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# Time-dependant peri-partum haematological, biochemical and rectal temperature changes in West African dwarf ewes

I.R. Obidike, L.O. Aka*, C.I. Okafor

*Department of Veterinary Physiology and Pharmacology, University Nigeria, Nsukka, Nigeria*

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ABSTRACT

Postpartum profiles of haematological components as well as some of the biochemical blood constituents were investigated in 16 West African dwarf ewes for the first 30 days following parturition. Blood samples collected from parturient ewes, managed semi-intensively, were analyzed for haematologic indices such as packed cell volume (PCV), erythrocyte count (EC), total leucocyte count (TLC), differential leucocyte count (DLC), haemoglobin concentration (Hb), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC). Likewise, serum components such as the triacylglycerols, total protein, creatinine, calcium, albumin and globulin were assessed at 5-day intervals for the 30-day period. The results of the study showed a significant ($p < 0.05$) increase in TLC ($7.4 \pm 0.7$ to $12.8 \pm 4.2 \times 10^3$ μl) up to day 15 postpartum, which was marked by relative significant lymphocytosis and insignificant neutrophilia beyond day 10. No significant changes were recorded in packed cell volume (%), erythrocyte count ($\times 10^6$ μl), haemoglobin concentration (g/dl), mean corpuscular volume (fl), mean corpuscular haemoglobin (pg), mean corpuscular haemoglobin concentration (g/dl) and rectal temperature (°C) between days 5 and 30 postpartum. There was however a significant ($p < 0.05$) increase in serum creatinine concentration ($2.8 \pm 3.6$ to $4.9 \pm 4.1$ mg/dl). On the other hand, albumin serum levels decreased significantly ($p < 0.05$) ($2.2 \pm 4.8$ to $0.7 \pm 0.9$ g/dl), within the first 15 days postpartum. There was a non-significant decrease in serum calcium concentration ($3.8 \pm 5.7$ to $3.0 \pm 4.7$ mequiv./l) at day 15 postpartum. Beyond this period, from days 25 to 30, a significant ($p < 0.05$) increase ($4.7 \pm 6.6$ and $4.8 \pm 4.4$ mequiv./l) occurred. Conversely, the serum triacylglycerol concentration significantly ($p < 0.05$) increased ($39.9 \pm 4.9$ to $51.7 \pm 6.2$ mg/dl) within the first 10 days postpartum. These findings revealed the postpartum physiological changes to be characteristically more biochemical than haematological. Thus serious threats to the peri-parturient health status could be better understood by an assessment of the peri-parturient haematological status.



## 1. Introduction

Female animal reproductive physiology is a field that describes the entire processes that underline the health of the female and the generation of new life that perpetuate animal population. For efficient livestock production, it is important that the physiologic characteristics of every reproductive phase, especially under practical conditions, be well observed and understood.

Reproductive performance of livestock in the tropics, as elsewhere, is determined by factors such as nutrition, disease, climate, management systems, genetics, etc. (Hots et al., 1985; Smith and Akinbamijo, 2000). Characteristically, each of these factors could affect the physiological

* Corresponding author. Tel.: +234 8083137674; fax: +234 42770644.
*E-mail address:* ikeobidike@yahoo.com (L.O. Aka).

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indices of the animal, either positively or negatively—in areas such as, e.g. the postpartum interval to the occurrence of oestrus (Osinowo and Ekpe, 1985; Butter and Smith, 1989), feed intake (Akpan and Mukasa, 2005), haematological and blood biochemical values (Sheldon et al., 2004), animal behaviour (Loosli et al., 1999), body weight (Akusu and Egbunike, 1990) body temperature and reproductive efficiency (Kristula et al., 2001).

Acceptable reproductive performance requires normal functional ovaries and regular oestrous cycles (Bond and McDowel, 1972), good breeding characteristics and behaviour (Dunlap and Vincent, 1971) and normal parturition and weaning events (Arthur, 2001). In most practical production systems, farmers battle with postparturition complications which give rise to a debilitation of the ewes' health and a prolonged weaning time with eventual economic loss and a distorted breeding programme. It is essential to gain insight into postpartum physiological changes in the female animal if a complete understanding and possible manipulation of the reproductive physiology is desired. In view of this, this trial sought to study the sequential postpartum haematological, biochemical and rectal temperature changes in local West African dwarf (WAD) ewes in Nsukka, a geographical zone of Eastern Nigeria, during the rainy season.

## 2. Materials and methods

A total of 16 adult WAD ewes, purchased from the Orba market in Udenu Local Government Area of the Enugu State of Nigeria were used for this study. The ewes recorded an average age and weight of 2–3.5 years and $10.9 \pm 1.2$ kg, respectively. All ewes were housed in pens made of thatch between February and October (rainy season) 2003, and fed combinations of *Panicum maximum*, *Stylosanthes gracilis*, and *Penisetum purpureum* forages *ad lib*, with occasional supplementation of palm kernel cake, wheat and maize offals. Salt was provided as a lick once (24 h) a week. Ectoparasites and endoparasites were routinely controlled, together with the prescribed vaccinations.

After a 30-day adaptation period, oestrous synchronization was performed utilizing a 100 mg progesterone (Longlife®, China) single dose intramuscular injection (Ola and Egbunike, 2005). Immediately upon administration of the progesterone, 2 mature rams of proven fertility were introduced into the pen and oestrus monitored daily (30 days). The degree of oestrous synchrony (%) within 9 h of the first mating was recorded by visual observation—this took place between 2 and 7 days after oestrous synchronization. Each time mating was observed, the mated ewes were identified with labelled tags tied round the neck, reflecting the animal number and time of mating. Between 1 and 3 months after mating, pregnancy was diagnosed and confirmed in each ewe by abdominal palpation and the use of a portable ultrasound machine. The dates of oestrus, following synchrony, recorded together with the date of expected lambing. From each parturient ewe, blood samples were collected from the jugular vein, starting at the 5th day postpartum and at 5-day intervals, for a period of 30 days.

Blood samples were collected for baseline serum haematological and biochemical values. In each case, blood was sampled, using a sterile needle and syringe by jugular venipuncture into duplicate bijour bottles—one containing EDTA, an anti-coagulating agent, and the other without EDTA for the haematological and biochemical analyses, respectively. The collected blood samples were immediately placed in a plastic jar, packed with ice and promptly transported to the haematology unit of the Department of Veterinary Medicine. The time interval between collection and transportation to the laboratory generally took less than 40 min. Blood samples used for biochemical analysis were centrifuged at $3000 \times g$ for 20 min and the plasma or serum aspirated, frozen until used for analyses.

The packed cell volume (PCV), erythrocytes count (EC), total leucocyte count (TLC), differential leucocyte count (DLC); were determined using standard procedures (Coles, 1986).

Drakins reagent (ICSH, 1965) served as the international reference standard for haemoglobinometry, as set by the International Council for Standardization in Haematology to determine the haemoglobin concentration (Hb). The mean corpuscular volume (MCV) (PCV/RBC $\times$ 10), mean corpuscular haemoglobin (MCH) (Hb/RBC $\times$ 10) and mean corpuscular haemoglobin concentration (MCHC) (Hb/PCV $\times$ 100) were then calculated using standard techniques (Jain, 1986). Values were expressed in femtolitre (fl), picogram (pg) or gram per litre (g/l), respectively.

Serum triacylglycerol levels were determined using Sigma assay kits (Peninsula Laboratories, Bachem group, Canada). Similarly serum total protein and albumin concentrations were determined using the biurete method and serum globulin level determined as the difference between total serum protein and albumin levels—as the fibrinogen present was involved in the clotting process. Serum creatinine was determined using the spectrophotometric Folin–Wu method (Coles, 1986) and using Lloyd's reagent and the value recorded at 520 nm against the blank reagent (5.0 ml distilled water) and unknown (4.0 ml distilled water and 1.0 ml protein free filtrated sample). The Serum Ca level was determined using the Ferro–Ham method (Coles, 1986). Rectal temperatures were recorded using a standard clinical thermometer.

Data were presented as the means (±S.D.) and were subjected to statistical analysis using the LSD-ANOVA in the software SPSS version 11.0, with the level of probability set at 0.05. A mean difference of $p < 0.05$ was regarded as significantly different (Marija, 1993).

## 3. Results

The results of this study demonstrated some classical changes in both the haematology and biochemistry of the postpartum WAD ewe. Most of these changes occurred within the first 3 weeks following parturition. There was no significant change in the prepartum and postpartum values for PCV, erythrocyte count (EC), Hb concentration and MCHC for the entire observation period. The MCV level also increased insignificantly between days 5 and 10 after parturition, but increased significantly ($p < 0.05$) above the prepartum value on day 15 and beyond—reaching a maximum value of $73.3 \pm 1.1$ fl on day 25 postpartum. The MCH level decreased from the prepartum value on day 10 following parturition (Tables 1 and 3). A gradual increase to normality (Table 1) was however observed from day 15 postpartum and later.

TLC's were significantly ($p < 0.05$) higher 10 days following parturition (Table 3), compared to the baseline value (Table 1). On day 15 however, a gradual decrease to a level of $10.8 \pm 4.2 \times 10^3$ μl was recorded. This increased blood leucocyte level was accompanied by an increase in the number of lymphocytes (Table 3) on days 5 and 10 postpar-

**Table 1**
Mean (±S.D.) haematological indices of West African dwarf ewes during the late trimester of pregnancy.

| Haematological parameters | Mean values |
|---|---|
| Total RBC ($\times 10^6$ μl) | 6.5 ± 1.9 |
| Total leucocyte ($\times 10^3$ μl) | 7.4 ± 0.7 |
| Haemoglobin (g/dl) | 10.7 ± 0.5 |
| PCV (%) | 38.5 ± 1.3 |
| MCV (fl) | 58.9 ± 4.7 |
| MCH (pg) | 16.4 ± 2.2 |
| MCHC (gm/l) | 27.8 ± 2.0 |
| Neutrophil (%) | 38.4 ± 5.4 |
| Lymphocytes (%) | 56.5 ± 5.6 |
| Eosinophils (%) | 2.1 ± 1.2 |
| Monocytes (%) | 3.0 ± 0.1 |
| Basophils (%) | [a] |

[a] Not recorded.