

## ***Trypanosoma evansi* and Trypanosomosis in Vietnam**

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### **ABSTRACT**

The purpose of this paper is to review some the research activities on *T. evansi* and trypanosomosis in Vietnam from 1960 -1998.

1. The epidemiology of trypanosomiasis was investigated by parasitological and immunoassay techniques. It was shown that:

- Trypanosomiasis occurred all over North, Central and South Vietnam, with both acute and chronic disease in cattle and buffalo.

- Infection rates in horses were high by mouse inoculation (MI) and haematocrit centrifuge test (HCT). A greater proportion of buffalo were found infected than the cattle by MI and Antigen Detection.

- Enzyme Linked Immunosorbent Assay (Ag-ELISA). It is possible that buffalo might be the reservoirs of the parasite.

- Abortion was a clinical sign in the pathology of trypanosomiasis in buffalo.

- In North Vietnam, differences in prevalence rates were observed in animals from mountain, intermediate and delta zones, the highest prevalence was seen in animals from intermediate, mountain zone (1990's) and adverted with the results in 1970's.

2. One isolate out of six isolates of *T. evansi* which were collected from six provinces in North and Central Vietnam was resistant to isometamidium chloride (in mice). The results that it is possible that drug resistance occurs in Vietnam and could be more common than is presently known.

3. Immunoassays that are used in Vietnam include the slide agglutination test (SAT), card agglutination test (CATT), indirect fluorescence antibody test (IFAT), enzyme linked immunosorbent assay for detection of antibody (Ab-ELISA) and enzyme linked immunosorbent assay for detection of antigen (Ag-ELISA).

### **INTRODUCTION**

Trypanosomosis caused by *Trypanosoma evansi* is the most important haemoprotozoan infection of livestock in Vietnam. *Trypanosoma evansi* was first detected in 1886 in mules from North Vietnam (Blanchard, 1886) and in the following years, the disease was also reported in horses. In South Vietnam, the first cases were detected in cattle (1906). It is transmitted mechanically by biting flies belonging to genera *Tetanus* and *Stomoxys*. Among the species of *Tetanus* found in Vietnam, *T. rubidium*, *T. stratus* and *T. kiangsinensis* are considered to be the most important vectors.

**Epidemiology of trypanosomiasis and current situation:** In North Vietnam, before 1960, trypanosomosis was considered to be a disease of horses. However, in 1960, trypanosomosis affected buffalo in three provinces of the Red River Delta region with 684 sick animals, 186 of which died (Khai 1996).

During the 1960's and 1970's, in the Red River Delta area, epidemics of surra in buffalo occurred, possibly due to the adverse effects of stress, work, malnutrition and climate. Buffalo usually died in winter-spring and were frequently found infected with both trypanosomiasis and fascioliasis (Lan 1974). It would seem that *Fasciola gigantica* and *T. evansi*, if occurring simultaneous, lowered the host's resistance considerably more than if they occurred alone. In winter-spring season of 1978-1979, outbreaks of trypanosomiasis in Hoang long and Kim Thanh districts caused mortality of 6.3% (500 buffalo died out of population 7,905) and 16.8% (1,453 died out of population 8,604), respectively (Lang 1,981). During these epidemics, no assessment was made of the overall prevalence and it is not known how extensive infection was.

Surveys carried out in buffalo and cattle in provinces of mountain, intermediate, delta and coastal zones showed that the prevalence of infection was highest in delta area (Table 1). At that time, draught- buffaloes were supplied from the mountain and intermediate areas to delta area. These difference in prevalence might be due to stress of travel of buffalo from mountain to delta. Alternatively, the shortage of food in winter-spring in delta areas plus working might have produced a high degree of stress in the animals.

Table 1: Epidemiology of trypanosomiasis in North Vietnam, 1970-1979\*  
\* Giemsa stain, wet blood film and mouse inoculation were used.

Ecological zone	Buffaloso		Cattle	
	No. of animal	Infection rate (%)	No. of animal	Infection rate (%)
Mountain zone	2,303	7.02	339	4.18
Intermediate zone	2,553	12.65	898	4.17
Delta zone	3,172	13.41	354	6.57
Coastal zone	1,207	8.81	217	2.07

Table 1 also shows a higher prevalence in buffalo than cattle. The high infection rates in buffalo could be associated with environmental factors rather than host factors. Buffaloes are used for land preparation in areas of irrigated rice fields which probably support higher populations of tabloid flies or differences in feeding preferences of tabanids. Another way, buffalo had been worked hardly in the cropping season, while cattle were used to supply meat, reproduction and rarely to plough in the light land. Stress of working and moving from the mountain to delta area could adding to buffalo being more susceptible than cattle.

From 1980 to 1987, in areas where *T. evansi* had caused severe problems in the past, fewer reports of disease were made, the disease appeared to be low, possibly owing to various control measures, such as treatment of animals once yearly with Naganol or Berenil. Other factors that might also contribute to this apparently low prevalence. Changes in agricultural management, methods of transport, and measures to improve the reproduction of buffalo in the delta area could have reduced the number of infected animals.

Trypanosomosis became a chronic disease, animals showed a mild clinical disease. No request to diagnose from the local veterinary stations was received. So, in this period no surveys.

From 1988-1998, outbreaks of surra have been recorded in North Vietnam. Table 2

shows the prevalence of *T. evansi* in cattle, buffalo and horses in an epidemic area (My 1994). Horses were seriously affected with clinical signs of fever, anaemia, edema, if there was no treatment, the mortality was 100%. Buffalo were infected more than cattle, except few buffalo died, the remains became a carrier. That is why, in this area, buffalo might act as the main reservoirs of *T. evansi*.

Table 2. Occurrence of *Trypanosoma evansi* in cattle, buffalo and horses in epidemic areas in the Intermediate zone

Village	Cattle			Buffalo			Horse	
	No. of sample	H Cal MI (+) %	Ag ELISA (+) %	No. of sample	H CT/ MI (+) %	Ag ELISA (+) %	No. of sample	H Cal MI (+) %
Hub nghi	12	0	0	58	9.4	20.7		
Que nham	20	0	10	41	26.3	24.4	20	40.0
Dai hoa	31	0	6.5	42	11.1	19.0	21	33.3
Total	63	0	6.3	141	15.0	21.3	41	36.5

HEC: Haematocrit centrifuge test, MI: Mouse inoculation, Ag-ELISA: ELISA detect antigen

A feature of infection was the occurrence of abortion (Table 3).

Table 3. Cases of abortion in buffalo caused by *Trypanosoma evansi* in North Vietnam

Place (Animal)	No. of abortion	Giemsa smear/MI		Ag-ELISA	
		No (+)	(+) %	No (+)	Ag-ELISA
Phung thuong (Milking buffalo)	28*	19	67.8		
Ky son (a) (Draught buffalo)	26**	5	19.2	10	38.5
Da bac (b) (Draught buffalo)	23**	11	47.8	15	65.2

\* Aborted females were negative for Leptospirosis, \*\* The infection rate with Leptospirosis and Brucellosis was low.

a. 24 % of buffaloes sampled serologically positive.

b. 36 % of buffaloes sampled serologically positive.

In Murrah buffalo (imported milking buffalo), 43,010 of pregnant buffalo aborted and the *T. evansi* infection rate of aborted buffalo was 67.8 % (by Giemsa smear/MI) (Khaki 1995). In Hoar bind province, abortion occurred in two districts, 38% & 65% and 19% & 47% of aborted animals were antigenaemic (by Ag-ELISA) and parasitaemic (by MI) respectively in Ky son and Da bac. In both areas, Leptospirosis and Brucellosis were eliminated as a possible cause of abortion (My 1994).

Table 4. Sero-epidemiology of trypanosomosis in buffalo, cattle in North Vietnam (1988-1995)

Province	No of sample	No of (+) sample	Infection rate (%)
Nam ha (delta)	1926	254	13.1
Ha bac (Intermediate)	1953	333	19.3
Hoa binh (Mountain)	1366	383	30.1
Bac thai (Mountain)	2317	557	25.5

Slide agglutination test (SAT) and cardagglutination test (CATT) were used.

Table 4 shows the results of serological investigation in four provinces in different geographical areas by SAT and CATT. The prevalence of infection varied between 13.1 and 30.1%, Nam ha, in delta area, was the lowest prevalence (Phuc 1994; My 1995; Thu 1995). Results from surveys at different times and places are not always strictly comparable because of differences in such factors such as diagnostic methods and the availability and application of trypanocidal drugs. However, some trends are apparent, the infection rate in delta area becomes the lowest (adverse with result in 1970's). This situation might be the change of agricultural management leading to improved care of animals, the condition of nutrition, the preventive and treatment of sick animals. Meanwhile, in the high area, the farmers manage a large herd with traditional farming methods of allowing animals to graze in the forest after the croup season leading to poorer husbandry and limited health care.

The serological evidences of infection in Central Vietnam was studied by the slide agglutination test in seven provinces. The prevalence of infection varied between provinces and prevalence rates in buffalo as high as 21.2% and in cattle as lower 6.6% (Quyet 1995).

In South Vietnam, from July 1978 to December 1981, investigations of surra in 2,226 buffalo and 1,165 cattle of 9 provinces in the plateau, intermediate, delta areas showed the infection rate 2.7-10% (by Giemsa stain and MI) (Thuan 1984).

Table 5 shows 2.09-12.60% milking buffalo and cattle in dairy farms suffered from *T. evansi*, while no evidence of infection in draught buffalo and dairy cattle in peri-urban regions of Ho Chi Minh city (Thach 1996).

Table 5. Trypanosomosis in South Vietnam

Place	Giemsa smear MI		
	n	(+)	%
Milking - buffalo Centre (Ben cat - Song be)	657	65	9.98
Dairy cattle Enterprise (An Phuoc - Song be)	619	78	12.60
Dairy cattle Centre (Duc Trong - Lam Dong )	143	3	2.09
Ho Chi Minh city (Peri-urban, draught buffalo)	391	0	0
Total	1,804	146	8.09

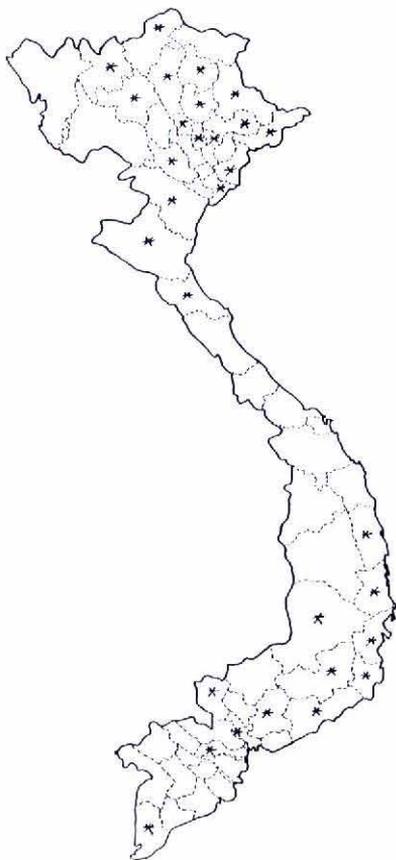


Figure 1. Map of Vietnam showing the endemic and epidemic provinces of *Trypanosoma evansi*.

Although severe epidemics of surra occurred in North Vietnam during 1960's-1970's, the disease now seems to have become endemic, with occasional epidemics. Trypanosomosis is still a serious animal health problem, however. It affects imported milking-buffalo, dairy cattle and causes abortion in milking-buffalo and draught buffalo. Outbreaks of this disease, lead to an overall reduction in the working capacity, yield of the milk of the animals that are essential for agriculture. The disease also exists throughout Vietnam, in North, Central and South (Fig. 1). The reservoirs of *T. evansi* still remain a big problem, if having a stress of working, lactation, reproduction.... They become a source of expanding disease. Little exact information is available, it is likely that the true incidence of diseases considered greater than it appears.

#### CHEMOTHERAPY AND THE SENSITIVITY OF *T. EVANSI* WITH TRYPANOCIDAL DRUGS

Control of trypanosomosis in domestic animals still depends on chemotherapy. For over 30 years, Naganol (suramin) has been used in Vietnam and the farmers in some provinces prefer using this drug. Since 1980, Brevil (diminazene aceturate) and Trypamidium (Isometamidium chloride) have also been used. In the 1970's and 1980's, trypanocidal drugs were used once or twice/year to treat herds of animals in some districts and provinces in North Vietnam for preventing the disease. This use of a trypanocides might have results in the appearance of drug-resistance.

Six isolates of *T. evansi* from five provinces in North Vietnam and one isolate from Central Vietnam the tested for their sensitivity to Naganol, Bedevil and Trypamidium in mice. All isolates were tested with Trypamidium doses from 1-128 mg/kg. One isolate, originally from a buffalo in Habac province was resistant to Trypamidium at a  $CD_{80}^* > 128$  mg/kg, 16 times more than  $CD_{100}^*$  of another isolate, DL<sub>1</sub> (the most sensitive isolate with Trypamidium). All isolates were sensitive to Naganol and Bedevil at 10-20 mg/kg and 3.5-7 mg/kg, respectively. It is not known how such a high degree of resistance might have arisen. Trypamidium is currently used in all the provinces from which isolates were derived. It is possible that different serological conditions, or incorrect application of the drug might have contributed to this resistance.

Whether there is the correlation between molecular characteristics of *T. evansi* with drug-resistance and pathogenicity of isolates in different geographical regions. Study on the characterization of *T. evansi* isolates required. In an attempt to control surra in Vietnam, the following measures need to be taken:

- Improve the ability to diagnose *T. evansi* in the provincial veterinary laboratories. To meet this requirement, kit or reagents have to be suitable, easily used and at a cost acceptable

to the farmers.

- Diagnose regularly in the province in the winter - spring months and treat the animals before the biting fly activity increases in May.
- Treat all sick and serologically positive animals.

\*CD<sub>80</sub> & CD<sub>100</sub>: The minimum dose of the drug curing 80 (100) per cent of the mice.

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