

## Prevalence of bovine *trypanosomiasis* in the kangaba circle (Mali)

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### Abstract

This study carried out between September and November 2023, in the Kangaba circle aimed to determine the prevalence of trypanosomiasis. Blood samples taken from 219 cattle comprising 142 females and 77 males examined for trypanosomes. Trypanosomes identified using the Buffy coat technique. This work made it possible to obtain a prevalence of 35.16% bovine *trypanosoma*. Statistical analysis revealed a statistically significant difference ( $p < 0.05$ ) between the prevalence rates observed in the different species of trypanosomes identified, such as *Trypanosoma congolense* (68.83%), *T. vivax* (19.48%) and *T. brucei* (11.69%). The prevalence of trypanosomiasis observed in male and female cattle was 42.86% for male cattle and 30.99% for females. Statistical analysis of the results revealed a significant difference ( $p < 0.05$ ) between trypanosomiasis prevalence rates observed in adult cattle (8.14%) and in young cattle (52.63%). In the commune of Kaniogo, out of 110 cattle examined, 42 individuals were positive for trypanosomiasis, representing an overall prevalence rate of 38.18%. Regarding the commune of Karan, 35 cattle were positive for trypanosomiasis out of 109 subjects examined, representing an overall prevalence rate of 32.11%. The results of our work revealed that bovine *trypanosomiasis* constitutes a real threat to cattle in the Kangaba circle.

**Keywords:** Prevalence of bovine trypanosomiasis; Kangaba; Mali

### 1. Introduction

African animal *trypanosomiasis* is among the greatest obstacles to increasing animal productivity [1] and increasing agricultural production in sub-humid zones [13]. The Malian herd mainly made up of zebu (84%) and taurines (trypanotolerant) represent only 16%. The massive migration of zebu towards the south (following an endemic drought) and uncontrolled crossings (bullfights - zebu) practiced by sedentary breeders constitute a threat to the maintenance of trypanotolerance. According to FAO estimates [8], the direct and indirect losses of AAT (African Animal Trypanosomiasis) in production and investments in disease control vary between 1 and 1.5 billion US dollars per year in Africa. Some studies have revealed that this disease reduces the calving rate of trypanotolerant animals by 1 to 12% compared to a rate of 11 to 20% for trypanosensitive animals Swallow[13]. The impact of African animal *trypanosomiasis* on calf mortality would be between 0 and 10% for trypanotolerant animals compared to rates varying between 10 and 26% for trypanosensitive animals. Economic losses due to all animal pathologies south of the Sahara amount to 6 billion euros per year, a quarter of which is attributable to African animal *trypanosomiasis* alone [9]. The crossing of trypanotolerant animals with zebu over several generations has also given rise to crossbreeds, with the consequence of increasing the number of trypanosensitive animals in several localities in Mali, including the Kangaba circle. These various factors mean that bovine trypanosomiasis constitutes a real animal health problem today, especially for ruminants in Mali. This led us to carry out the present study in order to improve our knowledge on the trypanosomiasis situation in the Kangaba circle.

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## 2. Material and methods

Blood samples took from 219 cattle in the communes of Kaniogo and Karan. Blood collected from the jugular vein of cattle using a sampling needle in vacuum "Vacutainer" tubes containing the anticoagulant "EDTA". The site code, animal identification number and date of collection wrote on each tube. The tubes containing the collected blood placed in a rack then kept in cooler containing pieces of ice, then sent to the Central Veterinary Laboratory in Bamako. The diagnostic technique used the "Buffy coat". This technique consists of filling 2/3 of a microtube with blood from each vacutainer tube. Next sealing one end of the microtube with plasticine (sealing paste) then centrifuge the microtube in a hematocrit centrifuge for 5 minutes at 12,000 rpm then cut the microtube using a diamond-tipped pencil at 1mm below the interphase to include the red blood cell layer. Using the broken end of the microtube, place a drop on a slide and cover it with a coverslip then proceed to microscopic observation.

The results obtained following the microscopic observations entered with Microsoft EXCEL 2010 software and analyzed with Stata version 12.1 software. The "chi 2" test used to compare the different variables.

## 3. Results

### 3.1. Prevalence of bovine trypanosomiasis

219 cattle examined, among which 77 positive cases were recorded, representing an overall prevalence rate of 35.16%. A statistically significant difference ( $p < 0.05$ ) observed between the prevalence rates of *Trypanosoma* .congolense (68.83%), *T.vivax* (19.48%) and *T.brucei* (11.69%) parasites., (Table 1).

**Table 1** Prevalence of bovine trypanosomiasis

Results	Number	Prevalence(%)	Test Stat
Negative	142	64,84	X-squared = 37.406, $p\text{-value} = 9.591e^{-10}$
Positive	77	35,16	
<i>T.brucei</i>	9	11,69	X-squared = 66.545, $p\text{-value} = 3.547e^{-15}$
<i>T.congolense</i>	53	68,83	
<i>T.vivax</i>	15	19,48	
Total	219	35,16	-

$p\text{-value} < 0,05$

### 3.2. Prevalence of bovine trypanosomiasis by sex

The 219 cattle examined included 142 females and 77 males. Among female cattle, 44 individuals were positive for trypanosomosis, representing an overall prevalence of 30.99%. Among male cattle, 33 subjects were positive; representing an overall prevalence rate of 42.86%. In female cattle, there was a statistically significant difference ( $p < 0.05$ ) between the different species of trypanosomes *T.congolense* (75%), *T.vivax* (15.91) and *T.brucei* (9.09). ) (Table 2). There was a significant difference ( $p < 0.05$ ) between trypanosome species in male cattle, the prevalence rates of which were respectively 60.61% for *T.congolense*, 24.24% for *T.vivax* and 15. 15% for *T. brucei* (Table 2).

**Table 2** Prevalence of bovine trypanosomiasis by sex

Sex	Results	Number	Prevalence (%)	Test Stat
Female	Negative	98	69,01	X-squared = 39.563, $p\text{-value} = 3.176e^{-10}$
	Positive	44	30,99	
	Total 1	142		
	<i>T.brucei</i>	4	9,09	X-squared = 52.023, $p\text{-value} = 5.051e^{-12}$
	<i>T.congolense</i>	33	75,00	

	<i>T.vivax</i>	7	15,91	
Male	Négative	44	57,14	<i>X-squared</i> = 2.5974, <i>p-value</i> = 0.107
	Positive	33	42,86	
	Total 2	77		
	<i>T.brucei</i>	5	15,15	<i>X-squared</i> = 17.182, <i>p-value</i> = 0.0001858
	<i>T.congolense</i>	20	60,61	
<i>T.vivax</i>	8	24,24		
Total		77/219	35,16	-

### 3.3. Prevalence of bovine trypanosomiasis according to age

70 young cattle were positive for trypanosomiasis, representing an overall prevalence of 52.63%. Statistical analysis revealed in these young cattle, a statistically significant difference ( $p < 0.05$ ) between the species *T.congolense* (67.14%), *T.vivax* (20%) and *T.brucei* (12.86%). (Table 3). In adult cattle, 7 positive cases of trypanosomiasis were recorded, for an overall prevalence of 8.14%. Statistical analysis of the results revealed a significant difference ( $p < 0.05$ ) between the different species of trypanosomes *T.congolense* (85.71%), *T.vivax* (14.29%) and *T.brucei* (0.00%) (Table 3).

**Table 3** Prevalence of bovine trypanosomiasis according to age

Age	results	Number	Prevalence (%)	Test Stat
young	Negative	63	47,37	<i>X-squared</i> = 0.54135, <i>p-value</i> = 0.4619
	Positive	70	52,63	
	Total 1	133		
	<i>T.brucei</i>	9	12,86	<i>X-squared</i> = 54.814, <i>p-value</i> = 1.251 <sup>e-12</sup>
	<i>T.congolense</i>	47	67,14	
<i>T.vivax</i>	14	20,00		
Adults	Negative	79	91,86	<i>X-squared</i> = 117.23, <i>p-value</i> < 2.2 <sup>e-16</sup>
	Positive	7	8,14	
	Total 2	86		
	<i>T.brucei</i>	0	0,00	<i>X-squared</i> = 13.286, <i>p-value</i> = 0.001303
	<i>T.congolense</i>	6	85,71	
<i>T.vivax</i>	1	14,29		
Total		77/219	35,16	-

### 3.4. Prevalence of bovine trypanosomiasis by municipality

In the commune of Kaniogo, out of 110 cattle examined, 42 individuals were positive for *trypanosomiasis*, representing an overall prevalence rate of 38.18%. Regarding the commune of Karan, 35 cattle were positive for *trypanosomiasis* out of 109 subjects examined, representing an overall prevalence rate of 32.11%. The prevalence rates observed in the species of trypanosomes identified in the commune of Kaniogo are in descending order: *T.congolense* (64.29%), *T.vivax* (26.19%), *T.brucei* (9.52%). The prevalence rates of the different species of trypanosomes identified in the commune of Karan are *T.congolense* (74.29%), *T.brucei* (14.29%) and *T.vivax* (11.43%) (Table 4)

**Table 4** Prevalence of bovine trypanosomiasis by municipality

Cercle	municipality	Resultats	Nombre	Prévalence (%)
Kangaba	Kaniogo	Negative	68	61,82
		Positive	42	38,18
		S/total 9	110	-
		<i>T.brucei</i>	4	9,52
		<i>T.congolense</i>	27	64,29
		<i>T.vivax</i>	11	26,19
	Karan	Negative	74	67,89
		Positive	35	32,11
		S/total 10	109	-
		<i>T.brucei</i>	5	14,29
		<i>T.congolense</i>	26	74,29
		<i>T.vivax</i>	4	11,43
	Total 2		77/219	35,16

#### 4. Discussion

The prevalence rate of bovine *trypanosomosis* in the Kangaba circle was 35.16%. Our result is comparable to those obtained by Bocoum and al[4] and Dawit and al[6] who respectively recorded an overall prevalence rate of 33.1%, 28.1%, 30.86% and 25.8%. Furthermore, our results are different from those obtained by Jiregna (2016), Dinaol and al.[7], Mulugeta and al[11] and Bekele and al[3], which respectively obtained overall prevalence rates of 6%, 6.5%, 13.19% and 5.85% . This high rate of prevalence of bovine trypanosomiasis could be due to the crossing of trypanotolerant local breeds from the Kangaba circle with trypanosensitive zebus coming from the Sahelian regions of Mali. The uncontrolled treatment of sick cattle by pastoralists and agro-pastoralists in the absence of veterinary services. The geographical location of the Kangaba circle in the southern part of the Koulikoro region would also be one of the causes of the increase in the prevalence rate of bovine trypanosomiasis. This region recognized as one of the most tsetse-infested regions in Mali. The prevalence observed in *Trypanosoma. congolense*, *T. vivax* and *T.brucei* are respectively 68.83%, 19.48% and 11.69%. The predominance of *Trypanosoma congolense* explained by its high concentration in the blood of infected cattle. Our results are similar to those of Tilahun et al[14] who observed prevalences of 66.67%, 28.89% and 2.22% respectively in *Trypanosoma. congolense*, *T.vivax* and *T.brucei*. Dinaol and al.[7] obtained a prevalence of 60% for *Trypanosoma congolense*, 28% for *Trpanosoma vivax* and 12% for *Trpanosoma brucei*. Different results are also obtained by Bocoum et al[4] who observed prevalence rates of 9.58% for *T. vivax*, 89.72% for *T. congolense* and 0.68% for *T. brucei* among the different species of trypanosomes. The overall prevalence rates of trypanosomiasis observed in male and female cattle are 42.86% and 30.99%, respectively. Our results differ from those obtained by Dawit and al[6], was 26.9% in male cattle and 24.7% in females, Sitena[12] which obtained 1.4% and 2.7% for males and females respectively. The same differences were noted in the results obtained by Ashagrie and al[2] who observed prevalence rates of 4.6% in male cattle and 4.8% in females. Different results were also obtained by Bekele and al[3] who observed prevalence rates of 3.55% and 7.47% in male and female cattle. This result explained by the fact that male and female cattle have the same level of susceptibility to trypanosomiasis. The prevalence of trypanosomiasis observed in young and adult cattle 52.63% and 8.14% respectively. In our study, the young cattle aged 3 to 4 years and went to pasture with the adult cattle. Their high susceptibility to trypanosomiasis could be due to their prolonged contact with vectors on pastures. Our results are different from those obtained by Dawit et al.[6] who observed prevalence rates of 54.7% in adult cattle and 5% in young cattle. Our results are also different from those obtained by Sitena[12] who observed prevalence rates of 2.7% and 1.4% respectively in adult and young cattle. Different results were also obtained by Yehunie Bishaw and al[15] who observed prevalence rates of 8.6% in adults and 2.01% in young cattle in adult and young cattle. At the commune level, the overall prevalence rate of trypanosomiasis observed in the commune of Kaniogo was 38.18%. This result is comparable to that obtained by Bocoum et al[4] who observed an overall prevalence rate of 40.62% in the commune of Misseni. The overall prevalence rate of

trypanosomosis in the commune of Karan was 32.11%. This result is also comparable to the prevalence rate of trypanosomosis (27.08%) recorded by Bocoum and al.[4] in the commune of Zegoua. The similarity in the prevalence rates of bovine trypanosomiasis in the communes of Kaniogo and Karan explained by their belonging to the same ecoclimatic zone.

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## 5. Conclusion

This study revealed that bovine trypanosomosis poses a real threat to cattle in Kangaba circle.

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## Compliance with ethical standards

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### *Disclosure of conflict of interest*

Modibo DIAKITE coordinated the design and planning of the study, the implementation of the laboratory analyses and the writing of the article; Modibo DIAKITE Brahima SACKO, Youssouf Gouro DIALL, Mahamadou KONTE and Sekouba BENGALY, participated in the design, planning and implementation of the study; Amadou SERY participated in the statistical analysis of the data.

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