International Journal of Biological, Life and Agricultural Sciences
ISSN: 2415-6612
Vol:12, No:7, 2018

Sanitary Measures in Piggeries, Awareness and Risk Factors of African Swine Fever in Benue State, Nigeria

A. Asambe

***Abstract*—**A study was conducted to determine the level of compliance with sanitary measures in piggeries, and awareness and risk factors of African swine fever in Benue State, Nigeria. Questionnaires were distributed to 74 respondents consisting of piggery owners and attendants in different piggeries across 12 LGAs to collect data for this study. Sanitary measures in piggeries were observed to be generally very poor, though respondents admitted being aware of ASF. Piggeries located within a 1 km radius of a slaughter slab (OR=9.2, 95% CI - 3.0-28.8), piggeries near refuse dump sites (OR=3.0, 95% CI - 1.0-9.5) and piggeries where farm workers wear their work clothes outside of the piggery premises (OR=0.2, 95% CI - 0.1-0.7) showed higher chances of ASFV infection and were significantly associated ($p < 0.0001$), ($p < 0.05$) and ($p < 0.01$), and were identified as potential risk factors. The study concluded that pigs in Benue State are still at risk of an ASF outbreak. Proper sanitary and hygienic practices is advocated and emphasized in piggeries, while routine surveillance for ASFV antibodies in pigs in Benue State is strongly recommended to provide a reliable reference data base to plan for the prevention of any devastating ASF outbreak.

***Keywords*—**African swine fever, awareness, piggery, risk factors, sanitary measures.

I. Introduction

AFRICAN swine fever (ASF) is an infectious disease that affects both domestic and wild pigs [20], [25]. The haemorrhagic and transboundary disease is caused by African swine fever virus (ASFV), belonging to the genus *Asfivirus* and currently the only member of the family *Asfarviridae* [8]. Apart domestic and wild pigs, soft tick of the genus *Ornithodoros* is equally found be a reservoir of the virus [28], [31].

The lack of vaccine and inability of ASFV infection to elicit the production of neutralizing antibodies, in addition to a much wider distribution of the soft tick vector, the *Ornithodoros* species are the principal challenge facing ASF control [5]. ASF is reported to have had severe socio-economic impact in endemic areas as well as on naïve pigs especially, where it is newly introduced threatening food security both at household and commercial levels with the consequent mortality and trade restrictions [18], [10].

The endemicity of ASF in Nigeria [11] and indeed Benue State [9], where intermittent infections are experienced has wiped out pig herds [26] over the years. ASF has remained a problem in Nigerian piggeries since 1997 [9], [13], [3], [4], where persistent infections with ASFV appear to recur in core pig-producing areas of the country [11]; thereby, adversely affecting the bustling and rising activities in the industry [4].

The continued presence and maintenance of the virus in domestic pig populations poses an enormous problem, thus prompting a cause for greater understanding of the factors responsible. Hence, the need for the assessment of the level of compliance with sanitary measures in piggeries, awareness and risk factors as these are vital for achieving control and eradication.

Asambe, A. is with the Department of Animal Science, Faculty of Agriculture and Agricultural Technology, Federal University Dutsinma, P.M.B 5001 Katsina State, Nigeria (phone: + 2348029592847; e-mail: drasambe@gmail.com).

II. Materials and Methods

A. Study Area

Benue state is located in the north-central region of Nigeria, a farming zone known for high pig production. Sampling locations include: Apa, Gboko, Gwer-west, Katsina Ala, Kwande, Makurdi, Obi, Ogbadibo, Oturkpo, Tarka, Ukum and Vandeikya local government areas (LGAs).

B. Questionnaire Design and Administration

A pre-tested structured, interviewer-administered questionnaire was used to obtain data on sanitary measures in piggeries, awareness and risk factors of ASF. A respondent was someone who was actively involved in the daily activities of the piggery, not necessarily the piggery owner.

C. Data Analysis

The results obtained were analysed by the Statistical Package for Social Sciences (SPSS) version 20.0. We conducted descriptive statistics and univariate analysis (Chi square) to test for association between categorical variables. P values ≤ 0.05 were considered significant.

D. Results

All the 74 piggeries had quarantine or isolation unit within 100 m radius of the regular pig pen, 17 (23%) of the sampled piggeries had designated working clothes, 27 (36.5%) of the piggery workers in the sampled piggeries had bath at work. 64 (83.8%) of the sampled piggeries did receive or lent out service boars; 64 (16.2%) disinfected the pen floor daily, 12 (16.2%) had routine pest control; 74 (100%) of the sampled farms cleaned their working utensils daily and only 12 (16.2%) of sampled piggeries had designated footwear for their workers. It was observed that respondents generally took

very poor biosecurity measures and had no measures in place to prevent their pigs from getting infected with ASF (Table I).

TABLE I
LEVEL OF COMPLIANCE WITH SANITARY MEASURES IN PIGGERIES

Measures	Yes (%)
Quarantine section within 100m of the main property	74 (100)
Designated work clothes for the piggery	17 (23.0)
Workers bath in the piggery after work	27 (36.5)
Lend out service boars	62 (83.8)
Clean (wash/sweep) pen floor daily	12 (16.2)
Disinfect pen floor daily	12 (16.2)
Clean (wash) work utensils daily	74 (100)
Carcass burial within 1km radius	74 (100)
Piggery designated footwear	12 (16.2)
Routine pests control	12 (16.2)
Access by stray animals	28 (37.8)
Presence of rodents on the piggery	74 (100)

A total of 74 respondents interviewed from the piggeries and all (100%) admitted being aware of ASF. The most common ASF related signs mentioned by the respondents were hyperaemia (reddening of skin) 51 (68.9%) followed by weakness or unwillingness of the pigs to stand 13 (17.6%) and abortion 10 (13.5%), respectively (Table II).

The results show that location of piggery within 1 km radius of a slaughter slabs had 9.2 (95% CI 3.0 – 28.8) more chances of getting infected and was significantly associated ($p<0.0001$) (Table III).

TABLE II
AWARENESS OF ASF ADMITTED BY RESPONDENTS

Category	Number of respondents	Yes (%)
Have you ever heard of ASF?	74	74 (100)
Common Signs of ASF Aware of by Respondents		
Abortion	74	10 (13.5)
Hyperaemia	74	51 (68.9)
Weakness	74	13 (17.6)

Statistically significant association ($p<0.05$) was found in the risk associated with ASF infection and pig farms located within 1 km radius of refuse dump sites and had 3.0 (95% CI 1.0 – 9.5) more chances of getting infected. (Table III). Also, farms where farm workers wear their work clothes outside of the piggery was significantly associated with ASF infection ($p<0.01$) with 0.2 (95% CI 0.1 - 0.7) more chances of getting infected (Table III).

TABLE III
RISK FACTORS ASSOCIATED WITH ASF

Category	OR (95% CI)	χ^2/p-values	Remarks
Slaughter slab within 1 km radius of the pig farm	9.2(3.0 - 28.8)	**(χ^2 = 20.704, p = 0.000)**	Significant
Refuse dump sites within 1 km radius of the pig farm	3.1(1.0 - 9.5)	**(χ^2 = 4.458, p = 0.035)**	Significant
Wearing of work clothes outside of the piggery premises	0.2(0.1 - 0.7)	**(χ^2 = 7.179, p = 0.007)**	Significant
Sharing of farm workers with other pig farms	Constant	Constant	Constant
Sharing of working utensils with other pig farms	Constant	Constant	Constant
Source of replacement stock	1.3(0.3 – 6.1)	(χ^2 = 0.121, p = 0.728)	Insignificant
Feeding of swill to pigs	0.5(0.1 - 2.2)	(χ^2= 0.910, p = 0.340)	Insignificant
Nearby pig farm within 1 km radius of each other	1.3(0.3 – 6.1)	(χ^2= 0.135, p = 0.714)	Insignificant
Presence of functional foot dip on the pig farm	1.0 (0.1 - 7.5)	(χ^2 = 0.002, p = 0.962)	Insignificant
Presence of ticks on pigs	0.7(0.2-3.2)	(χ^2= 0.210, p = 0.647)	Insignificant
Pig farm perimeter fencing	0.7(0.1 - 5.6)	(χ^2= 0.108, p = 0.743)	Insignificant

III. DISCUSSION

The difference observed in the level of compliance with the assessed sanitary measures between seropositive and seronegative piggeries in this study is in agreement with previous report by [2].

Respondents admitted to high level of awareness of ASF but had poor practices towards the disease. However, [1], [19], [14]-[17], [21], [24], [27], [22] suggested lack of adequate knowledge and information about pig production and health as constraints to improved management practices in piggeries.

The signs of hyperaemia, weakness or unwillingness of the pigs to stand followed by abortion mentioned by the respondents though, may or may not be due to ASF shows the ability of the farmers to recognize such associated signs and therefore assist in early detection of an ASF infection. However, this may be impeded by the farmers' unwillingness to report outbreaks which possibly could be explained by the adjudged low compensation by the government, if any, for the culling of affected pigs but it should be noted that early detection and reporting is critical to ASF control and eradication [30] and hence the farmers should be made aware of this.

The statistically significant association between ASF seropositivity and location of piggeries within 1 km radius of pig slaughter slab may be as a result of pig farmers presenting sick and unthrifty pigs for slaughter at abattoirs first without determining the cause of sickness, to which some may be ASF [29], [12] thus, contributing to ASF spread in nearby piggeries [6]. Since ASF virus is present in tissues and body fluids of slaughtered sick pigs, massive environmental contamination and possible nearby piggery infection may result. Similarly, rodents and wild birds are usually observed around open slaughter slabs environment and they carry away intestinal content and viscera, which some are infectious and are disposed of indiscriminately to nearby piggeries thus facilitating the infection of naïve pigs. Also, farmers often participate in various processes on slaughter slab floors with the consequent risk of carrying the virus to their piggeries with resultant infection as reported by [11] in major pig producing areas in Nigeria.

The statistically significant association observed in the ASF seropositivity of piggeries located near refuse dump sites or carcass disposal site agrees with the findings of [2] and may be related directly to a local spread between and within piggeries and may occur through direct pig-to-pig contact, or by fomites, especially in scavenging populations and possibly by stray animals such as dogs and pigs gaining access to the nearby piggeries [11].

The high positive association between wearing of farm clothes outside and ASF occurrence is in agreement with similar observation by [2], and could not be explained by the fact that ASF is reported to be transmitted by indirect contact through fomites though this mode of transmission is said to be efficient in a very high viral load [23], [7]. The movement of work clothes and contacts in and out of the farm at regular interval is suspected to serve as a vehicle for transmission.

IV. Conclusion

The study concluded that the identified risk factors for ASF were presence of slaughter slab within 1 km radius of the piggery; the presence of refuse dump sites within 1 km radius of piggery and wearing of designated work clothes outside the piggery premises suggest that pigs in Benue State are still at risk of an ASF outbreak. Strict adherence to hygienic and proper sanitary measures in piggeries, routine surveillance and monitoring of ASFV antibodies in pigs in Benue State to provide a comprehensive and readily accessible data base to plan for the prevention of any fulminating outbreak is therefore recommended.

References

[1] Adesehinwa, A. O. K., Aribido, S. O., Oyediji, G. O and Obiniyi, A. A. 2003. Production strategies for coping with the supply and demand of pork in some peri-urban areas of South-western Nigeria. *Livestock Research for Rural Development,* 15 (10) http://www.lrrd.org/lrrd15/10/ades1510.htm.

[2] Awosanya E. J., Olugasa B., Ogundipe G and Grohn Y. P. 2015. Seroprevalence and risk factors associated with African swine fever on pig farms in southwest Nigeria. *BMC Veterinary Research* 11:133.

[3] Babalobi O. O, Ayoade G. O., Olugasa B. O., Oluwayelu D. O and Oyedela O. 2003. Differential diagnosis of a swine epizootic of unknown aetiology in Ibadan, Oyo State, Nigeria. *Isreal Journal of Veterinary Medicine*; 58(2/3): 86-9.

[4] Babalobi O. O, Olugasa B. O, Oluwayelu D. O, Ijagbone I. F., Ayoade G.O and Agbede S. A., 2007. Analysis and evaluation of mortality losses of the 2001 African swine fever outbreak, Ibadan, Nigeria. *Tropical Animal Health and Production*. 39: 533-42.

[5] Boshoff, K. 2003. The utilisation of strategic analysis and planning by occupational therapy services. *Australian Occupational Therapy Journal* 50(4): 252 – 258.

[6] Costard, S., Wieland, B., de Glanville, W., Jori, F., Rowlands, R., Vosloo, W., Roger, F., Pfeiffer, D. U. and Dixon, L. K. 2009. African swine fever: how can global spread be prevented? Philosophical Transactions of the Royal Society of London. Series B. *Biological Sciences,* 364(1530): 2683-2696.

[7] de Carvalho, F. H. C., Weesendorp, E., Elbers, A. R. W., Bouma, A and Quak, S., 2013a. Transmission rate of African swine fever virus under experimental conditions. *Veterinary Microbiology*, 165(3-4): 296-304.

[8] Dixon, L. K., Costa J. V., Escribano, J. M., Rock, D. L., Venuela, E. and Wilkinsons, P. J. 2000. *Family Asfaviridae. In: Virus Taxonomy, Seventh Report of the International Committee on Taxonomy of Viruses*. Academic Press, London. Pp.165.

[9] El-Hicheri, K., 1998. Emergency assistance on control and eradication of an outbreak of African swine fever in Western Nigeria. *Report of the FAO Consultancy Mission to Nigeria.* TCP/NIR/7822(E). FAO, Rome, December.

[10] Etters, E. M. C., Seck, I., Grosbois, V., Jori, F., Blanco, E., Vial, L., Akakpo, A. J., Bada-Alhambedji, R., Kone, P. and Roger, F. L. 2011. Seroprevallance of African swine fever in Nigeria. *Emerging Infectious Disease Journal,* 17(1): 49-54.

[11] Fasina F. O., Agbaje, M., Ajani, F. L., Talabi, O. A., Lazarus, D. D., Gallardo, C., Thompson, P. N and Bastos, A. D. S. 2012. Risk factors for farm-level African swine fever infection in major pig-producing areas in Nigeria, 1997-2011. *Preventive Veterinary Medicine,* 107(1-2): 65-75.

[12] Fasina, F. O., Shamaki, D., Makinde, A. A., Lombin, L. H., Lazarus, D. D., Rufai, S. A., Adamu, S. Agom, S. D., Pelayo V., Soler, A., Simon, A., Adedeji, A. J., Yakubu, M. B., Mantip, S., Benshak, A. J., Okeke, I., Anagor, P., Mandeng, D. C., Akanbi, B. O., Ajibade, A. A. Faramade, I., Kazeem, M. M., Enurah, L. U., Bishop, R., Anchuelo, R., Martin, J. H. and Gallardo, C. 2010. Surveillance of African swine fever in Nigeria 2006-2009. *Transboundary and Emerging Diseases,* 57: 244-253.

[13] Food Agricultural Organization of the United Nations (FAO) 1998d: African swine fever in Nigeria hits rural poor. News & Highlights. Accessed on 25 March, 2016 from http://www.fao.org/NEWS/1998/981201-e.htm.

[14] Halimani, T. E., Ndlovu, L. R., Dzama, K., Chimonyo, M and Miller, B. G. 2007: Growth performance of pigs fed on diets containing *Acacia karroo*, *Acacia nilotica* and *Colophospermum mopane* leaf meals. *Livestock Research for Rural Development,* 19(12)

[15] Ironkwe, M. O and Amefule, K. U. 2008. Appraisal of indigenous pig production and management practices in Rivers State, Nigeria. *Journal of Agriculture and Social Research* 8: 1-7.

[16] Kagira, J. M., Maingi, N., Kanyari, P. W. N., Githigia, S. M., Ng'ang'a, J. C and Karuga, J. W. 2010. Characteristics of the smallholder free-range pig production system in western Kenya. *Tropical Animal Health and Production,* 42(5): 865–873.

[17] Karimuribo, E. D., Chenyambuga, S. W., Makene, V. W., Mathias, S. 2011. Charac-teristics and production constraints of rural-based small-scale pig farming in Iringa region, Tanzania. Livestock Research for Rural Development 23(8).

[18] Lubisi, A. B. 2005. Molecular epidemiology of African swine fever in East Africa. Dissertation for Award of MSc Degree University of Pretoria, South Africa, pp132.

[19] Mashatise, E., Hamudikuwanda, H., Dzama, K., Chimonyo, M and Kanengoni, A. 2005. Socio-economic roles, traditional management systems and reproductive patterns of mukota pigs in semi-arid north-eastern Zimbabwe. *Bunda Journal of Agriculture, Environmental Science and Technology,* 3(1): 97-105.

[20] Montgomery, R. E. 1921. On a form of swine fever occurring in British East Africa (Kenya colony). *Comparative Pathology* 34: 159-191.

[21] Moreki, J. C and Mphinyane, H. G., 2011. Opportunities and challenges of pig production in Botswana. *Livestock Research for Rural Development*,23(4) http://www.lrrd.org/lrrd23/4/more23087.htm.

[22] Muhanguzi D, Lutwama V and Mwiine F. N 2012. Factors that influence pig production in Central Uganda—case study of Nangabo Sub-County, Wakiso district. *Veterinary World*, 5(6): 346-51.

[23] Mur, L., Martinez-Lopez, B., Sanchez-Vizcaino, J. M. 2012d. Risk of African swine fever introduction into the European Union through transport-associated routes: returning trucks and waste from international ships and planes. *BMC Veterinary Research* 8 (1): 149.

[24] Nwanta, J. A., Shoyinka, S. V. O., Chah, K. F., Onunkwo, J. I., Onyenwe, I. W., Eze, J. I., Iheag-wam, C. N., Njoga, E. M., Onyema, I., Ogbu, K. I., Mbegbu, E. C., Nnadozie, P. N., Ibe, E. C and Oladimeji, K. T. 2011. Production characteristics, disease prevalence, and herd-health management of pigs in Southeast Nigeria. *Journal of Swine Health and Production,* 19(6): 331–339.

[25] Office international des epizooties (OIE), 2005. *Meeting of OIE Working Group on Wildlife Diseases*. Report No. 4. Paris, France. 47pp.

[26] Owolodun, O. A., Bastos, A. D. S., Antiabong, J. F., Ogedengbe, M. E., Ekong, P. S. and Yakubu, B. 2010. Molecular characterization of African swine fever viruses from Nigeria (2003-2006) recovers multiple virus variants and reaffirms CVR epidemiological utility. *Virus Genes* 41(3): 361-368.

[27] Petrus, N. P., Mpofu, I., Schneider, M. B and Nepembe, M. 2011. The constraints and potentials of pig production among communal farmers in Etayi Constituency of Namibia. *Livestock Research for Rural Development* 23(7), http://www.lrrd.org/lrrd23/7/petr23159.htm.

[28] Plowright, W., Parker, J. and Pierce M. 1969. African swine fever virus

in ticks (*Ornithodoros moubata*, Murray) collected from animal burrows in Tanzania. *Nature,* 221: 1071-1073.

[29] Randriamparany, T., Grenier, A., Tourette, I., Maharavo-Rahantamala, C.Y., Rousset, D., Lancelot, R., 2005. Epidemiological situation of African swine fever in Lake Alaotra Region (Madagascar) and possible consequences on the organization of disease control and surveillance. *Revue d Elevage et de Medecine Veterinaire des Pays Tropicaux,* 58: 15–20.

[30] Sánchez-Vizcaíno, J. M. 2010. Early detection and contingency plans for African swine fever. Compedium of technical items presented to the OIE World Assembly of Delegates and to OIE Regional Commissions, 129-168.

[31] Thomson, G. R., Gainaru, M., Lewis, A., Biggs, H., Nevill, E., van der Pypekamp, M., Gerbes, L., Esterhuysen, J., Bengis, R., Bezuidenhout, D. and Condy, J. 1981. The relationship between ASFV, the warthog and *Ornithodoros species* in southern Africa. In *ASF, Eur8466 EN. Proceedings of CEC/FAO Research Seminar* (Edited by Wilkinson P. J.). Sardinia, Italy. pp. 85-100.