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OVARIAN ACTIVITIES IN BUNAJI COWS SLAUGHTERED DURING THE DRY SEASON AT THE ZARIA ABATTOIR, KADUNA STATE,

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ABSTRACT

A total of one hundred and sixty ovaries (80 left and 80 right from 80 Bunaji cows slaughtered at Zaria abattoir, Kaduna State, during the dry season (March to May) were examined grossly for follicular and luteal structures. The findings were used to ascertain ovarian activity of these Bunaji cows before slaughter. Follicles were characterized on the basis of diameter: small (1-4 mm), medium (5-8 mm) and large (≥9 mm) while luteal structures were characterized on the basis of morphology: *corpus haemorrhagicum* (CH), *corpus luteum* (CL) and *corpus albicans* (CA). Presence of CL was indicative of cyclicity while abnormal ovarian function was described as the presence of one or more CA and follicular growth without a CL. Cows without luteal structures in the ovaries and complete absence of follicles were regarded to be in anoestrous. Cows with no CL in any of its ovaries were regarded as prepubertal heifers irrespective of the presence of follicular structures. Out of the eighty cows sampled, seventy-nine (98.75%) had functional structures indicative of present or past ovarian activity. Twenty-three (29.0%) were cycling, forty-one (51.0%) showed abnormal ovarian activity, one (1%) was in anoestrus and fifteen (19.0%) were pre-pubertal heifers. The results of this study show that fewer number of Bunaji cows continue to cycle despite the dry season effect which characterized by a lack of rainfall and low quality of pastures.

Keywords: Bunaji cows, Ovarian activity, dry Season

INTRODUCTION

A good livestock management practice demands that cattle slaughtered for consumption should be mainly bulls and reproductively inactive females (Opara *et al*., 2006). Information on the reproductive status of cows should be obtained, kept and evaluated so as to avoid the slaughter of actively reproducing females. On the contrary, such information is unavailable in Nigeria. This is because over 80% of livestock are in the traditional herds and are reared mostly by the Fulani pastoralists (Adubi and Aromolaran, 1998). Ovaries from slaughtered cows were shown to contain evidences of past and current ovarian activities. These include the presence of follicles at different stages of development, *corpus haemorrhagicum*, *corpus luteum* and *corpusalbicans* (Arthur *et al*., 1982).

Cyclical activity of the cow's reproductive system can be assessed from ovarian function using follicular population and sizes and the presence of corpora lutea (Dominguez 1995; Lopez *et al.*, 2005). In Nigeria where over ninety percent of the cattle are managed under extensive system, poor fertility is a common problem among the cattle herds. In addition to nutritional stress the

harsh climatic conditions and poor management are other contributing factors to fertility problems in the tropic (Voh *et al.,* 1984; Maina *et al*., 2010). Several methods have been employed to determine ovarian cyclicity of cattle such as rectal palpation of these animals, hormonal assay for progesterone level and ultrasonography examination.

Examination of genital structures of cattle slaughtered at the abattoir present not only a means of assessing ovarian functionality (Lopez, *et al*., 2005; Idalia, 2007, Maina *et al*., 2010). However, there are few reports in the abattoir examination of genital organs of cattle in Nigeria and scarcely any of such studies targeted the dry season where feed scarcity is pronounced. The objectives were to determine if Bunaji cows slaughtered in the dry season undergo normal ovarian cyclicity and also to determine the relative functionality of ovary (left or right) of Bunaji cows more actively involved in reproductive activity.

MATERIALS AND METHODS

Study area and period of study

The study was conducted on Bunaji cows slaughtered at the Zango abattoir, Zaria. Zaria is located in Kaduna state which is located within the Northern Guinea savannah ecological zone of Nigeria, lies between latitude 6° and 11°N and longitude 7° and 44°E with an average rainfall ranging from 1000 to 1250mm and average temperature ranges from 17°C to 33°C.

Animals and sample collection

The Bunaji breed of cows (n=80) were used in this study and a total of 160 ovaries were studied. The ovaries were collected and tagged with labels indicating the serial number of the animals. The samples were then transported to the laboratory for examination. The study was carried out between the months of March and May, 2011.

Sampling and gross studies

Both left and right ovaries were removed and put in separate plastic containers and appropriately labeled as left and right. These were removed using kitchen knife and the ovaries were trimmed of excess connective tissues and were appropriately put in the well labeled sample bottle labeled left and rights. The ovaries were then taken to a laboratory where they were further washed with clean tap water to enhance visual identification of ovarian structures. Blister-like structures on the ovaries were identified as follicles and classified into large, medium, and small based on the diameter (Dominguez, 1995; Opara *et al*., 2006; Maina *et al*., 2010). The total number of visible follicles on the surface of each ovary was counted and the diameter of each follicle was measured using a venier caliper. The follicles were then classified into three categories based on their sizes as described by Dominguez (1995): small (1-4 mm) medium (5-8 mm) and large (≥9 mm). Luteal structures were identified on the ovaries and each structure was classified as active corpus luteum or corpus albicans based on gross morphology as described by McDonald (1980). Ovaries showing presence of active corpus luteum and/or corpus haemorrhagicum were considered to have belonged to cows that were cycling. A cow was said to hadan abnormal ovarian function when its ovaries showed one or more corpus albicans and follicular growth without an active corpus luteum. Cows that had no luteal structures in its ovaries with complete absence of follicles were defined as anoestrous or prepubertal at slaughter.

RESULTS

The total number of small follicles, medium follicles, large follicles, based on their diameter, were calculated for both left and right ovaries and the sum of all the follicular structures for both ovaries were calculated, shown in Table 1. From the table, the total number of follicular structures in both left and right ovaries is 774 and 781 respectively.

Table 1: Follicular structures of Bunaji cows slaughtered at Zango abattoir

	LEFT				RIGHT			
SIZES	SMALL	MEDIUM	LARGE	TOTAL	SMALL	MEDIUM	LARGE	TOTAL
TOTAL	567	140	67	774	609	92	80	781

Table 2: Luteal structures of Bunaji cows slaughtered at Zango abattoir

	LEFT				RIGHT			
SIZES	CH	CL	CA	TOTAL	CH	CL	CA	TOTAL
TOTAL	5	9	89	103	8	11	75	94

From the above table, the total number of luteal structure for both left and right is 103 and 94 respectively, but cyclicity is based on presence of CH and CL which is 14 and 19 for the left and right respectively. Where CH is corpus haemorrhagicum, CL is corpus luteum, and CA is corpus albicans, from the above table.

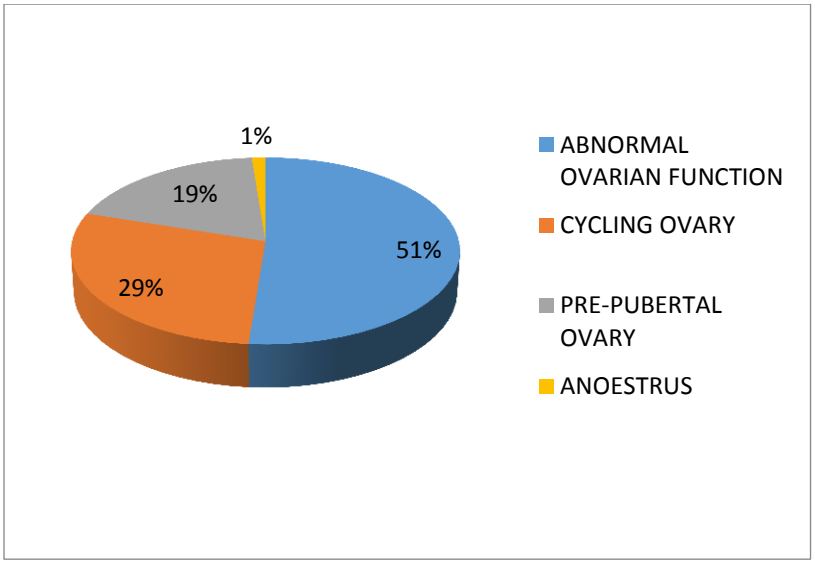


Figure 1: Classification of ovaries based on functional structures

Figure 1 shows the classification of ovaries based on functional structures. As shown in the figure, 23 animals cycled, 41 animals had abnormal ovarian activity, 1 animal was undergoing anoestrus and 15 animals are pre-pubertal heifers representing 29%, 51%, 1% and 19% respectively.

DISCUSION

This work indicated that 29.0% of sampled Bunaji cows were undergoing ovarian cyclicity. Low cyclicity may be due to nutritional stress (Randel, 1990). This is higher than that reported by Maina *et al*. (2010) for Red Bororo-13.5 %, Wadara-14.3, White Fulani-21.2%). A smaller percentage of cows cycle during the dry season. This may be due to *Bos indicus* adaptation to tropical climate and diseases (Jochle, 1972).

The average number of follicles was significantly higher than medium and large follicles with the large follicles having the least mean follicles per ovary in both left and right ovaries. This may be due to the fact that bovine ovaries possess large amounts of small follicular reserve from which Graafian follicles are continuously recruited for further development (McDonald, 1980).

The presence of small to large sized follicles on the ovaries was a further indication that the wave pattern of follicular turnover was taking place and therefore a state of normal cyclicity (McDonald, 1980). The ovaries that were considered as giving abnormal cyclicity although exhibited follicle at various stages of growth could not be classified into any of the four phases of the oestrous cycle namely: metoestrus, dioestrus, proestrus and oestrus based on the luteal structures present on them. By comparing follicular growth and luteal structures on the ovaries to different phases of the oestrous cycle, it was deduced that the ovaries that showed a functional corpus luteum were in a state of normal function and that the cows were in a dioestrus phase of the oestrous cycle which is the most lengthy period of the cycle.

The presence of corpora albicantia at various stages of degeneration was evidence that the cows have had previous oestrous cycles due to the fact that corpora albicantia persist and remain visible as fibrous connective tissue scars on the ovaries for several additional oestrous cycles (McDonald, 1980). Metoestrus is the state of early corpus luteum formation characterized by the presence of corpus haemorrhagicum which appears as a blood clot filled follicular cavity, and dioestrus state is characterized by a prominent large functional corpus luteum (Arthur, 1974). The implication therefore is that those ovaries were not in either of these two states which make the luteal phase of the oestrous cycle. Also preoestrus and oestrus are referred to as the follicular phase of the oestrous cycle, in which there is a prominent preovalatory follicle together with a regressing corpus luteum (McDonald, 1980; Maina *et al.,* 2010). The majority of these ovaries exhibited entirely small and medium follicles, due to these facts, the ovaries were considered to be in a state of abnormal function. The occurrence of abnormal ovarian function has been reported by many workers (King *et al.,* 1976; Maina *et al*., 2010) described various forms of abnormal ovarian function in dairy cows. Such abnormalities included cows that ovulated and formed a functional corpus luteum once followed by a prolonged period of anoestrus with no elevation of progesterone cows that ovulated once or twice followed by prolonged anoestrus with elevated progesterone, and cows that had long irregular cycles and infertility.

Comparing the ovarian structures and the types of abnormal functions mentioned earlier, some hypothesis could be made about the possible events happening in the animals that made their ovarian activity abnormal. The cows that had ovaries with corpora albicantia and small or medium follicles only, might be experiencing prolonged, irregular oestrus cycle (King *et al.,* 1976; Dawuda *et al.,* 1988) in which the corpus luteum of dioestrus regressed, but the follicles failed to proceed development to pre-ovulatory stage, perhaps due to suppression of pulsatile

reaction of luteinizing hormones (LH) as it occurs in early postpartum cows (Short *et al.,* 1990) or in severely malnourished cows (Imakawa *et al.,* 1983; Richard *et al*., 1989).

Secondly the cows might be in the processes of initiating postpartum anoestrus after experiencing few oestrous cycles (Dawuda *et al.,* 1988) perhaps due to nutritional stress or increased suckling demand (Randel, 1990), and in this case, the follicles may be undergoing arrested development. In other situations, the cows might be in the process of reinitiating their normal cyclicity after recovering from suckling stress or under nutrition. In this case the dominant follicle might be in the process of resumption of development to mature stage.

The complete absence of follicular structures observed in the ovaries of a cow was defined as a state of anoestrus due to complete ovarian inactivity because presence of follicles of various sizes is one of the indicators of an active ovary, since visible follicles exist in bovine ovaries right from birth and continue to remain throughout the productive life of the animals (Hopper *et al.,* 1993; Maina *et al.,* 2010). Furthermore, remnants of luteal structures observed on the ovaries was an affirmation that the cows had experienced successful ovulation and corpus luteum formation prior to complete atresia or disappearance of the follicles which rendered them anoestrus.

Some ovaries were classified as pre-pubertal because no luteal structure could be detected on them despite the presence of varying sizes of follicles. The absence of luteal structures means that the cows had never ovulated (Hopper *et al.,* 1993; Maina *et al*., 2010) and coupled with the fact that the size of follicles in the ovaries of infant cows and heifers ranges from 1 to 13 mm in diameter (Howe *et al.,* 1962; Maina *et al*., 2010) and that the follicles are in the process of continuous development and regression in a pattern similar to that of mature cyclic cows (Hopper *et al*., 1993).

Statistical analysis revealed no significant difference in the cyclicity between the right and left ovaries as $p>0.05$) but the right ovaries shows higher activity (57% vs. 43% for right and left ovaries respectively).This is in agreement with the work of Reece and Turner, 1938 Nielsen 1949, and Rajakoski 1960.

And different follicle size categories, also prevalences of different functional state of ovaries earlier classified occur in a pattern that could suggest that our indegionous cows cycle on but minimal level since abnormal ovarian function exhibited the highest prevalence of (51%) percentage of cycling animals (29%) , anoestrus(1% and that of pre-pubertal heifers is(19%).

Presence of CH evidenced the metestrus state in some of the cows while the presence of CL indicated the diestrus phase of the reproductive cycle (Arthur, 1974). This corroborates the work of Maina *et al.* (2010).

Percentage of pre-pubertal cows from this work was 19%. This is so because there was absence of luteal structures meaning that the cows had never ovulated as documented by Hopper *et al.* (1993). The slaughter of such heifers is an economic waste to the nation's cattle resource. Heifers have the potential to produce more calves if allowed to develop to maturity and bred.

Definite conclusion could not be made based on examination of ovarian structures alone, thus, more precise and accurate techniques such as progesterone and gonadotrophic hormone assay or ultrasonographic imaging needs to be employed to monitor the oestrous cycle and activities of ovaries in the cows. Another factor that could have led to this failure of detection of ovarian activities in the animals might be that the animals used in this study might have been sent to

market or slaughter as a result of old age or fertility problems, or there might have been presence of subclinical disease. These variables were not included and could not be controlled in this study.

CONCLUSION

In conclusion this work demonstrates the low level ovarian activity (29%) observed in slaughtered Bunaji cows in the dry season, Feed availability and malnutrition has effect on the resumption of ovarian activity and cyclicity in cows, and that the right ovary significantly shows more reproductive activity than the left ovary though not statistical significance which might due to smaller sample population

REFERENCES

Adubi, A.A., and Aromolaran A.B. (1998): Cattle/Beef marketing in Lagos: Practices, projections and prospects for the year 2010. Proceedings of the silver anniversary conference of Nigerian Society of Animal Production March, 21-26, Abeokuta, Nigeria. pp.111-112.

Arthur, G.H. (1974). Veterinary reproduction and obstetrics. *Bailliére Tindall*, London. Pp 14-64

Arthur, G.H., Moakes D.E., Pearson H. (1982): Veterinary Reproduction and Obstetrics.5th ed. *BaillereTindall*, London.

Dawuda, P.M., Eduvie, L.O., Esievo, K.A.N. and Molokwu, E.C.I. (1988). Interval between calving and first observable oestrus in post-partum Bunaji cows.*British Veterinary Journal* **144**(3): 258-261.

Dominguez, M.M., (1995). Effects of Body Condition, Reproductive Status and Breed on Follicular Population and Oocyte quality in Cows. *Theriogenology*, **43**:1405-1418.

Ginther O.J, Bergfelt D.R, Kulick L.J, and Kot K. (1996): Selection of the dominant follicle in cattle: role of two-way functional coupling between follicle stimulating hormone and the follicles. *Biology of Reproduction*, **62**:920–927.

Ginther, O.J., Bergfelt D.R., Kulick L.J., Kot K. (2000): Selection of Dominant Follicles in Cattle: role of estradiol. *Biology of Reproduction*, **63**: 383-389.

Hopper, W.W., Silox, R.W., Byerley, D.L. and Kiser, T.E. (1993). Follicular development in prepubertal dairy heifers.*Animal Reproduction Science*, **31**:7-12.

Howe, G.R., Black. D.L., Foley, R.C. and Black, W.G. (1962): Ovarian Activity in Prepubertal Dairy Calves. *Journal of Animal Science* 21:82-90.

Imakawa, K., Kittok , R.J. and Kinder, J.E. (1983). The Influence of Dietary Energy Intake on Progesterone Concentration in Beef Heifers. *Journal of Animal Science* 56:454-459.

Jochle, W. (1972): Pharmacological Aspects of the Control of the Cycle in Domestic Animals. Proc. 7th.

King, G.J., Hurnick, J. F. and Robertson, H.A. (1976). Ovarian Function and Oestrus in Dairy Cows during early Lactation. *Journal of Animal Science*, **42**:688-692.

Lobago F, Bekana, M. Gustafsson, and H. Kindahl, H (2007): Seasonal Fluctuations of Reproductive Functions in Zebu Cattle: *Tropical. Animal Health Production,* **39**: 395-403.

Lopez, H., Sartori. R. and Wiltbank, C. M. (2005).Reproductive Hormones and Follicular Growth during Development of one or Multiple Dominant Follicles in Cattle. *Biology of Reproduction* **72**: 788-795.

Maina V. A, Furon N. A and Adamu J.Y (2010): Ovarian Activity of *Bos indicus* (Zebu) Cows in North Eastern Nigeria. *Livestock Research for Rural Development,* **22** (7).

Mcdonald, L.E. (1980). Veterinary Endocrinology and Reproduction. Lea and Febiger, Philadalphia. 274-398.

Nielsen, F. 1949. Sterility in Cattle, especially as a result of Uterine Infection. 14th International/Veterinary Congress, **3**:105.

Opara, M.N, Okoli, C.I, Herbert U, and Adeyemo, O (2006): Ovarian Morphology and Estradiol-17β Concerntrations in Serum and Follicular Fluid of Slaughtered Zebu Cattle in Ibadan, Nigeria. *Veterinaski Arhive,* **76** (5), 403-411.

Rajakoski, E. 1960. The Ovarian Follicular System in Sexually Mature Heifers with special reference to Seasonal, Cyclical, and left-right Variation. *Acta Endocrinologica* **34**: Sup. 52.

Randel, R.D. (1990). Nutrition and Postpartum Rebreeding in Cattle. *Journal of Anima*l *Science,* **68**: 853-862.

Reece, R.P. and C.W. Turner. (1938). The Functional Activity of the Right and Left bovine Ovary. *Journal of Dairy Science,* **21**:37.

Richard, M.W., Wettmann, R.P. and Schoenemann, H.M. (1989). Nutritional Anestrus in Beef Cows: Body weight change, Body Condition, and Luteinizing Hormone in Serum and Ovarian Activity. *Journal of Animal Science* **67**:1520-1526.

Short R. E, Bellows R. A., Staigmiller R. B., Berardinelli J. G., and Custer E E (1990). Physiological Mechanisms Controlling Anoestrus and Infertility in Postpartum Beef Cattle. *Journal of Animal Science* 68: 99.

Voh, A. A., Oyedipe, E. O. and Buvanendran, V. (1984). Influence of Management and Season of Breeding on Pregnancy rates of Zebu Cattle in Artificial Insemination Programmes. *Tropical Agriculture* (Trinidad) **61**:265-266.