



## Pregnancy Related Biometrical Changes in the Ovaries and Uterus of the Red Bororo Cattle in Maiduguri, Nigeria

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### SUMMARY

Pregnancy related biometrical changes in apparently normal ovaries and uterus of 30 pregnant and 10 non - pregnant Red Bororo cows were undertaken in Maiduguri using abattoir samples, with the objective of providing baseline data on this aspect. Analysis of the dimensions showed steady increase ( $P < 0.05$  to  $P < 0.001$ ) in sizes of the ovaries and uteri along the trimesters of gestation. The right ovary was larger in size and heavier in weight than the left ovary both in pregnant and non – pregnant states. The right uterine horn was larger in size than the left uterine horn, thus suggesting their natural activities. The cervix showed levels of significant reduction ( $P < 0.05$  to  $P < 0.01$ ) in length and attendant increases in diameter from first trimester of gestation to full term, signifying the usefulness of the contraction of the sphincter muscles in the sealing of the cervix during pregnancy. In conclusion, the results of this study have established the baseline for the dimensions of ovaries and uterus of the pregnant and non – pregnant Red Bororo cows of Nigeria. This information will make diagnosis of various abnormalities of these organs easier in both physiological states.

**Key words:** Biometry, Ovary, Pregnancy, Red Bororo cow, Uterus.

### INTRODUCTION

Cattle today are the basis of a multi-billion dollar industry worldwide. The international trade in beef for the year 2000 was over \$30 billion and represented only 23 percent of world beef production (Clay, 2004). The production of milk, which is also made into cheese, butter, yogurt, and other dairy products, is comparable in economic size to beef production and provides an important part of the food supply for many of the world's population. The world cattle population was estimated to be about 1.3 billion heads, with about 15 percent in Africa (Anonymous, 2010). Nigeria had a mean cattle population of 13.9 million in 1990, of which 11.5 million were kept in pastoral system and 2.4 million in villages. They were predominantly Zebu, Muturu, Keteku, N'dama and Kuri (Mason *et al*, 1989). The Red Bororo is found in eastern Niger, northern Nigeria, western Chad and northern Cameroon. It belongs to the West African Zebu type (long lyre-horned). Their normal coloration is mahogany (Mason, 1996).

Successful reproduction on modern dairy farms requires an understanding of reproductive processes of the dairy cow and a working knowledge of the anatomy of parts of the reproductive tract. This knowledge can be useful in identifying and

correcting many situations leading to poor reproductive efficiency (Prange and Duby, 2011). The knowledge of biometrical status of female genital tract is essential to perform artificial insemination, pregnancy diagnosis and dealing with infertility problems (Memon, 1996). The information on biometry of the reproductive tract of Red Bororo cow is scanty in the literature, even rarer is that related to pregnancy. Therefore, this present study aims at documenting information on the progressive biometrical changes in the ovaries and uterus during pregnancy in the Red Bororo cow thus, providing the baseline data on this aspect. The slaughter - house material would be the best source for obtaining biometrical values (Rind *et al.*, 1999)

#### **MATERIALS AND METHODS**

The study was carried out on apparently normal ovaries and uteri of 30 pregnant (10 per trimester) and 10 non - pregnant adult Red Bororo cows procured at the Maiduguri metropolitan abattoir. The trimesters of pregnancy were verified, after biometrical measurements of the dimensions of the ovaries and uteri, by comparing the crown-rump length measurements of fetuses associated with each pregnancy with those of the guide to the ageing of cattle fetuses using crown-rump measurements (Evans and Sack, 1973). All the animals were apparently healthy and of variant ages and weights. The organs were collected immediately after slaughter by cutting off the broad ligament attaching them to the body wall. Pair of scissors, scalpel and blades were used to incise, excise or separate various segment of the reproductive organs before measurements. Superior tailoring measuring tapes (Butterfly brand) were used to measure length along the uteri as well as lengths and breadths of ovaries and internal and external os of the cervixes.

The thickness of the ovaries were measured with a micrometer screw gauge (Mitutoyo brand), all lengths were measured in centimeters. Ovarian weights were measured in grams using the electronic precision balance (Metra brand).

Measurements of the ovarian and uterine dimensions were adopted from Jaji *et al.*, (2010). The length of an ovary was the distance between the anterior and posterior poles of the ovary. The thickness was the distance between the medial and lateral surfaces of the ovary and the breadth, the distance between the attached and the free borders of the ovary.

The length of each uterine horn was the distance from the middle of the point of bifurcation to the tip of the uterine cornu, while the breadth was the widest distance between the two walls of the uterine horn. The length of the uterine body was the distance from the tip of the internal os of the cervix to the point of uterine bifurcation into horns while the breadth was the distance of the widest diameter from the left to the right uterine walls. The length of the cervix was the distance between the internal and external cervical os while the breadth was the distance between the left and right cervical walls.

The differences between the above dimensions along the three periods of gestation were tested using the ANOVA from the computer statistical software, Graph pad InStat<sup>®</sup>, version 3.06, 32 bit for Windows.

#### **RESULTS**

##### **Ovaries**

In the adult non - pregnant Red Bororo cows studied, the ovaries were observed to

be oval in shape. In the pregnant cow however, the ovaries were characterized by the presence of corpora lutea that altered their form and size.

In the adult non-pregnant Red Bororo cows studied, the left ovary measured  $3.52 \pm 0.33$  cm in the length,  $2.21 \pm 0.31$  cm in diameter,  $1.25 \pm 0.05$  cm in thickness and  $3.03 \pm 0.11$  g in weight, while the right ovary (Figure 1) measured  $4.33 \pm 0.74$  cm in length,  $3.01 \pm 0.40$  cm in diameter,  $1.35 \pm 0.10$  cm in thickness and  $4.89 \pm 0.18$  g in weight. Some of these dimensions and weights showed levels of significant increases when compared with non pregnant ones and along the trimesters of gestation (Table I).

#### **Uterine Horns**

In the adult non-pregnant Red Bororo cows studied, the left uterine horn measured  $13.50 \pm 1.22$  cm in length and  $3.74 \pm 0.50$  cm in diameter, while the right uterine horn (Figure 1) measured  $16.30 \pm 1.42$  cm in length and  $5.32 \pm 0.56$  cm in diameter. These dimensions and weights showed extremely significant increases along the trimesters of gestation in the pregnant ones (Table I).

#### **Uterine Body**

In the non - pregnant Red Bororo cow studied, the uterine body (Figure 1) measured  $12.64 \pm 1.02$  cm in length and  $4.65 \pm 0.41$  cm in diameter. These dimensions showed extremely significant increases along the trimesters of gestation in the pregnant ones (Table I).

#### **Cervix**

In the non - pregnant adult Red Bororo cow studied, the cervix (Figure 1) measured  $7.25 \pm 0.57$  cm in length and  $2.88 \pm 0.23$  cm in diameter. These dimensions showed levels of significant increases along the trimesters of gestation in the

pregnant ones (Table I).



Figure 1: Photograph of the reproductive system of a non-pregnant Red Bororo cow showing the locations of the ovary {O}, uterine horn {UH}, uterine body {UB} and Cervix {C}

**TABLE I: PREGNANCY RELATED BIOMETRICAL CHANGES IN THE OVARIES AND UTERUS OF THE RED BORORO CATTLE IN MAIDUGURI, NIGERIA.**

Organs	Dimensions	Physiological state of cows	Pregnant			
			Non - pregnant	1 <sup>st</sup> trimester (2-3 month)	2 <sup>nd</sup> trimester (4-6 month)	3 <sup>rd</sup> trimester (7-9 month)
<b>Ovary Right</b>	Length (cm)		5.20 ± 1.12 <sup>ns</sup>	5.42 ± 1.14 <sup>ns</sup>	6.02 ± 1.17**	
	Diameter (cm)		3.34 ± 0.41 <sup>ns</sup>	3.99 ± 0.50***	4.04 ± 0.70***	
	Thickness(cm)		1.60 ± 0.21*	1.74 ± 0.23***	1.82 ± 0.11***	
	Weight (g)		5.02 ± 0.61 <sup>ns</sup>	5.55 ± 0.85 <sup>ns</sup>	5.75 ± 0.87*	
<b>Left</b>	Length (cm)		4.09 ± 0.30**	4.24 ± 0.33***	4.82 ± 0.40***	
	Diameter (cm)		3.03 ± 0.28***	3.79 ± 0.31***	4.04 ± 0.38***	
	Thickness(cm)		1.32 ± 0.06 <sup>ns</sup>	1.41 ± 0.10 <sup>ns</sup>	1.46 ± 0.16 <sup>ns</sup>	
	Weight (g)		3.74 ± 0.18***	4.23 ± 0.30***	4.56 ± 0.19***	
<b>Uterine horn</b>	<b>Right</b>	Length (cm)	16.30 ± 1.42	42.6 ± 6.18***	45.9 ± 7.20***	40.13 ± 7.30***
		Diameter (cm)	5.32 ± 0.56	13.0 ± 2.18***	13.8 ± 2.30***	14.0 ± 2.34***
	<b>Left</b>	Length (cm)	13.50 ± 1.22	26.10 ± 5.26***	27.2 ± 5.30***	29.40 ± 5.32***
		Diameter (cm)	3.74 ± 0.50	9.90 ± 1.10***	9.90 ± 1.22***	10.19 ± 1.20***
<b>Uterine body</b>	Length (cm)	12.64 ± 1.02	20.5 ± 6.49***	23.9 ± 6.54***	24.10 ± 6.56***	
	Diameter (cm)	4.65 ± 0.41	11.7 ± 2.08***	12.10 ± 2.20***	12.13 ± 2.21***	
<b>Cervix</b>	Length (cm)	7.25 ± 0.57	6.62 ± 0.31*	6.41 ± 0.80**	6.43 ± 0.01**	
	Diameter (cm)	2.88 ± 0.23	3.25 ± 0.33 <sup>ns</sup>	3.66 ± 0.21*	3.57 ± 0.94*	

<sup>ns</sup> - Not significant

\* - Significant (P<0.05)

\*\* - Significant (P<0.01)

\*\*\* - Significant (P<0.001)

## DISCUSSION

### Ovaries

The left and right ovaries of the adult non-pregnant Red Bororo cows of the present study were observed to be round to oval in shape and their dimensions and

weights showed breed related variations from those of the Thari and Nelore breeds as reported by Kunbhar *et al.*, (2003) and Carvalho *et al.*, (2010). The right ovary was, on the average, slightly larger than the counterpart which in agreement with the

observation by Perkins *et al.* (1954) and Rind *et al.* (1999). Most of the ovaries in the present study were characterized by the presence of corpus luteum (CL) of pregnancy. The corpus luteum (CL) became larger and firmer with advancing pregnancies along the trimesters of gestation. This is in line with observations of Roberts (1982). The development and further increases in size of the CL across the three stages of gestation were associated with levels of significant increase in the overall size and weight of the ovaries. The CL persisted in the ovaries throughout the period of gestation; this is in agreement with the observations of Memon (1996) and Roberts (1982). The range of values of left and right ovarian dimensions of the non pregnant and pregnant Red Bororo cows of the present study were bit higher than those of the zebu cows of the same *Bos taurus indicus* breed group earlier reported by Neves *et al.* (2002) The length, diameter, thickness and weight of the ovaries of the non – pregnant cow of this present study shows slight variation with those of *Bos-taurus* breeds of cattle reported by Memon (1996), Arthur *et al.* (1989) and Peter (1993). It has been established that the ovaries of *Bos-indicus* breeds are generally smaller and lighter than *Bos-taurus* (Sloss and Duffy 1980). From the Red Bororo cows of this present study, the left ovary was observed to be shorter in length, narrower in diameter and lighter in weight than that the right ovary; this could further proof the statement by Reind *et al.* (1999) that the right ovary of cows is more active physiologically than the left ovary

### **Uterine Horns**

The uterus of the non - pregnant cow is “Y” shaped having two horns (Kunbhar *et al.*, 2003). The length of the uterine horn in the adult non–pregnant Red Bororo cows of the present study falls within the range

reported by Roberts (1982), however higher values were recorded by Sorensen (1988) and Petter (1993) while the diameter was slightly smaller than those reported by McEntee (1983) and Petter (1993). The difference in values could be due to variations in age and breed and fertility status (Kunbhar *et al.*, 2003). Just like the right ovary, the right uterine horn was also found to be larger and more active as greater percentage of fetuses (59.1%) in the present study were associated with it. In a study by Perkins *et al.* (1954), 57.3 % of the fetuses were found in the right uterine horn. This is in contrast to what is obtainable in the one horned - camel cows, where the left ovary and uterine horn are the most naturally active (Wilson, 1984). The uterine horns from pregnant cows of the present study showed extremely significant biometrical increases along the three trimester of gestation when compared with their non – pregnant counterparts. These increases could be attributed to the attendant increases in fetal sizes and fluids associated with gestation.

### **Uterine Body**

In the non - pregnant cow, two horns join together to form a body of uterus that is situated between os-internum and true bifurcation of cornua (Kunbhar *et al.*, 2003). The uterine body length recorded for the non – pregnant cows in this study was slightly higher than the values recorded by Roberts (1982), Garcia (1988) and Memon (1996) while the diameter was shorter than the values reported by Rebert (1982) and Garcia (1988). The discrepancy could be due to breed variation (Kunbhar *et al.*, 2003). The uterine body of the pregnant cows of the present study showed extremely significant increase in biometrical values along the three trimesters of gestation when compared with those of their non–pregnant

counterparts. As observed in the uterine horn, this could be attributed to the attendant increases in fetal sizes and fluids associated with gestation.

### **Cervix**

The cervical length and diameter recorded for the non-pregnant cows in this study was similar to the values recorded by Kunbhar *et al.*, (2003) and showed levels of significant increases along the trimesters of gestation.

In general the discrepancy between the results on the ovarian and uterine dimensions and weights of Red Bororo cows of this study and published results in breeds of cow might be due to breed difference. It has also been observed that feeding of goats on bush leaves, dry fodder or grass with less supplemented feeds from two to three weeks of age have also been shown to cause retarded growth and development of the reproductive tract (Obwolo, 1992). Differences in size of reproductive tract may also be due to climatic effects. For example, it has been observed that young goats in the tropics have to contend with the effects of the first dry season when growth may be seriously retarded. In the same vein, pregnant does with higher nutritional status produce heavier kids than those with poorer nutrition and this may affect the size of the reproductive tract of kids. (Akusu, 1987; Singh *et al.*, 1992; Oyeyemi *et al.*, 2001). These facts could also be true for the Red Bororo cattle, being a tropical breed and a member of the same *Bovidae* family with the goat.

In conclusion, the results of this study have established the baseline data for the dimensions of ovaries and uterus of the pregnant and non – pregnant Red Bororo cow of Nigeria. This information will make diagnosis of various abnormalities of these organs easier in both physiological states.

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