Review on the Distribution of *Trypanosoma evansi* Infection in Malaysia

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ABSTRACT

*Trypanosoma evansi* is a protozoan parasite which infects livestock in Malaysia. The study produces an initial report of trypanosome in Peninsular Malaysia; with the focus on the Perak state due to the high number of *T.evansi* cases were reported. The study was conducted by integrating geographical information system (GIS) and result showed that a total of 67 cases were reported positive *T.evansi* within the period of study (2000-2013). ArcGIS 9.3 was used to analyze the data and develop a choropleth map shows the distribution of *T.evansi*. Information obtained from this study would be a valuable contribution to develop a strategy and will enhance understanding about the epidemiology and distribution of *Trypanosoma evansi* in Malaysia and assist the authorities in improving their control strategies.

INTRODUCTION

The protozoan parasite, *Trypanosoma evansi* is transmitted mechanically between animals by tabanid flies (Family : Tabanidae). *T.evansi* causes the disease surra, which produce significant mortality and production losses in a variety of mammals in endemic countries.

In an effort committed to tackling the problem, Parasitology and haematology section in VRI have conducted several studies regarding the transmission, vector and statistical study on production losses in a variety of animal at local farms. The study was conducted by integrating geographic information system (ArcGIS 9.3) software to produce the geo-mapping of the positive *T.evansi* cases in Malaysia during 2000 to 2013.

METHODOLOGY

Study area

Malaysia (4.1936° N, 103.7249° E) is located in Southeast Asia and comprises East Malaysia (Peninsular) and West Malaysia (Sabah and Sarawak). Peninsular Malaysia is comprised of 11 states and 3 federal territories (Kuala Lumpur, Putrajaya and Labuan).

Data preparation

Trypanosoma data was generated from the laboratory report of Parasitology and Haematology Section in Veterinary Research Institute. The data were checked for the accuracy in entry, coding and typing
error. The information obtained from the data includes farm names and address, date of sampling, location and state, breed, age range, number of sample and number of positive cases. In this study, we focused on the number of positive cases for *T.evansi* from 2000 to 2013 in Peninsular Malaysia. The data were sorted according to years and species for further analysis.

**Data analysis**

The data were managed in Microsoft Excel® (Microsoft Corporation) spreadsheet and frequency tables were applied to calculate the cases based on state and animal. All data were utilized to create shapefile and each location of the cases was traced to its actual position on the earth surface. Geographical coordinates of the positive cases were marked using Global Positioning System (GPS). The navigation setup was set as degree decimal (DD) units and WGS1984 as the map datum.

**Data projection**

All data used in this study were projected in order to keep datasets aligned. The following projection was used in the study:

```plaintext
PROJCS["WGS 84 / Pseudo-Mercator", GEOGCS["GCS_WGS_1984", DATUM["D_WGS_1984", SPHEROID["WGS_1984",6378137,298.25723563]], PRIMEM["Greenwich",0], UNIT["Degree",0.017453292519943295]], PROJECTION["Mercator"], PARAMETER["central_meridian",0], PARAMETER["scale_factor",1], PARAMETER["false_easting",0], PARAMETER["false_northing",0], UNIT["Meter",1]]
```

Datasets utilized that did not match this coordinate system were re-projected to match it.

**Geographical Information System (GIS)**

All data were analyzed based on the attributes for each positive case and converted to shapefile by using GIS software, ArcGIS Version 9.3 (ESRI, 2006). All coordinates were imported into the software by using spreadsheet. A basemap of Malaysia (states and districts) were used as a layer to shows the exact location of the diseases. Data were mapped and categorized according to year by using different color coded symbol for each year. Basemap of Malaysia and Perak state were obtained from GIS data at the Department of Survey and Mapping Malaysia (JUPEM).

**RESULTS**

A total of 67 cases were reported positive *T.evansi* within the period of study (2000-2013). Among the states, the highest positive *T.evansi* case was observed in Perak (88.05%, 59 cases) and one (1) case were observed in Penang, Perlis, Selangor, Sarawak, Terengganu and Kedah respectively. In addition, there are no reported cases in Kelantan, Terengganu, Johor, Negeri Sembilan, Malacca and Sabah.

Figure 1 shows the number of positive *T.evansi* within years. The annual mean of infected case for the period of study was 4.79%, with year 2012 having the highest infected cases (17.91%, 12 cases). Meanwhile, zero-cases were reported for year 2002, 2004 and 2013. Increasing trend from 2000 to
2003, 2008 to 2013 and decreasing trend from 2003 to 2005 was observed. It is possible that the difference in intensity of sampling over the years has influenced the results note.

Figure 2 showed that cervine are the highest infected species, followed by cattle and equine. In 2007, Nurulaini et.al. reported that outbreak happen at one of the government cervine farm located at Lenggong, Perak with the deaths of seventeen (17) adult cervine in a week [7].

![Figure 1: Total Number Of Positive Trypanosoma evansi Reported From 2000 to 2013](image1.png)

![Figure 2: Total Number of Positive Trypanosoma evansi by Species](image2.png)
From the generated map (Figure 3: Map of Positive Cases *T.evansi*), it’s clearly identified that 88% of the positive cases occurred in Perak state. Thus, all positive cases were sorted and map was re-generated back by using Perak basemap to visualize the location of the positive cases of *T.evansi* in Perak.

Observation of the maps shows that the north parts (Perak, Penang and Kedah) of Peninsular Malaysia were at greatest risk in terms of the disease distribution. Even though the total number of cases is small, the authority should start planning the action or contingency plan for the preparedness of *T.evansi* outbreak.

**Figure 3: Positive Cases of *T.evansi* in Peninsular Malaysia**
DISCUSSION

In Asia, the geographical distribution of *T. evansi* is spreading steadily. It is present in large areas in India, China, and Russia [2]. It is sometimes difficult to distinguish it from *T. equiperdum* [3]. It is present in *Camelus bactrianus* and horses in Mongolia, with low prevalence. It is more frequent in Uzbekistan and Kazakhstan. In South East Asia, it affects principally horses, dogs, and buffaloes (*Bubalus bubalis*), as well as cattle, pigs, and deer.

During 2000 to 2013, there were 67 positive cases that could be clearly identified in Malaysia. There were no reported cases on 2002, 2004 and 2013. The highest cases were reported on 2012 with all 12 cases were reported in Perak. We believe that the highest case on 2012 was a function of the serosurveillance carried out by the department [4]. It is proven that the survey program was successful due to the zero number of cases in 2013.

The success of trypanosome transmission from the infected animal host to another animal primarily relies on the interval between feeding arthropod fly vector [1]. It was observed that *tabanid* flies (*Tabanus* species) were present in the sampling areas throughout the duration of the sample collection particularly in Perak state. The identification of the vector host (*tabanid*) is considered a vital link in the positive *T.evansi* cases in Perak.
CONCLUSION
The present study defines the distribution of T.evansi cases occurred in 2000-2013 in peninsular Malaysia particularly in Perak state. Further analysis of spatial and temporal patterns in the data need to be done to clarify the pattern of T.evansi cases. Incorporation of these data into a GIS map will facilitate the development of more specific spatial abundance model, which will be a valuable tool in examining the complex epidemiology of T.evansi.

This information would be a valuable contribution to a risk map for trypanosome in Malaysia and would support the direction of surveillance and decision making. Since trypanosomiasis in animals causes mortality and morbidity, new improved diagnostic techniques for fast detection of the organism are needed. The control of trypanosome infection in government farms can be done through frequent screening and monitoring of the animals. This is a more cost-effective method of controlling the disease rather than waiting for emergency interventions during outbreaks.

REFERENCES