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Surveillance epidemiologique of the peripneumonie contagious Bovine Chad: The case of the province of Chari-Baguirmi

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Abstract

Livestock farming constitutes an essential source of income for populations in developing countries. However, animal diseases remain one of the main obstacles to the productivity and sustainability of this sector. In Chad, contagious bovine pleuropneumonia (CBPP) continued to be a major threat, severely affecting cattle health and jeopardizing the livelihoods of pastoral communities. This study was conducted to carry out epidemiological surveillance and offers improved control measures for CBPP in the Chari-Baguirmi province. It was a descriptive and analytical cross-sectional study conducted from July 1 to September 30, 2025, at the Livestock Research Institute for Development (IRED) in n'djamena, chad. The calculated sample size was 380 cattle. Serological diagnosis was performed using the competitive ELISA (Enzyme-Linked ImmunoSorbent Assay) to detect specific antibodies against CBPP. Data were analyzed using Microsoft Word, Excel 2016, and SPSS version 21.0. Risk factors were considered significant at $P<0.05$ and $or>1$. The results showed an individual seroprevalence of 14.20%. Extensive farming practices and beef production were identified as major risk factors ($P<0.05$; $OR>1$). The Arab breed showed a highly significant association with infection ($P=0.001$). Free-roaming cattle were more than three times more exposed to CBPP ($P=0.002$), while lack of knowledge about the disease increased the risk of infection ($P=0.010$; $OR=1.030$). Nomadic and transhumant herders were also more exposed ($P=0.004$; $OR=2.414$ghz and $P=0.003$; $OR=2.067$). Finally, unvaccinated cattle (48.7%) presented year increased risk of infection ($P=0.002$). Overall, CBPP remains a transboundary disease whose control requires an integrated approach combining movement monitoring, vaccination, strengthened veterinary services, and farmer awareness. These measures would help improve animal health and enhance the resilience of livestock systems in Chad.

Keywords: Surveillance; Epidemiology; Contagious Bovine Pleuropneumonia; Chari-Baguirmi; Chad

1. Introduction

Contagious bovine pleuropneumonia (CBPP) is a disease in animal cross-border cattle caused by *Mycoplasma mycoides* subsp. *mycoides* (Mmm)(Tweyongyere, 2024). It is a notifiable disease, in case of emergence in livestock, according to the recommendations of the OMSA (Teodoro *et al*., 2020). CBPP is a criterion for goodness sake, making that an animal tests positive does not have access to international trade (Nana *et al.,* 2023). Since the eradication of rinderpest, which was the disease that caused the most deadly of the species, the CBPP has become the largest plague herds of cattle in sub-saharan Africa (Leila *and al,* 2024). Chad, located in this area, is no exception to this reality, because the rate of the prevalence of CBPP to the scale of the herds was 73 % (PRAPS, 2019). Thus, the aim of this research led to the Chari-Baguirmi is the epidemiological surveillance and improvement of measures against contagious bovine pleuropneumonia.

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2. Materials and methods

We have conducted our research on the CBPP, it is a study of epidemiological surveillance, cross-sectional and analytical extending over a period of three (3) months from 01 July to 30 September 2025. TheResearch institute of Livestock Development (IRED) we provided a three-month internship.The province of Chari-Baguirmi, of which the capital isMassenya (Figure 1) was the study area. The province of Chari-Baguirmi is located to the West of Chad and covers a total area of 45 432 km2. The company has 4 departments, who are the chari Baguirmi region Chief-place in the Massenya, Dourbali chef-lieu Dourbali, Chari Chef-lieu Mandalia and the Loug Chari Chef-lieu Bousso. The climate is tropical with a sahelian.

Our target group was made up of all the cattle, selected according to inclusion criteria and exclusion.

Figure 1 Geographical Map of the Chari Baguirmi (Zakaria, 2018)

Inclusion criteria : have been included all the cattleof the villages selected those with clinical signs, and those meadowsas no signs.

Exclusion criteria : ont were excluded : all the cattle belongingto the breeders who have not given their consent.

The minimum size of the sample was calculated by taking into account a method on the expression of the minimum size of the sample required in the study of large numbers, taking into account the proportion of infected animals in the population and on the other hand the expected values of the serological tests used (Schwartz, 1996):

According to Schwartz (1996) $N = p (1-p) *Z^2/i^2$ with N = sample size, p= prevalence of CBPP in the population, Z = constant =1.96 and d= desired precision. So for a minimal prevalence of 44,83 %(Mallaye, 2021) and a desired precision of 5 % there will be thus : N = 0.4483 (1- 0.4483)*1.962/0.25 = 380.

The data were collected through a card, they are captured and analyzed with the aid of :

- the Excel spreadsheet for Windows Microsoft Office 2016 ;
- the software Microsoft Access 2016 ;
- the software SPSS 21.0.

The serological analysis was performed with the test competition ELISA (IDvet). ID vet ELISA is a diagnostic kit designed to detect antibodies against *Mycoplasma mycoides subsp. mycoplasma* (*Mmm*) in the serum or plasma bovine individual. It is a serological test semi-quantitative measure of the percentage of competition (S/N %) antibodies in sera put in competition with monoclonal antibodies (mabs) highly specific Mmm called 117/5.

3. Results

3.1. Distribution of cattle

3.1.1. Distribution of cattle according to their age group

It follows from this figure that the majority of cattle in the study had more than 6 years (32,10 %), but the younger had 0 to 1 year, or 15,60 %.

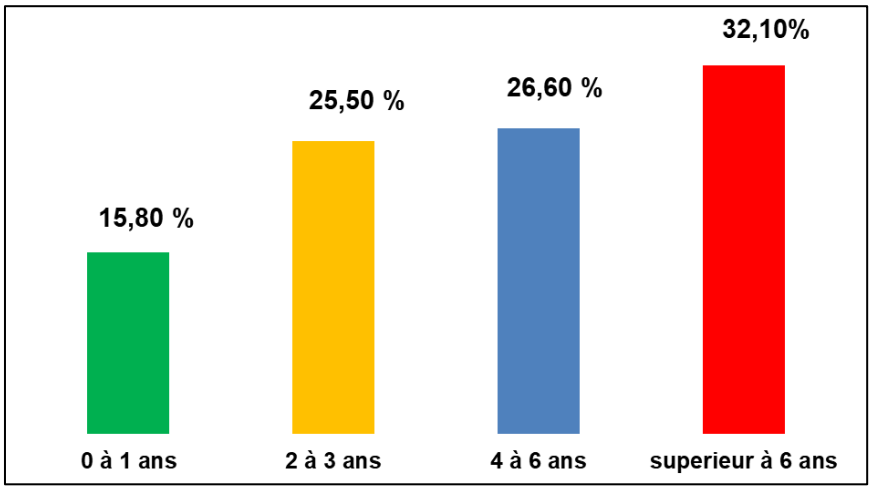

Figure 2 Distribution of cattle according to their age group

3.1.2. Distribution according to the types of farming

Figure 3 below shows us that 35,20 % of the farmers practice transhumance, 27,90 % are nomads, 20,30 % are farmed in semi-sedentary and 16,60 % practice a sedentary farming.

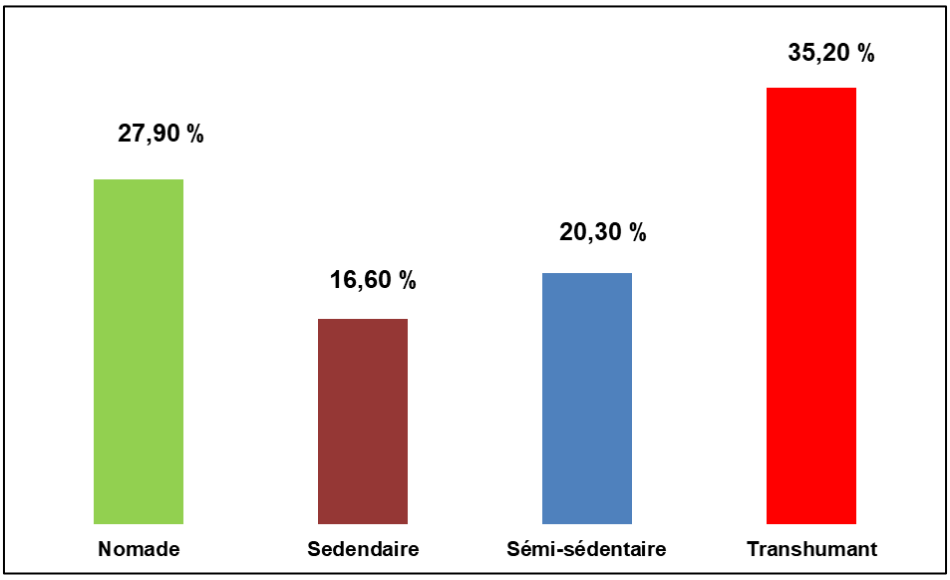

Figure 3 Distribution of farmers according to the types of farming

3.1.3. Distribution according to vaccination status

Most of the cattle in our study were vaccinated against CBPP (79,50 %), while 20,50 % were not vaccinated.

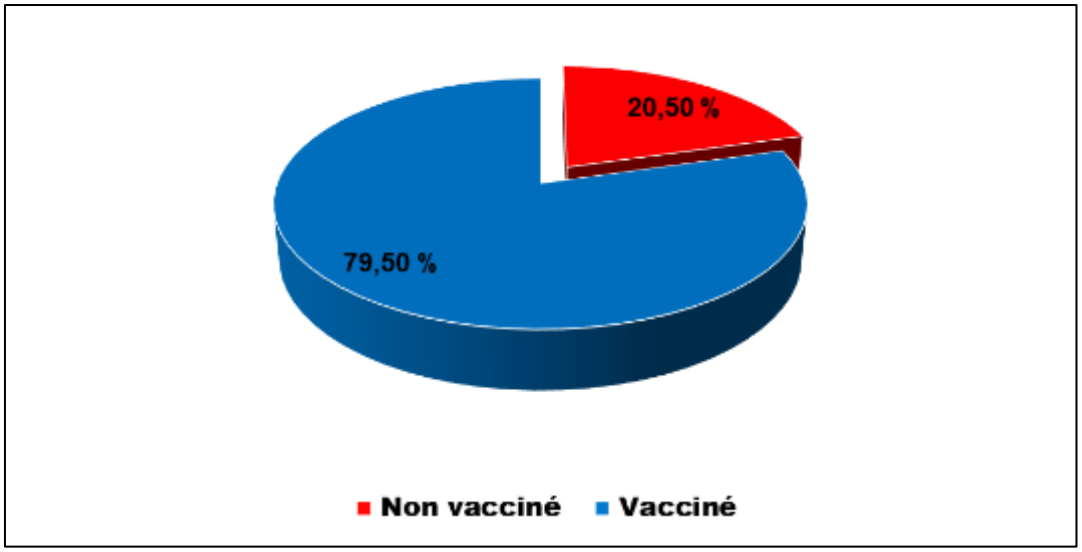

Figure 4 Distribution of cattle according to their vaccination status

3.2. Seroprevalence

3.2.1. Seroprevalence general infection of CBPP

This research has shown a prevalence of individual 14,20 % with a confidence interval of[10,8–17,9] for the CBPP within the study population (n = 380).

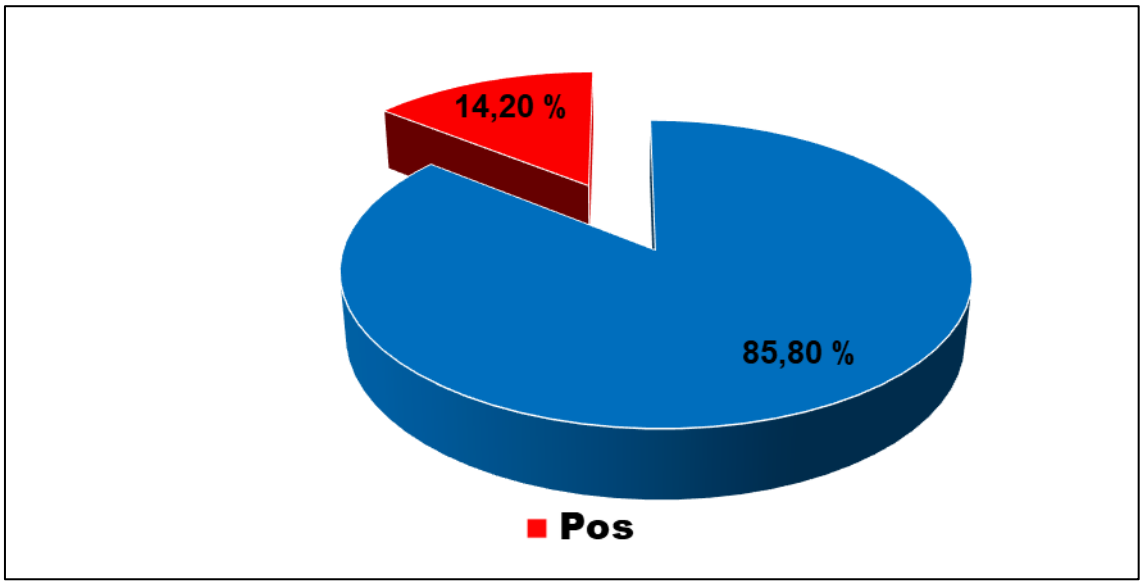

Figure 5 Prevalence of general infection of CBPP

3.3. Seroprevalence of the infection in the CBPP movements

We notice a statistically significant association between the animals straying and infection of CBPP (P=0.002).

Table *1* Seroprevalence of the infection in the CBPP movements

Movement of animals	Seroprevalence	P. Value	GOLD	95% CI	
Straying	21 (38,88 %)	Of 0.002	3,872	0,002	5,477
Picket Mobile	2 (3,70 %)	0,262	0,828	0,592	19,382

Picket fixed	3 (5,55 %)	1,074	0,769	0,990	20,231
Pasture,	28 (51,87 %)	1,872	1,077	1,504	2,287
Total of	54 (100 %)				

OR=Odds Ratio, CI=Confidence Interval

3.4. Seroprevalence of CBPP in terms of the knowledge of farmers on the CBPP

The animals which breeders have no knowledge on the CBPP are more exposed to the infection of CBPP (P=0.010 and or=1,030) : There is a relationship statically significant between the non-knowledge of the CBPP, and infection.

Table *2* Seroprevalence of infection as a function of knowledge of the farmers on the CBPP

Knowledge of the farmers on the CBPP	**Prevalence of**	**P. value**	**GOLD**	**95%**	
NON -	11(20,37 %)	OF 0.010	1,030	0,004	2,104
YES	43(79,63 %)	0,930	0,080	0,688	0,959
a Total of	54(100 %)				

OR=Odds Ratio, CI=Confidence Interval

3.5. Seroprevalence

In the province of Chari-Baguirmi, themobility of herds in the systems of transhumant and nomadic promotes a greater exposure to the CBPP compared to more stable systems.

Because there is a significant association between nomadic and infection of CBPP (p=0.004). The nomads were exposed to more than 2 times to the CBPP (OR=2,414) which translates to a differencestatistically significant. The transhumance is a risk factor (P=0.003) ; they are exposed to more than 2 times in the infection of CBPP (OR=2,067).

Table 3 Seroprevalence of CBPP in function of the type of farming practised by the breeders

Type of livestock	**Seroprevalence**	**P. Value**	**GOLD**	**95% CI**	
Nomadic	14 (25,92 %)	0,004	2,414	0,002	4,764
Sedentary	1 (1,85 %)	3,126	5,776	3,045	170,371
Semi-sedentary	3 (5,55 %)	2,204	9,061	2,686	30,565
Transhumant	36 (66.68 Percent)	Of 0.003	2,067	0,001	1,054
Total of	54 (100 %)				

OR=Odds Ratio, CI=Confidence Interval

3.6. Seroprevalence according to vaccination status

After the table X, we observe that the non-vaccinated animals (48,7 %) were exposed to the risk of infection with p = 0.002(P<0.05). This represents a statistically significant difference, suggesting that the status of non-vaccination is associated with a higher risk of seropositivity to the CBPP. In contrast, in vaccinated animals, p = 0.059 (P0,05) , therefore, the vaccination status does not present a significant relationship with the infection of CBPP.

Table 4 Seroprevalence of the infection CBPP according to vaccination status

Vaccination status	**Actual**	**Prevalence of**	**P. value**	**95 %**	
Non-vaccinated	38	70,37 %	0,002	0,001	0,115
Vaccinated	16	29,62 %	0,059	0,030	0,115
Total	54	100 %			

CI=Confidence Interval

4. Discussion

In this study, there was a question of achieving an epidemiological surveillance, and the improvement of the measures against contagious bovine pleuropneumonia in Chad : the case of the province of Chari Baguirmi.

This study showed a prevalence of individual 14.2 % in the province of Chari-Baguirmi. These results are similar to those found byCharfadine *and al,* (2019). During these works, 365 sera were collected, the rate of seroprevalence individual global was of 13.97 % in Mayo- Kébbi/West. Across africa, The seroprevalence observed in the Chari-Baguirmi is close to that reported in Cameroon (15,2 %) by Yaya *and al,* 2020. But it is lower than reported in Ethiopia, particularly in the Afar region, which 37.6% of prevalence have been recorded (Tulu *et al.,* 2021). On the other hand, it is higher than some neighbouring countries of Chad ; in particular, the Niger, or the prevalence reported by Issa *and al,* in 2022 is 4.15% and the central African Republic where the seroprevalence rate was 12.5 % (Ngounda *and al*, 2021).

Vaccination status is also a key factor : in this study, the seroprevalence is significantly higher in non-vaccinated animals (48,7 %) than among the vaccinated (5,3 %), with a significant difference (P=0.002). This result confirms the importance of vaccination coverage appropriate, and the importance of strengthening the vaccination campaigns, especially in areas of high mobility to limit the circulation of the disease, as pointed out by Nicholas *et al.,* (2008), and corroborated by Egbe *et al.,* (2022), Nigeria.

Overall, this study, supported by the results of other researchers in africa, confirms that the CBPP is still a cross-border disease majeure, which the control relies mainly on vaccination, management of the movements of herds and flocks, and the awareness of farmers.On the basis of the results obtained, we can say that the CBPP is an endemic disease in Chad. The current situation may constitute a serious obstacle to the development of livestock production in our country. Knowledge of the prevalence and distribution of CBPP should lead us to formulate the recommendations to limit its progression, and also to define the strategic lines for the control and eradication of the disease at national and sub-regional.

5. Summary

Farming is a vital source of income for people in developing countries. However, animal diseases represent one of the major obstacles to the productivity and sustainability of this sector. In Chad, the contagious bovine pleuropneumonia (CBPP) remains a serious condition that severely affect the health of cattle and jeopardizes the livelihoods of farmers. This study was conducted to carry out an epidemiological surveillance and propose measures for improvement of the control of CBPP in the province of Chari-Baguirmi. In total 380 cattle were collected. The serological diagnosis was performed by the test competition ELISA (Enzyme Linked ImmunoSorbent Assay) to detect the presence of antibodies specific to the CBPP. The collected data were analysed using Microsoft Word, spreadsheet Excel 2016 and SPSS 21.0. The risk factors were considered significant for $P<0.05$ and $GOLD>1$. The results showed a prevalence of individual 14,20 %. The seroprevalence of animals that are stray noted by the study is of 15,70 %, with a significant association with infection of CBPP (P=0.004). The lack of knowledge of the disease increases the risk of infection (P=0,010 ; $GOLD$=1,030). Pastoralists and pastoralists were also more exposed (P=0,004 ; $GOLD$=2,414 and P=0,003 ; $GOLD$=2,067). Finally, the non-vaccinated animals (48,70 %) had an increased risk of infection (P=0,002). Thus, the CBPP remains a cross-border disease whose control requires an integrated approach combining the monitoring of the movements, the vaccination, the strengthening of the veterinary services and the awareness of farmers. These measures will help to improve animal health and increase the resilience of farming systems in Chad.

6. Conclusion

Contagious bovine pleuropneumonia is a major threat to livestock in Chad, especially in the province of Chari Baguirmi. The present study showed 14.2% seroprevalence at the individual level 380 sera. The results obtained show an active circulation of the *Mycoplasma mycoides* subsp. and reveal the decisive influence of factors such as the practice of transhumance, the stray, the livestock density, low immunization coverage, and the failure of the therapeutic follow-up. These elements promote the spread of the disease, and undermine efforts to control in a region marked by intense movements of livestock and strong trade. The prevention is based not only on the strengthening of the vaccination, but also on a strict management of the movement of livestock, increased awareness of the breeders and vets more structured.

These effective measures must be implemented to control the spread of CBPP in the involvement of local communities and farmers, are working together to develop sustainable strategies, ensuring the health of the herds, and the well-being of people dependent on livestock.

Compliance with ethical standards

Disclosure of conflict of interest

None to be disclosed.

Statement of informed consent

Yes Informed consent was obtained from all individual participants included in the study.

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