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Use of Antibiotics in Dairy Cattle Farms in Vina, Department of the Adamawa Region in Cameroon

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Authors' contributions

This work was carried out in collaboration among all authors. Author BA supervised and was involved in writing the original draft. Author MAD was involved in the conceptualization. Author WM carried out the survey. Author TV was involved in the development of the methodology. Author AD managed the software and provided monitoring. Author NA supervised and validated the manuscript revision and editing. All authors read and approved the final manuscript.

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ABSTRACT

Aims: Antimicrobial resistance is a major risk factor for therapeutic failure and the spread of multi-resistant strains. The misuse of antibiotics in livestock is a practice that promotes the development of resistance. The objective of this work was to evaluate the risk factors linked to the use of antibiotics in dairy farms in the Vina Department (Adamawa - Cameroon).

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Place and Duration of Study: The study covered dairy cattle farms identified and distributed between the municipalities of Tchabal and Manwi from July to August 2021.
Methodology: A survey was carried out with 26 farmers to assess practices promoting the selection of resistant bacteria on dairy farms. The questions were answered during an interview with various breeders during visits to the farms. The questionnaire covered the general knowledge of the farmers about antibiotics, their trade names, their origin and how they are used.
Results: Our work revealed the use of antibiotics in self-medication without prior prescription by the veterinarian in all (100%) surveyed farms, due to lack of means (66.66%) and experience (33.34%). We also observed a high rate of systematic self-medication in the presence of an ill animal (83%). The surveys also showed that the choice of antibiotic molecule is 100% dependent on the habits and experience of farmers with a high proportion of use of tetracycline (56.4%) followed by β - Lactamine (31.4%).
Conclusion: The study focused on dairy cattle farms identified in the Vina Department, in the Adamawa region and distributed between the communes of Tchabal and Manwi.

Keywords: Investigation; antibiotic; dairy cattle; resistance; vina.

1. INTRODUCTION

The discovery and use of antibiotics in the last century has led to a change in medical history, improving life-threatening outcomes for many patients with infectious diseases (Binsaleh et al., 2024).

However, the emergence of antibiotic-resistant bacterial strains has ended with optimism generated by the discovery of effective antibiotics for the treatment of infections (Yaacoub et al., 2022). This resistance is now a serious public health problem (Kahn, 2016).

In terms of animal and human health, the development of antibiotic resistance raises the risk of finding a therapeutic impasse with regard to certain bacterial infections. To limit the zoonotic risk of transmission of these bacteria in humans, and therefore the risk of therapeutic failure, controlling antimicrobial resistance in the animal sector becomes essential (Kahn, 2016; Rahman and Hollis, 2023).

These types of resistance develop, among others, following the use of antibiotics in veterinary medicine (Kahn, 2016; (Rahman and Hollis, 2023; Sanders, 2010; Sanders et al., 2011; Bourély et al., 2019; Battraud, 2017). In this sense, surveillance networks have been established to monitor the proportion of resistant bacteria (Sanders et al., 2011; Madec et al., 2012; Casseri et al., 2022). In parallel, regulatory measures were put in place to control the consumption of antibiotics (Nouedjalié et al., 2019). However, the misuse of antibiotics in production animals is a practice that promotes the development of resistance (Kahn, 2016; ANSES, 2014; AFSSA, 2006). Antibiotics are widely used in prophylactic livestock systems or as feed additives or growth factors for animals (Bagre et al., 2015; Ben-Mahdi and Ouslimani, 2009). The dairy sector appears to be the most antibiotic-consuming sector, ahead of the breastfeeding sector (Cazeau et al., 2010; Gras-Martín et al., 2024). This type of use induces changes in the digestive flora of animals, leading to the emergence of resistant strains (Fabre et al., 2000; González et al., 2010). Their use is essential to avoid major economic losses (morbidity, mortality) associated with livestock diseases (mastitis, for example), so their use must be reasonable to perpetuate their availability and effectiveness (Sanders, 2005; Oliver et al., 2011). To achieve this same objective, farmers must master the risk factors (or practices at risk) associated with their use and management (Sanders et al., 2011; Casseri et al., 2022; Karen et al., 2017; David et al., 2018). Similarly, the WHO predicts that by 2050, antibiotic-resistant infectious diseases will be the leading cause of death by disease (World Health Organization, 2016). These factors are thus an indispensable part of the overall evaluation of antimicrobial resistance. This is why a survey was conducted on the use of antibiotics by dairy farmers to assess the presence of practices that promote the selection of resistant bacteria.

2. MATERIALS AND METHODS

2.1 Study Area

Located between the 6th and 8th degrees of latitude north and between the 11th and 15th degrees of longitude east, the region of Adamawa borders Nigeria to the west and the

Central African Republic to the east. Its capital is Ngaoundere. This mountainous area marks the border between southern forest Cameroon and northern savannas. With an area of nearly 637.014 km^2, Adamawa is the third largest region in Cameroon. Its population was estimated at approximately 12.053.815 in 2016 compared with 8.842.896 in 2005, for a population density of 19 inhabitants/km^2 (Andrianarison et al., 2022). It has 5 departments, including Vina, which is subdivided into eight arrondissements with Ngaoundere as its capital. The Vina covers an area of 17,196 km^2 and has approximately 317,888 inhabitants for a herd, estimated at 6,386,900 heads (Andrianarison et al., 2022; National Institute of Statistics, 2016).

The study covered 26 dairy cattle farms identified and distributed between the municipalities of Tchabal and Manwi.

2.2 Investigation

The bibliographical data on the use of antibiotics in cattle breeding allowed the identification of risk factors that could be involved in the emergence of resistant bacteria. For practical purposes, the study focused on two main factors that need clarification (Casseri et al., 2022). This is self-medication and noncompliance.

The survey was conducted from July to August 2021 using a participatory approach, which was based on voluntary work, aiming at an indiscriminate approach of breeders for their adherence to the study.

The questionnaire, modeled on Millogo *et al.* (2008), was modified and adapted for the study. It included general knowledge of antibiotics (generic name, family, trade name, composition, active ingredient, spectrum of action and half-life), origin and mode of use of antibiotics (dose, type of treatment, frequency of use).

2.3 Statistical Analyses

The database was created and managed using Access software (Microsoft office corporation 2019). Quantitative data were entered using Excel (Microsoft office corporation 2019) and analyzed using Statistical Package for the Social Sciences 17.0 (SPSS). The mean, standard deviation, minimum, maximum and median of the sensitivity, specificity, positive predictive value and negative predictive of publications were calculated.

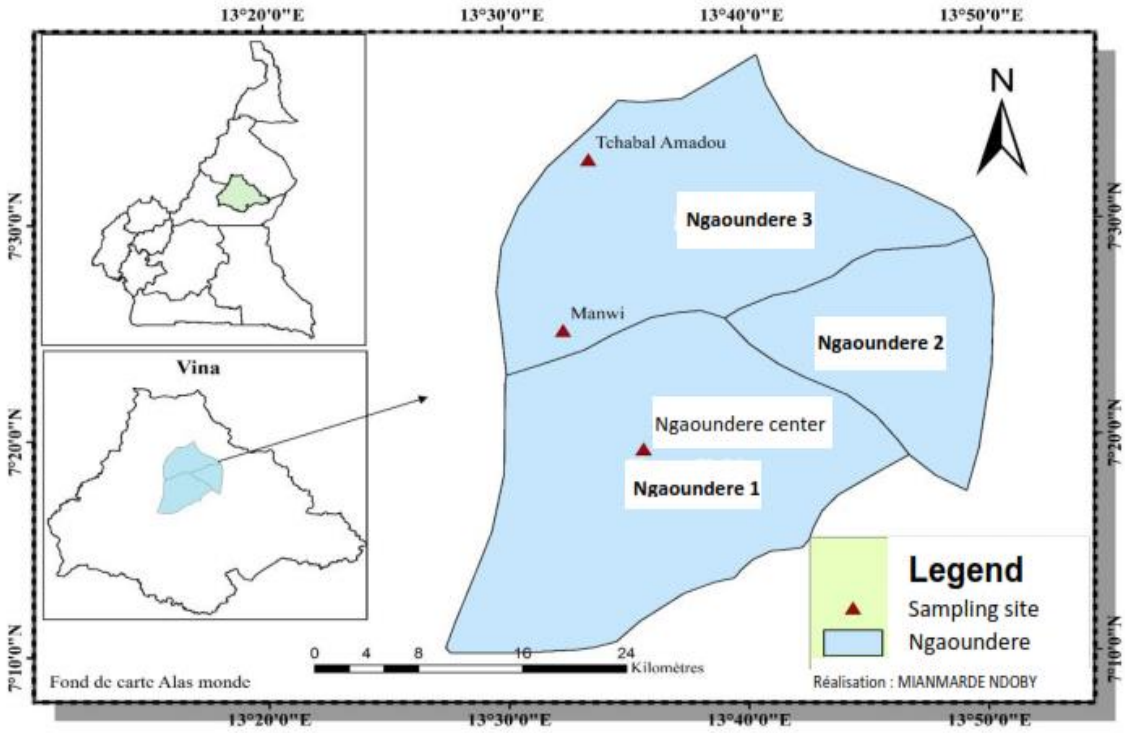

Fig. 1. Map of the study area location

3. RESULTS AND DISCUSSION

Of the 26 breeders approached for the study, only 12 answered the questionnaire, for a participation rate of 46.15%. The remaining 14 or 53.85% of the participants were breeders who categorically refused to contribute to the study (38.47%), and those with a very low level of education were excluded, implying the impossibility of communication (15.38%).

Table 1 below shows the various practices identified as being at risk by the investigation. These include self-medication and noncompliance with prescriptions.

The survey results revealed that all (100%) of the farmers used antibiotics for self-medication without a veterinary prescription. Among these, 8/12 (66.66%) were due to a lack of means, and 4/12 (33.34%) were due to experience and/or habits. These results are similar to the observations of Chatellet (2007) and Mlala (2016) on the use of antibiotics in cattle breeding in Anjou and La Loire and Puy-de-Dôme, who reported values of 87% and 82%, respectively. The difference in proportions in the results can be explained by the difference observed in the population studied as well as the sample size that led to the surveys being laundered.

Similarly, the frequency of use of antibiotics without a medical prescription remains very high, with 10/12 (or 83%) breeders practicing self-medication systematically in the presence of an ill animal compared with 2/12 (or 17%) who use a veterinarian in the event of livestock disease. The main reasons for self-medication are based on experience and economic factors for 66.66% of breeders and only experience for 33.34% of breeders.

The surveys also revealed that the choice of antibiotic is a function of habits and/or experience for all breeders (100%). This practice may be a significant factor in causing inappropriate, ineffective or unnecessary antibiotic treatment against the pathogen present (unadapted spectrum, nonbacterial microbiological agents, poorly defined dosage) (ANSES, 2014;Chardon and Brugere, 2014; Marquis et al., 2016).

Notably, in our study, 42% of breeders (5/12) put in a second treatment before resorting to the veterinarian. Indeed, any use of antibiotics exposes bacteria to selection pressure (Sanders et al., 2011), and the multiplicity of treatments is a risk of selection by multiresistant bacteria (Casseri et al., 2022).

Our study revealed compliance with veterinary agent prescriptions for 66.66% of the patients. In contrast, 33.34% of cases, owing to a lack of means, are called upon to fall back on generic and less expensive antibiotic molecules. Alternatively, after the health of the animal improves, the treatment should be discontinued, or the dosage and frequency of antibiotic administration should be changed. Notably, the modification of the antibiotic and its dosage, duration or frequency of administration are risk factors related to the emergence of resistant bacteria. Additionally, it can result in a lack of bacteriological healing in animals and is responsible for chronic transmission of virulent bacteria (Sanders et al., 2011; Haenni et al., 2012).

Tetracycline was the most commonly used antibiotic by breeders, with a proportion of 56.4%, followed by β-lactamine (31.4%). According to the farmers interviewed, their high use is due to their wider spectrum of action, their high availability and their convenient and easy administration. Our results are similar to those of Gay *et al.* (2012), who reported that breeders used more tetracycline and β-lactams to treat their animals.

Table 1. Risky practices

Risky practices	Proportion of livestock farmers (N/%)	
	Yes	Non
Practice of self-medication	12 (100)	00 (0)
Systematic practice of self-medication in case of illness	10 (83.34)	2 (16.66)
Antibiotic use by habit and/or experience	4 (33.34)	8 (66.66)
Antibiotic choice by habit and/or experience	12 (100)	00 (0)
Use of a veterinarian after failure to self-medicate	7 (58.34)	5 (41.66)
Compliance with the veterinary prescription	8 (66.66)	4 (33.34)
Discontinuation of treatment after improvement in animal health	4 (33.34)	8 (66.66)
Caution on self-medication by the veterinarian	12 (100)	00 (0)

According to Cazeau *et al.* (2009) and Gay *et al*. (2012), veterinarians use broad-spectrum molecules in the majority of treatments. To limit the occurrence of resistant bacteria, narrow-spectrum molecules are preferable (ANSES, 2014). Indeed, only bacteria with antibiotic resistance mechanisms multiply and proliferate (Sanders et al., 2011; AFSSA, 2006). Thus, the use of a product with a narrow spectrum limits the impact of destruction of the commensal flora (ANSES, 2014). Competition between microorganisms is maintained, which limits the emergence of these potentially resistant and virulent bacteria (Sanders et al., 2011; AFSSA, 2006; Mcewen and Fedorka-Cray, 2002).

4. CONCLUSION

Our survey results show that antibiotics are frequently used without veterinary agent prescription on dairy cattle farms in Vina. We have identified use of antibiotics in self-medication without prior prescription by the veterinarian in all (100%) surveyed farms, due to lack of means (66.66%) and experience (33.34%). We also observed a high rate of systematic self-medication in the presence of an ill animal (83%). Additionally, in most cases, the choice of antibiotics for self-medication is based on the experience of the breeder, which can constitute an inappropriate use of antibiotics, favoring the selection of resistant bacteria that can be transmitted to humans. The study highlights the urgent need for educational interventions targeting farmers to improve antibiotic usage practices and prevent antimicrobial resistance. Increasing the use of antibiotics as growth factors, preventive agents or curative agents in livestock is vital and urgent. This should promote the rational use of antibiotics and monitor the evolution of antibiotic resistance in humans and animals in a coordinated way.

5. RECOMMENDATIONS

The authors suggest that the government should increase the use of antibiotics in livestock as growth promoters.

And farmers to be aware of veterinary agents in the face of any disease status in animals.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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