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DETECTION OF AFRICAN SWINE FEVER VIRUS IN PIGS SLAUGHTERED AT ABATTOIR, JOS, PLATEAU STATE NIGERIA

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ABSTRACT

African swine fever (ASFV) is a reportable disease of swine, with serious economic limitations associated with losses in terms of production and international trade. About 100 spleen tissue samples were collected from abattoir Jos, Plateau State over a period of five weeks. The samples were prepared and analyzed using blocking enzymatic immunoassay (Blocking ELISA) test kit to test for antigen against ASFV. The result revealed an overall prevalence of 17% (95 CI: 10.6-25.3). The prevalence based on sex indicate a higher prevalence in male pigs 21.73 (95% CI 11.6 - 35.34) than in female pigs 12.96 (5.85 - 23.97); however, the difference in prevalence is not statistically significant $p>0.05$. The finding confirms that ASF is endemic in Plateau and the ASFV is prevalent in the study area. The circulation of the virus is a great risk and has a negative impact on the means of livelihood and food security in the state and the country at large. It is therefore recommended that further studies should be carried out to investigate the possible source of the infection on ASFV positive pigs and also characterized the ASFV antibodies in pigs and pig's farmers should ensure strict adherence for biosecurity measures on their farms.

1. INTRODUCTION

African swine fever (ASF) is a major reportable and transboundary disease affecting pigs worldwide, causing heavy financial losses in epidemic and endemic countries, impacting negatively on food supply, and threatening famers livelihoods (Beltran-Alcrudo et al., 2019; Uwishema et al., 2022; Onoja et al., 2023). Detection of ASFV in pigs can lead to international trade restrictions, Exacerbating national economic losses (Taylor et al., 2020). First outbreak of ASF in Nigeria was documented in 1973, with subsequent outbreaks in the years 1997, 1998 and 2001 (Babalobi et al., 2003). Since the 1997 outbreaks, sporadic cases of ASF have been persisting, indicating that ASF is enzootic in the country (Awosanya et al., 2015).

The disease has been reported in various states, including Taraba (Abwage et al., 2015), Benue (Asambe et al., 2018; 2019), Ogun, Oyo, and other southwestern states (Awosanya et al., 2015; Oluwole et al., 2016; Omowon et al., 2019). ASF poses a serious threat to pig production due to economic losses and impacting the national economy (Saka et al., 2010; Omowon et al., 2019; Adekola et al., 2022) and the loss of nutrients in the form of protein and fats from the food supply, further exacerbating food security issues (Okoth et al., 2013; Abwage et al., 2015). About 50 outbreaks of ASF was reported in 12 state of Nigeria in the year 2020. As of May 30, 2021, there were outbreaks in six states with nine confirmed cases (Chieloka and Mogaji, 2022; WAHIS, 2023; Ogundijo et al., 2023).

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African swine fever etiology is a tick-borne DNA virus belonging to the Asfivirus genus and Asfarvirade family, which replicates in the cytoplasm (Sánchez-Cordón et al., 2018). The Orinithodoros genus of soft ticks, is a member of the family Argasidae, serves as the biological vector and reservoir host for ASFV. Approximately eight species of Orinithodoros have been recognized as vectors for the transmission of ASF (Golnar et al., 2019; Gaudreault et al., 2020). Three epidemiological cycles of infection are recognized: Sylvatic, Domestic and Sylvatic-Domestic cycles. Most African countries have reported the three cycles, but in Nigeria the most recognized is the domestic cycle, which harbor the virus among domestic pigs, although some reported the ASF among riverine hogs (Awosanya et al., 2015). The clinical manifestation of ASF varies, presenting in per acute, acute form, sub-acute form and chronic form. In the per acute form, infected pigs are found dead within a period of four days following infection with the absence of gross pathological lesion. In the acute form there is usually high number of dead pigs, with 90-100% mortality in 4-21 days' post infection. Common postmortem changes are vasculitis which may include pulmonary edema, skin erythema, hyperemic splenomegaly, hemorrhagic lymphnodes and lungs, kidneys and urinary bladder with petechial hemorrhages. The sub-acute form is characterized by mortality of about 30-70% due to moderately Virulent strains, with pigs dying around 20 days' post-infection. The clinical signs are less severe than those in the acute form, with more pronounced vascular changes, including hemorrhage and edema. The chronic form, caused by low virulent isolates, is characterized by lack of vascular gross lesions and few mortality rates. Clinical signs include poor growth, emaciation, swelling of joints, skin ulcers, and secondary bacterial infections (Sánchez-Vizcaíno et al., 2015; Sánchez-Cordón et al., 2018).

Numerous laboratory diagnostic techniques have been developing for rapid control of ASF since inception. At The moment priority is to develop affordable, accurate, rapid and field based diagnostic tests that are highly sensitive and specific (Gaudreault et al., 2020). Currently, there is no available drug for proper treatment and effective vaccines for control of the disease (WOAH, 2019; Onoja et al., 2023; Weka et al., 2023; Ogundijo et al., 2023). ASF control require early disease detection in domesticated and wild reservoir pigs through active surveillance and control programs which will serve as effective means of outbreak prevention (Danzetta et al., 2020). Due to the impact of ASF on the pork production value chain and food security it is important to provide an update on ASF situation in Nigeria. The objective of this study is to detect the prevalence of African Swine Fever virus in pigs slaughtered at abattoirs in Jos, Plateau State.

2. MATERIALS AND METHODS

Study Area

This research study was conducted in Jos, Abattoir. Jos is the capital city of Plateau state with about 1,238 meters above sea level. The city has a dense population of about 900,000 inhabitants according to the National census of Nigeria 2006 (2006 Population Census).

Sampling Method

Convenient sampling technique was used to collect the sample, during which 100 spleen tissue samples were collected from the pigs slaughtered at the abattoir, Jos, Plateau State (20 samples every week for the period of five weeks). The samples were put into sample bottle labeled, and transported in ice pack to the Viral Research Laboratory, NVRI and stored at -20^{0}c until use.

Equipment

Distilled water, ELISA Kits, Pipette tips, Sample bottles, Refrigerator, Centrifuge, pistol and mortar, incubator, scissor.

Laboratory Analysis

Sample Preparation

10% tissue homogenate was prepared; thus, about 1g tissue sample taken, pistil and mortar were used to macerate the sample using sterile sand. The samples were Centrifuge at 1500rpm (revolution per minute) for 10 minutes. The supernatant was used for the analysis.

Test Procedure

The kit is a blocking ELISA based on the procedure of blocking enzyme immune assay and steps were carried out in accordance with the manufacturer's instructions. The steps taken include the Following:

1. All reagents (except conjugate) where allowed to come to room temperature before used.
2. To the wells A1 and B1 100µl of the negative control was added, and to A2 and B2 100 µl of the negative control was added. 100µl of samples test was added to each well. The plate was then sealed and incubated for a period of 1 hour at 37°c.
3. After the incubation period, the wells where emptied and washed four times using wash solution.

4. 100µl of specific conjugate was added to each well. The plate was sealed and incubated for 1hour at 37°c. It was washed 4 times following the described procedure.
5. To the plate 100µl of the substrate solution was added, in to every well. The plate was kept for a period of 15 min at 37°c.
6. Lastly to each of the well 100µl of stop solution was added to every well. The Optical density OD values were read on a MultiSkan® spectrophotometer ELISA plate reader (Thermo Scientific, USA) at 450nm wavelength.

Data Analysis

The data obtained were saved in Microsoft Excel® spreadsheet. The Microsoft Excel® spreadsheet was used to perform Descriptive statistics and open Epi Version 2.3.1 statistical tool (Dean et al., 2013).

3. RESULTS AND DISCUSSION

In this study 100 spleen tissue sample were obtained from pigs slaughtered from Jos, abattoir Plateau State, and analyzed for antigen against ASFV. The result revealed an overall prevalence of 17% (95% CI: 10.6 - 25.3). The prevalence based on sex indicate a higher prevalence in males 21.73 (95% CI 11.6 - 35.34) than in females 12.96 (5.85 - 23.97); however, the difference in prevalence is not statistically significant p>0.05. In table 1and 2 below:

Table 1: Prevalence of ASFV from slaughtered pigs

Total no of Animals	Number Positive	Number Negative
100	17	83
Total	17%	

Table 2: Prevalence of ASFV based on Sex

Sex	Number of animals	Number Positive	Number Negative	Proportion (%)	CI 95%
Female	54	7	47	12.96	5.85-2.39
Male	46	10	36	21.73	11.6 35.34
Total	100	17			

P-value = 0.1304; P> 0.05

Numerous serological studies have been conducted in Nigeria to measure the antibodies levels of African swine fever (ASFV) in pig populations, with examples including studies by Mailafiya and Iliya (2009) in kumo, Gombe State and Kperebeyi and Amostsuka (2010) in Delta State. The prevalence of ASFV in this study is significantly higher than previously reported in other studies in Nigeria. Compared to Owolodun et al. (2010) who found a 14% prevalence in Plateau State, the current study's findings are higher. Similarly, the prevalence is higher than the 13.2% reported by Abwage et al. (2015) in Taraba State and the 1.7% reported by Asambe et al. (2018) in Benue State, indicating a more widespread presence of ASFV in Nigeria.

However, the seroprevalence of ASFV obtained in this study is lower than the rates reported by several other studies in Nigeria. Compared to the high prevalence rates reported by Olugasa et al., (2007) (65.2%), Saka et al. (2010) (88%), and Awosanya et al (2015) (28%) in Commercial piggry South western Nigeria. Addtionaly, the prevalence is also lower than rates reported by Fasina et al., (2010) in different state, which are Ogun, Delta, Cross River, Plateau, Benue and Oyo states (60%), (60%), (53%), (47%). (44%) and (36%) respectively. The higher prevalence rates recorded in the study by Fasina et al. (2010) can be attributed to the fact that samples were collected during outbreaks of ASF, which is a significant factor that can impact the prevalence rate. In contrast, the current study's samples were collected during a period without an outbreak, which could explain the lower prevalence rate. The detections of ASFV in the pig population may also be due to the circulation of low pathogenic strains, development of resistance and carrier state in the local pig population, or poor reporting practices by farmers, who may not report outbreaks to authorities and instead dispose of affected pigs, as reported by Fasina et al. (2010).

The study found a higher prevalence of ASFV in male pigs (21.73%) compared to female pigs (12.96%), but the difference was not significant statically. This result is similar to that of Abwage et al. (2015), but contrasts with the report of Asambe et al. (2018) which found a higher prevalence in female pigs. The study's findings indicate the endemicity of ASFV in Plateau State, and highlight the importance of addressing biosecurity issues, such as poor compliance, inadequate protective clothing and insecure, due to loss in revenue, which can contribute to the resurgence of outbreaks (Janse van Rensburg et al., 2022). Additionally, the study suggests that inadequate knowledge of biosecurity procedures among small-scale pig farmers may be a

factor in the occurrence of ASF outbreaks (Jongeneel et al., 2021; Ogundijo et al., 2023).

4. CONCLUSION

This study detected the present of ASF antigen in pigs slaughtered in Jos main Abattoir Plateau State; this of course has a negative impact on the means of livelihood and food security in the state and the country at large.

5. RECOMMENDATIONS

Pig's farmers should ensure strict adherence to biosecurity measures on their farms and Further studies should be carried out to investigate the possible source of the infection on ASFV positive pigs and also characterized the ASFV in circulation in Jos Plateau State.

6. CONFLICT OF INTEREST

All authors have declared that there is no conflict of interests regarding the publication of this article.

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