Available online at www.sciencedirect.com
ScienceDirect
Veterinary Parasitology 141 (2006) 165–176
veterinary parasitology
www.elsevier.com/locate/vetpar

Response of four indigenous cattle breeds to natural tsetse and trypanosomosis challenge in the Ghibe valley of Ethiopia

H. Lemecha [a], W. Mulatu [b], I. Hussein [a], E. Rege [c], T. Tekle [a], S. Abdicho [a], W. Ayalew [b,*]

[a] *National Animal Health Research Center, P.O. Box 04, Sebeta, Ethiopia*
[b] *International Livestock Research Institute (ILRI), Animal Genetic Resources, P.O. Box 5689, Addis Ababa, Ethiopia*
[c] *International Livestock Research Institute (ILRI), P.O. Box 30907, Nairobi, Kenya*

Received 14 December 2005; received in revised form 8 April 2006; accepted 27 April 2006

Abstract

A comparative study on the response of four indigenous cattle breeds of Ethiopia, namely Abigar, Horro, Sheko and Gurage, to natural challenge of trypanosomosis in the Tolley–Gullele area of the Ghibe valley has been undertaken from August 2000 until August 2004. Fifty female yearlings each of Horro, Sheko and Abigar and 31 of the Gurage were purchased from their natural habitats and introduced in to medium to high tsetse–trypanosomosis challenge area of the Ghibe valley. While the natural habitats of first three breeds are naturally infested with tsetse flies and trypanosomosis, that of the Gurage is known to be very minimal, if any, and hence the Gurage breed was used in this study as the known susceptible breed. During the study animal health, production performance and tsetse fly situation were monitored monthly. The Sheko breed has manifested very significantly ($p < 0.001$) high overall average packed cell volume (PCV) values (25%) compared to that of Abigar (24%), Horro (23%) and Gurage (22%). It also had the lowest mean trypanosome prevalence rate of 9% against 23% of Horro, 26% of Abigar and 27% of Gurage, and the least number of Berenil® treatments (1.36) compared to Abigar (4.0), Horro (4.6) and Gurage (6.7). While the Abigar manifested high sensitivity and frequent death to PCV depression, the Horro showed strong resilience to PCV depression and better response to Berenil® treatment assistance. At this stage the Sheko breed was also found to be equal to the other breeds in its reproductive performance. These results need to be substantiated with further in-depth investigation including immune response, animal behavior and environmental influences.

Keyword: Packed cell volume (PCV); Anemia; Parasitaemia; Trypanosome prevalence rate; Trypanotolerance; Tsetse–trypanosomosis challenge

* Corresponding author. Tel.: +251 116 463 215; fax: +251 116 461 252.
E-mail address: w.ayalew@cgiar.org (W. Ayalew).

0304-4017/$ – see front matter © 2006 Elsevier B.V. All rights reserved.
doi:10.1016/j.vetpar.2006.04.035

1. Introduction

Trypanosomosis is one of the major impediments to livestock development and agricultural production in Ethiopia contributing negatively to the overall development in general and to food self-reliance efforts of the nation in particular. While tsetse-borne trypanosomosis is excluding some 180,000–200,000 km^2 of agriculturally suitable land in the west and southwest of the country, 14 million head of cattle, an equivalent number of small ruminants, nearly 7 million equines and 1.8 million camels are at the risk of contracting trypanosomosis at any one time (Langridge, 1976; MoARD, 2004).

In Ethiopia various efforts of containment of the disease and losses thereof have been directed mainly at the parasite in the host through trypanocidal drugs and secondarily at the vector through odor-baited, and insecticide impregnated targets and traps and insecticide-treated cattle (Slingenbergh, 1992; Barrett, 1992; Leak et al., 1996). Vector-targeted operations have been implemented mainly through specifically designed joint projects of the MOA FAO/UNDP/FLDP in the Upper Didessa valley (1986–1994), and FITCA-Ethiopia (1997–2004) (MoARD, 2004). Most of the activities including the pilot tsetse/trypanosomosis control trials conducted by the International Livestock Research Institute (ILRI) (formerly ILCA) in the Ghibe valley were essentially control schemes. Recently the joint ESTC/IAEA project is trying to introduce the Sterile Insect Technique (SIT) in the southern Rift valley of Ethiopia to eradicate the major vector in the area—*Glossina pallidipes*.

Although some good local results have been recorded in these efforts, the overall challenge level from tsetse–trypanosomosis did not improve. There are, rather, strong indications that conditions are deteriorating considering tsetse fly advances on several fronts (NTTICC, 1986; Jordan et al., 1989; Leak et al., 1990; MoARD, 2004) and worsening trypanocidal drug resistance (NTTICC, 1986; Codjia et al., 1993; Rowlands et al., 1995; Mulugeta et al., 1997; MoARD, 2004) from most tsetse–trypanosomosis affected areas. Moreover, new settlements of people in tsetse occupied areas have brought livestock in closer contact with tsetse and trypanosomosis and triggered serious disease outbreaks with heavy morbidity and mortality losses in the newly introduced stock in particular.

As the attempts directed against the parasite and the vector had not produced sustainable results it was imperative to look into other possibilities of alleviating the problem. An alternative, potentially cost-effective and sustainable option to reduce the prevalence of trypanosomosis is exploitation of the natural phenomenon known as *trypanotolerance* exhibited by certain livestock breeds that are indigenous to areas in which the disease is endemic (Rowlands and Teale, 1994). A well-known example is the taurine N'Dama cattle of West Africa. The possible presence of trypanotolerant attributes among the *Bos indicus* cattle in eastern Africa was first investigated on two native Kenyan cattle breeds by Njogu et al. (1985) and Dolan et al. (1994) and found out that the Orma cattle were observed to have less trypanosome prevalence, less mortality and needed much less prophylactic treatment when their PCV fell to 15% than the Galana Boran. Dolan (1987) also reported that other native cattle breeds in the Sudan, Uganda and Zaire may have differential susceptibility to trypanosomosis.

The use of animals naturally less susceptible to the disease has produced encouraging results in other countries of Africa (Congo Democratic Republic, Central African Republic, Gabon and the Congo). Two bulls and 50 cows of the trypanotolerant N'Dama breed were introduced into the Congo Democratic Republic (former Zaire) in1927 and their number stood at 25,000 by 1950 (Mortelman and Kageruka, 1976) and by 1989 the population grew to 230,000 (Itard, 1989). The exploitation of trypanotolerant breeds is practiced as a viable option for sustainable livestock production in nineteen countries in the most humid parts of West and Central Africa (d'Ieteren et al., 1998a). The N'Dama and other trypanotolerant West African cattle breeds are well-known for their ability to survive and produce milk, meat and other products in tsetse-infested areas, where susceptible Zebu and European breeds cannot. Trypanotolerance is defined as the relative capacity of an animal to control the development of the parasites and to limit their pathological effects (d'Ieteren et al., 1998b).

This study must be considered in the context of previous studies in west and east Africa. Although there are some perceptions and few circumstantial reports of the presence of trypanotolerant cattle breeds in Ethiopia (Epstein, 1971; Langridge, 1976; Alberro and Haile-Mariam, 1982a,b; ILCA, 1991), these have