

## Seroprevalence of Trade Hampering Livestock Diseases in Animals Originated from Borana at Export Quarantine Centers in Adama, Central Ethiopia

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**Abstract:** The presence of many infectious diseases such as *Foot and Mouth Disease (FMD)*, *contagious bovine pleuro pneumonia (CBPP)* and Brucellosis and other sanitary and phytosanitary (SPS) issues created many challenges for developing countries such as Ethiopia to access international livestock markets. A cross-sectional study was conducted on apparently healthy animals originated from Borana, to determine the seroprevalence of major animal diseases affecting livestock export specifically FMD and CBPP in Cattle and Brucellosis in sheep and camels. Collection of blood specimens was conducted from selected fattening and export quarantine centers in Adama while laboratory analysis of specimens was made in National Veterinary Institute (NVI). 3ABC ELISA and CFT were used to check antibodies against FMD and CBPP and Brucellosis respectively. The overall prevalence of FMD and CBPP in bulls was 5.7% (218/3777) and 0.4% (16/3777) respectively. 0.08% (3/3777) bulls were positive for FMD and CBPP antibodies. The prevalence of brucellosis in camels and sheep and was 0.8% (12/1500) and 0.51% (14/2744) respectively. The overall loss of hard currency due to failure to export the sero-reacting live animals from the six exporter farms included in our study was 183,808.1 US\$. The present study concluded that FMD, CBPP and Brucellosis were important diseases challenging the live animal export thereby threatening the livelihood of pastoralists' particularly and national agricultural economy in general. Hence, this necessitates giving attention towards designing and implementation of locally feasible control and prevention strategy options.

**Key words:** Borana • Brucellosis • Camels • Cattle • CBPP • FMD • Sheep

### INTRODUCTION

Livestock in developing countries play a crucial role in improving the ever worsening situation between food supply and demand due to human population pressure. Ethiopia has one of the largest livestock populations in Africa with an estimated population of with more than 52 million heads of cattle, 46 million small ruminants, about 9 million equines (Donkey, horses and mules) and over 1.1 million heads of camels in the accessible pastoral areas of the country[1]. Livestock in Ethiopia provides drought power, source of income, means of investment and important source of foreign exchange earning to the nation. Livestock provides 16% of the total GDP and generates 14% of the country's foreign exchange earnings. On a national level, livestock contributes a significant amount to export earnings in the formal market

(10 % of all formal export earnings, or US\$150 million per annum) and the informal market an estimated US\$300 million per annum [2].

The Ethiopian government has designed export-led industrialization strategy (2002) that focused on creation of favorable conditions to improve international competitiveness of the economy and generate foreign exchange thus is committed to develop the export industry through investment and export incentives and preferential market access, such as the African Growth and Opportunity act (AGOA) and the European Business Assistance Scheme (EBAS) [3]. The priority export commodities include livestock, hides and skins, meat and leather products. Marketing of livestock and livestock products is different from other agricultural commodities in such a way that transporting live animals to markets destination is delicate and costly. Animals could lose

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weight in transit or suffer from injuries due to unstable means of transport, could be exposed to disease causing pathogens[4]. Generally, east African livestock trade is characterized by illicit (Informal) trade between neighboring countries. Illicit (informal) trade seriously affects Ethiopia; an estimated 325,800 cattle, 1,150,000 sheep and goats, 300,000 skins and 150,000 hides outflow every year from Ethiopia through illicit cross border trade [5].

Animal health is the biggest constraint on trade of livestock and livestock products in Ethiopia. These major infectious and parasitic diseases endemic in Ethiopia are *Contagious bovine pleuro-pneumonia* (CBPP), *Lumpy skin disease* (LSD), *Foot and Mouth Disease* (FMD), *Newcastle Disease* (NCD), *Peste des petis ruminants* (PPR), *Capri pox* (sheep and goat pox), *African Horse sickness* (AHS), *Contagious caprinepleuropneumonia* (CCPP), Trypanosomosis, anthrax, black leg, hemorrhagic septicemia, brucellosis and internal and external parasitosis. These cause huge mortality and morbidity, affect qualities of hides and skins and challenged the country to access international livestock markets. An estimated 1.5-2.5 billion ETB is annually lost from animal diseases [6].

Food safety is of increasing importance worldwide, especially in developed countries. To comply with global requirements of World Trade Organization (WTO) and Sanitary and Phytosanitary (SPS) issues, certification for freedom of animal and zoonotic health hazards and chemical residues in livestock products are now frequently included in trade protocols to safeguard the public, animals and environment. Animal welfare issue is also importance [7]. The office international des epizooties (OIE) Terrestrial Animal Health Code specifies the guidelines for safe animal product trade, mainly underlining that livestock and livestock products for global trade must originate from countries or specified geographical areas of a country (Zone) that are free from major animal diseases, capable of causing economic losses or human diseases. Because of the endemic nature of major trade barrier animal diseases and infrastructural and technology limitations, developing countries such as Ethiopia are severely constrained by these international SPS regulations. To overcome this, Ethiopia is considering the establishment of disease free zone in Borena, Ogaden and Afar areas in order to maximize profits from the huge livestock resource [8].

The major markets for export are mainly Yemen, Egypt and Jordan. The main species of animals for export from Ethiopia are cattle, small ruminants and camels [9].

In Ethiopia, Adama Quarantine Station is among existing certified quarantine stations, for veterinary checkups and interventions required for export of live animals. In addition to control of internal and external parasites, a minimum of 21 quarantine days and vaccination schedules, Egypt market requires serological screening of animals for Brucellosis, CBPP and FMD.

Even though annual complete data on trade hampering animal diseases are found in the Adama Quarantine Station and other relevant offices, the magnitude and impact of these diseases at country level is not well documented. The objectives of this study were determining the prevalence and economic importance of trade hampering major animal diseases.

## MATERIALS AND METHODS

**Study Areas:** Collection of blood samples was conducted at six private export quarantine farms of beef animals located at Adama Quarantine Station and its surroundings. Adama city is located in the central parts of Oromia region, 99 kms away from the national capital, Addis Ababa. The laboratory works were conducted in Ethiopian National Veterinary Institute (NVI). The study was carried on beef animals originated from Borana range land of Oromia regional state which were intended for Egypt export market. Borana is situated about 600 km South of Addis Ababa, representing a vast lowland area of southern Ethiopia covering about 95,000 km<sup>2</sup> located at 3°36'-6°38'N latitude and 36°43'-40° 40' E longitude. It is bordered by Kenya from South, Somali regional state from East, highlands of Gujii from North and Southern Nation and Nationalities and People Regional State from West [10]. The Borana plateau generally slopes from an altitude of about 2000 meter a. s. l. in foothills of Bale-Sidama massifs (Jemjem plateau) in North to 1000 meters a. s. l. near the Kenya boundary in South with an abrupt mountains areas reaching up to 2000 meters a. s. l. or more [11]. The rain fall of the southern range land is typical bimodal rainfall type with about 60% of the rain falling from March to May (Short rainy season). The amount of rainfall increases from 400mm in lower altitude areas of south to about 700mm in north with an average precipitation of 600-650mm per annum [12]. The mean annual temperature varies from 19°C to 25°C with moderate seasonal variation. Season affects herding patterns due to its effect on forage and water resource availability [10]. Pastoral livestock production is the main means of livestock husbandry for hundreds of thousands of individuals in Borana [13].

**Study Animal Population and Sample Collection:** A cross-sectional study was conducted on apparently healthy animals intended for export to Egypt market. All are not vaccinated for the diseases to be tested. All animals kept in the six private holdings intended for the international market were sampled. Accordingly, 3777 cattle, 2744 sheep and 1,500 camels were included. From each study animals, after jugular vein puncture 5-9 ml of blood was collected in to plain Vacutaintube. The blood was left to clot for 12 hours and transported to NVI for serum separation. Serum storage was made at-20<sup>o</sup>c. Then each serum samples were subjected to the laboratory test through the OIE recommended diagnostic tool.

**Laboratory Procedures:** Serum samples from cattle were subjected for 3ABC ELISA and CFT to test to check antibodies against FMD and CBPP respectively [7] For the 3ABC ELISA, about 100il of prediluted samples (1: 16 in diluent buffer A) and controls (1:100 in CHEKIT FMD 3ABC sample diluents) were dispensed into the appropriate wells of the micro titer plate pre-coated with recombinant FMDV 3ABC viral antigen. Test procedures were conducted as indicated in the kit leaflet and OIE standards. Using Rose Bengal Plate Test (RBPT) screening test, camels and sheep serum samples were checked for the antibodies against Brucella and all positive reactors for RBPT was retested for confirmation using complement fixation test (CFT) according to the protocols recommended byOffice of International des Epizooties [7].

**Determination of Economic Losses:** For determination of the loss of hard currency associated with the animal diseases, the average weight of the animals was multiplied by average selling price per kg body weight during the course of the study.

**Methods of Data Management and Statistical Analysis:** Collected data were entered in MS-Excel. An intercooled Stata 7 software package [14] was used to perform statistical analysis. Descriptive statistics such as percentage was used to report prevalence of the diseases.

**RESULTS**

On this study, a total of 3777 bulls were examined and an overall prevalence of FMD and CBPP were 5.7% and 0.4% respectively. Only 3 (0.08%) bulls were positive for both diseases. The prevalence of brucellosis in camels and sheep asconfirmed by CFT was 0.8% and 0.51% respectively (Table 1). The overall loss of hard currency due to failure of exporting the sero-reacting live animals from the six farms that were included in our study was 183,808.1 US\$ (Table 2 and 3).

**DISCUSSION**

The overall seroprevalence of 5.77% and 0.4% for FMD and CBPP respectively observed in our study was indicative of epidemiologic importance of the diseases in Borana. The overall prevalence of FMD was comparable with the findings of 5.53 % on exported bulls of

Table 1: Sero-prevalence of major trade barrier animal diseases

	Diseasen tested	Test type	Origin of animal	Total number of Animal tested	Serological status		Prevalence Animal species
					Positive	Negative	
Cattle	FMD	3 ABC-ELISA	Borana	3777	218	3559	5.77
Cattle	CBPP	CFT	Borana	3777	16	3761	0.4
Sheep	Brucellosis	CFT	Borana	2744	14	2730	0.51
Camels	Brucellosis	CFT	Borana	1500	12	1488	0.8

Table 2. Summary of the loss of hard currency due to FMD and CBPP in export bulls from selected farms from Adama Quarantine Station

Animal species	Average live weight (A)	Total animalsexamined (B)	Culled (C)	Unit Price/kg US\$ (D)	Total Loss (US\$)(A*C*D)
Cattle	450 kg	3777	234	1.57	165,321.00

Table 3. Summary of the loss of hard currency due to brucellosis in export camels and sheep from selected farms from Adama Quarantine Station

Animal species	Total animalsexamined (B)	Brucellosis positive	Unit price/head US\$	Total Loss (B*C)(US\$)
Camel	1500	12	1470.6	17, 647.10
Sheep	2744	14	60	840.00
Total				18,487.10

Borana and Jimma origin [15], 5.6% in Afar Regional State [16], 8.18% of Borana origin bulls by Andualem [11] and 8.18% South Omo zone [17]. On the other hand, our result was lower as compared to FMD reported seroprevalences of 26.5% [18] and 21% [19] in Borana pastoral production system, 12 % [20] in Bench Maji zone of Southern Ethiopia, 28.9% [21] Addis Ababa dairy cattle and 21.49% in cattle from Bale zone [22]. These variations could be due to difference in characteristics of study animals, variation via temporal and spatial distribution of pathogens and husbandry factors. In this study, all animals were healthy bulls purchased after physical examination and brought to the fattening and quarantine farms. On the other hand, animal in field conditions do have a chance of movement, contact with other domestic animals and reservoir wild animals hence affecting the epidemiology of FMD [23]. According to the Ministry of Agriculture and Rural Development of Ethiopia [24] incidence of FMD has increased between 1.3 to 1.5 times since 1990. A small-scale vaccination practice against FMD was realized in occasion like FMD outbreak in different parts the country. However, FMD control by vaccination does not seem to be successful, since vaccination coverage itself is limited to some cases while animals vaccinated using the existing bivalent A and O vaccine were found affected by severe outbreak [25]. By virtue of these facts and the existing livestock movement without restriction, FMD virus contamination is maintained endemic in the population making difficult to design effective control measures. The observed sero-prevalence of CBPP in cattle was very low as compared to the reports of Kassaye and Molla [26] and Bonnet *et al.* [27] who reported 4% and 4.6% respectively. This might be due to the variation in temporal and spatial distribution of pathogens and the variation in the employed serological tests. However, the importance of this disease should not be underestimated as there could be severe outbreaks characterized by high morbidity and mortality in addition to the fact current Ethiopian T1/44 vaccine against CBPP is ineffective with possibility of many post vaccine reactions [13].

The seroprevalence of *Brucella* in camels (0.8 %) was comparable to the reports of [28] but lower than reports of Bekele *et al.* [29], Tilahun *et al.* [30], Zewold and Haileselassie [31], Birhanu [32], Megersa *et al.* [33] and Teshome *et al.* [34] in various regions of Ethiopia and in Egypt [35], in Sudan [36] and in Saudi Arabia [37]. Status of brucellosis in camels depends on the *Brucella* species prevalent in other animals sharing

their habitat and on the husbandry methods of camels. [36] reported higher prevalence of Brucellosis (23.8%) from camels kept mixed with ruminant species. According to Abbas and Omer [38], seroprevalence of camel brucellosis appears to follow two distinct patterns: a low prevalence (below 5%) in nomadic or extensively kept camels and high prevalence (8-15%) in camels kept intensively or semi-intensively. Camels are mainly browsers, less frequently drink water and reach maturity late with prolonged reproduction intervals. This factor could contribute to low prevalence of brucellosis among pastoral camels. Moreover, the prevalence of ovine brucellosis in this study (0.51%) was higher than the reported 0% in Bahir Dar [39] but lower than 3.2% in Afar region [40], 5.6% in Afar and Somali [41], 1.6% in Adamitulu-Jido-Kombolcha District [42] and extensive reports reviewed in Yohannes *et al.* [43].

In conclusion, regardless of the variations in reported computed epidemiological data about the prevalence of these diseases in different areas of the country, Brucellosis has zoonotic importance and impact of all on gaining hard currency and over all national economy is huge which may discourage exporter enterprises to participate in livestock trade. Therefore, control of these animal diseases through principles of zonation and vaccination; animals movement control through quarantine and proper inspection; and use of extensive regular serological survey and pathogen characterization for development of proper vaccine should be in place.

#### ACKNOWLEDGEMENTS

We would like to acknowledge Adama Quarantine Station authorized persons in facilitating the work; livestock Ethiopian exporters and Egyptian importers who covered all costs related to specimen collections and laboratory analysis; and laboratory experts at National Veterinary Institute (NVI) who analyzed, approved and authorized the laboratory results.

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