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## Abnormalities of Reproductive Organs of Sows Slaughtered at Yaounde Town, Cameroon

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**Abstract:**

The present study was conducted at the pig municipal abattoir of Yaounde (Cameroon), to determine the prevalence of pathologies of the reproductive tract in sows. The reproductive organs of 450 sows of varied ages were collected and examined. Genital tract diseases were identified from observable macroscopic lesions and abnormalities. For each sow, the breed, Body Condition Score (BCS), age, and physiological status (pregnant or not) were registered to investigate their influence on the genital tract disease prevalence. It was observed that most slaughtered sows belong to local breeds (Bakossi, Bamileke, Kousseri, Mankon Long Nose). The average age (in months) and Body Condition Score (BCS) were  $15.02 \pm 8.45$  and  $2.90 \pm 0.60$ , respectively, while a pregnancy rate of 18% was observed. A general prevalence rate of 37.3% was observed for genital tract abnormalities with the following pathologies being the most common: ovarian cysts (19.3%), cervicitis (6%), vulvar discharges (5.6%), parovarian cysts (4%), oophoritis (4%), pyometra (3.6%), vaginitis (3.6%), vulvitis (3.3%), tumor of the oviduct (3.3%), metritis (2.9%), hydrometra (2.7%). An 18.89% prevalence rate was obtained for concomitant pathologies with a high frequency (7.1%) of the association of vulvar discharge (uterine origin) with hydrometra. Local breeds of sows with moderate BCS and about 12 months of age were the most susceptible to ovarian cysts, cervicitis, and vulvar discharges (uterine origin). This high prevalence rate of reproductive tract abnormalities is a possible reason for the high rate of infertility observed in the pig farming industry. Further studies must be carried out to elucidate the real causes of these pathologies.

**Keywords:** Cameroon, genital diseases, prevalence, Sow, Yaounde.

## INTRODUCTION

Cameroon has a population of around 23 million (Bucrep, 2018). This ever-growing population creates a high demand for animal proteins which cannot be met by domestic production. Given that pork is consumed by almost 70% of the Cameroonian population (Insc, 2011), the pig population in 2015 was estimated at more than 2.8 million for individual consumption of 2.98 kg/person per year; which is far below the recommended annual minimum protein intake of 5kg per person per year (Minepia, 2015). This low production can be explained by the fact that the majority of pig farmers operate in a traditional system (Kouamo *et al.*, 2015). Pig fertility has deteriorated significantly in recent decades due to increasing infertility observed. This problem of infertility or low production, associated with the desire of the population, acquire information and control animal breeding, has led to the development of new reproductive biotechnologies (Mermillod, 2003), still known under the name of assisted reproductive techniques (ARTs). The main applications of these ARTs namely artificial insemination (AI), embryo transfer (ET), in vitro embryo production, in pigs, are necessary to increase productivity, preserve the genetic potential of animals sub-fertile or dead, and reduce reproductive pathologies (Deuleuze *et al.*, 2009). However, the results of these biotechnologies in all of sub-Saharan Africa, and Cameroon in particular, remain low (less than 40%).

Several factors could be responsible, notably, those related to the animal (age, health status, number of post-partum days, and breed) and exogenous factors such as feed, breastfeeding, and mastery of the AI technique (Kouamo *et al.*, 2019). Lack of knowledge of the prevalence of pathologies in the sows' genital tract could also be one of the factors responsible for this low success rate in reproductive biotechnology. Determining the prevalence of pathological conditions of the genital tract is an essential first step to clarify the individual factors

responsible for infertility and to make recommendations as to specific as possible to the breeding conditions encountered. The slaughterhouse appears to be the best source of pathological data of the female genital tract (Fathalla *et al.*, 2000).

Studies on the prevalence of pathologies of the genital tract of exotic sows have been undertaken in recent decades. But similar studies in local sows remain little or not known. It is in this context that this research was carried out with the major objective being to determine the prevalence of pathologies of the genital tract of local sows. The specific aim was to characterize the sows slaughtered, determine the prevalence of pathologies of their genital tract, and study the influence of breed, Body Condition Score (BCS), age, and physiological status on the prevalence of pathologies of the genital tract.

## MATERIALS AND METHODS

### Site and study period

This study was carried out in the city of Yaounde, capital of the Central region of Cameroon, precisely at the municipal pig slaughterhouse of Yaoundé 8 (Nkomkana) located at the coordinate points 3° 53'17.2" North 11° 29'47.6" East. The climate is of the equatorial type with two rainy seasons and two dry seasons. Average annual precipitation is estimated at 1600 mm and the average temperature is around 25°C (Minimum = 23.21 °C, Maximum = 26.31 °C).

### Ethical statement

The study was approved by the Ethical Committee of the School of Veterinary Medicine and Sciences of the University of Ngaoundere as well as the ministry of livestock, fisheries, and animal industries and care as described in the European Community guidelines; EEC

Directive 86/609/EEC, of the 24<sup>th</sup> November 1986.

### **Study animals**

The study involved 450 genital tracts collected from sows of various local and hybrid breeds at the slaughterhouse. Information taken from the owners showed that 19.3%, 75.3%, 4%, and 1.3% of the animals slaughtered come from the West, Center, Far North, and North regions of Cameroon.

### **Characterization of sows**

The sows were chosen randomly, each sow undergoing a general examination before and after slaughter to identify the main characteristics such as breed, age, body condition score (BCS), and physiological status. The breed was determined based on phenotypic characteristics as described by Kouamo *et al.* (2015) and classified into three groups: local called "indigenous", exotic called improved, and crossbreed or hybrids. The BCS was determined according to the so-called scoring method described by Machebe *et al.* (2012) on a scale of 1 to 5. The age was evaluated by dentition and the sows were classified into three age groups based on the eruption of permanent incisors and molars. Females with permanent molars 1 were considered gilts (1.5 - 7 months), those with permanent molars 2 as likely to be gilts (8-12 months), and those with incisor 1 as adults (Anta, 2009). After the sows were slaughtered and their gut was removed, the uteri were examined for the presence or absence of fetuses.

### **Diagnosis of genital pathologies**

After the females were slaughtered and gutted, the entire reproductive system of each sow was separated from the pelvic viscera and the broad ligament. Placed on an inspection table, this genitalia was carefully examined from the vulva to the ovaries. The ovaries with follicles over 11 mm in diameter were considered cystic and classified into follicular

cysts (thin wall and easily depressible) and luteal cysts (thicker wall) based on appearance (Mc. Entee, 1990).

### **Statistical analysis**

The data collected were saved in Microsoft Excel 2013 and the statistical analysis was carried out with SPSS software (Statistical Package for Social Sciences) version 20. Analysis of variance (ANOVA) was carried out for the comparison of means. The chi-square test was used to assess the effects of breed, body condition score, age, and physiological status on the prevalence of different conditions. All data were represented as mean  $\pm$  SEM (Standard Error of Mean) and percentage (only for pathologies) at the 5% threshold.

## **RESULTS**

### **Characteristic of sows**

Of the 450 sows examined, 0.07% (n = 3), 14.7% (n = 66), 16% (n = 72), 20% (n = 90) and 48.7% (n = 219) were of the Pietrain, Large White, Landrace, Naima and local breeds (Bakossi, Bamileke, Kousseri, Mankon Long Nose), respectively.

The average body condition score (BCS) of the sows examined was  $2.90 \pm 0.603$  with a minimum of 1 and a maximum of 5. 10.7% (n = 48), 68% (n = 306) and 21.3% (n = 96) sows were with a BCS of (1-2), 3 and (4-5), respectively.

The sows were on average  $15.02 \pm 8.45$  months old, knowing that the youngest were 2.5 months old gilts and the oldest sows were around 36 months old. 26.7% (n = 120), 19.3% (n = 87) and 54% (n = 243) of sows were with an age (in months) of [1 - 7], [8 - 12] and > 12, respectively.

### Physiological status

Of the 450 sows examined, the proportion of pregnant sows was 18% (n=81) and the total number of lost fetuses was 978. The most

slaughtered pregnant sow breeds were: landrace (20.8%, n = 15) out of the total 72 landraces and local breed (20.5%, n = 45) out of the total 219 local sows (Table 1).

**Table 1.** Frequency distribution of physiological status by the breed of sows.

	Frequency/percentage	Physiological status			P-value
		Pregnant	Non-pregnant	Total	
Landrace	Frequency	15	57	72	0.205
	Percentage (%)	20.8	79.2	100	
Large-white	Frequency	12	54	66	
	Percentage (%)	18.2	81.8	100	
Naima	Frequency	9	81	90	
	Percentage (%)	10.0	90.0	100	
Pietrain	Frequency	0	3	3	
	Percentage (%)	0.0	100	100	
Local	Frequency	45	174	219	
	Percentage (%)	20.5	79.5	100	
Total	Frequency	81	369	450	
	Percentage (%)	18.0	82.0	100	

### Prevalence of pathologies of the genital organs

The overall prevalence of genital pathologies encountered in sows at the slaughterhouse in Yaounde was 37.3% (168/450). Table 2, presents the different pathologies of the genital tract according to location. The prevalence of ovarian pathologies was 26% (n = 117). Frequently encountered pathologies consisted of ovarian cyst (19.3%), oophoritis (4%), and ovarian hypoplasia (2%). The most common oviduct pathology was the para-ovarian cyst (4%). The uterine portion of the genital tract was the most affected. Pathologies affecting all parts of the uterus were: the pyometra (3.6%), metritis (2.9%), hydrometer (2.7%), and hemorrhagic metritis (1.3%). In the vagina, vaginitis was observed in 3.6% of specimens and vulvar discharge was

the most common pathology in the vulvar portion with a prevalence of 5.6% (Table 2).

### Prevalence of concomitant pathologies of the genital organs

Of the 168 sows presenting at least one of the pathologies described, 85 (18.89%) of them presented at least two concomitant genital pathologies. Table 3 presents the different cases of associations of pathologies. It appears that the ovarian cyst associated with oophoritis, the vulvar discharge associated with the hydrometer, and the vulvar discharges associated with the oviduct tumor were the most associated (7.1%). Seventeen (17) sows presented the association of more than three pathologies.

**Table 2.** Frequency distribution of the prevalence of genital pathologies according to location.

	<b>Pathologies</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Ovaries</b>	Ovarian cyst	87	19.3
	Oophoritis	18	4
	Ovarian abscess	3	0,7
	Ovarian hypoplasia	9	2
	<b>Total</b>	<b>117</b>	<b>26</b>
<b>Oviduct</b>	Para-ovarian cyst	18	4
	Salpingitis	12	2.7
	Tumor of the oviduct	15	3.3
	Pyosalpinx	6	1.3
	<b>Total</b>	<b>51</b>	<b>11.3</b>
<b>Uterus</b>	Pyometra	16	3.6
	Macerated fetus	3	0.7
	Hemorrhagic metritis	6	1.3
	Metritis	13	2.9
	Hydrometra	12	2.7
	Cervicitis	27	6
	Atrophy of uterine horn	1	0.3
	<b>Total</b>	<b>78</b>	<b>17.2%</b>
<b>Vagina</b>	Vaginal prolapsus	6	1.3
	Vaginitis	16	3.6
	Vaginal abscess	3	0.7
	<b>Total</b>	<b>25</b>	<b>5.6</b>
<b>Vulva</b>	Vulval discharge	25	5.6
	Vulvitis	15	3.3
	<b>Total</b>	<b>40</b>	<b>8.9</b>

**Table 3.** Concomitant genital pathologies of sows.

<b>Pathologies</b>	<b>Number</b>	<b>Percentage</b>
Ovarian atrophy + cystic ovary + para-ovarian cyst	3	3.5
Cervicitis + para-ovarian cyst+ cystic ovary	2	2.4
Vulvar discharge + tumor of the oviduct	6	7.1
Vulvar discharge + vaginitis + pyometra + metritis	1	1.2
Vulvar discharge + cervicitis + cystic ovary+ oophoritis	2	2.4
Vulvar discharge + hydrometra	6	7.1
Vulvar discharge + cervicitis + metritis + cystic ovary	3	3.5
Vulvar discharge + cystic ovary+ oophoritis	1	1.2
Vulvar discharge + pyometra	3	3.5
Macerated fetus + cervicitis	3	3.5
Hydrometra + ovarian hypoplasia	3	3.5
Cystic ovary+ oophoritis	6	7.1
Para-ovarian cyst + cystic ovary	4	4.7
Para-ovarian cyst + salpingitis + cystic ovary	3	3.5
Haemorrhagicmetritis+ salpingitis	3	3.5
Vaginal prolapsus+ pyometra	2	2.4
Pyometra + pyosalpinx	3	3.5
Pyometra + pyosalpinx + oophoritis	3	3.5
Salpingitis + cystic ovary	3	3.5
Salpingitis + cystic ovary+ oophoritis	3	3.5
Vaginitis + vaginal prolapsus + pyometra + oophoritis	3	3.5
Vulvitis + vaginitis + hydrometra + tumor of the oviduct	2	2.4
Vulvitis + cervicitis + cystic ovary	2	2.4
Vulvitis + vaginitis + vaginal abscess + cervicitis	3	3.5
Vulvitis + vaginitis + haemorrhagicmetritis+ cystic ovary	3	3.5
Vulvitis+ cervicitis + cystic ovary	1	1.2
Vulvitis + vaginitis + ovarian hypoplasia	3	3.5
<b>Total</b>	<b>85</b>	<b>100.0</b>

### Prevalence of pathologies of the genital organs according to breed, BCS, age, and physiological status

The effect of breed, BCS, age, and physiological status was only considered for pathologies with a prevalence > 3.00%, namely: ovarian cysts (19.3%), oophoritis (4%), oviduct tumors (3.3%), para ovarian cysts (4%), cervicitis (6%), pyometritis (3.6%), vaginitis (3.6%), vulval discharge (5.6%), vulvitis (3.3%). Sows of local breeds were significantly more affected by ovarian cysts than the others ( $p$

<0.05); the breed with fewer ovarian cysts was the Naima breed. The Landrace breed was significantly more affected by cervicitis. Sows with average BCS (3) presented significantly more ovarian cysts (12.7%) than thin (BCS = 1-2) (1.3%) and fat sows (BCS = 4-5) (5.3%) ( $p$  <0.05). Ovarian and para-ovarian cysts, cervicitis, and vulval discharge were significantly less common in gilts (1-7 months) than adult sows (> 12 months) ( $p$  <0.05). The prevalence of ovarian cysts and cervicitis was higher in non-pregnant sows (6%) (Table 4).

**Table 4.** Prevalence of pathologies in different parts of the genital tract.

Animal characteristic	Oophoritis	Ovarian cyst	Tumor of the oviduct	Para-ovarian cyst	Pyometra	Cervicitis	Vaginitis	Vulval discharge	Vulvitis
	(n=18)	(n=87)	(n=15)	(n =18)	(n = 16)	(n = 27)	(n = 16)	(n = 25)	(n = 15)
<b>Breed</b>									
Pietrain	0.0	0.0 <sup>a</sup>	0.0	0.0	0.0	0.0 <sup>a</sup>	0.0 <sup>a</sup>	0.0	0.0 <sup>a</sup>
Large-white	0.7	2 <sup>a</sup>	0.0	0.7	0.9	0.7 <sup>a</sup>	0.2 <sup>a</sup>	0.9	0.0 <sup>a</sup>
Landrace	0.7	2.7 <sup>a</sup>	1.3	1.3	0.7	2.7 <sup>b</sup>	0.7 <sup>a</sup>	1.3	1.3 <sup>b</sup>
Naima	0.7	0.7 <sup>a</sup>	0.7	0.7	0.7	1.3 <sup>a</sup>	1.3 <sup>b</sup>	1.3	0.7 <sup>b</sup>
Local breed	2	8.7 <sup>b</sup>	1.3	1.3	1.3	1.3 <sup>a</sup>	1.3 <sup>b</sup>	2	1.3 <sup>b</sup>
<b>p-value</b>	<b>0.990</b>	<b>0.00</b>	<b>0.08</b>	<b>0.32</b>	<b>0.76</b>	<b>0.00</b>	<b>0.41</b>	<b>0.67</b>	<b>0.08</b>
<b>BCS</b>									
Thin (1 – 2)	0.0	1.3 <sup>a</sup>	0.7	0.7 <sup>a</sup>	0.9	0.7 <sup>b</sup>	0.9 <sup>a</sup>	0.2 <sup>a</sup>	0.7 <sup>a</sup>
Moderate (3)	3.3	12.7 <sup>b</sup>	2	1.3 <sup>a</sup>	2.7	2.7 <sup>a</sup>	2 <sup>b</sup>	4 <sup>b</sup>	1.3 <sup>b</sup>
Fat (4 – 5)	0.7	5.3 <sup>a</sup>	0.7	2 <sup>b</sup>	0.0	2.7 <sup>a</sup>	0.7 <sup>a</sup>	1.3 <sup>a</sup>	1.3 <sup>b</sup>
<b>p-value</b>	<b>0.71</b>	<b>0.00</b>	<b>0.49</b>	<b>0.06</b>	<b>0.37</b>	<b>0.00</b>	<b>0.48</b>	<b>0.17</b>	<b>0.00</b>
<b>Age</b>									
[1 – 7 months]	0.0	2 <sup>a</sup>	0.0	0.0 <sup>a</sup>	0.9	0.0 <sup>a</sup>	0.2 <sup>a</sup>	0.2 <sup>a</sup>	0.0 <sup>a</sup>
[8 – 12 months]	0.7	2.7 <sup>a</sup>	1.7	1.3 <sup>b</sup>	0.7	0.7 <sup>a</sup>	1.3 <sup>b</sup>	0.7 <sup>a</sup>	0.7 <sup>a</sup>
> 12 months	3.3	14.7 <sup>b</sup>	2.7 <sup>b</sup>	2.7 <sup>b</sup>	2	5.3 <sup>b</sup>	2 <sup>b</sup>	5 <sup>b</sup>	2.7 <sup>b</sup>
<b>p-value</b>	<b>0.18</b>	<b>0.00</b>	<b>0.48</b>	<b>0.02</b>	<b>0.98</b>	<b>0.00</b>	<b>0.06</b>	<b>0.00</b>	<b>0.48</b>
<b>Physiological status</b>									
Pregnant	0.7	6 <sup>a</sup>	0.0 <sup>a</sup>	1.3	0.7	0.0 <sup>a</sup>	0.7	0.7 <sup>a</sup>	0.7
Non pregnant	3.3	13.3 <sup>b</sup>	3.3 <sup>b</sup>	2.7	2.9	6 <sup>b</sup>	2.9	4.9 <sup>b</sup>	2.7
<b>p-value</b>	<b>0.881</b>	<b>0.00</b>	<b>0.06</b>	<b>0.84</b>	<b>0.94</b>	<b>0.01</b>	<b>0.93</b>	<b>0.42</b>	<b>0.84</b>

<sup>a,b</sup> percentages in columns with different superscripts are significant ( $P < 0.05$ ).

## DISCUSSION

The average age of the sows examined corroborates the result reported by Mopate *et al.*

(2009) in Bangui (Central African Republic) but higher than that recorded by Griot (1998) which is 250 days minimum in France. This difference could be due to the fact that most local breeders



want to get the most out of their females and prefer to slaughter the males. Females are most often kept for reproductive reasons. The average BCS obtained would be linked to the study period, having taken place from July to October. These months constitute periods of rain, pleasant temperature, and therefore thermal comfort for the animals. The frequency of pregnant sows slaughtered (18%) is different from that reported by Tchoumboue (1989) which was 26.89% in a slaughterhouse in the same city. This difference could be linked to the awareness of breeders who are more organized and aware of the drawbacks of this practice, to the difference in the sample size and the pathologies which prevail during the study periods.

Several pathologies of the reproductive system have been revealed at the slaughterhouse level; these pathologies are similar to those found by Madec and Kobish (1982). The pathology most found in this study was the ovarian cyst (19%), as reported by Madec and Kobish (1982) which reveals a prevalence of 8.5% on European sows present in France. The study of Kang and Son (1984) report a prevalence of 18.1% in gilts and 48.6% in sows. These values are higher than those found in this study. This difference could be due to the differences in breed between the two studies, the diet, and the age of the study population. Previous factors, therefore, influence the prevalence of ovarian cysts in sows.

The prevalence of oophoritis (4%) is above the 1.7% of Mc. Entee (1990) who reported that this pathology is very rare in sows compared to other species. This difference would be due to the different study contexts, the breed, and the number of animals studied, but also to their breeding hygiene, their health, and/or their nutritional level.

Para-ovarian cysts are more common in sows older than 12 months than in young sows. Martinat-Botte (1998) found a prevalence of 9.3%, on the other hand. This difference in prevalence would be attributed to the difference

in breed at the level of the study populations, the age, and the follow-up within these populations. The prevalence of pyometra was lower than that reported by Madec and Kobish (1982) which was 5%. This difference would be due to the difference in sample size between the two study populations, to the hygiene and the study context.

Age was a parameter that influenced the prevalence cervicitis of during this study. Previous studies reported the existence of a relationship between age and prevalence of cervicitis (Salman and Esraa, 2013). This would explain the role that the age of animals would play in the appearance of these anomalies. Vulvar discharge is the result of a disorder of the reproductive system. Thomas *et al.* (2013) obtained a prevalence of 7.5%. Bertchinger *et al.* (1992) found that vulvar discharge is linked to age because it is more frequent in older sows. These observations are consistent with those made in this study where we found that sows older than 12 months are more prone to vulvar discharge. The prevalence of vulvitis (3.3%) would be related to the difference in age between the two study populations, to the state of health of the two populations which was different, the management of the breeding.

The prevalence of concomitant genital pathologies shows that these pathologies are one of the major causes of infertility in the sow. Consequently, associative treatments specific to these pathologies must be undertaken before any practice of reproductive biotechnologies.

## CONCLUSION

The present study revealed that the prevalence of pathologies of the reproductive system was 37.3% and ovarian cysts (19.3%) as the most frequent pathologies. Local breed sows with an average BCS, older than 12 months were the most susceptible to genital pathologies. In order to improve the percentage of success of reproductive biotechnologies and consequently

boost pig production, future studies aimed at determining the causes of these pathologies should be considered. It would be necessary to include in the protocols for estrus synchronization, artificial insemination, and even embryo transfer specific treatments to each listed pathology. Better support for breeders and awareness-raising on hygiene on farms would reduce external contamination factors.

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## CONFLICT OF INTEREST

All the authors have declared that no conflict of interest exists.

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