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INTERSEX PIGLET WITH BILOBED URINARY BLADDER IN KUMASI, GHANA: A CASE REPORT

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ABSTRACT

This paper reports a case of a true intersex in a pig in Kumasi, Ghana. The diagnosis was based on gross and histomorphological assessment of the genital organs which consist of a left ovary, two uterine horns and body of uterus, along with a right testis without an epididymis. Vagina and vulva were also absent. A perineal scrotal pouch and a tubular tract connection with an intra-abdominal urinary bladder conducting urine through a miniature paraphimotic sigmoid shaped penis were observed. A rectal prolapse was consequent to rectal compression by the inadequately voided urinary bladder. Gonadal hormonal profiles were analysed and compared in the true intersex and those of the males and female siblings using standard techniques. The embryologic, reproductive, and swine production cost implications of intersex were discussed.

Keywords: Intersex pig, Gross histology, Genital organs, Hormonal profile

INTRODUCTION

Intersexuality is a phenomenon characterized by existence of male and female gonadal tissues in an animal (Bansal *et al*., 2005). Three categories currently recognized are: those with ovary-like structures alone, referred to as female pseudohermaphrodites, those with ovotestes or testes and ovaries on one side, referred to as true hermaphrodites, and those with only testis-like structures which are called male pseudohermaphrodites (Pailhoux *et al*., 2001). The phenomenon, although rare in animals (Manumolian, 1993; Bansal *et al*., 2005) has been reported in sheep and goats (Bosu and Basrur, 1984; Monteagudo *et al*., 2008), dogs (Kuiper and Distl, 2004), cattle (Pavan-Carreira, 2008), equine (Bouters *et al*., 1972), swine (Pailhoux *et al*., 2001) and recognized as a common cause of infertility in domestic animals (Bosu and Basrur, 1984). The incidence is relatively higher in the swine species, especially in large farms where rigorous breeding activities are conducted with percentage occurrence varying among countries depending on available data. There is, however, a dearth of information in literature on intersexuality with urinary bladder bi-lobe among animal species. This report describes the microscopic features of the gonadal structures and the morphometry of the external genitalia in a true intersex piglet at Kumasi, Ghana. The embryologic, reproductive, and swine production cost implications of the

phenomenon, especially, in a poor resource setting, were discussed with recommendations to minimize reoccurrence in breeding farms.

CASE PRESENTATION

A pseudohermaphrodite two weeks old piglet, large-white cross, in a litter of 10 (five intact boars and four sows) bred at the Animal Science Farm of Kwame Nkrumah University of Science and Technology, Kumasi, Ghana was presented with a history of inappetence which resulted in its stunted growth among litter mates and anatomical features which makes its sexuality difficult to determine.

Morphometrical Examination: The piglet weighed 8 kg. The physical parameters evaluated such as temperature, heart and respiratory rates were within normal range. The piglet was smaller than litter mates despite being isolated in a different pen for maximum care. It had 7 paired mammary gland teats. Prepuce and penis were absent from the ventral abdomen. Perineal region had an anal orifice and a distally located fluid filled scrotal sac with no evidence of testes. A sigmoid shaped paraphimotic penal structure hanged just distal to the scrotum (Figures 1 and 2).

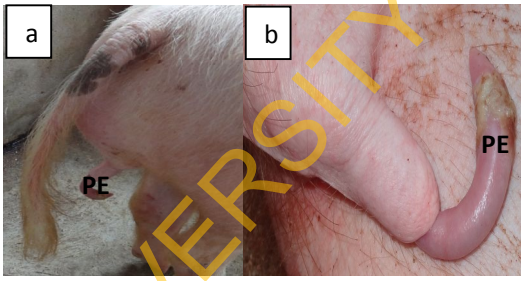

Figure 1: Perineal region has an anal orifice and a distally located fluid filled scrotal sac with no evidence of testes and a sigmoid shaped paraphimotic penal (PE) structure hanged just distal to the scrotum (Figure 1 a and b)

The piglet had urine and faecal incontinence which made scrotal palpation very painful with resultant rectal prolapse. Faeces voided with difficulty were dry, strong and pelleted. An exploratory laparotomy was performed at the sixth week.

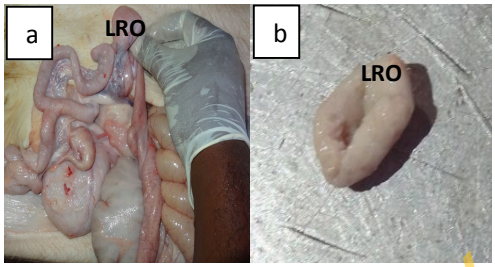

Figure 2: Right structures (a) which were slightly bigger than the left and grossly diagnosed as the left right ovaries (LRO) (b)

Exploratory Laparotomy: A ventral midline laparotomy and scrotal pouch explorations under balanced aneasthesia with 2 % Xylazine (1 mg/kg), 5 % Ketamine (10 mg/kg) alongside 0.1 % atropine (0.05 mg/kg) revealed an intra-abdominal urinary bladder with a tract to the scrotum, a uterine body and horns, a left ovary and a testicle which was attached to the right horn and two times smaller than the ovary (Figure 2). Exploration of the intra-scrotal pouch reveals a communication with the urinary bladder.

Pre-slaughter Measurements: Morphometric studies to obtain phenotypic variations such as: prepuce-scrotum distance, umbilicus prepuce distance, scrotal length, scrotal diameter, and body length of the intersex and those of the siblings were done using standard techniques (Bansal *et al.*, 2005) and compared.

Hormonal Assay: 10 ml of blood was obtained from the intersex piglet and five of the siblings (3 males, 2 females) via jugular venupuncture at two weeks and at six weeks (before slaughter), processed and assay for gonadal hormone (Cook *et al.,* 1977).

Necropsy and Histopathology: The intersex piglet was slaughtered at six weeks by stunning with an electric stunning machine (K. Schermer Company, Germany), and necropsy was done to re-evaluate gonadal structures and to obtain samples for histology. Tissues from the suspected ovotestis were routinely processed for histopathological examination, stained with Haematoxylin and Eosin and view under light microscope (Bancroft *et al.,* 1994).

Data Analysis: Data on morphometric, hormonal and histopathology generated were analyzed using Microsoft Genstat for windows Version 9. Student t-test to compare differences between the means and probability value of $p<0.05$ was accepted as significant.

RESULTS

Morphometric Characters: Values of measurement of intersex gonadal structures for comparison with those of siblings are as shown in Table 1.

Table 1: Morphometric character of the reproductive organs in intact males and intersex

Parameters	Intact male	Intersex
Preputial scrotal distance	38 – 39	32.30
Scotal length	12 – 15	12
Scrotal diameter	9 – 9.5	8
Body length	99 – 115	107
Number of teats	10 – 18	7
Length of penis	Most preputial (18-20 cm)	13 (Protruded 9 cm, preputial 4 cm)
Structure of penis	Sigmoid (mid) and preputial	Penile curve (sigmoid)

There were marked differences in the preputial scrotal distance, scrotal length, scrotal diameter, body length, number of teats, length of penis and structure of penis of the intersex when compared to the litter mate. The intersex has an exposed protruded sigmoid penis as shown in Figure 1.

Hormones in Pigs

Estrogen: The estrogen level at 2 weeks of age (**pre-pubertal**) for the male siblings was higher (17.63 ± 0.64 pg/ml) but not significant ($p>0.05$), when compared with that of intersex (13.9 pg/ml), and the female siblings (15.00 ± 0.57 pg/ml) (Table 2).

Table 2: Gonadotropins profile of intersex piglet with those of siblings at age of 2 weeks

Piglet	LH (IU/L)	FSHI (IU/ml)	Estrogen (pg/ml)
H	10.1	1.9	13.9
M	9.13 ± 1.91	1.7 ± 0.35	17.63 ± 0.64
F	9.75 ± 0.21	1.8 ± 0.14	15 ± 0.57
	Testosterone (µg/ml)	**h-Prolatin (mlU/L)**	**Progesterone (mmol/L)**
H	2.0	0.1	0.1
M	2.87±0.8	0.1 ± 1.7	-
F	-	1.45 ± 1.91	1.45 ± 1.91

Key: *H = intersex piglet, M = sibling male piglet, F = sibling female piglet*

Table 3: Gonadotropins profile of intersex piglet with those of siblings at age 6 weeks

Piglet	LH (IU/L)	FSHI (IU/ml)	Estrogen (pg/ml)
H	0.30 ± 0.00	0.20	71.60
M	-	-	-
F	0.65 ± 0.35	0.20 ± 0.00	74.20 ± 1.98
	Testosterone (µg/ml)	**h-Prolatin (mlU/L)**	**Progesterone (mmol/L)**
H	2.00	10.20	27.20
M	-	-	-
F	-	5.10 ± 0.00	2.65 ± 3.32

Key: *H = intersex piglet, M = sibling male piglet, F = sibling female piglet*

Luteinizing hormone (LH): The LH level at 2 weeks of age (pre-pubertal), for the intersex (10.1 UI/L) was higher but not significant ($p>0.05$) than those of the male (9.13± 1.91 UI/L) and female (9.75 ± 0.21 UI/L) siblings (Table 2). The LH values, at 6 weeks for the female siblings (0.65 ± 0.35 UI/L) were significantly higher ($p>0.05$) than those of intersex (0.3 UI/L) (Table 3).

Testosterone: The testosterone level at 2 weeks of age (pre-pubertal), for the intersex (2.00 µg/ml) was lower, but not significant ($p>0.05$) than those of the male (2.87 ± 0.90 µg/ml) siblings (Table 2). The testosterone values at 6weeks were not compared with intersex (2.00 µg/ml) for absence of male siblings (Table 3).

Follicle stimulating hormone (FSH): The FSH level of the intersex (1.90 ± 0.00 IU/ml) at 2 weeks of age (pre-pubertal) was higher but not significant (p>0.05) than those of the male (1.70 ± 0.00 IU/ml) land female (1.80 ± 0.00 IU/ml) siblings (Table 2). The FSH values for the intersex (0.20 ± 0.00) and female siblings (0.20 ± 0.00 IU/ml) were not different at 6 weeks of age (Table 3).

Prolactin: The prolactin level of the intersex (0.10 mIU/L) was not different from those of male siblings (0.10 ± 0.00 mIU/L), but significantly lower than those of female siblings at 2 weeks of age (1.45 ± 1.91) (Table 2). The intersex prolactin level at six weeks (10.20 mIU/L) was significantly higher (p<0.05) than those female (5.10 ± 0.00 mIU/L) (Table 3).

Progesterone: The intersex progesterone level at 2 weeks of age (0.10 mmol/L) was significantly lower (p<0.05) than those of female siblings (1.45 ± 1.91 mmol/L) (Table 2). The intersex progesterone level (27.20 mmol/L) was significantly higher (p<0.05) than those of female siblings (2.65 ± 3.32 mmol/L) at 6 weeks of age (Table 3).

Histopathology: The microscopic features revealed, seminiferous tubules with spermatocytic arrest, leydig hypertrophy and focal areas of ovarian stroma. These features are consistent with ovotestis with underdeveloped seminiferous tubules (Figures 3).

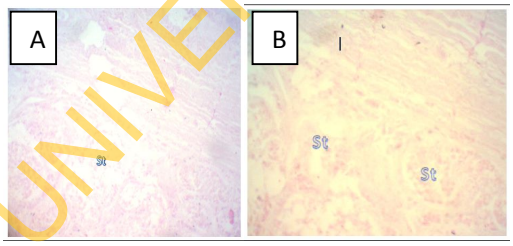

Figure 3: A and B showed histological section of the ovotestis with underdeveloped empty seminiferous tubules (St) with no spermatogenic cells. H & E Mag x 40, 100 respectively

DISCUSSION

This is the first report of this intersex in pigs in Ghana. The condition described is similar to that previously described by some researchers (Hunter *et al.,* 1982; Hunter and Greve, 1995) who described the co-existence of much-enlarged clitoris, an enlarged penile and preputial sheath. The major histological alteration observed in this case is the ovotestis which consisted of extensive interstitial tissue and seminiferous tubules with prominent sertoli cells devoid of spermatozoa (Hunter *et al.,* 1982). Although other reports described coarse hair and incipient tusk development with varying degrees of masculinization, in this case, tusk and masculine characteristics are not prominent at this age. The prominent sigmoid shape penis is a very prominent finding in this case, which may prevent intromission if allowed to grow to puberty.

In this report the the intersex pig had testosterone and progesterone in plasma which gave an indication of the presence of testis and ovary respectively in this animal. The progesterone in this case was 5 – 90 times higher than intact female; this result differs from the report of Hunter *et al.* (1982) where the concentrations of progesterone were similar to the expected in sows.

Surgical exploration done on this case revealed ovaries with a proportion of testicular tissue with underdeveloped seminiferous tubules with spermatocytic arrest, leydig hypertrophy and focal areas of ovarian stroma. These features are consistent with those described as ovotestis by other workers (Hunter *et al.,* 1982; Hunter and Greve, 1995). The possible cause in this case may not be readily ascertained but literatures revealed that most intersex pigs possess XX sex chromosomes and usually 36 autosomes; which mostly are under the influence of an autosomal recessive gene carried by certain boars (Hunter, 1996).

This case report clearly showed that this condition need to be known to veterinarians and pig farmers especially in poor resource setting where the consequences to breeding could be enormous.

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