

## **A Survey of *Trypanosoma* and *Microfilaria* Parasites Prevalence in Cattle in the Accra Plains of Southern Ghana: Implications for Trypanosomiasis Control Strategies in Ghana and Livestock Health**

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**Abstract:** This survey was undertaken between September, 2010 and December, 2010 to determine Trypanosomiasis and microfilaria prevalence in cattle in the Shai Hills area of the Greater Accra Region of Southern Ghana in relation to livestock health as per PCV counts. The results showed that *Trypanosoma* parasites were absent, however, microfilaria parasites were present. The prevalence level of microfilaria among the cattle (Sanga) was 6.5% ( $p < 0.05$ ). This was found among the bulls and the cows. The PCV ranges were; calves, 26-40 ( $p < 0.05$ ), cows, 26-34 ( $p < 0.05$ ) and the bulls, 21-29 ( $p < 0.05$ ), respectively. These results showed that the continuous monitoring and treatment of Trypanosomiasis by the Ministry of Agriculture technical officers (MoFA) is effective in controlling the disease among cattle. However, the results also showed that microfilaria parasites were prevalent. This appeared to have affected the health status of the cattle with low PCV counts as observed in the bulls. The implication for health and reproduction would be weak calves and less effective mating in the adults of reproductive age.

**Key words:** Microfilaria, nagana, parasites, prevalence, survey, trypanosomiasis

### **INTRODUCTION**

Trypanosome infection refers to both the human form of the infection and that which affect livestock mainly cattle. Parasitic protozoan trypanosomes of the genus *Trypanosoma* are responsible for infection in vertebrates. The infection is called Trypanosomiasis. More than 66 million people of all ages in 36 sub-Saharan African countries suffer from human *trypanosomiasis* which is caused by either *Trypanosoma brucei gambiense* or *Trypanosoma brucei rhodesiense*.

The disease can be very fatal if not treated. At the advance stages of infection in humans, the disease attack the central nervous system where it causes changes in the personality of the individual, alters the biological clock of the body, slurs speech, causes seizures and difficulty in walking and breathing but early diagnosis and control of the tsetse flies by reducing the reservoirs of infection can be useful in controlling the disease. In areas where the Nagana type of trypanosomiasis affecting livestock is endemic, the lands are not good enough for farming, adversely having a devastating economic and sociological impact on many communities.

*T. brucei* is classified as a salivarian parasite in humans because of its mode of transmission. Thus, infected fly bites a human, takes up blood meal and transmit the parasite through the saliva but sometimes the

parasite can be transmitted sexually, from mother to child through the placenta and milk, and by the consumption of parasite-contaminated blood meal.

There are 36 endemic countries and the economies of these countries are dependent on agricultural but unfortunately these rural communities who form the backbone are those who suffer from *trypanosomiasis* disease. They abandon fertile lands for fear of the disease which is an impediment to agriculture development and livestock production. Studies have shown that losses from trypanosomiasis in cultivation and food production may be as high as 50% and it is estimated that twice as much land could be cultivated if drought animals were not affected by sleeping sickness (Kuzoe, 1991).

The completion of the life cycle of the *T. Brucei* depends on the regular change between the vertebrate host and the tsetse fly vector, though it can be transmitted from vertebrate host to vertebrate host. The parasite undergoes two major transformations during its journey through these two hosts, resulting in two different forms. Beginning at the time just previous to the bite of the tsetse fly, the parasite residing in the salivary glands of the fly is in the procyclic form, due to its glycosylated protein coat. Here it differentiates into the metatrypanosome form which is capable of affecting the vertebrate host but in the vertebrate host it survive extracellularly in the blood, reproducing through binary fission, and disseminating to

sites in the host such as the brain, where it causes tissue damage that leads to lethargy, sleeping sickness and eventually death.

When a tsetse fly bites a host, metatrypanastigotes are transferred into the skin. A chancre develops at the site of the bite due to an acute inflammatory response by the host. The parasite then makes its way to the bloodstream via the lymph nodes that drain the site of the bite. The host will begin to produce antibodies which will successfully remove majority of the parasite. Because the host cannot accommodate the parasite, it in the long run disseminate via the circulatory system into areas like the brain, restricting blood flow through the vessels and causing damage that results in lethargy and sleepiness and finally coma and death.

In the quest to control the disease, some measures or methods have been developed including vaccination strategies against the *T. brucei* but they are not without some challenges. The Variable Surface Glycoproteins (VSG) as a result of its high degree of variability and the switching at the genomic level makes vaccine development very difficult and therefore cannot be used as vaccine target. Glycolysis of an antiparasitic drug is also being used since the predominant bloodstream form of the *T. brucei* has no energy resources and so this glycolysis in the bloodstream form of *Trypanosoma brucei* provides a suitable framework for studying the prospects for using enzyme inhibitors as antiparasitic drugs (Einsenthal, 1997).

A second focus of the vaccine research has been on attempting to eliminate the pathogenicity of the parasite, not the infection itself. Some cattle species in Africa are more resistant to infection than others and studies have shown that a *Trypanosoma congolense* cysteine protease may play a role in the different levels of tolerance (Einsenthal, 1997).

Microfilariae are responsible for lymphatic filariasis in man especially those infected with *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori* whilst most animal species are susceptible to *Brugia pahangi* (Wannaporn *et al.*, 2006). *B. pahangi* infection in cats was determined to be as high as 25.30% near Bangkok, Chungpivat and Sucharit (1993) and 4.17% in dogs (Nithiuthai and Chungpivat, 1992). *B. pahangi* was reported also in one person signifying cross infection (Wannaporn *et al.*, 2006).

Various coordinated and integrated methods have been employed to control and manage Nagana in Ghana. This includes area sprays, use of traps against the flies, drug and vaccine treatments. Spot treatments have been employed by field extension officers of the Ministry of Food and Agriculture (MoFA) to manage and control the disease. This survey tried to overview the success of the programme and also assesses the prevalence of microfilaria among the livestock.

## MATERIALS AND METHODS

**Study area:** This study was undertaken between September, 2010 and December, 2010 at the Accra Plains (Shai Hills) in the Greater Accra Region of Southern Ghana.

**Sample delineation:** Samples were selected based on the number of animals in the Kraals. In each Kraal at the study areas selected, a tenth of both sexes, all calves were selected for the study and blood samples collected by puncturing the marginal ear lobe vein into heparinised capillary tubes. All major kraals in the Shai Hills Area were covered. A total of 3100 animals were sampled.

### Determination of PCV:

**Microhaematocrit tube method:** Sample tubes were sealed at the unfilled end with plasticine and sent to the laboratory. The tubes were placed in the numbered slots of the haematocrit rotor with the sealed end against the rim gasket. The inner lid cover was positioned so as not to dislodge the tubes. The tubes were then centrifuged using International Micro-Capillary Centrifuge, Model MB timed for 5 min and the PCV readings read using the micro-haematocrit reader.

### Determination of trypanosomes and microfilaria by the buffy coat method:

Sample tubes were sealed at the unfilled end with a sealant and sent to the laboratory. The tubes were placed in the numbered slots of the haematocrit rotor with the sealed end against the rim gasket. The inner lid cover was positioned so as not to dislodge the tubes. The tubes were then centrifuged using International Micro-Capillary Centrifuge, Model MB timed for 5 min. Each tube was prepared for analysis as follows: the centrifuged tube was placed between two strips of plasticine and gently pressed down. The space under the cover slide was then filled with water. The slide was then examined under a microscope at x10 magnification for any signs of motile trypanosomes and microfilaria whilst rolling the tube gently.

## RESULTS AND DISCUSSION

**Trypanosoma parasite prevalence in livestock:** All the sampled animals were negative in terms of trypanosome parasites as shown in Table 1. Neither, the calves, cows nor the bulls were infected.

Table 1: Trypanosomes and microfilaria prevalence in cattle at Shai Hi

Sample type	N	Prevalence %	
		Microfilaria	Trypanosomes
Calves	140	-	-
Cows	140	2.25	-
Bulls	30	2.25	-

Table 2: Comparison of PCV ranges

Sample type	Expected PCV range	Average PCV	Observed PCV	Range
Calves	30-40	39	26-40	p<0.05
Cows	30-40	30	26-34	p<0.05
Bulls	30-40	25	21-29	p<0.05

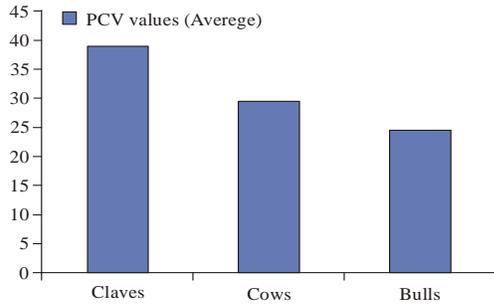


Fig. 1: Comparison of average PCV (Y-axis) value of Calves, Cows and Bulls (X-axis)

**Microfilaria infections:** Microfilaria parasites were present in two of the experimental group of animals. The prevalence levels were same at 2.25% in the cows and the bulls. The calves were not infected.

**Packed Cell Volumes (PCV):** The determined Packed Cell Volumes of the experimental animals were shown in Table 2. The calves had the highest values with an average of 39 (p<0.05). Cows followed in value of 30 average PCV (p<0.05). The bulls have the lowest value at 25 with wide or significant individual variations (p<0.05). Refer to Fig. 1.

Trypanosomiasis or Nagana is a very debilitating disease in livestock. In sub-Saharan Africa where incomes are very meager and livestock resources especially the small holder ones serve as supplements to household incomes, any effect that turns to dwindle household incomes become a threat not only to the animals but the household itself. Because of this, much importance is attached to livestock infections such as Nagana or Trypanosomiasis.

The number of erythrocytes and white corpuscles of animals in good health varies between individuals and in same individuals according to its condition and health. Factors such as parasitism and underfeeding cause anemia which reveals itself in reduction of the red blood cell count and a reduction of the hemoglobin contained within each blood cell (Pagot, 1992). Table 1, showed the prevalence of Trypanosomiasis and filaria in the samples. None of the samples was positive for trypanosomes but microfilaria was present in the age groups (2.25%) except the calves. This parasitama was reflected on the PCV ranges observed in the cows and the bulls. This phenomenon was shown graphically in Fig. 1.

Filaria infestation occurs in a wide range of animals including humans. It is found in cattle, horses with a worldwide distribution and high prevalence (Collobert

*et al.*, 1995; Monahan *et al.*, 1995; Bradley *et al.*, 1998; Lyons *et al.*, 2000; Marques and Scroferneker, 2004). With increased urbanization and encroachment on livestock grazing fields for human settlement, much attention should be paid to the control of microfilaria as a result of cross infection as recorded by (Wannaporn *et al.*, 2006).

## CONCLUSION AND RECOMMENDATION

We therefore concluded that the Nagana (Trypanosomiasis) control strategy put in place by the MoFA of Ghana has been able to successfully contain the disease in cattle at the study area. We also anticipate that to maintain insignificant disease levels in the cattle, the current control strategy must be maintained. Microfilaria control also should be incorporated into the National Trypanosomiasis (Nagana) control programme.

## REFERENCES

- Bradley, J.E., B.M. Atogho, L. Elson, G.R. Stewart and M.A. Boussinesq, 1998. Cocktail of recombinant *Onchocerca volvulus* antigens for serological diagnosis with the potential to predict the endemicity of onchocerciasis infection. *Trans. R. Soc. Trop. Med. Hyg.*, 59: 877-882.
- Chungpivat, S. and S. Sucharit, 1993. Microfilariae in cats in Bangkok Thai. *J. Vet. Med.*, 23: 75-87.
- Collobert, C., N. Bernard and C. Lamidey, 1995. Prevalence of *Onchocerca* species and *Thelazia lacrimalis* in horses examined post mortem in Normandy. *Vet. Rec.*, 136: 463-465.
- Einsenthal, R., 1997. Prospects for antiparasitic drugs. *J. Biol. Chem.*, 273: 5500-5505.
- Kuzoe, F.A.S., 1991. Perspectives in research on and control of African Trypanosomiasis annals. *Trop. Med. Parasitol.*, 85: 33-41.
- Lyons, E.T., T.W. Swerczek, S.C. Tolliver, H.D. Bair, J.H. Drudge and L.E. Ennis, 2000. Prevalence of selected species of intestinal parasites in equids at necropsy in Central Kentucky (1995-1999). *Vet. Parasitol.*, 92: 51-62.
- Marques, S.M. and M.L. Scroferneker, 2004. *Onchocerca cervicalis* in horses from Southern Brazil. *Trop. Anim. Health Prod.*, 36: 636-633.
- Monahan, C.M., M.R. Chapman, D.D. French and T.R. Klei, 1995. Efficacy of moxidectin oral gel against *Onchocerca cervicalis microfilariae*. *J. Parasitol.*, 81: 117-118.

Nithiuthai, S. and S. Chungpivat, 1992. Lymphatic filaria (*Brugia pahangi*) in dogs. *J. Thai Vet. Pract.*, 4: 123-133.

Pagot, J., 1992. *Animal Production in the Tropics and Subtropics*. Mac-Millan, London, pp: 517, ISBN 0-333-53818-8.

Wannaporn, J., C. Sudchit and V. Nareerat, 2006. The observation of microfilarial rate and density in cats inoculated with increasing numbers of *Brugia pahangi* infective larvae. *SE Asian J. Trop. Med. Pub. Hth.*, 37: 40-42.