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A comparative study on some biological constituents in serum during normal and silent estrous cycles of crossbred cows of Assam

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Abstract

For the present study a total of twenty normal cyclic and twenty confirmed silent estrous cows yielding 8 – 20 liters of milk were selected at random. Blood samples were collected from each animal on day 0, 10, 17 and 20 (day 0 of the next cycle) and each sample was analyzed for estimation of calcium, inorganic phosphorus, magnesium, zinc, total protein, glucose and cholesterol by using quality kits. The analysis of variance revealed that mean level of serum calcium, zinc, total protein, and glucose differ highly significant ($p < 0.01$) between different days of estrous cycle in both silent and normal estrous cows. While serum inorganic phosphorus and cholesterol did not differ significantly while serum magnesium differed significantly ($p < 0.05$) between different days but all above differed highly significant ($p < 0.01$) among different days of estrous cycle in silent and normal estrous cows.

Keywords: Calcium, cholesterol, inorganic phosphorus, magnesium, silent estrus, zinc

Introduction

Silent estrus condition is one of the major reproductive problems of high yielding crossbred cows which contributing great economic loss to the dairy farmers. High yielding traits of crossbred cattle might be one of the stress factors leading to this problem^[31]. High producing dairy cows have inherently low expression of estrus signs^[25], particularly during the early postpartum period. Cows affected with silent estrus are needed to be examined at frequent intervals for detection of estrus which is painstaking and tedious. Farmers cannot detect animals in silent estrus. Thus lack of behavioural signs of estrus, and or unobserved estrus or poor estrus detection efficiency of farmers in this condition can greatly increase the incidence of anestrus. Comparative information on serum biological constituents during the period of normal and silent estrous cycles of crossbred cattle under the prevailing condition of Assam appeared to be limited. Therefore, the present study was carried out to compare levels of different biological constituents in serum at different days of normal and silent estrous cycles of crossbred cows of Assam.

Materials and methods

A total of twenty normal cyclic and twenty silent estrous cows were selected at random for this study. Jugular blood samples were collected from each experimental animal on day 0, 10, 17 and 20 (day 0 of the next cycle) and each sample was used for estimation of calcium, inorganic phosphorous, magnesium, zinc other biological constituents like total protein, glucose, cholesterol by using quality kits. Then the values were statistically analyzed to compare the results between two groups and between different days of estrous cycle using standard software version (SPSS20).

Results and Discussion

The mean level of serum calcium, inorganic phosphorus, magnesium, zinc, total protein, glucose and cholesterol on different days of estrous cycle in silent and normal estrous cows has been presented in Table 1.

The mean concentration of calcium in serum was ranged from 8.67 to 9.69 in silent estrous and 8.95 to 10.46 mg / dl in normal estrous cows. Significantly higher ($P < 0.01$) level of calcium was recorded on the day of estrus in both silent and normal estrous cows than on day

10 and 17 of estrous cycle. These findings were in agreement with the findings of [14, 9, 22]. While [33] reported lower value of calcium during estrus.

Peak serum calcium concentration observed at day 0 and 20 (day of estrus) might be due in part to high serum concentration of estradiol recorded during this phase. This finding agrees with the observations of [35], who reported high blood calcium concentration in ewes during the oestral phase of the estrous cycle. High estradiol levels during oestral phase causes increased intestinal absorption of calcium [10].

The mean concentration of inorganic phosphorus in serum

was ranged from 5.42 to 6.01 in silent estrous and 5.56 to 6.07 mg / dl in normal estrous cows. On the day of estrus, the serum inorganic phosphorus was significantly higher ($P < 0.01$) than on day 17 of estrous cycle in both the groups. The higher level of serum inorganic phosphorus during estrus might be due to elevated estrogen, which raised the level of phosphorus subsequently. These findings were in agreement with the findings of [14, 19, 11, 9, 34, 8, 13, 27, 4, 6, 1, 22]. While [18] reported lower values of inorganic phosphorus during estrus and [2, 30] reported higher values than the present findings.

Table 1: Blood biological constituents of silent estrus and normal estrous crossbred cows on different days of estrous cycle.

Biological constituent	Status of cow	Day of estrous cycle			
		Day 0	Day 10	Day 17	Day 20
		Mean \pm S.E.	Mean \pm S.E.	Mean \pm S.E.	Mean \pm S.E.
Calcium (mg/dl)	Silent estrus	9.69 ^{abc} _A \pm 0.25	8.87 ^c _{AB} \pm 0.26	8.67 ^c _B \pm 0.24	9.62 ^c _{AB} \pm 0.17
	Normal cyclic	10.46 ^{bc} _A \pm 0.31	9.02 ^{ac} _B \pm 0.11	8.95 ^c _B \pm 0.05	9.86 ^c _{AB} \pm 0.32
Inorganic Phosphorus (mg/dl)	Silent estrus	5.95 ^A \pm 0.22	5.68 ^{AB} \pm 0.19	5.42 ^B \pm 0.20	6.01 ^A \pm 0.13
	Normal cyclic	6.07 ^A \pm 0.14	5.68 ^{AB} \pm 0.23	5.56 ^B \pm 0.20	5.95 ^{AB} \pm 0.24
Magnesium (mg/dl)	Silent estrus	3.10 ^A \pm 0.11	3.67 ^B \pm 0.14	3.36 ^a _{AB} \pm 0.14	3.26 ^a _{AB} \pm 0.11
	Normal cyclic	3.08 ^A \pm 0.06	3.72 ^B \pm 0.18	3.32 ^a _A \pm 0.15	3.04 ^a _B \pm 0.06
Zinc (μ g / dl)	Silent estrus	138.84 ^a _B \pm 1.33	128.67 ^{bc} _B \pm 1.38	129.59 ^{bc} _B \pm 1.37	139.28 ^A \pm 0.87
	Normal cyclic	140.36 ^{ab} _A \pm 0.91	133.09 ^a _B \pm 1.66	133.27 ^{ac} _B \pm 1.61	142.40 ^A \pm 1.60
Protein (mg/dl)	Silent estrus	8.18 ^{ac} _{AB} \pm 0.08	8.08 ^{ab} _{AB} \pm 0.08	7.97 ^A \pm 0.08	8.24 ^B \pm 0.06
	Normal cyclic	8.21 ^{ab} _A \pm 0.08	8.03 ^{ab} _{AB} \pm 0.04	7.93 ^B \pm 0.03	8.17 ^A \pm 0.04
Glucose (mg/dl)	Silent estrus	58.88 ^A \pm 0.81	62.46 ^B \pm 0.76	63.44 ^B \pm 0.82	59.10 ^{AB} \pm 1.24
	Normal cyclic	57.06 ^A \pm 1.38	60.34 ^{BC} \pm 1.34	61.85 ^C \pm 1.05	57.51 ^{AB} \pm 0.88
Cholesterol (mg/dl)	Silent estrus	127.38 ^A \pm 4.62	107.41 ^B \pm 5.40	109.53 ^B \pm 4.69	124.40 ^A \pm 5.24
	Normal cyclic	124.31 ^A \pm 6.52	110.13 ^{BC} \pm 5.76	108.37 ^C \pm 7.03	121.81 ^{AB} \pm 6.46

Means with different subscripts (a,b) within a column and superscripts (A,B,C) within a row differ significantly ($P < 0.01$).

The mean concentration of magnesium in serum was ranged from 3.10 to 3.67 in silent estrus and 3.04 to 3.72 mg / dl in normal estrous cows. The highest concentration was recorded on day 10 of estrous cycle and showed decreasing trend towards the day of estrus in both the silent and normal estrous cows. These findings were in agreement with the findings of [2, 18, 9], while [4] reported lower values of magnesium than the present findings.

The mean concentration of zinc in serum ranged from 128.67 to 139.28 μ g / dl in silent estrous and 133.09 to 142.40 μ g / dl in normal estrous cows. Significantly higher ($P < 0.01$) level of serum zinc was recorded on the day of estrus in both silent and normal estrous cows than on day 10 and 17 of the estrous cycle.

There is direct or indirect beneficial effect of zinc on reproduction [16]. Zinc is also component of various enzymes. During estrus, the changes that occur in hormone and enzymatic profiles may lead to higher level of zinc. Similarly, higher level of zinc during estrus also reported by [9]. But the present findings were disagreement with the findings that reported by [26, 4, 22].

The mean concentration of total protein in serum ranged from 7.97 to 8.24 mg / dl in silent estrus and 7.93 to 8.21 mg / dl in normal cyclic cows. Significantly higher ($P < 0.01$) level of serum total protein was recorded on the day of estrus in both silent and normal estrous cows than on day 10 and 17 of the estrous cycle.

The present findings were in agreement with the findings of [9, 12]. While [3, 34] reported a higher value and [19, 22, 29, 6, 24, 36, 28] reported a lower value than the present findings. Fluctuations in total serum protein concentration at different days of estrous cycle observed in the present study might be due to several factors like age of the animal, breed of the animal [32],

physiological factors and nutritional factor.

In the present study the mean concentration of serum glucose ranged from 58.88 to 63.44 mg / dl in silent estrous and 57.06 to 61.85 mg / dl in normal cyclic cows. The present findings were in agreement with the findings of [23, 9, 17, 24]. While [19, 1] reported a higher value and [3, 5, 28] reported a lower value than the present findings.

The mean concentration of cholesterol in serum was ranged from 107.41 to 127.38 in silent estrus and 108.37 to 124.31 mg / dl in normal estrous cows. The highest concentration was recorded on the day of estrus and lowest values were recorded on day 17 of estrous cycle in both silent and normal estrous cows. The present findings were in agreement with the findings of [23, 24, 28]. While [19, 3, 34, 8, 6] reported a higher value and [17] reported a lower value than the present findings.

Highest cholesterol level on the day of estrus might be due to requirement for synthesis of required steroid for manifestation of reproductive signs of cycles [15]. Cholesterol had been reported to be a starting material for the biosynthesis of steroid hormones as reported by [21]. As [20] reported increase demand for cholesterol for biosynthesis of androstenedione, progesterone and estrogen by the avascular granulosa cells under the influence of LH surge and [7] found stimulatory effects of high density lipoprotein and cholesterol on the cell division of the granulosa cell.

Conclusion

The mean concentration of serum calcium ranged from 8.67 to 11.44 and 8.95 to 10.46 mg / dl; inorganic phosphorus 5.17 to 6.20 and 5.56 to 6.07 mg / dl; magnesium 3.10 to 3.97 and 3.04 to 3.72 mg / dl; zinc 131.76 to 144.01 and 128.67 to 139.28 μ g / dl; total protein 7.85 to 8.42 and 7.93 to 8.21 mg / dl; glucose 57.49 to 64.01 mg / dl and 57.06 to 61.85 mg / dl;

cholesterol 106.04 to 130.42 and 108.37 to 124.31 mg / dl in silent estrus and normal estrous cows, respectively. As the concentration of serum calcium, inorganic phosphorus, magnesium, zinc, total protein, glucose and cholesterol was within the normal range in both silent and normal estrous cows, by estimating blood biochemicals silent estrus could not be differentiate from the normal estrus cows.

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