SEROLOGICAL EVIDENCE OF AFRICAN SWINE FEVER VIRUS INFECTION IN COMMERCIAL PIG HERDS IN SOUTHWEST NIGERIA

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ABSTRACT

Sera from pigs were assayed for African swine fever virus (ASFV) antibodies to determine the presence and prevalence of ASFV infection in 28 pig herds in southwest Nigeria during 2006 - 2007. A total of 374 pigs were screened in Lagos, Ogun, Ondo, Osun and Oyo States using the Enzyme Linked Immunosorbent Assay method. Out of the 28 farms, 2 were negative (7.1%) for ASFV antibodies. Thirteen out of 15 small herds (86.7%) and 13 out of 13 (100%) medium and large farms were positive for ASFV antibodies. Seroprevalence ranged from 50% (Ondo), 52.5% (Oyo), 59.8% (Lagos), and 60.7% (Ogun) to 70% (Osun). Seroprevalence was higher within the older stocks - finishers, gilts, sows and boars (77.3%-96.8%) than in the younger stocks - piglets, weaners, and growers (13.8%-39.7%). In essence, almost all breeder stocks became infected. The overall prevalence rate of 65.2% (244/374) and average prevalence rate of 56.8% per farm were indicative of widespread ASFV infection in pig population in southwest Nigeria. This study shows the persistence of ASFV since its re-introduction into southwest Nigeria in 1997. This highlights the need for improved hygiene and biosecurity measures on pig farms. In conclusion, the need for renewed collaboration between livestock and veterinary extension services providers to implement strategies for ASFV control in southwest Nigeria is stressed.

Keywords: African swine fever virus, antibodies, seroprevalence, southwest Nigeria

INTRODUCTION

African swine fever (ASF) is a severe viral disease of pigs that could result in nearly 100% mortality rate, usually leads to devastating effect on a country's economy, agriculture and food security (Vapnek, 1999). It is a trans-boundary disease, being highly contagious and has the potential for very rapid spread irrespective of national borders, causing serious socio-economic and possibly public health consequences (EMPRES http://www.fao.org/EMPRES/default.htm). There is as yet no vaccine against ASF and mass slaughter is the only available means to prevent further virus transmission.

ASF was first documented in Nigeria at a commercial piggery in Ogun State, where it caused 100% mortality in 1973 (Gumm, 1998). This outbreak did not receive laboratory confirmation. The first confirmed outbreak was reported in Lagos and Ogun states in September 1997. Between September 1997 and July 1998 outbreaks of ASF were reported in Lagos and Ogun states in southwest Nigeria (Odemuyiwa *et al*, 2000).

According to a FAO consultant's opinion, the infection came likely from the OUÉMÉ department in Benin (El-Hicheri, 1998). The first outbreak in Oyo state was reported in March 2001 (Babalobi *et al*, 2003). This disease has continued to spread through contacts with infected and carrier pigs during stock trade, farm visits by stock market middle men and during stock breeding activities in southwest Nigeria (Olugasa and Ijagbone, 2007). An average mortality loss was estimated to be USD3076.77 per farm in Ibadan in 2001 among 306 farms reportedly affected. This severe and devastating disease requires surveillance as means of anticipation to make prevention possible through preparedness and response (Munroe and Willis, 2007). This is a multidisciplinary task to save pig farmers in southwest Nigeria from losing out on a vital means of livelihood.

There is paucity of information on ASFV prevalence in commercial and backyard small scale pig herds in southwest Nigeria (Olugasa, 2006; Olugasa and Ijagbone, 2007). Babalobi *et al* (2003), documents the clinical features and pathology including differential diagnosis for natural ASFV infection in southwest Nigeria. Ayoade and Adeyemi (2003), reviewed the clinical signs and epidemiology of ASF in Nigeria. Olugasa and Ijagbone (2007), reports on the pattern of spread of ASFV infection in southwest Nigeria and presents human factors as the most important means involved in the spread of virus through their involvement in pigs/pig products movement over considerable distances.

El-Hicheri (1998), showed that pig markets also played an important role in spreading ASF as some of the outbreaks were declared in the pig markets of Kafanchan in Kaduna State, Gboko in Benue State and Makurdi in Adamawa State.

As part of on-going population studies for the design and implementation of strategies for ASFV control in southwest Nigeria, under a project funded at the University of Ibadan by MacArthur Foundation Re-entry grant (Ref.No:800/406/54/2006/REG/1), this author embarked on assay for ASFV antibodies in commercial and backyard small scale pig herds in southwest Nigeria. The objective was to establish the presence and prevalence of African swine fever virus in pig herds in southwest Nigeria.

This paper is an evaluation of age group seroprevalence of ASFV infection in pig herds in southwest Nigeria.

MATERIALS AND METHODS

Study Area: The study area is southwest Nigeria and includes Ikorodu (3.4°N, 6.6°E), Agege (3.3°N, 6.6°E), and environs in Lagos state, Abeokuta, Ijebu and environs (3.4°N, 7.2°E) in Ogun state, Ibadan and environs (3.8°N, 9.3°E) in Oyo state, Oloba and environs (4.7°N, 7.7°E) in Osun state and Ile-Oluji (4.8°N, 72°E) in Ondo state (Figure 1). A total of 28 pig herds comprising of 15 small size herds, often located in the backyard (comprising of 1 – 200 pigs), 7 medium size (comprising of 201 – 500 pigs) and 6 large size commercial farms (comprising of 501 or more pigs). Table 1 shows distribution of farms included in the study by states.

Blood samples

For ASFV antibody assay, 5mls of blood was drawn by venipuncture of the cranial vena-cava from 2 to 140 randomly selected apparently healthy pigs, from 28 different herds, from the study location (Table 2). No clinical signs suggestive of ASF were observed in any of the flocks during the screening exercises except on 3 farms. Serum was stored at -4°C until it was tested.

Enzyme Linked Immunosorbent Assay (ELISA)

ASFV antigen obtained from Institute for Animal Health (IAH) Pirbright, Working Surrey, UK was coated on NUNC microtitre plate diluted 1:30 in coating buffer overnight (18 hours). A serum dilution of 1:100 was used following the OIE manual for antibody detection ELISA (OIE, 2004). Optical density values were read at 492nm using a IRE96® ELISA reader (IRE, France).

RESULTS

Twenty-six of the 28 pig herds sampled (92.9%) were seropositive, with seroprevalence ranging from 40% to 100%. Some 13.3% (2/15) of the small backyard herds were seronegative. Thus about 86.6% (13/15) of the small herds were seropositive. The 7 medium and 6 large commercial herds were also positive (Table 2). Overall seroprevalence in small herds was 53.4% (range 0%-100%). Overall seroprevalence in medium farms was 65.5% (range 60%-75%), and overall seroprevalence in large farms was 63.8% (range 50% - 77.8%), Table 2. Figure 2 shows that the seroprevalence is lowest in weaners (13.7%), followed by piglets (37.1%). Older stocks - finishers, gilts, sows and boars have seroprevalence greater than 77% (range 77.2% - 96.8%).

DISCUSSION

Although outbreaks of ASF were previously confirmed in all the six states of southwest Nigeria based on samples from suspected cases submitted for laboratory diagnosis at the National Veterinary Research Institute, (NVRI) Vom, Plateau State, Nigeria (Majiyagbe *et al,* 2004), this appears to be the first sero-epizootiological survey of ASFV to determine the prevalence of the infection in states of southwest Nigeria. Almost all participating farms in this study were affected, and over half of all pigs had antibodies against ASFV. Considering that farmers do not vaccinate pigs against ASFV, the high seroprevalence is a result of ASFV infection.

Finishers, gilts, sows and boars appear to have higher prevalence rates (77.2% - 96.8%) than weaners and piglets (13.7%-37.1%). Figure 2 indicates that this is most likely related to their age; the older the stock the higher the likelihood of becoming infected. This is of interest, because piglets from ASFV infected breeders are probably protected during their first weeks of life by maternally derived antibodies of the homologous virus. Figure 2 shows that their passive antibodies are lost within weeks, when most weaners become seronegative. It is known that most weaners become infected shortly after the loss of maternal antibodies in wild pigs (Wilkinson 1984). This may be the case also in domestic pigs. The high rates of infection in finishers, gilts, sows and boars underline the need to improve hygiene and biosecurity on these farms to prevent cross contamination between herds. Contacts between susceptible

and infected herds should be avoided. The combination of periodic decontamination and timely removal of seroconverted pigs from herds may reduce seroprevalence.

African swine fever outbreaks in southwest Nigeria were shown to produce mortality losses that ranged from 75.9% (growers), 83.1% (weaners), 91.2% (finishers) and 99.8% (piglets) to 100% in gilts, sows and boars (Babalobi *et al*, 2007). The present findings indicate that survivors of previous ASF outbreaks were retained on farms for breeding. As a result, ASFV antibodies have persisted in pigs in southwest Nigeria. It may be assumed that this has been the practice since the re-introduction of ASFV into southwest Nigeria in 1997. The continuous presence of recovered pigs in the population enables virus spread through trade and breeding, leading to the pattern termed TRAMMEBA (an acronym for trade, middle men and breeders' activities) described by Olugasa and Ijagbone (2007). Now, a programme to "roll-back TRAMMEBA" is recommended.

Since slaughter policy has not been implemented by the Animal Health Authorities in Nigeria for ASFV control, livestock extension services (LES) and veterinary extension services (VES) both have increasing roles to play in the implementation of strategies for ASFV control. VES (Esuruoso and Olugasa, 1997) traditionally covers the clinical and surveillance information on ASFV infection, while LES covers problems of breeds, breeding and genetics, feeds, feeding and nutrition (including watering), housing, mode of management practice and environmental concerns. VES and LES both have the means to appreciate, initiate and undertake necessary extension, protection and interventions - that would lead to salutary results - in financial, economic and social health terms. Integration of these two services will benefit ASFV control and pig production.

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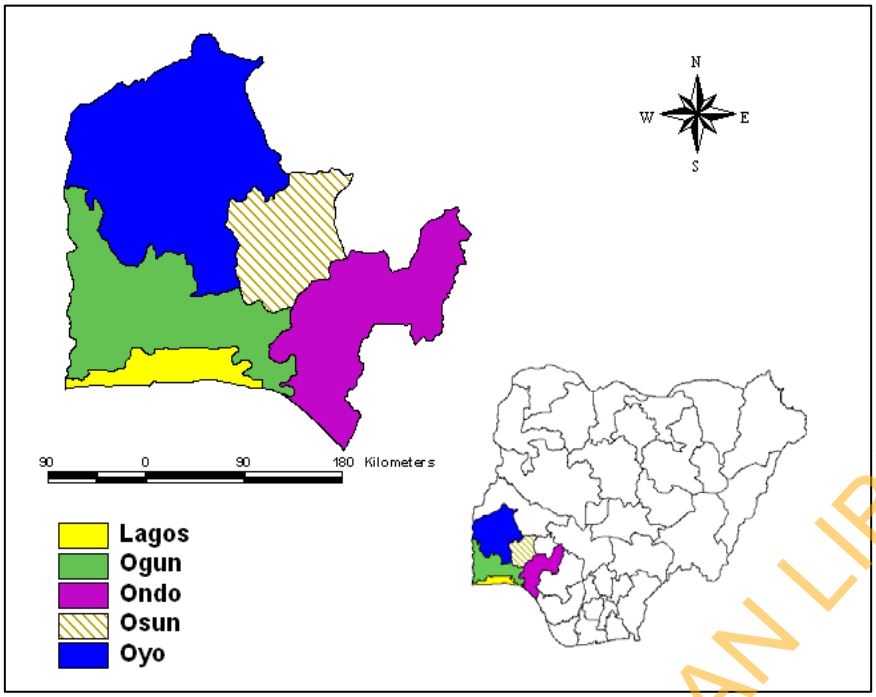

Figure 1: The five study states with as inset showing their location in southwest Nigeria

Table 1: Classification and distribution of farms included in the study

State	Large size piggery (>501 pigs)	Medium size piggery (201-500 pigs)	Small size piggery (1-200 pigs)	Total
Lagos	2	3	3	8
Ogun	2	2	4	8
Ondo	-	-	1	1
Osun	-	-	3	3
Oyo	2	2	4	8
Total	**6**	**7**	**15**	**28**

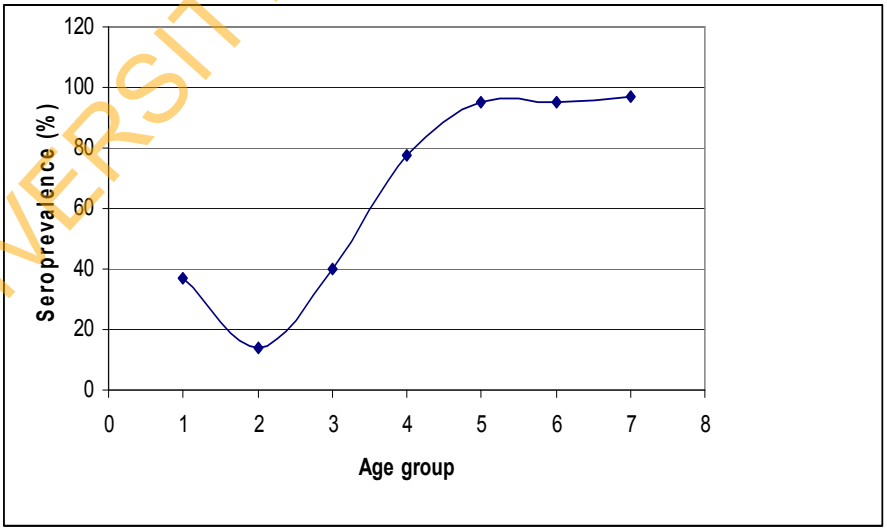

Fig. 2: Age dependent seroprevalence in breeder and growing pigs

Farm ID	Herd size	Class	No of samples tested	No + ve	Seroprevalence %	Boars		Sows		Gilts		Finishers		Growers		Weaners		Piglets	
						No. tested	No. +ve	No. tested	No. +ve	No. tested	No. +ve	No. tested	No. +ve	No. tested	No. +ve	No. tested	No. +ve	No. tested	No. +ve
Ikorodu-1	210	M	11	7	63.6	2	2	1	1	1	1	3	2	1	0	1	0	2	1
Ikorodu-2	107	S	8	6	75.0	1	1	2	2	1	1	-	-	-	-	2	1	2	1
Ikorodu-3	207	M	10	7	70.0	1	1	2	2	1	1	1	1	3	2	-	-	2	0
Ikorodu-4	238	M	12	8	66.7	2	2	2	2	1	1	1	1	4	2	-	-	2	0
OkeAro-1	525	L	9	5	55.6	1	1	1	1	1	1	2	1	2	1	2	0	-	
OkeAro-2	512	L	7	4	57.1	2	2	1	1	-		1	1	2	0	1	0	-	
Agege	78	S	5	2	40.0	1	1	1	1	-		-	-	1	0	2	0	-	
OkoOba	84	S	6	3	50.0	1	1	1	1	-		2	1	1	0	1	0	-	
Abeokuta	55	S	22	22	100.0	6	6	8	8	4	4	4	4	-	-	-	-	-	
Okesota	648	L	9	7	77.8	1	1	2	2	1	1	2	2	1	1	2	0	-	
Lugbeju	261	M	16	10	62.5	2	2	2	2	2	2	2	2	4	1	4	1	-	
Iyalaje	48	S	5	0	0.0	1	0	1	0	-		-	-	-	-	2	0	1	0
Elega	50	S	10	6	60.0	2	2	2	2	1	1	-	-	-	-	3	0	2	1
Ololoo	152	M	10	6	60.0	2	2	2	2	1	1	-	-	-	-	3	0	2	1
Ijara	42	S	4	2	50.0	2	1	1	1	-		-	-	-	-	1	0	-	
Ijebu	528	L	8	6	75.0	2	2	2	2	-		-	-	2	1	-	-	2	1
Ajibode-1	446	M	23	14	60.9	2	2	2	2	2	2	4	3	8	4	3	0	2	1
Ibadan	858	L	140	94	67.1	21	21	25	25	15	15	13	12	31	12	21	3	14	6
Samanda	211	M	8	6	75.0	1	1	1	1	2	2	-	-	2	1	2	1	-	
Basorun	142	S	4	2	50.0	-	-	1	1	0		1	1	-	-	1	0	1	0
Akobo	52	S	2	0	0.0	-	-	1	0	-		-	-	-	-	-	-	1	0
Ajibode-2	82	S	3	2	66.7	-	-	-	-	-		-	-	3	2	-	-	-	
Ejioku-1	513	L	14	7	50.0	3	3	3	3	2	1	3	0	3	0	-	-	-	
Ejioku-2	87	S	4	2	50.0	1	1	-	-	2	1	1	0	-	-	-	-	-	
Oloba-1	33	S	10	7	70.0	2	2	1	0	1	1	2	2	-	-	2	1	2	1
Oloba-2	51	S	5	4	80.0	-	-	-	-	2	2	1	1	-	-	2	1	-	
Olopon	57	S	5	3	60.0	1	1	-	-	2	2	-	-	-	-	2	0	-	-
Ile-Oluji	28	S	4	2	50.0	2	2	-	-	-		1	0	-	-	1	0	-	-
Total			374	244	65.2 (*)	62	60	65	62	42	40	44	34	68	27	58	08	35	13

Table 2: Seroprevalence of African swine fever virus antibodies in southwest Nigeria