

The health status of pigs in North Cameroon

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Key words

Swine - Health - African swine fever - ELISA - Cameroon.

Summary

A study was conducted to identify among other constraints pathological conditions affecting pig productivity and potential as a livestock subsector in the semiarid North Cameroon. Data were collected in three phases: a cross-sectional survey, a one-year monitoring of a cohort of selected herds and a one-year pork inspection. Results indicated that lousiness due to *Haematopinus suis* was the most common pathological condition with a herd prevalence above 50% during the monitoring phase and of 75.8% in a sample of 750 slaughtered pigs. Gastroenteritis prevalence was low (4%), but highly associated with piglet mortality. Pathological lesions of public health importance recorded during pork inspection were tuberculosis and cysticercosis lesions with prevalences of 33.2 and 12.3%, respectively. Indirect ELISA serological results on 150 samples were 98% negative for the African swine fever virus (ASF), suggesting that the region was ASF-free. The region can thus be regarded as potentially suitable for the development of the country's pig industry. Proper pork inspection and hygiene measures should be enforced to protect human health from infected meat.

INTRODUCTION

In 1980, the pig population in Cameroon was estimated at 1,470,000, and more than 95% of them were located in the southern part of the country. The African swine fever (ASF) epidemic that was reported in Cameroon for the first time in 1982 (3) decimated an estimated 80% of the country's pig population. Epidemics were limited to the South of the country (figure 1) and, to date, no outbreak of ASF has been reported in the three northern provinces (Adamawa, North and Far North) stretching from latitude 6°N to Lake Chad (latitude 13°N). As ASF remains endemic in the South, pig production is gaining ground in the North and Far North provinces. More than 80% of pigs produced in this region are sold in the South in major cities like Yaounde and Douala (figure 1). In 1996, the pig population in both provinces was estimated at 200,000 (8) compared to about 15,000 in 1986 (7). The growing importance of pig production in this region therefore calls for the identification of constraints and potentials with a view to improving productivity and developing the country's pig industry in a region that is free from ASF. This

livestock subsector could easily follow the example of Thailand (10), where pig production progressed from backyard type to one of Thailand's major industrial livestock sectors within two decades.

MATERIALS AND METHODS

The study consisted of three phases:

1. A rapid survey (cross-sectional study) which provided information on the present state of pig production including population estimates, breeds, reproduction parameters, pathology, mortality and general management practices
2. A twelve-month monitoring period of a cohort of selected herds
3. A twelve-month collection of pork inspection data

The rapid survey phase

In February 1996, a survey was carried out involving 357 pig farms in 38 sites containing about 6000 pigs. Figure 2 shows the major towns and villages visited to which the remaining sites were associated. The data collected included among other information the clinical manifestations observed and mortalities recorded throughout the year by the farmer. Blood was collected from 2 to 3 randomly-selected animals over 1 year of age in herds of at least 10 pigs. Sampling was evenly performed throughout the survey area. A total of 150 samples from 71 males and 79 females were collected for ASF serology.

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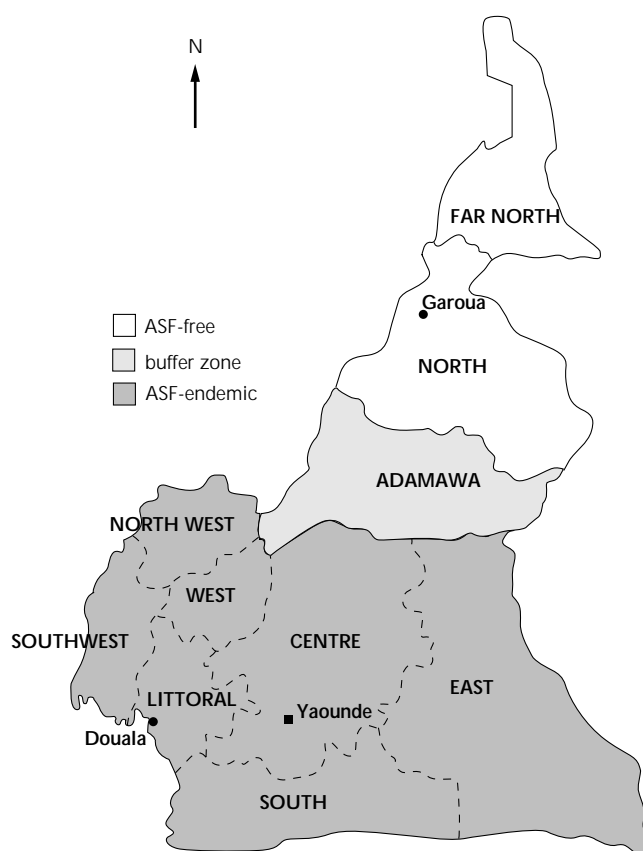


Figure 1: Presumed African swine fever virus distribution map of Cameroon.

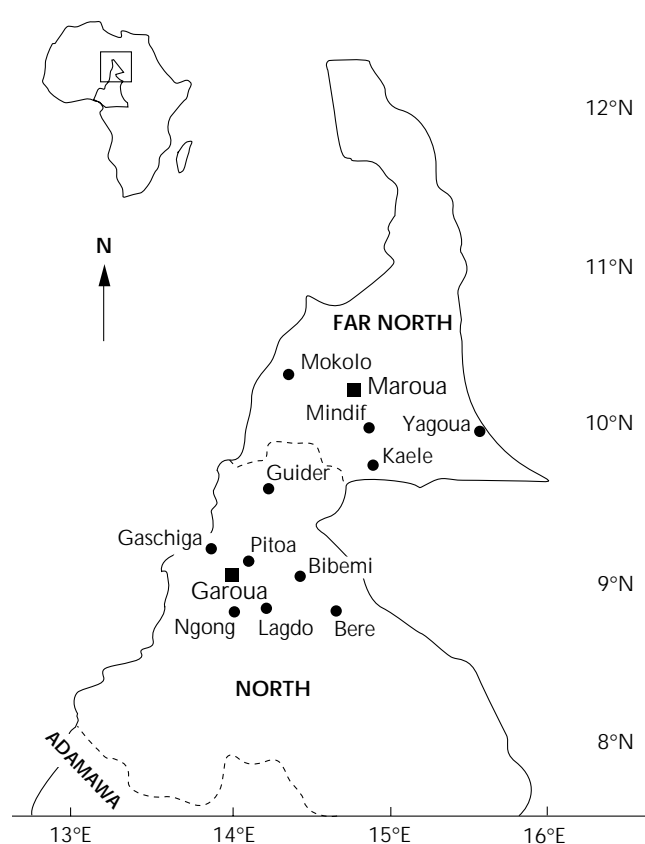


Figure 2: Major sites in northern Cameroon where survey data on pig production were recorded and samples for African swine fever serology collected.

The cohort phase

A total of 24 pig farms averaging about 20 heads each were monitored from July 1996 to June 1997. Farm choice was based on three criteria as follows: representativity of the different rearing systems identified as intensive, semi intensive and free roaming (8), a minimum herd size of 15 animals as initial population and the willingness of the farmer to participate. The monitoring health aspect consisted in noting clinical symptoms in the course of fortnightly visits as well as mortalities and their possible causes through autopsy findings.

The inspection phase

Systematic antemortem and postmortem inspections were carried out at pig slaughter points in Garoua for twelve months from August 1997 to July 1998, and all pathological findings were recorded. A total of 750 pigs were inspected.

Serological analysis

Serum samples were assayed by the indirect ELISA at the Pirbright virology laboratory, UK. Polystyrene ELISA plates (NUNC Immuno-plate 1) were used. The antigen was treated to a two-fold dilution with carbonate/bicarbonate buffer and 100 µl were dispensed into each well and stored overnight at room temperature. The reference antiserum (50 µl) was also treated to a two-fold dilution in PBS, 0.05% Tween 20, 1% Marvel® and added to each well after washing the plate four times with PBS (Dulbecco's modification) and incubated at 37°C for one hour on an orbital shaker. The plate was then washed four times with PBS and 50 µl of 1:2000 dilution of protein A conjugate was added and

incubated at 37°C for one hour. After a final wash with PBS, 50 µl of substrate solution (30% H₂O₂ in ortho-phenylenediamine) was added to each well and the reaction was stopped after 10 min by adding 50 µl of 1M H₂SO₄ to each well. The optical density was read at 492 nm wavelength.

Statistical analysis

The chi-square test was used to compare the appearance of clinical signs and mortalities in the different rearing systems of the monitoring phase and to assess the age, sex of the animal and season as risk factors influencing the occurrence of certain pathological findings at postmortem.

■ RESULTS

Survey results indicated that the main clinical observations as reported by the farmers were itching (lousiness), cough, diarrhea and the presence of *Ascaris suum* in pig feces, in descending order of magnitude (figure 3). Lousiness prevalence in herd was above 50%. Figure 3 also shows the incidence of cough and diarrhea, which were the main symptoms observed during the 12-month monitoring phase. Cough prevalence was higher during the dry season from December to May while diarrhea was more prevalent from July to September corresponding to the peak of the wet season (figure 4). The occurrence of clinical signs did not depend on the rearing system. Annual mortality rates were 57.5, 54.5 and 37.6% in intensive, semi-intensive and free-roaming systems, respectively. There was no significant difference between the rates due to the high variation from one herd to another. Mortality distribution according to age group is presented in figure 5. Most

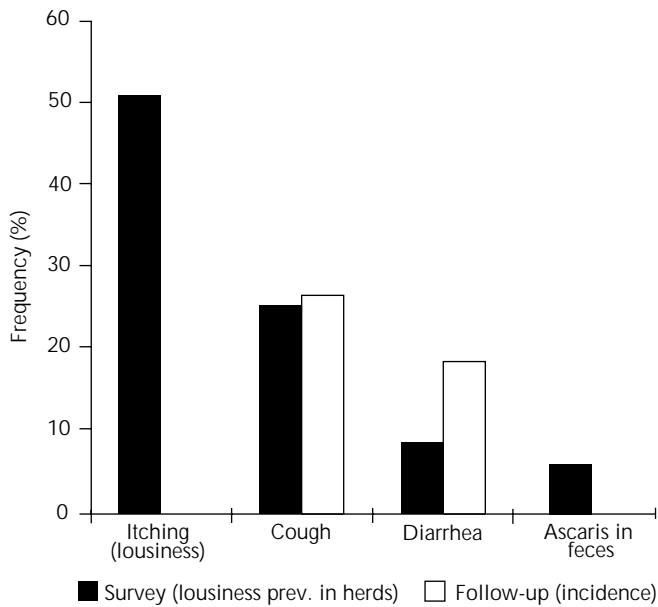


Figure 3: Frequency of appearance of clinical symptoms in monitored herds in northern Cameroon.

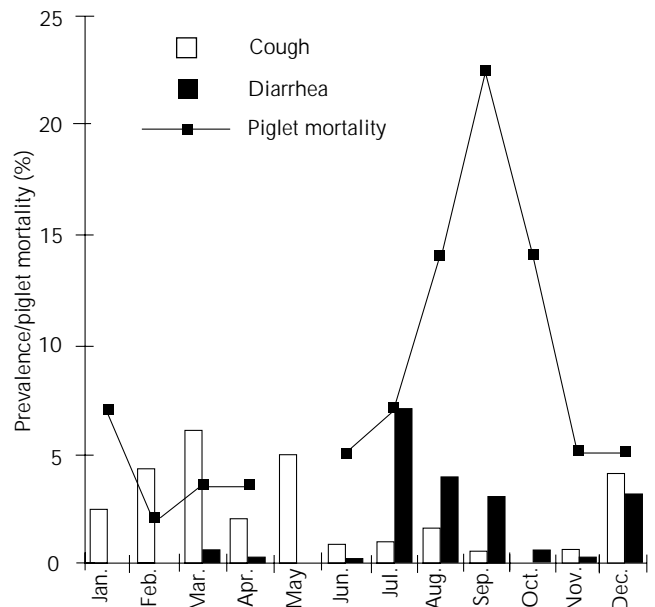


Figure 4: Seasonal prevalence of the main clinical symptoms and piglet mortality in monitored herds in northern Cameroon.

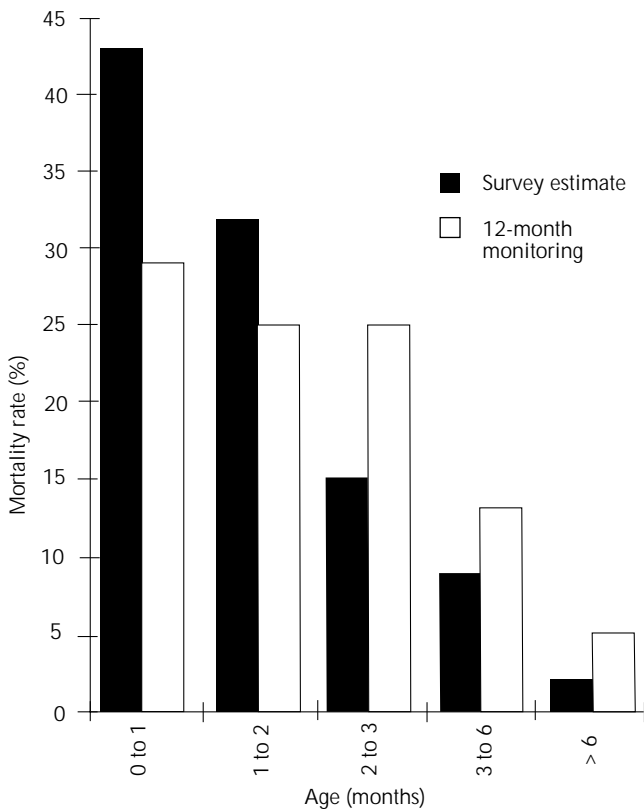


Figure 5: Distribution of piglet mortality by age groups.

mortalities occurred in piglets of the preweaning age of three months and below. The most important cause of mortality (23.6%) was poor mothering ability (crushing or eating of young) due to poor housing and inadequate nutrition, followed by diarrhea (14.5% of total mortalities). There were similarities in mortality pattern by age group between survey estimates and monitored data (figure 5).

Serological results for ASF were globally negative. Of the 150 samples analyzed 147 were negative and 3 positive. Incidentally, the positive three were from females.

Pork inspection findings are represented in table I. About 76% of slaughtered pigs were infested by the louse *Haematopinus suis*. Tuberculosis (TB) lesions were the most common postmortem pathology with a prevalence of 33.2%. Other important lesions were cysticercosis (cystic stage of the tapeworm *Taenia solium*), liver milkspots and presence of *Ascaris suum* larvae in the lungs. The age and sex of the animal and the season were considered as predisposing factors to the occurrence of some of the pathological conditions encountered at pork inspection. Table II shows that these factors had no influence on the occurrence of tuberculosis lesions and cysticercosis. However, female pigs were more vulnerable to *Ascaris suum* larvae in the lungs than males ($p = 0.002$) and this condition was also significantly more common in the dry season ($p = 0.048$). Lousiness was highly associated

Table I

Prevalence of pathological findings at pork inspection in Garoua, North Cameroon

Pathology	Prevalence (%)
Lousiness	75.8
Tuberculosis	33.2
Heart cysts	12.3
Milkspots	12.3
<i>Verminous pneumonia</i>	10.0
Oral cysts	7.9
Skin lesions (non-specific)	4.7
Gastroenteritis	4.0
Orchitis	1.4
Metritis	1.3
<i>Stephanurus dentatus</i> (kidneys)	1.2
Mastitis	0.9
<i>Ascaris suum</i>	0.3
Foot and mouth disease	0.1

Table II

Relative risk (RR) of occurrence of pathological lesions associated to various factors at pig inspection in North Cameroon

Lesion	Predisposing Factor	Relative risk (RR)	Confidence interval	Mantel-Haenszel P value
TB	Age	1.15	0.83 < RR < 1.60	0.39
	Sex	1.00	0.81 < RR < 1.24	0.99
	Season	1.05	0.84 < RR < 1.31	0.68
Heart cysts	Age	1.53	0.77 < RR < 3.06	0.21
	Sex	1.29	0.85 < RR < 1.95	0.23
	Season	1.19	0.79 < RR < 1.79	0.41
<i>Verminous pneumonia</i>	Age	1.07	0.55 < RR < 2.07	0.84
	Sex	2.03	1.28 < RR < 3.23	0.002 ^a
	Season	1.56	1.00 < RR < 2.41	0.048 ^b
Lousiness	Age	1.28	1.09 < RR < 1.51	0.0002 ^c
	Sex	1.01	0.93 < RR < 1.10	0.82

^a Significantly, more females than males were affected

^b More cases significantly occurred during the dry season

^c More adults were significantly infested than young ones

^d There was a significantly higher prevalence during the dry season

with older animals ($p = 0.0002$) and with the dry season ($p = 0.0001$). Seasonal variation of the main diseases is presented in figure 6. It shows that lousiness prevalence is high throughout the dry season and early in the rainy season, dropping sharply in August and remaining low until October, i.e., at the peak and until the end of the rainy season. Although gastroenteritis is not presented in figure 6, the 4% cases (table I) were all recorded in August and September (at the peak of the rainy season).

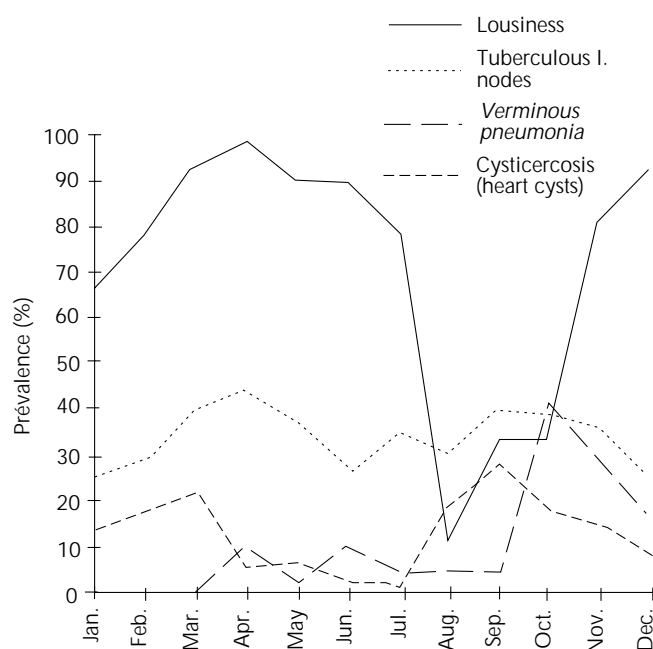


Figure 6: Monthly prevalence of main pathological lesions.

DISCUSSION

Results of this study have shown that although diseases may not be a major constraint to pig production in North Cameroon, they are not, however, negligible. Louse infestation by *Haematopinus suis* can cause considerable production losses because of the biting nuisance, especially when prevalence is as high as 75.8% as recorded in slaughtered pigs. This prevalence was more than 10 times higher than that of 7.2% reported by George *et al.* (6) from clinical records in a similar climatic region of northern Nigeria. Treatment of pigs against ectoparasites is uncommon in North Cameroon. Readily available acaricides such as deltamethrin (BUTOX®) are in oily suspensions and their use in pigs is generally ill-advised because of possible accumulation in subcutaneous fats.

High humidity during the rainy season is not conducive to lice development, which explains the low lousiness prevalence from August to October. No explanation could be found for a lower prevalence of lice in younger pigs (less than 6 months old).

Although of lower prevalence (4% in slaughtered pigs), gastroenteritis (diarrhea) was highly associated with mortalities in young pigs between July and September as illustrated in figure 4. No identification of microbial pathogens associated with gastroenteritis was done in this study. Atti *et al.* demonstrated that rotavirus antigens were present in 45% of diarrheic piglets against zero in normal ones (2). Adetosoye and Adeniran associated *Campylobacter faecalis* to gastroenteritis of piglets in Gongola State of Nigeria (1), neighboring the region of the present study. It would be necessary, however, to carry out a specific diagnosis of this condition in North Cameroon for more efficient treatment.

Although the prevalence of *Ascaris suum* larvae in the lungs was high (10%), it did not seem to be of clinical importance. The period of high prevalence, from October to December (figure 6), did not coincide with that of cough from December to May (figure 4). Cough might have been induced by other causes.

The apparent ASF-free condition of North Cameroon should be strictly maintained. Ekue *et al.* stated that ASF is endemic in Cameroon (5). This followed epidemiological studies that were only carried out in the South of the country. Outbreaks have been confirmed in all seven provinces of the South as opposed to none in the three northern provinces. It is possible that the Adamawa province is not completely free from the ASF virus since it is a buffer zone between the endemic South and the free northern zones. But it seems safe to state that the zone of the study, i.e., from latitude 9°N northwards, is ASF-free. The recorded three positive cases could be false positives, giving the test a 98% specificity, which is acceptable. Paradoxically, the reservoir host of the ASF virus, the warthog, is absent in the ASF-endemic South but present in the North (4). These authors also reported the absence of the vector tick, *Ornitodoros moubata* in the South of Cameroon. It appears necessary to carry out more epidemiological studies. They should include: 1) the determination of the virus carrier status of the warthog; 2) resampling with more sensitive and specific tests such as PCR in areas where the serologically positive cases were recorded; and 3) sampling in the buffer zone, i.e., the Adamawa province, to help draw the ASF virus distribution map of Cameroon.

While pork inspection did not reveal significant pathological findings affecting pig productivity, it was the opposite with regard to public health. A prevalence level above 33 and 12% for tuberculosis lesions and human tapeworm cysts, respectively, caused pork to be a potential public health hazard. Prevailing pig rearing practices in the region, where pigs were allowed to roam freely, contributed to the situation as pigs were often exposed to

human pathogens. The situation could only be corrected through intensive pig rearing and proper pork inspection and condemnation when appropriate.

■ CONCLUSION

Diseases were not an important production constraint in pig farming in North Cameroon. It is however necessary to identify gastrointestinal pathogens and treat pigs accordingly. Powdery acaricides are becoming more readily available and their use in treating against lice and other ectoparasites is advised. African swine fever is apparently absent from the region, thus, making it a region of choice for the development of the country's pig industry. Intensive sampling and search for the ASF virus still need to be carried out in the three northern provinces of Cameroon in order to declare them a virus-free zone. The high prevalence of zoonosis observed at pork inspection calls for a more proper and rigorous inspection and enforcement of public health hygiene.

Acknowledgments

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Résumé

Awa D.N., Njoya A., Ngo Tama A.C., Ekue F.N. L'état sanitaire des porcs au Nord Cameroun

Une étude a été menée pour identifier, entre autres contraintes, les conditions pathologiques qui affectent la productivité des porcs et leur potentiel en tant que filière de l'élevage dans la zone semi-aride du Nord Cameroun. Les données ont été collectées en trois étapes : une enquête transversale, un suivi des troupeaux sélectionnés au cours d'une année et une inspection de la viande porcine pendant une année. Les résultats ont montré que les infestations dues à *Haematopinus suis* étaient la condition pathologique la plus fréquente avec une prévalence supérieure à 50 p. 100 dans les troupeaux au cours de la phase de suivi et de 75,8 p. 100 dans un échantillon de 750 porcs abattus. Les gastro-entérites étaient de faible prévalence (4 p. 100), mais fortement associées à la mortalité des porcelets. Les lésions pathologiques importantes pour la santé publique enregistrées à l'inspection de la viande porcine étaient celles de la tuberculose et de la cysticercose avec des prévalences respectivement de 33,2 et 12,3 p. 100. Les résultats de la sérologie indirecte par Elisa effectuée sur 150 échantillons étaient négatifs à 98 p. 100 pour le virus de la peste porcine africaine (PPA), ce qui laisse à penser que la région était indemne de PPA. Cette région pourrait par conséquent être considérée comme une zone favorable au développement de l'industrie porcine dans le pays. L'inspection de la viande de porc et les mesures d'hygiène devraient être mis en œuvre pour assurer la protection de la population humaine contre les viandes infectées.

Mots-clés : Porcin - Santé - Peste porcine africaine - Test Elisa - Cameroun.

Resumen

Awa D.N., Njoya A., Ngo Tama A.C., Ekue F.N. Estado de salud de los cerdos en el norte de Camerún

Un estudio fue llevado a cabo, con el fin de identificar, entre otros, las condiciones patológicas que afectan el potencial y la productividad porcina, como sub sector de producción animal en la zona semi árida del Norte de Camerún. Los datos se recolectaron en tres fases: un estudio cruzado, un seguimiento de cohortes de un año en hatos seleccionados y una inspección de los cerdos durante un año. Los resultados indican que las pérdidas debidas a *Haematopinus suis* representaron la condición patológica más común, con una prevalencia en el hato de más de 50% durante la fase de monitoreo y de 75,8% en una muestra de 750 cerdos sacrificados. La prevalencia de gastroenteritis fue baja (4%), pero altamente asociada con la mortalidad de los lechones. Las lesiones patológicas con importancia para la salud pública, registradas durante la inspección porcina, fueron de tuberculosis y cysticercosis, con prevalencias de 33,2 y 12,3% respectivamente. Noventa y ocho por ciento (98%) de los resultados serológicos de un test ELISA indirecto, realizado en 150 muestras, fueron negativos para el virus de la fiebre porcina africana (ASF), lo que sugiere que la región esta libre de ASF. Por lo tanto, esta zona puede considerarse potencialmente apropiada para el desarrollo de la industria porcina del país. Con el fin de proteger la salud humana contra carne infectada, deben reforzarse, tanto las medidas de higiene, como una inspección porcina adecuada.

Palabras clave: Cerdo - Salud - Peste porcina africana - ELISA - Camerún.