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IDENTIFICATION OF COMMON LIVESTOCK DISEASES AND INVENTORY OF CONTROL METHODS

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SUMMARY

The aim is to combat bovine haemo parasitosis, other diseases, and their vectors by identifying the symptoms, means and methods of control used by farmers. A survey was conducted from 05 May to 20 June 2020 and from 15 November to 17 December 2022 in the department of Kounahiri. Livestock breeders and agri-breeders were selected in this locality and questionnaires were sent to them to assess their perception of livestock farming. As for the farmers, the focus was on the symptoms of bovine anaplasmosis and other recurrent diseases, as well as the variability of control methods. The majority (63.92%) of the population surveyed considered livestock farming to be a secondary activity, even though they were involved in it. The lack of early diagnosis led to the identification of several clinical signs, the most common of which were diarrhea (100%), lesions (100%) and respiratory difficulties (94.29%). Several methods were used to control the vectors, the main ones being spraying and injections. The molecules most frequently used to control ticks and biting flies were Promectin1% and Phypronil goldem, with frequencies of 40% and 30% respectively. For bovine anaplasmosis and other recurrent pathologies, Peni strepto and Oxytetracycline were the most widely used molecules, with identical frequencies of 18.72%. What's more, 82.86% of farmers did not respect the dosage of antibiotics, acaricides and antiparasitic (P=0.0001). By exploring the collaborative efforts of stakeholders, the study provides an overview of the measures being taken to address these health challenges in cattle.

KEYWORDS: anaplasmosis, clinical signs, Côte d'Ivoire, diseases livestock, vector.

INTRODUCTION

Food security and agricultural development are major strategic issues. Undoubtedly, issues such as increasing demographic, food and climate constraints are now taking on a more structural dimension.[1] However, small-scale farmers in developing countries are among the populations most affected by climate change. This is due to agriculture's dependence on weather conditions and the low resilience of farming systems to climate variability and change.[2] As a result, agricultural production environments have weakened, and this is shifting agricultural production activities towards livestock production. Yet the latter is also likely to suffer from frequent droughts that vary by region and time.[3] The repercussions of losses inflicted by a pathology can be very significant for populations with catastrophic effects in terms of food security.[4] Meat is the most valuable livestock product and, for many people, serves as a prime source of animal protein. It is either consumed as a component of kitchen-style food preparations or as processed meat products.[5] It constitutes a very favorable ground for parasitic diseases, such as fasciolosis and hydatidosis, infections, such as tuberculosis and abscesses, and physical issues, such as traumatic meats, which are zoonotic or non-zoonotic pathological findings with the mode of transmission either direct or indirect and causing serious economic losses.[6] Livestock may in addition act as reservoirs for pathogens that can also infect humans, a particular problem where humans and farmed animals come into close contact.[5] Besides, veterinary treatments, mainly antibiotics, used for therapeutic or prophylactic purposes in dairy cows[7], may be the cause of the presence of their residues in milk and meat. These residues can sometimes be a danger for

the consumer by triggering rare allergic and toxic cases, or by promoting the emergence of a multi-resistant microflora.[8] In addition, they constitute one of the major constraints to the emergence of livestock production units in West Africa.[9] Above all, infections due to Anaplasma spp are very important.[10] Anaplasma spp are obligate intracellular, Gram-negative bacteria infecting animals as well as humans and are transmitted by ticks.[11] On the other hand, climate change is already weighing on agricultural yields in some African, Caribbean and Pacific (ACP) countries. It is also having a negative impact on the abundance and distribution of fish stocks, the nutritional quality of foodstuffs, and biodiversity.[2] As a result, farmers' perception of lifting has an impact on the extent of means to control anaplasmosis, its vectors and vector-borne diseases. Limited resources and climatic hazards that have a negative impact on crops should prompt farmers to diversify their sources of income. Many techniques are used for early diagnosis of bovine tuberculosis, either being antemortem or postmortem, each with its diagnostic merits as well as limitations. Antemortem techniques depend either on cellular or on humoral immune responses, while postmortem diagnosis depends on adequate visual inspection, palpation, and subsequent diagnostic procedures such as bacterial isolation, characteristic histopathology, and PCR to reach the final diagnosis.[12] Controlling the symptoms of bovine anaplasmosis, other pathologies even though they are non-specific, will enable farmers to consume better-quality products. The aim is to combat bovine haemo parasitosis, other diseases, and their vectors by identifying the symptoms, means and methods of control used by farmers.

MATERIALS AND METHODS

Study site

This work took place from May 2020 to December 2022 in the department of Kounahiri in the Béré region. The chief town of the Béré region is 520 Km from the city of Abidjan. It is located in the North Center of Côte d'Ivoire and this department lies precisely between latitudes 7°30' and 8°10' N then longitudes 5°40' and 6°20'W and covers an area of 2110 km², its population is estimated at 101111 in habitants.[13] Its population is predominantly rural and agricultural. The department lies between the medium and low forest agro-climatic zones (**Figure 1**). The medium forest zone has an equatorial climate with two rainy and two dry seasons. The climate has only two seasons (wet and dry). Average rainfall is 899.6 mm. The area available for development is 50,000 hectares. There are two types of vegetation: sub-Sudanese savannah in the northern part of the region, and Sudanese savannah in the extreme south. Livestock farming is one of the region's most important activities.

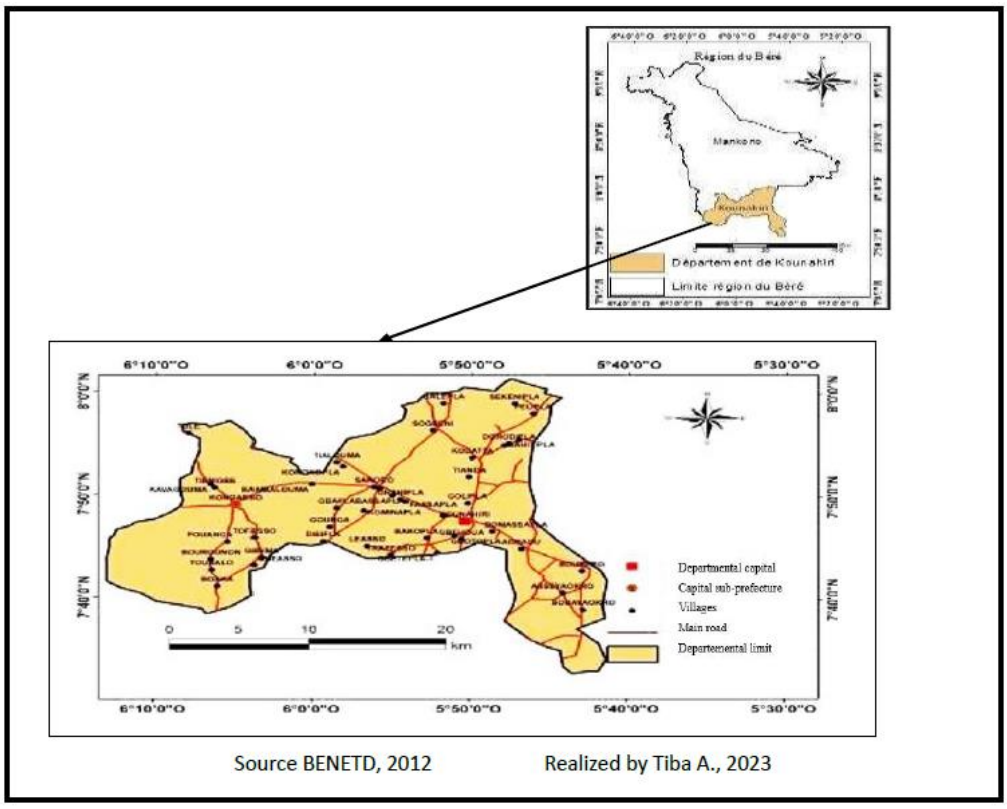

Figure 1: Map of Kounahiri department.

Processes

A total of 105 livestock farmers and agro-pastoralists with livestock were selected in this locality. At least one farmer or herder was interviewed. The interviewee was then used as a channel to find the next person to be included in the survey. The farmers interviewed were the

guardians of breeders owning at least one head of cattle and having agricultural property in the vicinity of the cattle farms. The aim was to assess their perception of livestock farming. The questionnaires addressed to farmers also concerned the diversification of their source of income in the face of irregular rainfall due to climate change. As for livestock farmers, the focus was on the symptoms of bovine anaplasmosis and other recurrent diseases, as well as the variability of control methods. The aim was to assess their level of involvement in the fight against anaplasmosis, its vectors and vector-borne diseases. In order to take photographs of the physical symptoms, the animals were stabilized in restraint pens. We recognize that animals are sentient beings and are committed to treating them with respect, compassion and care throughout our work.

Statistical analysis

The data collected from the questionnaires were entered using Sphinx software. The Chi-square ($\chi 2$) test was then used to compare the frequencies and prevalence of the various parameters discussed. All statistical tests used were considered significant at the 5% level.

RESULTS

Variability of clinical signs and recurrent effects of ticks and other vectors

On all the farms (35), clinical observations and information gathered from farmers on the history of the animals on each farm reveal a diversity of bovine diseases. Farmers report that the obstacles inflicted on cattle by ticks and other vectors are mainly: sudden death, respiratory difficulties, diarrhea, lesions (skin and between the hooves), discharges (ocular, nasal and oral), nodular dermatitis and isolation (**Figure 2**). On the other hand, veterinary officers met at the sampling sites revealed other diseases of very low frequency on the farms. These include babesiosis, foot-and-mouth disease, bluetongue and bovine pleuropneumonia. The effects most frequently encountered on the majority of farms were respiratory difficulties (94.29%), diarrhea (100%) and lesions (100%). Next, discharge and nodular dermatitis were moderately observed on the farms surveyed, with specific prevalence of 68.57% and 31.43%. On the other hand, sudden death with a prevalence of 2.86%, isolation, foot-and-mouth disease, bluetongue and bovine pleuropneumonia were the least observed effects (**Table 1**). Statically, there was a significant difference (P=0.0001) in the occurrence of the effects of ticks and biting insects on the farms surveyed.

Table 1: Diversity of recurring effects.

		Number of positive farms N = 35	Frequency (%)	P-value
Clinical signs and recurrent effects	sudden death	1/35	2.86^{e}	0.0001*
	breathing difficulties	33/35	94.29^{a}	
	Diarrhea	35/35	100^{a}	
	Lesions (cutaneous and inter-hoof)	35/35	100^{a}	
	Discharges (ocular, nasal and oral)	24/35	68.57^{b}	
	nodular dermatitis	11/35	31.43^{c}	
	Isolation	6/35	17.14^{d}	
	Babesiosis	35/35	100^{a}	
	foot-and-mouth disease	4/35	11.43^{d}	
	Bluetongue	2/35	5.71^{e}	
	bovine pleuropneumonia	1/35	2.86^{f}	

*Values in the same column not bearing the same superscript letter differ significantly at p-value = 0.0001 for each parameter. * Very significant*

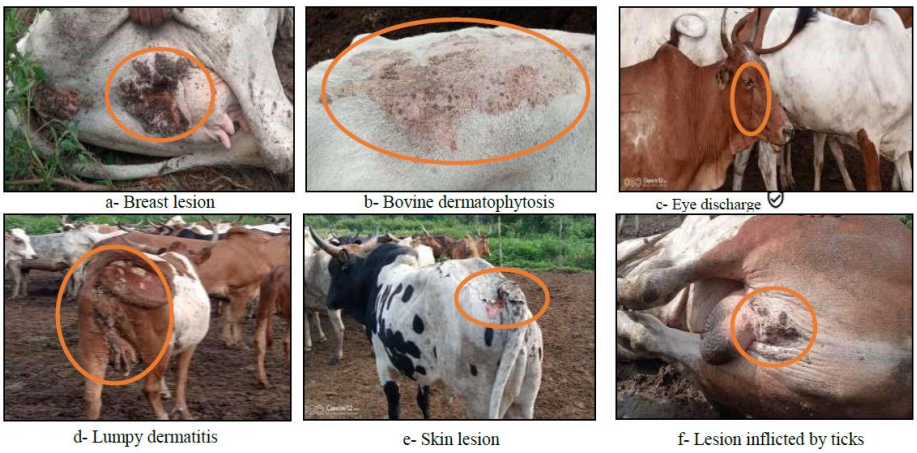

Figure 2: Variability of symptoms of anaplasmosis from other blood parasites.

Inventory of vector control measures

Faced with the damage caused by biting insects, ticks and tick-borne diseases, the livestock farmers and veterinary surgeons interviewed use a multitude of molecules. According to these livestock professionals, the means and methods of control are often specific, but some have a broad spectrum of action. In the fight against ticks and biting insects (biting flies and others), spraying and injections are the main (100%) control methods. With regard to antiticides, the antiparasiticides and other means of controlling ticks and biting flies observed were mainly: Cypermetrin CIS: 10% W/V MN. (Ectosip), Ivermectin 1%, Promectin1%, Phypronil goldem (tic-mouche) and Potasse. On most farms, the molecules most frequently used to control ticks and biting flies were Promectin1% and Phypronil goldem, with prevalences of 40% and 30% respectively. These were followed by Cypermetrin CIS: 10% W/V MN (16.25%) and Ivermectin 1% (8.75%). Potash and other mixtures were the products least used by farmers, with proportions of 3.75% and 1.25% respectively. Statistical analysis shows a significant difference (P=0.0001) in the use of the different control methods (**Figure 3**).

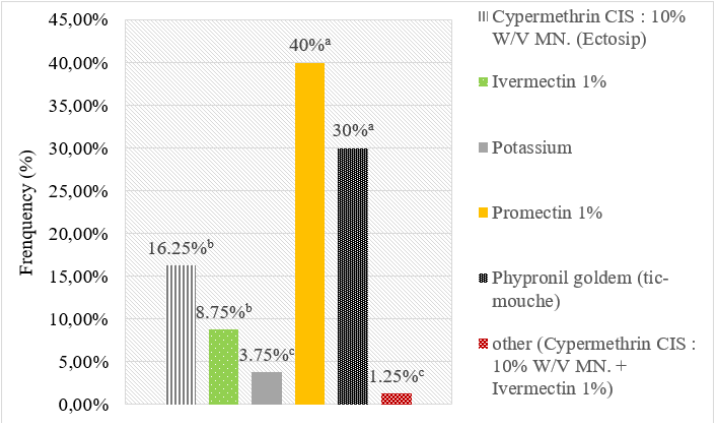

Figure 3: Evaluation of the frequency of means of control against *Anaplasma* vectors.

Identification of the means of fight anaplasmosis and other pathologies

Antiparasitic, internal and external deworming are the main control methods. Breeders most often used several molecules, including: Tylocare injectable, Diminaveto, Tylosine 20% (macrolide family: macrolides), Oxytetracyline (Oxytetracyline 10%, and Oxytetracyline long acting 20%), Veridium, Trypamidium Samorin 125mg, Securidium, Peni strepto, Tylosin tartrate (Tylodozer), Albendazole Bolus-2500mg, Veriben B12 (diamidine family), Vitabolus and Survidium 2,36g. To deal with recurrent pathologies, Peni strepto and Oxytetracyline were the most frequently used molecules, with identical frequencies of 18.72%. Breeders also used other veterinary medicines, but at relatively low rates: Trypamidium Samorin 125mg (12.83%), Survidium 2.36g (10.70%), Albendazole Bolus-2500mg (7.49%) and Tylosine 20% (10.16%). Breeders also claim that other molecules were used in most known and specific cases. These included Tylocare injectable, Diminaveto, Veridium, Securidium, Tylosin tartrate, Albendazole Bolus-2500mg, Veriben B12 and Survidium 2.36g at different frequencies (**Figure 4**). Statistical analysis reveals a highly significant difference (P = 0.0001) in the frequency of use of the molecules.

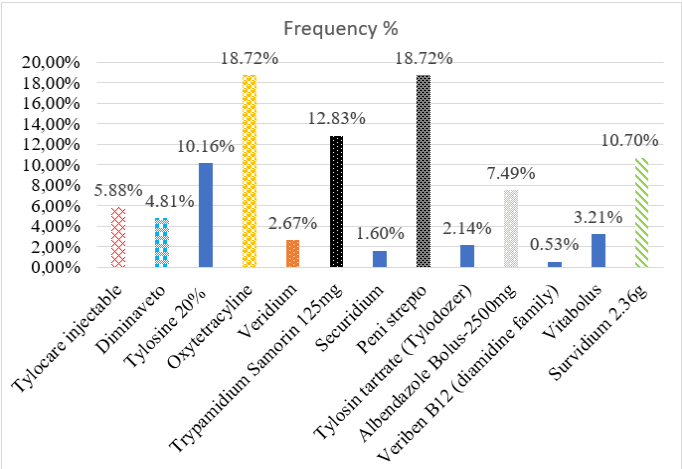

Figure 4: Evaluation of the frequency of the means of control against Anaplasma and common livestock diseases.

Evaluation of factors influencing the effectiveness of control methods

The results of this study suggest that several factors could influence the effectiveness of control methods and means. Due to their level of education, the importance attached to livestock farming, the availability of veterinary services and their ethnic group, livestock farmers in this locality reveal the ineffectiveness of animal protection actions. In terms of education, only 6.67% of the livestock farmers interviewed could read and write, compared with over ¾ (93.33%) who were uneducated. On the other hand, 98 out of 105 people interviewed, either 92.38%, had livestock farming as a secondary activity. As for veterinary services, the majority (89.52%) of these populations indicated that they were inaccessible. Other ethnic groups were more involved in livestock farming in this zone than the Fulani and Mona. In contrast, the Ouan and Gouro were not involved in pastoral activities (**Table 2**).

Table 2: Summary of factors influencing the effectiveness of control means and methods.

Factors		Number N = 105	Prevalence (%)	P-value
educational level	Educated	7/105	6.67^{b}	0.0001^{*}
	Uneducated	98/105	93.33^{a}	
Place given to breeding	Main activity	8/105	$7/62^{b}$	0.0001^{*}
	Secondary activity	97/105	92.38^{a}	
Veterinary service	Accessible	11/105	10.48^{b}	0.0001^{*}
	Inaccessible	94/105	89.52^{a}	
Ethnic group	Peul	10/105	9.52^{b}	0.0001^{*}
	Mona	4/105	3.81^{c}	
	Ouan	-	-	
	Gouro	-	-	
	Other	91/105	86.67^{a}	

*Values in the same column not bearing the same superscript letter differ significantly at p-value = 0.0001 for each parameter. * Very significant*

Identification of inconsistencies in control methods

Suggested treatments for cattle show a number of shortcomings in terms of dosage, frequency of use and specificity to the pathology. Three modes of use were observed: overdosing, underdosing and normal dosing. In the majority (82.86%) of farms, the molecules used were either low-dose or overdose. Only a few (17.14%) were able to comply with the recommended dosage (Graph A). Consequently, they had no sanitary prophylaxis program in place on their farms (all 35 of them). In addition, the frequency of use of veterinary care was mostly daily and quarterly (Graph B). The respective proportions of medication use were (68.57% and 31.43%). On all farms (100%), the molecules used were broad-spectrum. However, a few with a more specific action were also used (**Figure 5**), representing a prevalence of 31.43% (Graph C).

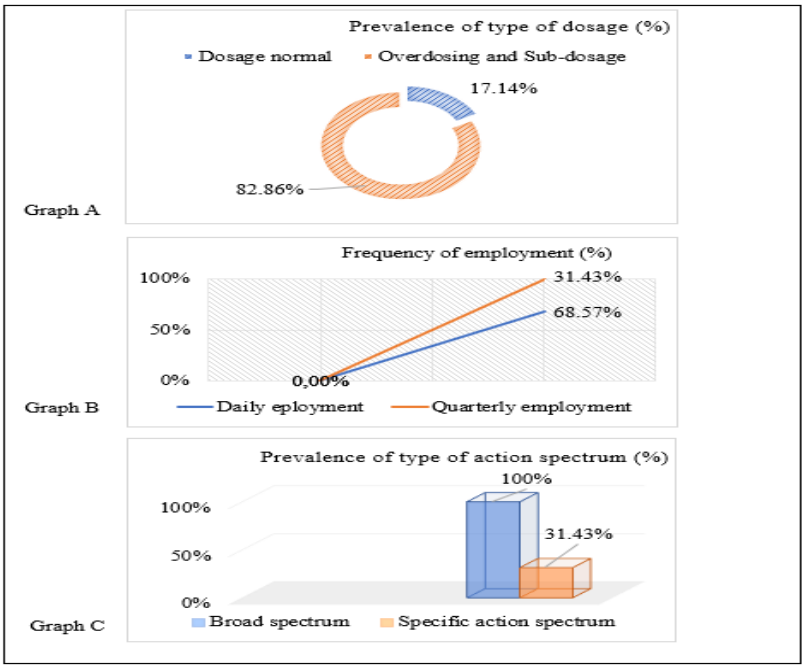

Figure 5: Factors of inconsistencies in control means and methods.

DISCUSSION

With regard to the diversity of clinical signs observed in these cattle, the effects most frequently encountered in the majority of farms were respiratory difficulties (94.29%), diarrhoea (100%) and lesions (100%). The high proportion of diarrhoea can be explained by the abusive use of pesticides by farmers to treat their crops, most of which are close to and in the path of the herds. A high vector load and the combined action of ticks are also thought to be responsible for the lesions. Our results are similar to those of Kumar et al. According to them, the most characteristic symptoms of anaplasmosis are anaemia, anorexia, pyrexia, depression and jaundice in large ruminants. In addition, Anaplasma marginale infection can also lead to reduced milk production, abortion in pregnant females and in extreme cases kill animals.[14] Similar clinical manifestations such as diarrhoea syndrome and respiratory problems have been observed in China in cattle with respective ratios of 7.96% and 4.19%[15], although radically lower than our infection rates obtained. A study carried out in Gondar in north-west Ethiopia revealed the overall seroprevalence of bovine viral diarrhea in a herd at 68.3%.[16]

Various means of vector control are used by breeders, mostly at relatively different frequencies. The acaricides Promectin 1% and Phypronil goldem were the most widely used, with prevalencies of 40% and 30% respectively. This may be due to a number of factors: firstly, the choice of these two acaricides was based on their affordability on the market and their availability. Secondly, the majority of acaricides were increasingly ineffective, and in most cases did not comply with the manufacturer's recommendations. Similar work by Yéo and colleagues indicates a prevalence of 94.64% of sedentary farmers resorting to acaricides due to resistance developed by mites on animals.[17]

The fight against parasitosis and other bovine pathologies appears to be a major preoccupation for livestock farmers, given the diversity and high frequency of these diseases. Peni strepto and Oxytetracyline are the most widely used molecules, with identical frequencies of 18.72%. The massive use of these two molecules would appear to be due to their efficacy, approved by breeders, but also to their spectrum of action and cost. This work does not confirm the research by Achi et al. who claim that Amitraz, the veterinary drug, has been popularized by agents of the Company for the Development of Animal Production.[18] The molecules also differ from those used in the treatment of acute anaplasmosis by Shan and colleagues. The efficacy of single-dose enrofloxacin (ENR) 100mg/mL (5.7mg/Ib; 12.5mg/kg) subcutaneously was 81.8%.[19] Work carried out with a view to assessing the ability of oxytetracycline to eliminate the persistence of Anaplasma marginale in cattle and calves has been approved. During the experiments, oxytetracycline was injected at 19.8mg/kg body weight into infected cattle three times at three-week intervals.[20]

Several factors have an impact on the effectiveness of the control methods used by farmers. The lack of literacy among more than ¾ (93.33%) of the farmers questioned, and the lack of access to veterinary services for the majority (89.52%), were the main limiting factors. This can be explained by the shortage of veterinary doctors or their poor distribution across the country. In addition, the poor appreciation of parents for educated young people who decide to return to livestock farming, the lack of organization among livestock farmers that could attract the attention of decision-makers, and the low level of early diagnosis. This differs from the findings in northern Benin, where classes grouping all cattle breeders with primary and secondary education the majority of breeders buy antibiotics from the vet, seek his advice when buying or administering antibiotics and adapt the dosage to the live weight of the cattle.[21] Mensah and colleagues also point out that instruction seems to promote the correct use of antibiotics among herders in their study carried out in northwest Benin.[22]

Numerous shortcomings were noted in terms of dosage, frequency of use and specificity of control methods. Firstly, the majority (82.86%) of farmers used molecules either in low doses or overdoses, and secondly, all (100%) used molecules with a broad spectrum of action. This may explain the rapid spread of the disease, the vectors and their control in endemic areas, and the increased parasite load. Our results do not contradict those of Yéo and colleagues in a study conducted in the Poro region of Côte d'Ivoire, which showed that 85.71% of antibiotics were injected by sedentary herders at low doses.[17] Contrary results were obtained by Suriyasathaporn et al. who showed that two classes do not comply or comply moderately with the rules for antibiotic use and constitute the high and medium risk classes respectively for the development of antibiotic resistance and the presence of antibiotic residues in milk and meat.[23]

CONCLUSION

Although livestock farming is mainly seen as a secondary activity, despite the enormous climatic and economic difficulties faced by farmers, it nevertheless plays an important role in this area. As a result, a multitude of pathologies are rife, with alarming clinical signs that are not lost on farmers. But the lack of veterinary services for early diagnosis and advice on the use of antibiotics in accordance with the correct dosage is a real obstacle to effective control of bovine anaplasmosis and all the other pathologies affecting cattle. In addition, educating livestock farmers to improve husbandry practices is essential for rapid treatment, prevention and optimal control of diseases and their vectors.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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