

Abstract of Thesis/Dissertation

Applicant

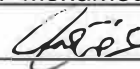
Master's/Doctoral Program in Animal and Food Hygiene

Graduate School of Animal Husbandry

Obihiro University of Agriculture and Veterinary Medicine

Student ID: 17360003Name of Applicant: Afraa Tajelsir Mohamed Elata

Signature of Applicant: _____



Title : Studies on the roles of livestock reservoirs in the epidemic of trypanosomosis and piroplasmosis

(トリパノソーマ症とピロプラズマ症の流行において家畜のレゼルボアが果たしている役割に関する研究)

Abstract

This study has provided epidemiological data on the prevalence of two of the most devastating animal parasitic diseases in two developing countries using molecular and serological approaches. Sudan in north east of Africa and the Philippines in south east of Asia were chosen as they represent developing countries in two different continents with different livestock systems and climate zones.

Livestock play a central role to the economies of developing countries and are usually means of transitioning from poverty to wealth. Endemic vector born protozoan parasites, especially animal trypanosomosis, babesiosis and theileriosis, are major sources of economic losses in animal husbandry, especially in developing countries. The donkeys in North African countries and the water buffaloes in South East Asian countries have characteristic role in each area. However, the extent of those losses is yet to be accurately specified.

The prevalence of equine trypanosomosis and equine piroplasmosis was examined in donkeys in Sudan, wherein donkeys are economically important animals, providing transportation and considered as a source of income to the individuals in rural areas and margins of the cities. Two batches of samples were collected in different parts of Sudan. a prevalence of 38.9% for *Trypanozoon* (77/198) and 9.1% for *T. congolense* (18/198) in

donkeys in West Omdurman, Khartoum State, Sudan, and a prevalence of 25.5% for *Trypanozoon* (68/267) in donkeys in different parts of Sudan were detected using ITS1 PCR. Serologically, out of the 198 samples collected in the first batch, 52 (26.3%), 56 (28.3%), and 19 (9.6%) serum samples were found to be positive using CATT/*T. evansi*, TeCA-based ELISA, and rTeGM6-4r-based ELISA, respectively. Further, out of the 267 samples in the second batch, 101 (37.8%) and 75 (28.1%) serum samples were found to be positive for trypanosome antibodies using TeCA- and rTeGM6-based ELISAs, respectively.

The results revealed that trypanosomes (*T. congolense* and *Trypanozoon* spp.) and piroplasms (*Baesia caballi* and *Theileria equi*) are highly prevalent in the study area. In general, and since the studied animals were apparently healthy, this indicated that donkeys seem to have the greatest resistance to these protozoan diseases and don't show symptoms though high prevalence of the diseases. The sero-prevalence recorded by ELISAs and card agglutination test for *T. evansi* was higher than the prevalence recorded by PCR. This suggested that the parasitemia was lower than the detectable levels by PCR, confirming that donkeys are somehow tolerant to infection maintaining very low parasitemia. From this perspective, donkeys might play important role as reservoir host in the transmission of those diseases to the more susceptible hosts, especially horse, because no control measures are applied against these diseases in donkeys as they don't show any clinical symptoms. In addition, despite Sudan is known as a non-tsetse infested country, except some tsetse-infested areas in the Southeast and Southwest parts, and the study area is a tsetse-free, *T. congolense*, which is known as a tsetse-transmitted trypanosome sp., was detected by PCR in Khartoum State, which is very far from the tsetse-infested areas of the country, with a prevalence of 9.1%. This result suggested that the mechanical transmission of this parasite by blood-sucking insects (e.g. tabanus flies), the same route of transmission of *T. vivax* and *T. evansi*. Therefore, special attention is required since the tsetse transmitted trypanosome is reported in tsetse-free area and special control measures are urgently needed.

The prevalence of trypanosomosis in four domestic animal species (water buffalo, goats, cattle and horses) was detected in the Philippines. Water buffalo is the national animal in the Philippines. Several outbreaks of surra, caused by *T. evansi*, were reported in domestic animals including water buffalo in different areas in the Philippines. Thus, animal trypanosomosis is one of the most important parasitic diseases that significantly affect the economy of the country. To control trypanosomosis, the Philippines government has planned

to implement a national control program to provide regular trypanocidal treatments in areas with high prevalence of clinical disease. However, *T. evansi* infections were reported in this study in several animal species that were sampled in Cebu and Bohol for the detection of *Trypanosoma* spp. using PCR-based assays. Of the 251 goats sampled in Cebu, 85 (33.9%) were positive for *T. evansi* using ITS1 PCR. Of the water buffaloes that were first sampled in Bohol, 24.8% (27/109) were positive for *T. evansi*, 17.4% (19/109) were positive for *T. theileri*, and 3.7% (4/109) were positive for a mixed infection of *T. evansi* and *T. theileri*. In the second batch of samples, only *T. evansi* was detected, and was present in 16.7% (7/42) of sampled water buffaloes. In the second batch of samples, an overall trypanosome prevalence of 44.7% in cattle (34/76), followed by 34.3% in goats (12/35), and 28.6% in horses (2/7) was found. In cattle, 22 (28.9%) samples were positive for *T. evansi*, 7 (9.2%) samples were positive for *T. theileri*, and 5 (6.6%) samples contained signs of a mixed infection of *T. evansi* and *T. theileri*, while in goats 7 (20%) samples were positive for *T. evansi*, 4 (11.4%) samples were positive for *T. theileri*, and only one (2.9%) sample was positive for a mixed infection of *T. evansi* and *T. theileri*. In horses, only *T. evansi* was detected, and it was only found in 2 (28.6%) samples.

In general, *T. evansi* infection in water buffaloes and horses causes severe clinical symptoms; however, none of the clinical signs was observed in this study.

This suggested the possibility of emergence of drug resistance due to improper treatment causing the animal to be tested positive without clinical symptoms. Moreover, *T. evansi* infection is reported, for the first time, in goats in Cebu Island which is considered as surra-free. This could be explained by the fact that Cebu City, the second largest metropolitan city located in Cebu Island, is the usual gateway of livestock trade in the Visayas region. Therefore, it is an area of a high risk of infection. It is commonly believed that caprine trypanosomosis is only sporadic because goats are highly resistant to infection. This study suggested that *T. evansi* is prevalent in Cebu Island and goats might play a vital role, as reservoir animals, in the transmission of *T. evansi* infection to other domestic animals in this area.

The study shows the endemicity of animal trypanosomosis and piroplasmosis in North Africa and the endemicity of animal trypanosomosis in South Eastern Asia. The study also highlights the importance of domestic animals that can be infected with no symptoms. These animals, like donkeys and goats in this study, may act as reservoir animals for these protozoan diseases, and can transmit these diseases to the susceptible animals. This study

proves the importance of regular surveillance to estimate the prevalence of these diseases, which highlights their various dynamics in the affected areas, thus, making it easier to put in place effective and efficient intervention measures.

Notes 1. Fill in the Japanese translation for an English in the ().

2. Abstract should be between 1,800 and 2,200 characters in Japanese, or be between 1,000 and 1,400 words in English.

3. Do not include figures and tables.

4. Abstract can be longer than one page.