

Analysis of the Epidemiological Situation of African Swine Fever in the Republic of Chad: 2010-2022

Ban-bo Bebanto Antipas^{1,2,*}, Naibi Keitoyo Amedé³, Bidjeh Kebkiba²

¹Laboratory of Biochemistry, Cellular and Molecular Biology, Microbiology (L2BCM),
Faculty of Exact and Applied Sciences (FSEA), University of N'Djamena

²Higher Institute of Sciences and Technologies (I2ST), Chad

³Livestock Research Institute for Development (IREL), N'Djamena, Chad

Abstract African swine fever virus (ASFV) was introduced into the Republic of Chad in 2010 and spread widely throughout the pig farming production area. Due to the lack of knowledge of risk factors, the significant spread in certain parts of the country and the difficulty of management in the wild reservoir threaten pig production in Chad. The purpose of this study is to analyze the epidemiological situation of African swine fever in pig farms in highly infected cities in Chad and to propose control measures for it. **Methodology:** Analysis of the epidemiological situation of ASF was made based on the work carried out mainly in the Republic of Chad during the period from 2010 to 2022 [6,7,9,10,12,14,16-21]. The administrative and legislative texts (Orders and Law) [2-5,13] were consulted. Data from interviews with pig producers, related to the disease, farming practices and the application of texts in the field were analyzed. **Results:** Pig farming is practiced in a traditional way with very few facilities; sanitary measures are almost non-existent; during periods of epizootics, mortality reached 100% in places; sanitary measures are not applied in most farms. The prevalence rate in 2022 was 76.9% in 7th arrondissement and 33% in the sub-prefecture of Mandalia and the Department of Chari Baguirmi. The variations in seroprevalence were linked to the rainy season (15.70%), the types of pig farming (16.78%), and the floor of the pigsty (clay earth (24.59%), absence of litter (17.07%). The prevalence rate was 19.23% in males and in animals aged between 0 and 4 months was the most affected with a prevalence rate of 78.52%. **Conclusion and application of the results:** the recent seroprevalence rates of 12.10% and 33.33% variable between the departments, and the prevalence of 14 to 33% in the same departments, show that ASF virus still circulates in pig farms in the Republic of Chad. The presence of this virus in farms is maintained because of the ignorance of risk factors, insufficient biosecurity measures and poor farming practices. While conducting awareness campaigns among breeders to better equip them to permanently break the chain of disease contamination, Ministry in charge of livestock should have the means to control it.

Keywords African swine fever, Seroprevalence, Prevalence, Pig farming, Republic of Chad

1. Introduction

African Swine Fever (ASF) caused by a DNA virus belongs to the Asfarviridae family in which the ASF virus is the only representative and included in the genus Asfivirus [8]. ASF virus was first diagnosed in Kenya in 1910 by Montgomery; it is manifested by an acute hemorrhagic fever with a mortality rate of 100% in domestic pigs [15]. In Central Africa, incursions were officially reported in Sao Tome and Principe in 1979 and in Cameroon in 1982 [1,11,22]. The Republic of Chad experienced ASF for the first time in October 2010. Despite emergency health measures taken by Chad's veterinary services (DVS), the disease was reported in less than four months in four

provinces: Mayo-Kebbi Est and Ouest, Tandjilé, Logone Occidental and next in Chari Baguirmi [6]. In 2012, a first outbreak of ASF reappeared in Mandoul and Batha with cases of infection in warthogs [9]. In 2018, ASF was once again reported in 3 districts of Ndjama (1st, 7th and 9th) with a mortality rate of 89.72%. All these periods of epidemics were followed by stamping out of a large number of animals. Such an event could contribute to the extinction of local breeds already well adapted to environmental conditions [6,7,10]. Deficiencies in biosecurity and disease management as well as the swine value chain (type of breeding, state of the pigsty, movement of animals, marketing and processing) would be the first factors of introduction of the ASF virus in the different provinces of Republic of Chad and its persistence in the country. Failures were also observed in the practice of "stamping out". According to many other authors [6,7], the risk of ASF endemicity is real after the passage of the virus. This work aims to analyze the epidemiological situation of ASF from

* Corresponding author:

bbantipas@yahoo.fr (Ban-bo Bebanto Antipas)

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2010 to 2022 and to propose an appropriate approach for its eradication in the country.

2. Importance

In the Republic of Chad, pig farming is particularly developed in the provinces of Logone Oriental, Mayo-Kebbi Est, Mayo-Kebbi Ouest, Moyen Chari, Tandjilé, Mandoul, Logone Occidental, Chari-Baguirmi, Ndjamena, Hadjer-Lamis and Guéra. The strongly Muslim north of Chad does not practice pig farming for religious reasons [14,17]. The pig is often preferred for its rapid development, its short gestation of 3.5 months and its rapid growth. Diseases are on the whole rarer in this species than in the others. Pig feed is based on the combination of different cereal processing by-products such as bran, spent grains, alcohol residues and kitchen waste, throughout the year. It has the ability to convert average quality food into good quality protein [18]. On the other hand, the pig plays an essential role in different ceremonies such as wedding, funeral, ritual and honor ancestors. In traditional societies, and the dead are of considerable importance and the slaughter of animals, often pigs, is systematic. In Christian and animist families, it increasingly occupies a place of choice among the animals slaughtered during various festivals and celebrations. It is also present in other ceremonies, in addition to weddings and funerals. For example, in Ngambaye and Marba areas in the Republic of Chad, the pig is often used for funeral ceremonies [20].

3. Production System

Overall, in the Republic of Chad, the farming system is essentially traditional, even if there are some large semi-intensive farms with improved breeds. The traditional production system is strongly linked to the culture of the population and to the place of pig in ceremonies. Under the term traditional mode, free-range breeding and artisanal breeding methods are grouped together. Farmers generally associate livestock with their agricultural or commercial activities [16,21]. Producers have accommodation of the traditional shelter type, which is usually occupied during the rainy season. The pigsties are often badly maintained without respect for hygiene, with walls mainly made of mud (87%), a roof made of recycled sheets, dented and perforated (70%). The floor is not stabilized in 87,2% of cases. In farms where feeders exist, it is generally a few makeshift utensils (half drum in steel or plastic, wooden box, old basin) that are used. Water troughs (plastic or aluminum buckets or old basins) only existed in 25,5% of farms. In 65% of cases, feeders also served as drinkers [18].

In the south of the country, animals are generally free during the dry season and locked in pigsties or tied under trees during the rainy season, to prevent them from damaging crops. During the dry season, stray animals feed on what they

find in garbage dumps or by-products from the processing of agricultural foodstuffs, such as sorghum grains, which some breeders distribute to them, and return to the pigsty at specific times, to drink or receive a food ration [18,21].

4. Disease Surveillance System

The wandering of pigs poses a real health problem, in particular parasitism. Massive infestation of pigs by *Taenia solium cysticerci* is often observed. In N'Djamena, 95% of total seizures at the Farcha slaughterhouse in the years 1982-1998 are due to this pathology [20]. In the traditional farming system, the health monitoring of pig herds is neglected or even ignored because parasitic diseases such as cysticercosis caused by the pig tapeworm (*Taenia solium*), also reduce the access of meat products. pig to more profitable markets [12].

Most animals feed in garbage cans where they find food debris. For their baths, pigs use water from drains and surface water. The pigsties are built with local materials that are generally unhealthy and poorly ventilated. The equipment is also local and insufficient. The surrounding environment is unhealthy and especially during the rainy season [6].

The major disadvantages of this traditional breeding are the high mortality of the piglets and their poor growth often due to inbreeding linked to the lack of reproduction management. In addition, these animals in the wild are not monitored from a health point of view and veterinary treatments are rare. In the current context of the existence of ASF, this type of breeding favors contact between animals and the dissemination of the disease. In rural areas, breeders and consumers are the main players in the spread and the appearance of ASF virus. As well as the ignorance of the ASF by some producers is a great handicap [6,12].

5. Epidemiological Situation from 2010 to 2022

The Republic of Chad immediately declared African swine fever for the first time on its territory on October 22, 2010. Two probable sources of introduction of ASF in the Mayo-Kebbi East province have been reported: pork brought back from Cameroon during funeral activities; pigs incubating the virus would have been brought back to the region following the stamping-out measures introduced during the outbreak of ASF in Cameroon [10]. These were pigs sick with ASF, slaughtered in an emergency for sale or introduced into families in Chad.

Despite emergency health measures taken by Chad's veterinary services (DVS) in 2010, the disease was reported in 5 provinces. These are the provinces of Mayo-Kebbi Est, Mayo-Kebbi Ouest, Tandjilé, Logone and Chari Baguirmi. After a small lull in many outbreaks, the presence of ASF was reported by the DVS in 2012 in warthogs in the

Provinces of Batha and Mandoul (central and southern provinces). In September 2018, ASF was once again reported in N'Djamena, affecting three arrondissements (1st, 7th and 9th) with a mortality rate of 89.72%. Both epidemic periods were followed by the slaughter of large numbers of animals. However, biosecurity measures have not limited the spread of ASF. The application of strict "stamping out" from the hearth has led pig producers to cross already porous borders with their animals to escape stamping out, and the accompanying measures did not follow these stamping-out operations, hence the distribution of the virus through infected animals in several departments [6,7,10]. In addition, Chad's Animal Disease Epidemiological Surveillance Network reports that very little attention is paid to ASF in pig farms in N'Djamena [10].

After a lull between 2012 and 2017, the 2015 study revealed that 4.72% pigs were ASFV positive, therefore

healthy carriers of the virus.

In view of these results, it can be said that the ASF virus is circulating in apparently healthy pig farms in N'Djamena as in other cities in the country. The circulation of the virus in the country demonstrates the limits of the control strategy used to control the disease in traditional scavenging farms (in 2022).

If the first causes of the rapid spread of the ASF virus were firstly the application of strict "stamping out" from the outbreak, the ignorance of producers', biosecurity measures and the precarious socio-economic situation of rural populations, circulation of the ASF virus in pig farms is maintained by the production system. The favoring factors are the types of breeding, the season, the soil, litter, sex, race, age. The seroprevalence rate reached 78% for the piglets group aged from 0 to 4 months.

Table 1. Serology in 2015

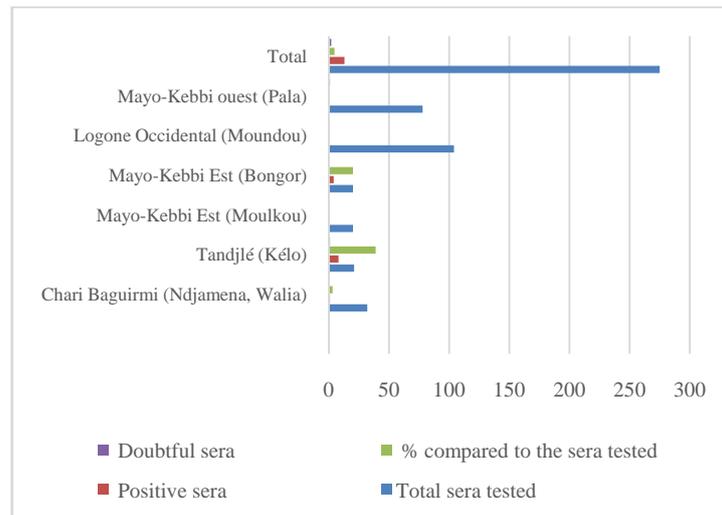


Table 1 shows serological results in 2015

Table 2. Serology in the Departments in 2022

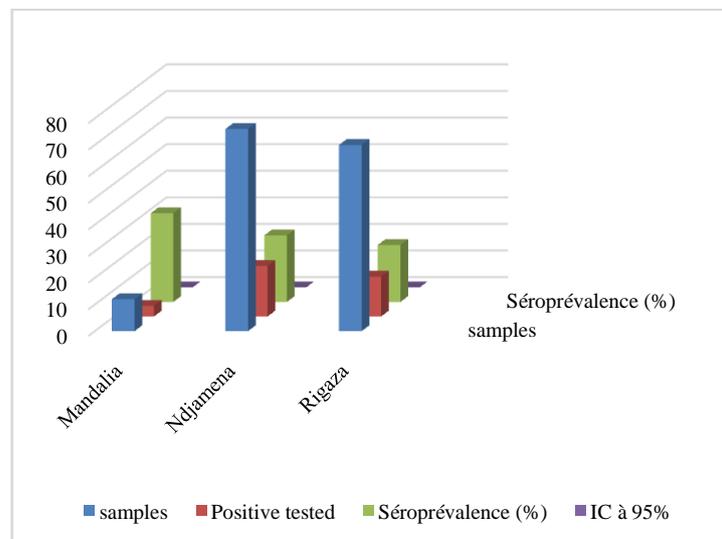


Table 3. Risk factors

Risk factors	Factors nature	Number	Positif tests	Séroprévalence %
Breeding Type	Traditional	137	23	16,8
	Semi-modern	17	0	0
Season	raining	121	19	15,7
	dry	33	4	12,12
Pigsties soil	Concrete floor	37	2	5,40
	Bricks	17	4	23,5
	Sand	39	2	5,12
Sex	Clay floor	61	15	24,6
	Female	128	18	14,1
	Male	26	5	19,2
Litter	straw	24	2	8,3
	no litter	123	21	17,1
Race	bran	7	0	0
	Local	112	15	13,1
	Mixte	26	7	26,9
Age	0- 4 months	28	6	78,5
	5 - 9 months	44	10	50
	10 – 14 months	37	4	16
	≥ 15 months	43	3	15,8

6. Conclusions

As with many countries in Africa, after the first appearance of ASF, the disease remained endemic in The Republic of Chad. Infected pigs introduced from Cameroon have been identified as the first causes of the disease. The method of spreading the virus in the outbreak, "strict or total stamping out" has been identified as one of the factors favoring rapid spread in farms. The circulation of the virus in farms is maintained by poor knowledge of biosecurity measures. The other factors favoring the circulation of the virus in the farms, in particular the type of breeding, the soil, the litter, the breed, the sex, the age, were noted by the study. Training and sensitization on the disease, its source and the means to eradicate it, including the hygiene of the immediate environment and sanitation, remain the main issues for the control of ASF and other infectious diseases among pigs. To achieve the end of the disease, it will be necessary to accompany this practice with hygiene and sanitary measures.

REFERENCES

- [1] Accra, 2017. Stratégie régionale pour le contrôle de la peste porcine africaine en Afrique. 56p.
- [2] Arrêté N°028/PR/PM/MERA/SG/DGDE/136/DSV/2010 du 27mai 2010.
- [3] Arrêté N°090/MERA/SG/DRERA-MKE du 21 octobre 2010 portant délimitation des zones de mise en œuvre des mesures de police sanitaire dans la Délégation Régionale d'Élevage (DRE) du Mayo-Kebbi-Est (MKE).
- [4] Arrêté N°094/PR/PM/MISP/GMKE/SG/2010 du 18 octobre 2010, portant mise en place des mesures de police sanitaire dans la Délégation Régionale d'Élevage du Mayo-Kebbi-Est.
- [5] Arrêté N°1009/PR/PM/05 portant composition et attribution de fonctionnement du comité national de lutte contre les maladies réputées légalement contagieuses des animaux du 06 mai 2005.
- [6] Ban-bo BA, Idriss OA, Squarzoni CD 2012. Contrôle de la Peste Porcine Africaine (PPA) dans les élevages porcins traditionnels au Tchad. *Journal of Animal & Plant Sciences*, 15(3): 2261-2266.
- [7] Bidjeh K, Ban-Bo BA, Mopaté LY, 2015. Factors contributing to the introduction and the spread of African Swine Fever Virus in Chad. *IJCMAS*, 4(8): 607-613.
- [8] Carrascosa JL, Carazo JM, Carrascosa AL, 1984. General morphology and capsid fine structure of African swine fever virus particles. *Virology*, 132: 160-172.
- [9] Direction des Services Vétérinaires (DSV), 2018. Information sur la Peste Porcine Africaine (PPA) au Tchad, Note d'information 3p.
- [10] Direction des Services Vétérinaires (DSV), 2018. Rapport provisoire de la situation de la situation épidémiologique de la Peste Porcine Africaine dans la commune de Ndjamen, Rapport d'activité de terrain, Tchad, 10p.
- [11] Food and Agriculture Organization (FAO), 2011. Préparation des plans d'intervention contre la Peste Porcine Africaine. Édité par M.L. Penrith, V. Guberti, K. Depner et J. Lubroth. Manuel FAO Production et santé animaux. *Manuel Production et Santé Animale FAO* 8: 84p.
- [12] Koussou M.O., Duteurtre G, 2002: Les facteurs de compétitivité de la filière porcine dans le bassin du Logone. Communication présentée au colloque «Systèmes

- agro-alimentaires localisés Syal», Montpellier, Cirad, octobre 13 p. http://pigtrop.cirad.fr/fr/vie_scientifique/economie_Lo gone.htm.
- [13] Loi 09/PR/2004, portant organisation de la police sanitaire et la prophylaxie collective des maladies réputée légalement contagieuses des animaux sur le territoire de la république du Tchad du 19 mai 2004.
- [14] Ministère de l'Élevage et des Productions Animales, 2015. Recensement Général de l'Élevage, Principaux résultats de recensement, 78p.
- [15] Montgomery RE: 1921. On a form of swine fever occurring in British East Africa (Kenya colony). *J. Comp. Pathol.* 34: 159-191, 243- 262.
- [16] Mopaté L. Y, Koussou M. O: 2003: L'élevage porcin, un élevage ignoré mais pourtant bien implanté dans les agro-systèmes ruraux et périurbains du Tchad LRVZ-PRASAC Research Gate.
- [17] Mopaté L. Y, Koussou M.O, Kaboré-Zoungrana C.Y: 2007: Dynamique de la production porcine à N'Djaména (Tchad) évolution des abattages, des poids carcasses durant les cinq dernières décennies et prévisions actuelles, *Revue Scientifique du Tchad*. Vol N°09, Numéro 02.
- [18] Mopaté L. Y. 1, Kaboré-Zoungrana C. Y., Facho B.,: 2011: Des sons de riz, maïs et sorgho mobilisables dans l'alimentation des porcs *J. Appl. Biosci.*
- [19] Mopaté L.Y, Koussou M.O, Nguertoum E.A, Ngo tama A.C, Lakouetene T., Awa N.D, Mal Mal H.E. 2009: Caractéristiques et performances des élevages porcins urbains et périurbains des savanes d'Afrique centrale: cas des villes de Garoua, Pala et Bangui Actes du colloque «Savanes africaines en développement: innover pour durer», 20-23 avril 2009, Garoua, Cameroun. Prasad, N'Djaména, Tchad; Cirad, Montpellier, France, cédérom.
- [20] Mopaté L.Y., Koussou M.O 2002: L'élevage porcin, un élevage ignoré mais pourtant bien implanté dans les agro-systèmes ruraux et périurbains du Tchad. Actes du colloque, 27-31 mai, Garoua, Cameroun.
- [21] Mopaté L.Y., Koussou M.O., Kaboré-Zoungrana C.Y., 2006: L'élevage porcin au Tchad: bilan de l'introduction, de l'amélioration et de la diffusion des races exotiques. *Bulletin d'Information sur les ressources génétiques animales*, FAO, Rome, Italie, 38: 87-98.
- [22] Thomson, G. R. 1985. The epidemiology of African swine fever: the role of freelifving hosts in Africa. *J. Vet. Res.* 52(3): 201-209. Thomson, 1985.