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PACKED CELL VOLUME AS A MEASURE OF PORCINE HEALTH AND THE IMPLICATION ON THE CONTROL OF SLEEPING SICKNESS IN UGANDA

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Summary

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Information about pig health in Uganda is greatly lacking and recent studies have indicated a high prevalence of trypanosome infections among pigs kept in the tsetse infested and trypanosomosis endemic areas of Southeastern Uganda. This study looked at the packed cell volume as an indicator of the health status of the pigs kept in Southeastern Uganda. Whole blood was collected from pigs kept in three agroecological zones of Southeastern Uganda (designated as zone I, II and III) as these were predominant in the trypanosomiasis endemic foci of Kamuli, Mukono and Tororo districts respectively.

The packed cell volume (PCV) for the three zones was recorded at averages of 34.70 %, 28.70 % and 33.32 % for zones I, II and III respectively. Meanwhile pale mucous membranes were observed only in some pigs (not quantified) with PCV ≤ 23% otherwise it was not a common finding. For the three zones 8.71%; 18.37% and 21.95% of the pigs from zones I, II & III respectively had PCV ≤ 23%. During the investigation there were no complaints of ill health of the pigs in all the areas, save for zone III where African swine fever is thought to have been responsible for the death of pigs the previous year. Since this investigation was carried out at a time when the prevalence of *Trypanosoma brucei* infections were high among pigs in zone I and II, it is concluded that *T.brucei* sub-group infections among pigs are not associated with ill health of the pigs.

Key words: packed cell volume, pigs, sleeping sickness, trypanosomes

INTRODUCTION

Human African trypanosomiasis (HAT) and African animal trypanosomosis (AAT) are still a major constraint to human and animal health in Eastern Uganda. The impact of trypanosomiasis on the pig industry in Uganda is still unknown with very little attention being paid on the significance of trypanosome infection among this animal species (personal observation). Earlier studies by Okuna *et al*. (1986) and Katunguka-Rwakishaya (1996) suggested that the pig could be potentially carrying human infective parasites, and their role in the sleeping sickness transmission has

been recently defined by Waiswa *et al.* (2003). The association between humans and pigs combined with the fact that tsetse have partly become peridomestic because of the *Lantana camara* and the poorly managed banana/coffee plantations around the homestead (Waiswa *et al*., 2000) is of great concern especially as these animals carry the human infective trypanosomes. It is therefore becoming increasingly necessary to study the impact of the presence of *T.brucei* sub-group infections on the health of the pigs in the trypanosomiasis endemic areas. Since packed cell volume is among the parameters that are routinely measured in the district laboratories in Uganda, its usefulness as a measure of the health status of pigs in this country has to be evaluated.

MATERIALS AND METHODS

Study area

Selection of the study areas and sampling design. Three agroecological systems designated as zone I, zone II and zone III according to the PMA document (Anonymous, 2000) were studied as these were found to be predominant in many of the sleeping sickness foci of Southeastern Uganda. The selected districts were: Zone I (Kamuli district) where coffee–banana–rice/sugarcane–live stock are the major agricultural activities. Zone II (Mukono District) where coffee–banana–livestock are the major agricultural activities with vanilla as a new cash crop being taken up by the communities. Zone III (Tororo District) where millet–maize–upland rice–livestock are the major agricultural activities with typical riverine environment. Sub-counties with reports of new sleeping sickness cases were chosen for this study and a total of nine sub-counties (three from each agroecological zone) were selected as the study area.

Animal population. Kamuli district has 535 310 livestock of which 80 296 (15%) are pigs (Kamuli Veterinary Department records, 1998) while Mukono district has 405 310 livestock of which 81 062 (20%) are pigs (Mukono district Veterinary Department records, 1998) and Tororo district has about 425 215 livestock of which 21 260 (5%) are pigs (Tororo district Veterinary Department records, 1998).

Animal survey

Animal owners and mobilisation. The local leaders and the Veterinary Department Extension staff helped with the mobilization and information dissemination. Pig owners were advised to stay at home on the day of the "home to home visit" during blood sample taking and the pig was bled from the anterior vena cava. The blood was immediately transferred to a vial containing heparin as anticoagulant. A total of 1181 pigs were bled from the three Agroecological zones (839 from zone I; 301 from zone II and 41 from zone III).

Handling of animal blood samples. Five millilitres (5 mL) of whole blood was collected and examined for presence of trypanosomes by using the haematocrit centrifugation technique (HCT) (Woo, 1970). The procedure has already been described by Waiswa *et al.* (2003). The packed cell volume (PCV) was read using a Micro-haematocrit tube reader.

Isolation of T. brucei in mice

Male albino mice weighing between 19–22 g and 274 in total (Table 2) were used for purposes of isolating *T. brucei* from blood with PCV equal or less than 23%. The purpose was to try and isolate *T. brucei* from apparently aparasitaemic animals but with very low PCV. Two mice were

inoculated for each blood sample and marked using picric acid. The mice were kept in cages and housed in a fly proof unit at the faculty of Veterinary Medicine, Makerere University. In the monitoring of the development of parasitaemia, a drop of blood was collected from the tail of the mice and examined by the use of a wet blood film preparation, starting at day one post infection until development of parasitaemia or until 60 days post infection/blood inoculation. At the peak of the first rising parasitaemia, the mice were bled and the trypanosomes in whole blood (heparin anticoagulant) were then preserved with glycerol and stored in liquid nitrogen until needed for the trypanosome characterization studies using human serum resistance tests as described by Waiswa *et al.* (2003).

Trypanosome identification

In addition to ability to infect the mice, size and motility in the wet film were used to characterize the trypanosome isolates. Microscopic examination using the morphological characteristics of the trypanosomes in the thin blood smear were also used in the identification of the *T. brucei* subgroup trypanosomes.

RESULTS AND DISCUSSION

Mean PCV (%) values for pigs kept in the three zones were: Zone I = 34.70 %; Zone II = 28.70 % and Zone III = 33.32 %. The percentage of pigs with PCV ≤ 23 for each of the three agroecological systems were: Zone I = 8.71%; Zone II = 18.37% and Zone III = 21.95%.

Table 1 gives a summary of these PCV categories. Blood samples with PCV ≤ 23% were inoculated in mice regardless of whether they were microscopically positive for trypanosomes or not. A total of 5 *T. brucei* subgroup isolates (2 from zone I and 3 from zone II) were obtained from parasitologically negative pig blood which had PCV ≤ 23% and no *Nannomonas* group trypanosome was isolated from such blood (Table 2).

Records available show a Trypanosome prevalence of 17.53% among pigs in the study area with almost all (82.5%) being *T. brucei* sub-group infections (Waiswa *et al*., 2003). Moreover, the percentages of the *T. brucei* infections could be higher as some infections may end up undetected by the parasitological techniques (Nyeko *et al.,* 1990). Many of these *T.brucei* infections have been reported to be potentially human infective (Waiswa *et al.,* 2003) and this can be at-

Table 1. Summary of the PCV categories for the pigs from the three agroecological systems (zones)

PCV Category %	Zone I	Zone II	Zone III	Remarks
PCV ≤ 23	8.71 %	18.37 %	21.95 %	Blood samples inoculated in mice
PCV ≥ 24 %	91.29 %	81.63 %	78.05 %	Only trypanosome positive blood samples were inoculated in mice
Total number of pigs	839	301	41	1181 pigs for all the three zones

Table 2. *Trypanosome brucei* isolation from microscopically trypanosome negative blood samples with packed cell volume equal or less than 23%

Zone	Number of blood samples with PCV ≤ 23%	Number of mice inoculated	Number positive	Percentage
I	73	146	2	2.74
II	55	110	3	5.46
III	9	18	0	0.00
Total	137	274	5	3.65

Note: The *Trypanosome brucei* subgroup were the only trypanosomes isolated from blood with PCV ≤ 23%.

tributed to the little attention paid to trypanosomosis in pigs and lack of curative or prophylactic treatment with trypanocidal drugs (personal observation). The "Pig-Tsetse-Human" cycle remains undisturbed as *T. brucei* infected pigs can stay without showing any clinical signs as only some of the 8.71%, 18.37% and 21.95% of the pigs from zones I, II and III show signs of anaemia due to their PCV values being ≤ 23% and therefore miss out on the trypanocidal treatments that could have been given by the veterinary staff as is done in cattle. It is apparent that even the National policy for the control of tsetse and trypanosomosis in Uganda does not provide for the elimination of trypanosomes from pigs (personal observation). Ultimately, this animal becomes a risk factor for the humans as far as sleeping sickness is concerned.

While this study shows that *T. brucei* sub-group infections may not be a great cause of anemia and disease among the pigs, it is possible that infections with the *Nannomonas* type that are always recorded at very low levels (Okuna *et al*., 1986, Katunguka–Rwakishaya, 1996, Waiswa *et al.,* 2003) affect pig health in the tsetse infested areas of Uganda as *T.simiae* causes an acute disease which is sometimes characterized by low packed cell volumes among pigs (Ilemobade and Balogun, 1981). Similarly, studies have shown that pigs are an important host for *G. f. fuscipes*, the major vector for trypanosomiasis in Uganda (unpublished) and many tsetse catches are recorded around homes with piggery units (Okoth, 1986; Waiswa *et al.,* 2000). Because of this, there are high chances of infections being picked and transmitted to man or other hosts. Therefore, in the sleeping sickness endemic areas, extension workers should take blood samples from pigs and give them appropriate treatment even in circumstances where they do not show signs of ill health.

CONCLUSION

In this study, it has been shown that pigs that are microscopically negative for trypanosomes some times carry *T. brucei* subgroup infections. In developing countries where laboratories services in rural areas are limited to parasitological methods, the use of low PCV values as a basis

for treating pigs against trypanosomiasis would help in the control of sleeping sickness. Since the normal PCV values for porcine is in the range of 30-50%, we recommend that in the tsetse infested and trypanosomaiasis endemic areas of Uganda, pigs with PCV values lower than 30% get trypanocidal treatment for purposes of improving the health of the pigs and benefiting the sleeping sickness control programme especially in the sleeping sickness endemic foci areas like South-eastern Uganda.

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