

# BLOOD BIOCHEMICAL PROFILE IN REPEAT BREEDING COWS

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## ABSTRACT

*A study has been undertaken in six repeat breeding and six normally cycling Jersey - Sindhi cross bred cows maintained at Live stock Research Station, Kattupakkam. The serum cholesterol concentration in the repeat breeding cows revealed the highest level on 10<sup>th</sup> day of the cycle, whereas the lowest concentration was observed on day 5 of the cycle. However the difference was not significant in between days of the cycle. The cholesterol levels were significantly lower ( $P = 0.01$ ) in all the five days of the cycle in repeat breeding cows in comparison with the normally cycling cows. The concentration of plasma glucose in repeat breeding cows showed significant ( $P = 0.01$ ) difference between days. The highest glucose concentration was observed on 5<sup>th</sup> day the lowest concentration on 20<sup>th</sup> day of the cycle. In repeat breeding cows, highest and lowest concentrations of plasma proteins were recorded on day 5 and 20 of the cycle, respectively. The repeat breeding cows had significantly lower ( $P = 0.01$ ) concentration of protein when compared to normally cycling cows irrespective of the days of the cycle. In repeat breeding cows, lowest level of albumin was observed on day 15 of the cycle, and highest concentration on day 20. A significant ( $P = 0.01$ ) difference was observed between these lowest and highest albumin concentrations. In repeat breeding cows, lowest and highest levels of globulin were recorded on day 20 and 5 of the cycle, respectively which was also significantly ( $P = 0.01$ ) different.*

**Key words:** Repeat – breeder – Cholesterol – Glucose - Plasma protein – Albumin – Globulin

## INTRODUCTION

Reproductive performance is one of the important factors determining the profitability of the dairy farmers. This can be achieved by resuming the ovarian cycle within 30 days of postpartum, first service conception is less than 90 days, with an average caving interval of one year. Fat, one of the nutrients apparently enhanced postpartum reproductive performance by increasing the energy

status of the animals and thus stimulated the ovarian follicular growth and luteal functions (Highshoe *et al.*, 1991; Wehrman *et al.*, 1991). High incidence of repeat-breeding and anoestrous are associated with the deficiencies of cholesterol (Kumar and Sharma, 1993), glucose (Jani *et al.*, 1995), protein, albumin and globulin (Joe Arosh *et al.*, 1998).

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## MATERIALS AND METHODS

Twelve Jersey- Sindhi cross bred cows maintained at Livestock Research Station, Kattupakkam were utilized for this study. From this six cows exhibiting regular cycle but not conceived even after three or more inseminations after calving and without any detectable uterine infection were identified as repeat breeding cows. Six cows having regular oestrous cycle with heard record of high conception rate were designated as normal cycling cows. Blood samples of each repeat breeding and normally cycling cows were collected at 5 days interval from the day of oestrous (0 days); serum as well as plasma were separated.

Total serum cholesterol concentration was estimated as per the enzymatic endpoint method of Trinder, (1969) with the kit supplied by Randox, U.K.

Plasma glucose concentration was estimated by the method of Trinder, (1964) using the kits supplied by Reddy's laboratories, Hyderabad.

The total protein, albumin and globulin concentrations in the plasma were estimated as per the method of Doumas *et al.* (1972) using the kits supplied by Reddy's laboratories, Hyderabad.

## RESULTS AND DISCUSSION

In the present study, the total serum cholesterol concentrations in repeat breeding cows were lower ( $P=0.01$ ) when compared to normally cycling cows. This is in agreement with the reports of Ashturkar *et al.* (1995), Burle *et al.* (1995), Ramakrishna (1996) and Madumeet Singh and Pant (1998), whereas Dutta *et al.* (1991) have observed higher cholesterol levels in repeat breeders than normally cycling cows.

The present study indicated highest level

of cholesterol on day 10 of the oestrous cycle in repeat breeding cows, however the difference was not significant when compared to other four days of the cycle. Agarwal *et al.* (1982) also reported no cyclic change in the cholesterol levels on day 1, 13 and 16 of the oestrous cycle. This might be due to inadequate availability of metabolites and metabolic hormones in the central nervous system causing low level of GnRH secretion from the hypothalamus and also the gonadotrophic hormones from the anterior pituitary gland. Perek and Deen, (1985) and Joe Arosh *et al.* (1998) also suggested the association of low levels of cholesterol with reduced level of steroidogenesis.

Highshoe *et al.* (1991) reported increased demand for cholesterol for the biosynthesis of androstenedione, progesterone and estrogen by the avascular granulosa cells under the influence of LH surge. Bao *et al.* (1995) found the stimulatory effects of high density lipoprotein and cholesterol on the cell division of the granulosa cell culture. The highest level of cholesterol on day 15 of the cycle in normally cycling cows could be due to increased steroidogenesis in the active luteal cells during midluteal phase of the oestrous cycle.

The repeat breeding cows showed significantly higher ( $P=0.01$ ) glucose levels on day 5 of the cycle ( $50.31\pm 4.19$  mg/dl) and day 10 ( $45.60\pm 6.60$  mg/dl), whereas significantly lower ( $P=0.01$ ) level ( $30.93\pm 4.39$  mg/dl) was recorded on day 20 of the oestrous cycle when compared to day 5 and 10 of the cycle. Parmer *et al.* (1986) also reported higher level of glucose during the luteal phase in repeat breeders. El- Beley (1993) suggested that altered level of glucose might be the reason for reduced luteal functions in repeat breeding cows. Higher blood glucose concentrations directly increased the progesterone production by increasing the pulse and mean concentration of LH (Richards *et al.*, 1989) or indirectly stimulate prolonged

Table: **BLOOD BIOCHEMICAL PROFILE IN REPEAT-BREEDING COWS**  
**TOTAL SERUM CHOLESTEROL CONCENTRATION (mg/dl)**

Groups	Days of oestrous				
	0	5	10	15	20
Repeat breeder	81.93 <sup>al</sup> ± 9.18	81.80 <sup>al</sup> ± 7.79	96.97 <sup>al</sup> ± 14.61	87.63 <sup>al</sup> ± 8.68	84.82 <sup>al</sup> ± 11.17
Normally cyclic	109.05 <sup>z</sup> ± 9.38	115.10 <sup>z</sup> ± 9.38	124.10 <sup>z</sup> ± 10.49	130.16 <sup>z</sup> ± 16.50	115.12 <sup>z</sup> ± 10.13
<b>PLASMA GLUCOSE CONCENTRATION (mg/dl)</b>					
Groups	Days of oestrous				
	0	5	10	15	20
Repeat breeder	32.12 <sup>al</sup> ± 3.54	50.31 <sup>bl</sup> ± 3.54	45.06 <sup>bl</sup> ± 6.60	33.65 <sup>al</sup> ± 3.19	30.93 <sup>al</sup> ± 4.39
Normally cyclic	56.56 <sup>z</sup> ± 3.14	64.58 <sup>z</sup> ± 5.97	60.70 <sup>z</sup> ± 5.97	63.41 <sup>z</sup> ± 4.87	59.21 <sup>z</sup> ± 3.56
<b>PLASMA TOTAL PROTEIN CONCENTRATION (g/dl)</b>					
Groups	Days of oestrous				
	0	5	10	15	20
Repeat breeder	6.49 <sup>abl</sup> ± 0.09	6.55 <sup>al</sup> ± 0.05	6.45 <sup>abl</sup> ± 0.03	6.35 <sup>abl</sup> ± 0.03	6.32 <sup>bl</sup> ± 0.01
Normally cyclic	6.97 <sup>z</sup> ± 0.14	6.82 <sup>z</sup> ± 0.10	6.83 <sup>z</sup> ± 0.18	6.62 <sup>z</sup> ± 0.15	6.76 <sup>z</sup> ± 0.14
<b>PLASMA ALBUMIN CONCENTRATION (g/dl)</b>					
Groups	Days of oestrous				
	0	5	10	15	20
Repeat breeder	2.89 <sup>abl</sup> ± 0.06	2.85 <sup>abl</sup> ± 0.01	2.83 <sup>abl</sup> ± 0.04	2.75 <sup>bl</sup> ± 0.11	2.95 <sup>al</sup> ± 0.05
Normally cyclic	3.15 <sup>z</sup> ± 0.05	3.11 <sup>z</sup> ± 0.07	3.15 <sup>z</sup> ± 0.14	2.95 <sup>z</sup> ± 0.11	3.18 <sup>z</sup> ± 0.08
<b>PLASMA GLOBULIN CONCENTRATION (g/dl)</b>					
Groups	Days of oestrous				
	0	5	10	15	20
Repeat breeder	3.60 <sup>abl</sup> ± 0.08	3.70 <sup>al</sup> ± 0.05	3.60 <sup>abl</sup> ± 0.05	3.60 <sup>abl</sup> ± 0.07	3.37 <sup>bl</sup> ± 0.07
Normally cyclic	3.82 <sup>z</sup> ± 0.10	3.71 <sup>z</sup> ± 0.05	3.68 <sup>z</sup> ± 0.19	3.67 <sup>z</sup> ± 0.22	3.58 <sup>z</sup> ± 0.11

Means bearing different superscripts differ significantly (P = 0.01)

progesterone release during early luteal phase by increasing insulin level (Mc Ardle and Holtorf, 1989). Poor energy status in repeat breeders due to hypoglycemia could be the reason for impaired hypothalamic hypophyseal ovarian axis and reduced ovarian activities (Joe Arosh *et al.*, 1998).

Significantly lower ( $P=0.01$ ) concentration of plasma total protein in the repeat breeding cows in comparison with the normally cycling cows irrespective of the days of the cycle is comparable to the findings of El-Belely (1993), Burle *et al.* (1995) and Jani *et al.* (1995). However Gandotra *et al.* (1993) and Ramakrishna (1996) observed no significant variation in the protein levels between normally cycling and repeat breeding cows.

Low level of plasma protein resulted in the deficiency of certain amino acids required for the biosynthesis of gonadotropins and gonadal hormones (Vohra *et al.*, 1995) and Joe Arosh *et al.*, 1998) might cause reproductive hormonal disturbances in animals leading to inactive ovaries (Roberts, 1971).

In repeat breeding cows, highest level of total protein was recorded on day 5 of the cycle ( $6.55\pm 0.05$  g/dl) which was significantly different ( $P = 0.01$ ) from the lowest plasma total protein concentration on day 20 of the cycle ( $6.32\pm 0.01$  g/dl). In normally cycling cows, day 0 showed significantly higher ( $P=0.01$ ) concentration of total protein ( $6.97\pm 0.14$  g/dl) when compared to day 15 of the cycle ( $6.62\pm 0.15$  g/dl). Kaitenbach and Dunn (1980) suggested that progesterone played

a regulatory role in the synthesis of specific amino acids. This might be the reason for increased demand for protein and amino acids for GnRH and LH synthesis during early luteal phase of the cycle.

The repeat breeding cows showed significantly lower ( $P = 0.01$ ) concentration of albumin when compared to normally cycling cows irrespective of the days of the cycle. This finding is in agreement with the report of Rowlands *et al.* (1980) and Ramakrishna (1996).

In repeat breeding cows, the albumin concentration was lowest on day 15 ( $2.75\pm 0.11$  g/dl) and highest on day 20 of the cycle ( $2.95\pm 0.05$  g/dl) and there was a significant ( $P = 0.01$ ) difference between the albumin concentration on day 15 and day 20 of the cycle. This high level of albumin in normally cycling cows revealed increased demand for amino acids and protein for the biosynthesis of GnRH and LH to initiate ovulation.

The plasma globulin levels in repeat breeders were significantly lower ( $P = 0.01$ ) in comparison with normally cycling cows irrespective of days of the cycle. Significantly higher ( $P=0.01$ ) level of plasma globulin was observed in normally cycling cows on day 0 of the cycle ( $3.82\pm 0.01$  g/dl) in comparison with day 20 of the cycle ( $3.58\pm 0.11$  g/dl). In repeat breeding cows, significantly lower level ( $P=0.01$ ) of globulin was observed on day 20 of the cycle ( $3.37\pm 0.07$  g/dl) when compared to day 5 of the cycle ( $3.70\pm 0.07$  g/dl). It is suggested that globulin functioning as a carrier protein for copper, altered the biosynthesis of specific coenzymes, thus the steroidogenesis during early luteal phase of the cycle in repeat breeding cows.

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