Review On The Risk of East Cost Fever on Holstein Dairy Heifers Importation from Kenya to Amhara Region of Ethiopia

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Abstract: East Coast fever (ECF) is a tick-borne disease (TBD) of cattle whose agent is a protozoan parasite called *Theileria parva.* The parasite is transmitted cyclopropagatively and trans-stadially by a three-host tick called *Rhipicephalus appendiculatus,* which have dropped from infected cattle during the preceding stage of the life cycle. Kenya is one of the most ECF affected country come across with remarkable economic losses from its dairy industry. Ethiopia, free from both the agent and the vector, still lacks to implement animal movement bans strictly within and from neighboring countries (Kenya) which may expose the country the introduction of the vector. For a vector-borne disease whose transmission depends on environmental characteristics that influence vector dynamics, a change in the environment implies a change in the epidemiology of the disease In Kenya, ECF control has previously relied predominantly on tick control using acaricides and chemotherapy while ECF immunization is steadily being disseminated, there is a probability of entrance of the parasite with carrier or immunized imported cattle population from any ECF endemic countries. The country should impose strict measures to stop free animal movement and strong risk analysis measures while importing live animals.
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Introduction

East Coast fever is probably the most important livestock diseases in Africa, causing an annual loss of 1.1 million cattle and $168 million in 1992. It is found in Sudan, South Africa, the Democratic Republic of Congo, Zimbabwe, Zambia, Tanzania, Kenya, Uganda, and Swaziland. The primary vector for *T. parva* is *Rhipicephalus appendiculatus*. (Lawrence et al., 1992).

T. parva was first described in 1902 in Zimbabwe, but was misdiagnosed as redwater (a disease caused by *Babesia bigemina*). *Theileria* species are the only eukaryotic organisms known to transform lymphocytes. The intermediate hosts for *T. parva* are cattle. The definitive hosts are the ticks. Native cattle are often resistant to the parasite, but not without symptoms. They are hosts to the parasite, but do not suffer as severely as foreign cattle. (*Newson RM,.1976).*

The impact of ECF control in a given area will depend on a number of factors. These include the incidence and severity of clinical disease experienced, the abundance of cattle, the role of cattle and their products in society, the relative importance of ECF compared with other diseases and the nutritional and management constraints to livestock production that are present. Before embarking on widespread ECF control programmes, it is thus essential to identify the different circumstances of disease risk prevailing within a target area so that such programmes can be tailored accordingly to permit optimum cost-effectiveness. (*Maloo SH 2001).*

Therefore, Ethiopia is free from ECF *(T. parva* infection) and its vector *R. appendiculatus*, climatically favourable highlands and uncontrolled livestock movement from the southern Sudan and Kenya where the disease and vector are found ensures the existence of a considerable risk. Thus, the objective of this risk analysis is:-

- To conduct an assessment of east cost fever risks in importation of Holstein heifers from Kenya to Ethiopia.

Epidemiological and Geographic Distribution of East cost Fever in Kenya

Indigenous zebu cattle are kept under traditional extensive management conditions in vast areas of Kenya. These systems are characterized by little or no tick control. Yet, *T. parva* infections in these systems result in little loss in productivity and/or mortality (*Norval RAI 1992).*

This phenomenon has been termed ‘endemic stability’. Endemic stability to ECF has been defined as the state in a cattle population where the large majority (>70%) of the population becomes infected and immune by 6 months of age, and little or no clinical disease occurs (*Norval RAI 1992)*.

Endemic stability is thought to be the result of complex interactions of several factors such as the high innate resistance of zebu cattle raised in ECF-endemic areas, ability of zebu cattle to rapidly and effectively develop immunity to *T. parva* infection, suitable ecological factors for the vector and regular transmission of the parasite in all age groups of cattle population, thus regularly boosting immunity. (*Lawrence JA 1992).*

Endemic instability describes a state in which only a small proportion (<30%) of the cattle in the population become infected and immune by 6 months of age leading to a build-up of a susceptible population and, therefore, clinical disease is experienced across all age groups. The latter situation normally exists where animals are kept under low levels of tick challenge.. Indigenous zebu cattle are kept under traditional extensive management conditions in vast areas of Kenya. These systems are characterized by little or no tick control. Yet, *T. parva* infections in these systems result in little loss in productivity and/or mortality. This phenomenon has been termed 'endemic stability' *(Morzaria SP 1988).*

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Consequently, the majority of cattle in such populations are immune. Endemic instability describes a state in which only a small proportion (<30%) of the cattle in the population become infected and immune by 6 months of age leading to a build-up of a susceptible population and, therefore, clinical disease is experienced across all age groups. The latter situation normally exists where animals are kept under low levels of tick challenge. Traditional extensive systems can be divided into traditional crop-livestock and the livestock-dependent systems.

The distribution of ECF is strictly associated with the distribution of the vector tick species. In the case of *Rhipicephalus appendiculatus*, the area extends from southern Sudan to South Africa and as far west as Zaire. The range of *T. parva* is less than the tick vector for *T. parva*-free populations of *R. appendiculatus* occur in Zambia, Kenya, and South Africa. *R. appendiculatus* is found from sea level to over 8,000 feet in areas where there is annual rainfall of over 20 inches (500 mm). (*Maloo SH 2001).*

Hazard Identification

Although ECF *(T. parva* infection) and its vector *R. appendiculatus* have not been found in Ethiopia, the relatively uncontrolled passage of livestock from the southern Sudan and Kenya where the disease and vector are found ensures that a considerable risk exists. If infected ticks become established on the climatically favorable highlands of Ethiopia, In endemic unstable areas, which are characterized by a wider range of intermediate antibody prevalence levels, control measures, for instance, immunization, depend on the proportion of the susceptible population *(Deem SL 1993*).

The goal of such an approach is to increase the proportion of immune animals to endemic stability status and minimize tick control to allow the infected ticks to naturally sustain endemic stability through continuous challenge. Indeed, a study on economic impacts of cattle ECF immunization in a traditional crop-livestock system in Kilifi District at the Kenyan coast, demonstrated that ECF ITM integrated control strategies were financially and economically more profitable than acaricides-based strategies *(Moll G 1984)*.

Risked population and selection of epidemiological parameters

East Coast fever (ECF) is a major cause of cattle mortality and loss of productivity in the eleven African countries in which it is known to exist. However, its impact varies considerably within these countries. (*Norval RAI 1992,)* This is due to differing virulence of *Theileria parva* strains, to differences in abundance and infectivity of the vector tick, *Rhipicephalus appendiculatus,* to the presence of other tick vectors and to differences in susceptibility to the tick and the parasite of the cattle breeds and types present. (*Latif AA 1995)* The impact of ECF control in a given area will depend on a number of factors.

These include the incidence and severity of clinical disease experienced, the abundance of cattle, the role of cattle and their products in society, the relative importance of ECF compared with other diseases and the nutritional and management constraints to livestock production that are present. *(Gitau GK 1999).*

Before embarking on widespread ECF control programmes, it is thus essential to identify the different circumstances of disease risk prevailing within a target area so that such programmes can be tailored accordingly to permit optimum cost-effectiveness. (*Swart RJ 2003).*

Table. Epidemiological determinants of ECF chosen for geographic representation (Environmental Systems Research Institute, Redlands, California 92373, USA

Parameter	**Quality**	**Data source**
Host		
Cattle	Known distribution and distribution of major indigenous breeds/types	Inter-African Bureau of Animal Resources (IBAR) and published literature
Buffalo	Known distribution	Published literature
Restrictions to domestic host population		
Game parks	Known distribution and perceived level of security (i.e., exclusion of livestock)	Global Resources Information Database, United Nations Environmental Programme
Tsetse fly	Known distribution by species	IBAR
Vector		
Rhipicephalus appendiculatus	Recorded distribution	Published literature
R. duttoni, R. nitens, R. bergeoni and *R. zambeziensis*	Probable distribution	Expert opinion
Ecoclimatic suitability	Distribution by index value	Climate: published literature, FAO, CIAT E.I.: CLIMEX (climate matching model), CSIRO
Disease		
Clinical theileriosis	Recorded distribution	Published literature, government reports
Antibodies to *Theileria parva*	Recorded distribution	Published literature government reports
Parameter	Quality	Data source
Host		
Cattle	Known distribution and distribution of major indigenous breeds/types	Inter-African Bureau of Animal Resources (IBAR) and published literature
Buffalo	Known distribution	Published literature
Restrictions to domestic host population		
Game parks	Known distribution and perceived level of security (i.e., exclusion of livestock)	Global Resources Information Database, United Nations Environmental Programme
Tsetse fly	Known distribution by species	IBAR

Special import/Export/ conditions (release)

The cattle generaly must be accompanied by a health certificate signed by Official Veterinarian of the country of origin confirming main conditions that;

1. Clinically free of any diseases condition at the time of transportation.
2. At time of exporting/importation or loading the animals were examined and found to be free of symptoms of diseases.
3. The animal came from herds confirmed to be free of any infectious diseases or were tested and found free.
4. 30 days prior to shipment, the animals must be kept on premises,
5. Animals must be kept in isolation from the first laboratory test.
6. Owners must declare that the animals have not been Inter Governmental Authority on Development (IGAD) Regional Animal Health Certification.
7. The transportation of the animals must comply with the International approved standards for live animals transportation. Prior to loading the vehicles must be cleansed, disinfected and disinfected.
8. The animals should not come in contact with other animals on route and must be rendered tick and other ectoparasites free with an appropriate chemical.
9. The animals should be shipped directly into the destination and no transshipment is allowed

without the authority of the Veterinary Administration of the respective country.

Exposure Probablity Assesment

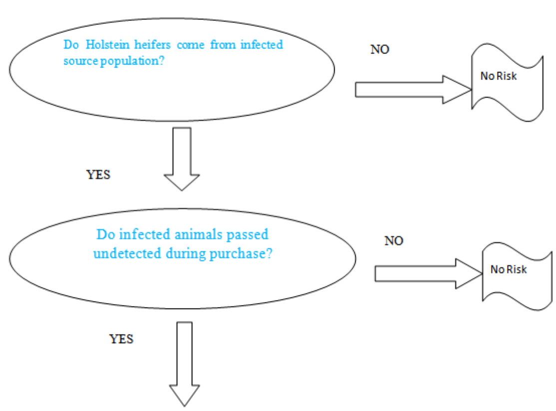
Carrier animals have an important role in the transmission of the infection to ticks, which then are able to transmit the parasites to a susceptible host. Although ECF *(T. parva* infection) and its vector *R. appendiculatus* have not been found in Ethiopia, the relatively uncontrolled passage of livestock from Kenya where the disease and vector are found ensures that a considerable risk exists. If infected ticks become established on the climatically favorable highlands in the central, northern and southern Ethiopia, close to 100% mortality of improved and indigenous cattle could occur. (Norval et al., 1991).

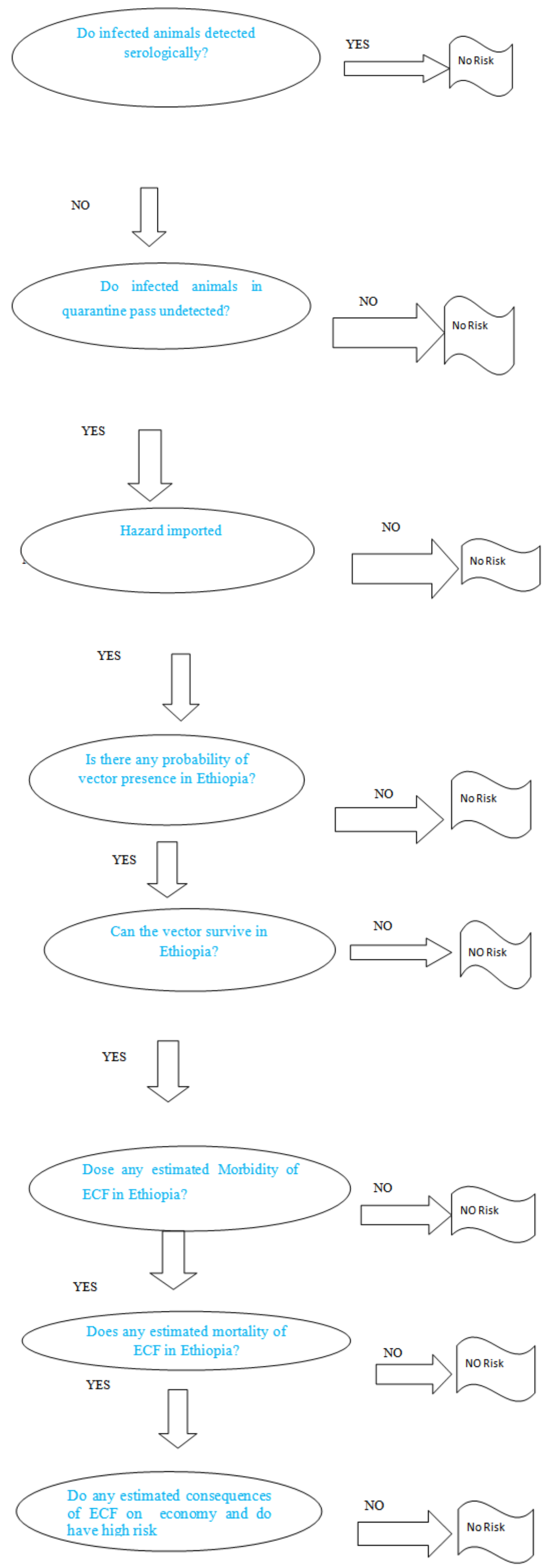
Effects Of ECF

- ❖ Mortality rates under endemically stable conditions occur mostly in calves and vary from zero to 50%. (Moll et al, 1984; Berkvens et al, 1989).
- ❖ Depending on the frequency of applications, annual costs of acaricide range from US$ 2 to US$ 20 per animal. (Young et al, 1990; Perry et al, 1990).
- ❖ Farmers who pay for the service can spend as much as US$ 10 to 20 per animal per treatment. (Mutugi et al, 1988; Young et al, 1988).
- ❖ farmers face a substantial risk if they try to keep crossbred cattle to improve livestock productivity and efficiency due to their high susceptibility to the disease. (Callow, 1983).
- ❖ animals may suffer from weight loss, produce low milk yields, provide less draft power and could possibly suffer from reduced fertility and delays in reaching maturity. (Lawrence and McCosker, 1981; Brown, 1985).

Therefore, simply Our Country, Ethiopia will encounter all the above consequences highly if East coast fever is become endemic.

Risk Pathway





Conclusion And Recommendations

Ethiopia; Amhara Region is free from East Coast Fever infection without presence of free animal movements from infected area. The agent *T. parva* can be introduced through carrier or immunized animals from endemic countries irrespective of any diagnostic measures conducted.

In general, this analysis indicated that importing Holstein heifers from Kenya has a risk of introduction of the disease (ECF). Therefore; Ethiopia takes a measure of…

❖ Clinically free of any diseases condition at the time of transportation.

❖ At time of exporting/importation or loading the animals were examined and found to be free of symptoms of diseases.

❖ The animal came from herds confirmed to be free of any infectious diseases or were tested and found free.

References

1. Berkvens, D., Geysen, D. M and Lynen, G. M., 1989. East Coast fever immunization in the Eastern Province of Zambia. In: Dolan T T (ed), *Theileriosis in Eastern, Central and Southern Africa*. ILRAD (International Laboratory for Research on Animal Disease), Nairobi, Kenya. pp. 83-86.
2. Brown, C. G. D., 1985. Immunization against East Coast fever: Progress towards a vaccine. In: Irvin A D (ed), *Immunization against theileriosis in Africa*. ILRAD (International Laboratory for Research on Animal Diseases), Nairobi, Kenya. pp. 90-96.
3. Callow, L. L., 1983. Ticks and tick-borne diseases as a barrier to the introduction of exotic cattle to the tropics. In: *Ticks and tick-borne diseases*. FAO Animal Production and Health Paper 36. FAO (Food and Agriculture Organization of the United Nations), Rome, Italy. pp. 48 53.
4. De Deken, R., Martin, V., Saido, A., Madder, M., Brandt, J., Geysen, D., 2007. An outbreak of east coast fever on the Comoros: a consequence of the import of immunised cattle from Tanzania? Vet Parasitol, 143:245–253.
5. *Deem SL, Perry BD, Katende JM, McDermott JJ, Mahan SM, Maloo SH, Morzaria SP, Musoke AJ, Rowlands GJ: Variations in prevalence rates of tick-borne diseases in Zebu cattle by agro-ecological zone: Implications for the East Coast fever immunization. Prev Vet Med. 1993, 16: 171-187. 10.1016/0167-5877(93)90064-Z.* View Article Google Scholar
6. *Gitau GK, Perry BD, Katende JM, McDermott JJ, Morzaria SP, Young AS: The prevalence of tick-borne infections in small-holder farms in Murang'a District, Kenya: a cross-sectional study. Prev Vet Med. 1997, 30: 95-107. 10.1016/S0167-5877(96)01100-2.*ViewArticlePubMedGoogle Scholar
7. *Latif AA, Rowlands GJ, Punyua DK, Hassan SM, Capstick PB: An epidemiological study of tick-borne diseases and their effects on productivity of zebu cattle under traditional management on Rusinga Island, western Kenya. Prev Vet Med. 1995, 22: 169-181. 10.1016/0167-5877(94)00408-B.*View ArticleGoogle Scholar
8. Lawrence, J. A. and McCosker, P. J., 1981. Economics of theileriosis control: appraisal and future perspectives. In: Irvin, A D, Cunningham, M P and Young A S (eds), *Advances in the control of Theileriosis*. Martinus Nijhoff Publishers, The Hague, The Netherlands. pp. 419-422.
9. Lawrence JA, Perry BD, Williamson SM, 1992: East coast fever. In Infectious Diseases of Livestock. Volume 1. 2nd edition. Edited by Coetzer JAW, Tustin RC. Southern Africa, Cape Town: Oxford University Press: 448–467.
10. Maloo SH, Thorpe W, Kioo G, Ngumi P, Rowlands GJ, Perry BD., 2001. Seroprevalences of vector-transmitted infections of smallholder dairy cattle in coastal Kenya. Prev Vet Med, 52:1–16.
11. Moll G. Lohding A and Young A S., 1984. Epidemiology of theileriosis in the Trans-Mara Division, Kenya. Husbandry and disease background and preliminary observation on theileriosis in calves. *Preventive Veterinary Medicine* 2:801-831.
12. *Morzaria SP, Musoke AJ, Latif AA: Recognition of Theileria parvaantigens by field sera from Rusinga Island. Kenya. Kenya Vet. 1988, 12: 8.* Google Scholar
13. Mutugi J J. Young A S. Maritim A C, Ndungu S G, Stagg D A Grootenhuis, J G and Letich B L., 1988. Immunization of cattle against theileriosis using varying doses of *Theileria parva lawrencei* and *T. parva parva* sporzoites and oxytetracycline treatments. *International Journal for Parasitology* 18(4):453-461.
14. *Newson RM: The lifecycle of Rhipicephalus appendiculatus on the Kenyan coast. Edited by: Wilde JKH. 1978, University of Edinburgh: Center of Tropical Veterinary Medicine, Edinburgh, 46-50. 27 September-1 October 1976* Google Scholar
15. Norval, R.A.I., Perry, B.D., and Young, A.S., 1992. The Epidemiology of Theileriosis in Africa. London:Academic Press, 481 pp.

16. Norval R.A.I., Perry B.D., Gebreab F. and Lessard P., 1991. East Coast fever: a problem of the future for the Horn of Africa? *Preventive Veterinary Medicine* 10:163–172.
17. Norval RAI, Perry BD, Young AS, Lawrence JA, Mukhebi AW, Bishop R, McKeever D., 1992.
18. Perry B D, Mukhebi A W. Norval R A I and Barrett J C., 1990. *A preliminary assessment of current and alternative tick and tick-borne disease control strategies in Zimbabwe*. Report to the Director of Veterinary Services, Zimbabwe. 41 pp.
19. *Swart RJ, Raskin P, Robinson J: The problem of the future: sustainability science and scenario analysis. Global Environ Chang. 2004, 14: 137-146. 10.1016/j.gloenvcha.2003.10.002.View ArticleGoogle Scholar*
20. Young A S. Kariuki D P. Mutugi J J. Heath D L and Long R C., 1990. Economic losses in cattle due to tick control and effects of tick-borne diseases on selected farms in Nakuru District, Kenya. *Preventive Veterinary Medicine* (in press).

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