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FLUCTUATION OF SOME BLOOD PARAMETERS THROUGHOUT THE ESTROUS CYCLE IN GOATS.*

MABROUK, E.A.; ABOUL-ELA, A.; IBRAHIM, S.S. and ALI, K.M.

• Department of Physiology., Fac. Vet. Med., Cairo Univ.,Beni-Suef Branch.

SUMMARY

Seven healthy mature Baladi does (10-14 months old) were used in the present study. Estrus was synchronized using lutalyse . Heat was detected by the use of rutting aproned buck.

Individual blood samples were collected daily in the morning throughout the two successive cycles following the 1st post-synchronized cycle. Each sample was divided into three portions for determinatin of ERS, hematological studies as well as for serum separation for biochemical analysis.

The obtained results revealed the following:-
R.B.Cs count and Hb concentration as well as total leucocytic count and neutrophils% were significnatly higher during estrous phase, whereas, E.S.R. and platelets count as well as lymphocyte% were significantly lower during that phase.

Urea, creatinine and A.C.P. levels were significantly low during estrous phase, whereas, A.L.P., A.S.T, total bilirubin uric acid , total proteins, albumins, globulins, total calcium, inorganic phosphorus, total glucose levels were significantly higer during that phase.

INTRODUCTION

The results of several studies revealed that native breeds of gaots do not exhibit a period anestrum with an often high frequency of estrous cycles during June reported that, some blood cellular elements may exhibit significant variations during the estrous cycle (Merric, 1960; Manfredi, 1963; Nasr, 1974; El-Bagdady, 1976 and Cristofori et al., 1976). However, such studies on goat, seem to be scaty . Meanwhile, the fluctuation of some blood biochemical parameters throughout the estrous cycle has been recorded in some species of animals (Singh and Dutt, 1974, Jo, 1981; El-Naggar et al., 1983; Ibrahim et al., 1984; Mabrouk, 1989 and Ibrahim 1989).

The available literature did not include similar investigations in goat. It is intended by this work to furnish basic information about the hematological and biochemical changes which may occur during estrous cycle in goats.

MATERIAL AND METHODS

Estrus was synchronized in seven mature does (10-14 months old) using lutalyse (Upjhon Co., Belgium). Each doe was injected intramuscularly with 2.0ml "Lutalyse" . A second injection was given after 10 days from the first one. Onset of

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estrus was deteced by a sexually active rutting buck. According to Jones and Knifton (1972) estrous cycle was classified into the following phases:

1- The period from day 3 up to day 7 represents early luteal phase.
2- The period from day 8 up to day 13 represents middle luteal phase.
3- The period from day 14 up to day 17 represents late luteal phase.
4-Day 18 and/or day 19 (according to the duration of estrous cycle represents proestrous phase).

Individual blood samples were collected daily from all does throughout the two successive cycles following the first post-synchronization cycle. Each blood sample (7 ml) was subdivided into three portions: 1.6 ml was mixed with 0.4ml sodium citrate solution (3.8 %), a second portion 1.5ml was mixed with 1.5ml mg EDTA and the third portion 4 ml was utilized for serum separation. The first portion was used for the determination of sedimentation rate while the second one was utilized for the determination of some hematological parameters. Serum samples were kept at -20°C until biochemical investigations were carried out.

Hematological studies:

Erythrocytic sedimentation rate (ESR) was determined according to a modified technique (Ali, 1994). Red blood cell counts (R.B.Cs), total white blood cells (W.B.Cs), hemoglobin concentration (Hb), differential leucocytic counts as well as platelets count were determined using the universal techniques as described by Dacie and Lewis (1977).

Biochemical investigations:

The following biochemical constituents were estimated;-

- Urea (mg%), Patton and Crouch, (1977) at wave length 580 n.m.
- Creatinine (mg%) Husdan and Rapoport, (1968) at wave length 520 n.m.
- Alkaline phosphatase (ALP) and acid phosphatases (ACP) U/L, Kind and King (1954) at wave length 510 n.m.
- Aspartate aminotransferase (A.S.T) and alanine aminotransferase (A.L.T) U/ml Reitman and Frankel (1957) at wave length 505 n.m.
- Total bilirubin (u mol/L), Henry (1964) at wave lenth 530 n.m.
- Uric acid (mg%), Morin and Prox (1973) at wave length 595 n.m.
- Total protein and albumin (g%), Rojkin et al., (1974) at wave length 540 n.m. Concentration of globulins (g%) was determined by subtraction of albumin from total proteins.
- Total calcium (mg%), Gindler and King (1972) at wave length 612 n.m.
- Inorganic phosphorus (mg%), Goldenberg (1966) at wave length 690 n.m.
- Glucose (mg%), Triender (1969) at wave length 500 n.m.

Statistical analysis was carried out after Snedecor (1971).

RESULTS

Values of tested hematological and biochemical parameters are illustrated in Tables (1&2 respectively

Table (1) Hematological changes throughout estrous cycle in goat (Mean ± S.E.

	Phases of estrous cycle				
N	Estrus (28) Bbc	Early luteal (70) b	Middle luteal (84) B	Late luteal (56) c	Proestrus (18)
R.BCs (10^6/mm^3)	16.921±0.525 Aa	15.015±0.330 A	15.128±0.265 a	14.696±0.380	16.383±0.744
ESR (m.m/hr)	12.882±0.582 ABc	14.692±0.453 A	14.528±0.340 C	13.728±0.564 B	14.393±0.792
Hb (g%)	11.576±0.356 AaCc	10.275±0.381 ab	9.921±0.300 C	10.033±0.428 C	10.097±0.761 A
platelets(10^3/mm^3)	301.118±20.424 An	356.370±15.832	378.612±12.326 A	382.625±17.971 a	372.714±29.726
WBCs (10^6/mm^3)	14.250±0.58 ABb	13.264±0.528 B	12.744±0.387 b	12.635±0.456 A	12.954±0.933
Lymphocytes %	48.588±0.982 Bbc	52.222±0.833 B	52.265±0.658 C	51.958±0.848 b	50.714±0.209
Neutrophils%	41.94±0.833	38.926±0.757	38.572±0.431	38.417±0.823	40.00±0.896
Monocytes %	6.58±0.322	5.926±0.324	6.408±0.239	6.583±0.351	6.429±0.309
Esoniphils %	2.864±0.206	2.926±0.226	3.041±0.172	3.042±0.265	2.857±0.340
Basophils%	00	00	00	00	00

N : Number of Samples.

– ± Standard error

– values , within the same row , having the same capital or small letter are significantly different : –

Λ or a at $P < 0.05$

(B or b) or (C or c) at $P < 0.01$

table (2) : Biochemical changes in serum of goat throughout estrous cycle (Mean ± S.E).

	Phases of estrous cycle				
N	Estrus (28) AD	Early luteal (70)	Middle luteal (84) A	Late luteal (56) D	Procstrus (18)
Urea	35.011±1.715 A	38.211±1.952 D	39.469±1.421 AD	40.771±1.148	39.50±2.984
Creatinine	1.011±0.028 A	1.019±0.016	1.091±0.016	1.082±0.030 A	1.04±0.031
ALP	150.221±2.321 AaB	145.884±1.175 B	147.181±1.847 A	143.956±1.91 a	149.532±3.423 A
ACP	0.429±0.024 AaB	0.538±0.019 B	0.481±0.013 A	0.506±0.011 a	0.501±0.019
AST	94.324±3744 Aa	84.429±3.272 A	82.729±2.424 a	81.717±3.325	88.571±6.377
ALT	46.765±2.692 A	40.036±1.998	39.896±1.766	42.125±2.213 A	43.286±5.322
Total bilirubin	3.513±0.264 AD	2.927±0.216 A	2.949±0.142 D	2.761±0.181	3.183±0.261
Uric acid	0.620±0.023 D	0.551±0.026	0.543±0.017 D	0.576±0.023	0.581±0.038
Total proteins	6.659±0.112 D	6.403±0.096	6.265±0.082 D	6.597±0.160	6.421±0.181
Albumins	3.955±0.062 D	3.811±0.58	3.707±0.048 D	3.906±0.095	3.80±0.107
Globulins	2.698±0.048 Aa	2.639±0.098 A	2.557±0.023 a	2.636±0.049	2.691±0.092
Total calcium	9.829±0.230 A D d	9.015±0.242 D	9.085±0.255 A	9.281±0.309 d	9.112±0.789
Inorganic phosphorus	8.404±0.393 A a	7.053±0.267 AB	7.425±0.186 ab	7.208±0.226	7.610±0.654 Bb
Glucose	66.914±2.147	58.083±1.995	58.832±1.559	61.945±1.856	66.320±3.167

N : Number of Samples .

– ± Standard error

– values , within the same row , having the same capital or small letter are significantly different : –

(A or a) or (B or b) at $P < 0.05$

(D or d) at $P < 0.01$

DISCUSSION

It is well recognized that most of hormonal fluctuations which take place during estrous cycle are concomitant with changes in the reproductive system as well as in other systems in the body. Therefore, the current work was designed to elucidate the possible influence of such hormonal fluctuation on some hematological changes in the blood of goats throughout the estrous cycle.

Data presented in Table (1) reveal that R.B.Cs. count during estrous phase (16.921± 0.525 10^6 /mm^3) was significantly higher when compared to estimated values in different luteal phases . This result comes in agreement with previous reports (Nasr, 1974 and El-Bogdady, 1976).

It is recorded that during estrus there is a pronounced elevation in both histamine and adrenaline levels (Rota and Cristofori, 1974 and Soliman et al., 1966, respectively). Histamine increases capillary permeability (Busse, 1979 and El-Sadek et al., 1989). Meanwhile, increased adrenaline level induced splenic contraction resulting in an increase in the number of circulating R.B.Cs (Nemi, 1993). Thus, the determined increase in R.B.Cs. count during estrus , in the present study, can be attributed to the combined effect of hemoconcentration due to histamine and partially to increased circulating R.B.Cs due to splenic contraction.

The presnt data for E.S.R and Hb concentration in different phases seem to be logic and can be attributed to the differences in R.B.Cs. count

The number of platelets during estrus (301.118 ± 20.434 10^3 / mm^3) was significantly lower compared to estimated values in other phases . This finding passes parallel with previous reports in cattle (Rota and Cristofori 1974 and Cristofori et al., 1976). The latter authors mentioned that estrogen has a destructive effect on platelets.

The present results revealed significant increase in total leucocytic count accompanied with marked lymphopenia during estrus (Table,1). These findings agree with previous observations (Nasr, 1974 and El-Bagdady), 1976). Soliman et al., (1966) added that estrogen has a direct effect on hemopoietic organs resulting in an increase in the rate of realese of the already formed and reserved white blood cells. The authors added that estrogen indirectly increases the level of corticosteroids which result in marked leucocytosis lymphopenia and neutrophilia.

Concentrations of urea and creatinine in serum decreased significantly during estrous phase (Table,2). These results can be attributed to the higher levels of estrogens and histamine during this phase (Kaneko et al., 1989 and Rota and Cristofori, 1974), moreover, histamine increases cardiac output and cosequently renal blood flow (Goodman and Gilman, 1980).

Kaneko et al. (1989) mentioned that higher estrogen level was accompanied with elevated level of A.L.P. Therefore , the detected higher level of A.L.P. during estrus can be accepted.

Increased A.S.T. and A.L.T activaties during estrus in the present study, receive good support from the results of a previous study (Abdel-Kader, 1979) in goats where similar effect was noticed when estrogen was injected . It is worth mentioning that, increased transaminases during

estrus may refer to a temporary state of liver insufficiency. The estimated higher level of total bilirubin at estrous phase supports this opinion. Moreover, elvated uric acid concentration in serum of goats during estrus again confirms this speculation. Benjamin, (1984) mentioned that liver cell damage interferes with the conversion of uric acid to allantion and cosequently the amount of uric acid in blood and urine increases.

Higher concentration of proteins , albumins and globulins in serum, during estrous phase (Table 2) may be attributed to the temporary state of hemoconcentration as influenced by higher histamine level during this phase.

It is well known that calcium and phosphorus levels in blood are influenced by some non dietary factors of which estrogens and thyroid hormones as well as Vitamin D are the most imporatnt (Goodman and Gilman, 1980). Moreover, it was found that increased estradiol level led to increased Vit.D level (MacIntyre et al., 1978). These facts may offer a reliable explanation for the higher concentration of these two electrolytes in serum of goats during estrous phase.

The hyperglycaemic effect of estrogens and thyroid hormones has been reported (McDonald, 1980). Accordingly , the higher glucose levels detected during estrus can be accepted and attributed to the higher levels of these hormones.

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