Preliminary study of the incidence of pre-weaning mortality in exotic and West African dwarf pigs in South Nigeria

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UKO (O.J.), ATAJA (A.M.), BABATUNDE (G.M.). Etude préliminaire de l'incidence de la mortalité jusqu'au sevrage, chez les porcs de races exotiques et naine de l'Afrique de l'Ouest au Nigeria-Sud. *Revue Élev. Méd. vét. Pays trop.*, 1994, **47** (3) : 329-332

Les auteurs ont recherché l'incidence de la mortalité jusqu'au moment du sevrage, chez les porcs importés et ceux de la race naine de l'Afrique de l'Ouest. L'étude a été conduite à Ibadan (Nigeria-Sud) pendant douze mois. La mortalité, de la naissance au sevrage, a été de 29,3 et 44,8 p. 100 pour les porcelets importés et les porcelets indigènes, respectivement. La plupart de ces pertes sont intervenues pendant la première semaine de vie (26,9 et 37,9 p. 100 dans les races exotiques et la race indigène, respectivement). Les porcelets exotiques étaient plus lourds ($p < 0,01$) à la naissance que les porcelets de race locale ou indigène avec des poids moyens de 1,21 ± 0,20 et 0,64 ± 0,06 kg respectivement. Les porcelets indigène parvenus au sevrage étaient significativement plus lourds ($p < 0,05$) à la naissance que leurs compagnons de même portée morts à la naissance ; cependant, cette différence n'était pas significative ($p > 0,05$) chez les porcelets exotiques. La taille de la portée a varié ($p < 0,05$) entre les deux types de races mais n'a eu d'effet significatif ($p < 0,05$) sur le taux de mortalité que chez la race indigène. Les causes apparentes de la mortalité chez les porcelets exotiques et indigènes ont été les suivantes, respectivement : traumatisme, 16,0 et 1,8 p. 100 ; gastro-entérite, 2,1 et 5,4 p. 100 ; mortinatalité, 0,6 et 2,9 p. 100 ; détresse respiratoire, 0,3 et 1,5 p. 100 ; causes non identifiées, 10,33 et 33,3 p. 100. Aucune incidence notable de la saison n'a été constatée sur la mortalité. Les effets spécifiques du poids à la naissance, ceux des maladies infectieuses et de l'alimentation n'étaient pas discernables, compte tenu du niveau de l'étude. Ils feront l'objet de prochaines recherches.

Mots clés : Porcin - Mortalité - Poids à la naissance - Poids au sevrage - Sevrage - Nigeria.

INTRODUCTION

Neonatal mortality in farm animals will continue to receive attention from researchers due to its conspicuous economic importance in livestock production. Several studies have demonstrated that lighter animals at birth suffer higher mortality than the heavier ones (3, 4, 7, 14). BAUMAN *et al.* (1) reported that over 50 % of deaths usually occur before the end of the second day of life in pigs. A large proportion of mortality among baby pigs can be attributed to failure to suckle within the first few hours of life (1).

Some of these animals are normal-sized, apparently well-developed pigs that are born at term (2). However, the small-sized pigs are at a disadvantage in reaching teats placed too high or covered by the dam's body and may not be able to nurse vigorously during the time that colostrum or milk are available (3). This predisposes light piglets to losses caused by crushing by the dam and other fatal traumatic injuries that constitute the highest mortality group among live-born pigs. Most of the injuries occur within the first 36-48 hours post-partum (2). RANDALL (10) has shown that one of the main factors in the aetiology of pig mortality during delivery is anoxia from premature rupture of the umbilical cord, impeded umbilical blood flow or tenuous connections between placenta and uterus. Pre-weaning losses in pigs are also related to litter size (6, 12) which is determined by several factors (5, 8, 9, 11).

Information on swine problems in Nigeria is limited. The West African dwarf pig is particularly neglected. The study was therefore intended to relate several factors to mortality in the indigenous piglet. The exotic breeds in Nigeria were used for comparison.

MATERIALS AND METHODS

Breeds of pigs used in this survey were Large White, Landrace and Large White x Landrace crosses, referred to as exotic breeds, and West African dwarf pigs, commonly known as indigenous breed. They were aged about 1-4 years and with a weight range of 85-180 and 45-80 kg for exotic and indigenous breeds, respectively, at the time of first mating in this study. Accurate records on parity of the sows were not kept on the farm. The animals belonged to the University of Ibadan Teaching and Research Farm, South Nigeria. The breeding herds consisted of 37 sows and 3 boars of exotic breeds from the commercial unit and 45 sows and 7 boars of indigenous breed from the Rockefeller Foundation Research unit on the farm. Although the indigenous pigs are basically kept by rural dwellers as scavengers in several instances, both breeds (exotic and indigenous) were reared intensively under natural conditions with temperature and relative humidity ranges of 25-28°C and 55-85 %, respectively, on concrete floors throughout the 12 months of the study. A total of 853 exotic and 587 indigenous piglets were used for the study, born in 92 and 111 litters, respectively, during the period of 12 months.

The farrowing pens had farrowing rails and separate creep areas for the piglets and were heated by infrared lamps. All pens were cleaned, disinfected and lime-washed after each litter. The pens were routinely cleaned daily while housing the sow and her litter. Gestating and

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lactating diets with the following composition: DE, 13.0 MJ/kg; CP, 14 and 16% and lysine, 4.5 and 7.0 %, respectively, were offered at 2.0 and 5.0 kg/pig/day to the exotic pigs. The same diets were also offered to the indigenous pigs at 1.5 and 3.0 kg/pig/day.

All the diets were supplemented with brewer's spent grains and water was provided *ad libitum*. Two weeks before farrowing the sows were moved to new concrete pens and dewormed with piperazine citrate. They were later transferred to their respective farrowing pens a week before they were due to farrow. The mammary glands of the sows were washed with detergent and antiseptic (Dettol®, Reckitt & Coleman, Hull, UK) to eliminate possible excessive loads of pathogens. Daily farm visits throughout the duration of the study were made at about 07.00 hours in order to collect data and to observe general conditions of the animals, maternal instincts and possible causes of death of the piglets.

The piglets were identified by ear tattoo and weighed on the first day of life on a baby scale. The litter size and mortality of pre-weaned piglets were also recorded. Each of the piglets received 100 mg of iron dextran preparation intramuscularly at one and two weeks of age. A pelleted creep feed was offered in the 4th week of life. The sick and weak piglets were isolated from their litter mates as soon as they were noticed. The piglets were weaned at 6 weeks of age.

Post mortem examinations of all carcases were carried out but no specimens were taken for bacteriological identification. The apparent causes of death were classified as trauma, starvation and stillbirth according to the method proposed by SHARPE (12). Gastroenteritis was incriminated as the cause of death when the piglets were diarrhoeic.

Respiratory distress was considered to be the cause of death when clinical signs and *post mortem* lesions were confined to the respiratory system. Piglets that had congenital abnormalities, runts, etc., but whose immediate cause of death was starvation, trauma, etc. were classified as such. Statistical analyses were performed using Student's test (13).

RESULTS

The exotic piglets were significantly ($p < 0.01$) heavier at birth than the indigenous breed. The birth weights ranged from 0.88-1.95 and 0.47-1.00 kg for exotic and indigenous piglets, respectively. The average birth weight of the indigenous piglets that died was lower ($p < 0.05$) than that of those that survived. However, this difference was marginal ($p > 0.05$) among the exotic breeds. The birth weights of piglets are presented in table I.

Approximately 83 % of the exotic breeds that weighed 1.00 kg and above at birth survived to weaning age while 51.0 % survival rate was recorded among the piglets that weighed less than 1.00 kg. In the indigenous breed, 82.0 % of the piglets that weighed between 0.60 and 1.00 kg at birth were weaned whereas a survival rate of approximately 31.0 % was observed in those piglets that weighed less than 0.60 kg. The relationship between birth weight and mortality rate ($r = -0.78$ and -0.86 for exotic and indigenous breeds, respectively) in both breeds of the pigs is shown in table II.

Litter size differed significantly ($p < 0.05$) between the two breeds. The effect of litter size on the mortality rate (table III) was significant only in the indigenous breed.

Two hundred and fifty exotic and 263 indigenous piglets died before weaning, giving a mortality rate of 29.3 and 44.8 % in the exotic and indigenous breeds, respectively (tables II, IV). Most of the losses occurred during day 0-first week of life (26.9 and 37.9 % for exotic and indigenous, respectively) with smaller losses (exotic, 2.4 % and indigenous, 6.9 %) in the subsequent weeks (2-6). The immediate causes of death have been summarized in table IV.

Apparently, trauma accounted for the highest cause of death in the exotic breed whereas starvation/unidentified causes were the most important single cause of death in

TABLE I *Average birth weight of exotic and indigenous piglets.*

Weight (kg) ± Standard error	Breed		Standard error difference (t-test)
	Exotic	Indigenous	
Weight of total piglets born	1.21 ± 0.20	0.64 ± 0.06	0.22**
Weight of weaned piglets	1.23 ± 0.18[a]	0.73 ± 0.05[a]	0.19
Weight of dead piglets	1.19 ± 0.22[a]	0.54 ± 0.07[b]	0.23

[a, b] *Average weights with different superscripts in the same breed differed ($p < 0.05$) ; ** significant difference ($p < 0.01$) in average weights between the two breeds.*

TABLE II *Relationship between birth weight and mortality rate in exotic and indigenous piglets.*

Breed	Birth weights (kg)	Number died	Number survived	Total number	Mortality (%)
Exotic	0.80-0.89	51	30	81	63.0
	0.90-0.99	107	132	239	44.8
	1.00-1.39	64	235	299	21.4
	1.40-1.59	22	148	170	12.9
	⩾ 1.60	6	58	64	9.4
	Total	250	603	853	(29.3)
Indigenous	0.40-0.49	41	5	46	89.1
	0.50-0.59	172	92	264	65.2
	0.60-0.69	43	127	170	25.3
	0.70-0.79	5	54	59	8.5
	⩾ 0.80	2	46	48	4.2
	Total	263	324	587	(44.8)

Figures in parenthesis represent mortality rate in the number of pigs born.

TABLE III Effect of litter size on mortality rate.

Parameters	Breed	
	Exotic	Indigenous
Litter size+	4-7, 8-9, 10-12, 13-14	3-5, 6-8
Number of litters	18, 37, 30, 7	89, 22
Average number of pigs weaned per litter	5.0, 6.3, 7.4, 8.3	2.9, 3.0
Average number of pigs died per litter	1.4, 2.1, 3.8, 4.8	1.8, 4.7
Pigs that survived per litter (p. 100)	78.1, 75.0, 66.1, 63.3	61.7, 39.1
Mortality per litter (%)*	21.9, 25.0, 33.9, 36.7	38.3, 60.9

*+, * : Litter size differed ($p < 0.05$) between the two breeds but its effect on the mortality rate was significant ($p < 0.05$) only in the indigenous breed, respectively.*

TABLE IV Apparent causes of mortality expressed as a percentage of the total pigs born.

Causes of deaths (%)	Breed	
	Exotic	Indigenous
Trauma	16.0 (54,6)	1.8 (4.0)
Starvation/unidentified causes	10.3 (35.2)	33.3 (74.1)
Stillbirth	0.6 (2.0)	2.9 (6.5)
Gastroenteritis	2.1 (7.2)	5.4 (12.1)
Respiratory distress	0.3 (1.0)	1.5 (3.3)
Total	29.3 (100)	44.8 (100)

Figures in parenthesis are percentages of the total deaths.

the indigenous pigs. Gastroenteritis as manifested in the form of diarrhoea was the third major cause of mortality in both of the breeds. Cases of stillbirth were relatively fewer among the exotic than in the indigenous breed. The majority of the traumatized (exotic, 14.4 % and indigenous, 1.6 %) and starved (exotic, 9.3 % and indigenous, 31.8 %) piglets died within the first week of life while deaths due to scour (exotic, 1.9 % and indigenous, 3.7 %) were more predominant in the second to the sixth week of age.

DISCUSSION

The significantly lower birth weight of the indigenous breed compared with exotic breed was presumably genetic. The high mortality rate recorded in light piglets of the indigenous breed in this survey is consistent with other reports (4, 7, 14). Several reasons have been previously advanced for this; however, the possibility of small pigs being less mature in other ways than their litter mates (6, 12) was more apparent in the indigenous breed. The significant difference in the birth weights of the dead and weaned indigenous piglets further demonstrated the relationship between birth weight and mortality rate. However, it is still difficult in this study to assess precisely the effect of birth weight on piglet mortality, so, the role of birth weight must be considered within the litter.

Litter size in the indigenous pigs was significantly smaller with an average of 6.2 piglets per litter when compared with the exotic breeds which have a mean size of 9.8 piglets per litter. Apart from the breed factor which is known to determine the size of litter (8), SCOFIELD (11) reported that prenatal losses of potential piglets in sows are often between 30 and 40 % ovulation rate. Perhaps the losses may be higher in the indigenous sows due to placental insufficiency (9) to support large number of foetuses, even if numerous ova were shed, because of miniature nature of the pigs. The litter size in both of the breeds has an inverse relationship with the birth weights of the piglets and therefore a direct effect on the deaths of lighter piglets. This is also more pronounced in the indigenous breeds, probably because of the limited capacity of the uterus to sustain numerous heavier foetuses.

The high number of cases of traumatic injuries with subsequent death in the exotic piglets was caused by restlessness and disregard for the piglets by the dams, while the negligible incidence in the indigenous piglets is suggestive of the better behavioural tendency of the sow towards her young ones. Deaths of piglets attributed to starvation cannot be fully accounted for at this stage of the study for the following reasons: (a) absence of ingesta in the digestive tract which was used as an indication of starvation is only a guide since diseased animals may not ingest food; (b) although the first 2-3 pairs of mammary glands in many of the farrowed indigenous dams secreted little or no milk, starvation caused as many as 35.2 % of the deaths in exotic piglets in spite of adequate milk production by the dams; and (c) no histological examination of tissues or samples were taken for bacteriological examination to confirm the health status of the piglets. There was no noticeable seasonal influence on the mortality of piglets resulting from reduced voluntary feed intake or milk production by the dams (not shown). Indeed, Ibadan, South Nigeria does not experience extreme temperature variations due to seasonality like the Northern part of Nigeria; moreover, the indigenous pigs are native to the environment. As for the exotic breeds, the breeding stocks were imported into the University Farm about 30 years ago and all the progeny of the stocks have also adapted to the environment. In an earlier study with Large White and Landrace in Ibadan, Nigeria, PAYNE (8) observed the fecundity of these animals to be about the same as it would be in the temperate zone but weaning weights were low and stillbirth and piglet mortality rates were high. However, he could not state with any certainty what part of this lower productivity was due to the effects of the climatic environment. Therefore, starvation and infections will be further investigated as possible causes of piglet losses. More cases of dystocia were recorded in the indigenous than in the exotic sows and this accounted for the higher percentage of stillborn piglets in the former breed. Piglets with pleural petechiation were classified as respiratorily distressed and this was responsible for about half of the mortality in this group.

CONCLUSION

There was marked interplay between the various contributory factors to the mortality in both breeds. The indigenous piglet was particularly vulnerable to pre-weaning mortality probably due to its conspicuous miniature nature. The small litter size and body weight of the indigenous sow make it imperative that intensive selection for improved litter and body size traits as well as viability rate of its piglets be practiced to take advantage of its good behavioural instinct and adaptability to the local environment for profitable commercial pig production. The roles of birth weight, infections and nutrition as causes of piglet losses are not discernible at this stage of the survey. These will, however, be investigated in future studies.

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UKO (O.J.), ATAJA (A.M.), BABATUNDE (G.M.). Preliminary study of the incidence of pre-weaning mortality in exotic and West African dwarf pigs in South Nigeria. *Revue Élev. Méd. vét. Pays trop.*, 1994, **47** (3): 329-332

The incidence of pre-weaning mortality in exotic and indigenous West African dwarf pigs in Ibadan, South Nigeria, was investigated for a continuous period of 12 months. Mortality from birth to weaning in exotic and indigenous piglets was 29.3 and 44.8 %, respectively. Most of these losses occurred during the first week of life (26.9 and 37.9 % in exotic and indigenous breeds, respectively). The exotic piglets were heavier ($p < 0.01$) at birth than the indigenous with an average weight of 1.21 ± 0.20 and 0.64 ± 0.06 kg, respectively. Weaned indigenous piglets were significantly ($p < 0.05$) heavier at birth than the dead litter mates ; however, this difference was not significant ($p > 0.05$) in exotic piglets. Litter size differed ($p < 0.05$) between the two breeds but had significant ($p < 0.05$) effect on mortality rate only in the indigenous breed. Apparent causes of death in exotic and indigenous piglets were: trauma, 16.0 and 1.8; gastroenteritis, 2.1 and 5.4; stillbirth, 0.6 and 2.9; respiratory distress, 0.3 and 1.5 and unidentified causes, 10.3 and 33.3 %, respectively. There was no noticeable seasonal influence on the mortality. The specific effects of birth weight, infection and nutrition on piglet mortality were not discernible at this stage of the study. These will be investigated in future studies.

Key words: Swine - Mortality - Birth weight - Weaning weight - Weaning - Nigeria.

UKO (O.J.), ATAJA (A.M.), BABATUNDE (G.M.). Estudio preliminar sobre la incidencia de la mortalidad pre-destete en cerdos exóticos y cerdos enanos de Africa del Oeste en el sur de Nigeria. *Revue Élev. Méd. vét. Pays trop.*, 1994, **47** (3) :329-332

Durante un período contínuo de 12 meses, se estudió la incidencia de la mortalidad pre-destete en cerdos exóticos y cerdos autóctonos enanos de Africa del Oeste en Ibadán, Nigeria del sur. La mortalidad del nacimiento al destete en cerdos exóticos y autóctonos fue de 29,3 y 44,8 p. 100 respectivamente. La mayoría de estas pérdidas se ocurrieron durante la primera semana de vida (26,9 y 37,9 p. 100 en razas exóticas y autóctonas respectivamente). Los lechones exóticos fueron más pesados ($p < 0,01$) al nacimiento que los autóctonos, con un peso promedio de 1,21 ± 0,20 y 0,64 ± 0,06 kg respectivamente. Los cerdos autóctonos destetados fueron significativamente más pesados ($p < 0,05$) al nacimiento que aquellos de la misma camada que murieron. Sin embargo, esta diferencia no es significativa ($p > 0,05$) en los lechones exóticos. El tamaño de la camada difirió ($p < 0,05$) entre las dos razas, pero solamente en la raza autóctona presentó un efecto significativo ($p < 0,05$) sobre la tasa de mortalidad. Entre las posibles causas de muerte, tanto en la raza exótica como en la autóctona, están: traumatismos, 16,0 y 1,8 p. 100 ; gastroenteritis, 2,1 y 5,4 p. 100 ; natimuertos, 0,6 y 2,9; disfunción respiratoria, 0,3 y 1,5 y causas no identificadas, 10,3 y 33,3 p. 100, respectivamente. No se observó una influencia estacionaria sobre la mortalidad de los lechones. Los efectos específicos del peso al nacimiento, de las infecciones y de la nutrición sobre la mortalidad de los lechones no se identificaron en esta etapa del estudio. Sin embargo, este punto será investigado en estudios futuros.

Palabras clave : Cerdo - Mortalidad - Peso al nacimiento - Peso al destete - Destete - Nigeria.