the monthly prevalences of trypanosome parasitaemia for the prophylactic and control groups during the first two years of the comparison. Prophylaxis reduced mean monthly detectable parasitaemia from 5.7 to 3.5%, a reduction of 39%.

Effect of prophylaxis and parasitaemia on PCV

The mean monthly PCV of parasitaemic animals (23.3%) was consistently lower than the PCV of non-parasitaemic animals (27.8%). However non-parasitaemic animals under prophylaxis had a similar mean PCV to those non-parasitaemic animals not receiving prophylaxis (Figure 2).

Figure 2. Monthly mean PCVs for contrasting prophylactic and parasitaemic groups, May 1984 to April 1986.



Effect of prophylaxis on health and production traits

Prophylactic treatment of the dam had little effect on the health of her progeny (Table 1). However calves reared by dams receiving prophylaxis were 5 kg heavier (8%) at 12 months of age than the calves of control cows. This heavier weight can be attributed to the calf extracting more milk from the prophylactically treated dam.

Table 1. Least-squares means and standard errors of calf pre-weaning health and weight traits for the non-prophylactic and prophylactic groups.

Calf pre-weaning period, birth to 12 months	Non-prophylactic		Prophylactic[a]	
	Mean	s.e.	Mean	s.e.
Number of parasitaemias detected	0.21	0.099	0.17	0.062
Average PCV (%)	26.6	0.46	26.4	0.29

Number of therapeutic treatments required	0.25	0.099	0.23	0.062
Weight at 12 months (kg)	58.5	3.13	63.4	1.95

[a] Prophylactic treatment refers to the dam.

Calf health and performance during the period 12 to 18 months of age was superior if the calf and/or its dam received prophylaxis. The prophylactic group had fewer detectable parasitaemias (73% less) and required fewer therapeutic treatments (82% less) and had 38% faster daily liveweight gain (Table 2). Mean PCV was not affected by prophylactic treatment.

Table 2. Least-squares means and standard errors of health and weight traits of calves from 12 to 18 months of age in the non-prophylactic and prophylactic groups.

Calf 12-18 months period	Non-prophylactic		Prophylactic[a]	
	Mean	s.e.	Mean	s.e.
Number of parasitaemias detected	0.44	0.141	0.12	0.034
Average PCV (%)	26.3	0.31	26.5	0.21
Number of therapeutic treatments requires	0.22	0.062	0.44	0.114
Daily liveweight gain (g)	73.2	3.81	100.8	3.12

[a] Prophylactic treatment refers to the calf and/or its dam.

Table 3 presents the results for the effect of prophylactic treatment of the calf on its health and growth traits measured during the 18- to 30-month period. Prophylaxis marginally improved mean PCV, reduced the number of detectable parasitaemias by 44% and the number of therapeutic treatments by 55% and increased daily liveweight gain by 11%.

Table 3. Least-squares means and standard errors of calf post-weaning health and weight traits for the non-prophylactic and prophylactic groups.

Calf 18-30 month period	Non-prophylactic		Prophylactic[a]	
	Mean	s.e.	Mean	s.e.
Number of parasitaemias detected	0.39	0.065	0.22	0.042
Average PCV (%)	26.5	0.19	27.1	0.13
Number of therapeutic treatments required	0.38	0.061	0.17	0.040
Daily liveweight gain (g)	115	5.9	127	3.8

[a] Prophylactic treatment refers to the calf.

Prophylactic treatment of calves, but not of their dams, improved calf viability over the period from birth to 30 months. Prophylaxis reduced the mortality rate of calves reared by non-prophylactic dams from 10.6 to 6.0% and that of calves reared by prophylactic dams from 11.7 to 3.5%.

Table 4. Least-squares means and standard errors of breeding cow health and production traits for the non-prophylactic and prophylactic groups.

	Non-prophylactic		Prophylactic	
	Mean	s.e.	Mean	s.e.
Number of parasitaemias detected	0.38	0.083	0.23	0.046
Average PCV (%)	26.4	0.45	27.6	0.25

Number of therapeutic treatments required	0.56	0.075	0.20	0.042
Calving interval (days)	476	24.1	474	13.3
Lactation length (days)	177	21.1	204	14.5
Lactation milk extracted (kg)	158	24.0	196	16.5
Cow weight (kg)	189	4.5	188	2.5
Cow weight change, parturition to 8 months (kg)	0	3.7	-6	2.6

Table 5. Effect of prophylactic regime on productivity of East African Zebu cattle.

	No prophylaxis	**Prophylaxis**
Cows		
Calving percentage	76.4	77.0
Annual cow viability (%)	95.0	95.0
Annual extracted milk yield (kg)	120.5	150.6
Cow weight (kg)	189.0	185.0
Calf weight at 12 months (kg)	58.5	63.4
Calf viability to 12 months (%)	91.3	96.3
Productivity[a] per cow per year (kg)	47.6	56.4
Productivity[a] per 100 kg 10.73 cow per year (kg)	25.2	30.5
Productivity[a] per 100 kg cow/year/kg	103.7	124.8
Youngstock, 12-30 months		
Weight increase, 12-18 months (kg)	13.4	18.4
Weight increase, 18-30 months (kg)	41.9	46.5
Viability, 12-30 months (%)	97.5	98.9
Total performance, 12-30 months (kg)	53.9	64.2

[a] Weight of 12-month-old calf and liveweight equivalent of milk extracted for human consumption.

Prophylactic treatment of cows had beneficial effects on their health and performance (Table 4). Prophylactic cows had 39% fewer detectable parasitaemias, 64% fewer therapeutic treatments and provided 24% more extracted milk. Cow liveweight and calving interval were not affected by prophylaxis, nor was cow viability (Table 5). However other components of the cow productivity index (annual extracted milk yield, 25% greater; calf weight at 12 months of age, 8.4% greater; and calf viability to 12 months, 5.5% better) were improved by prophylactic treatment of the cow and/or her calf. The resulting indices (total 12-month-old calf weight plus the liveweight equivalent of milk produced per cow per year or per 100 kg of cow weight maintained per year or per 100 kg metabolic weight of cow maintained per year) showed significant increases in productivity due to prophylaxis (Table 5). Productivity per cow was improved by 18.5%, productivity per unit of cow weight by 21% and productivity per unit of cow metabolic weight by 20%. The performance of young stock from 12 months to 30 months of age was also improved by prophylaxis (Table 5), with weight increase from 12 to 18 months 37% superior and from 18 to 30 months 11% superior. Viability was also slightly better giving an improvement of 19% for production for the period 12 to 30 months of age.

Conclusion

The success of this long-term study has clearly demonstrated that with good organization and sound infrastructure it is possible to foster the goodwill and confidence of cattle owners and, as a result, implement animal health and production research and improvement programmes at the village level.

The use of prophylaxis to control trypanosomiasis, the major disease of cattle in the Muhaka area, increased the productivity of the East African Zebu village cattle by 20% for breeding cows and by 19% for young stock. The effectiveness of the trypanocidal drug intervention should allow the introduction of more productive genotypes into the area in a programme with concurrent improvements in pasture and forage production.

The increases in productivity resulting from the chemoprophylaxis were also cost effective (Itty et al., article 35 of these Proceedings), demonstrating the biological and economic advantages of the intervention regime for village cattle at trypanosomiasis risk.

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