BLOOD PROFILE OF JERSEY CROSSBRED COWS UNDER DIFFERENT PHYSIOLOGICAL STAGES*

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ABSTRACT

A study was conducted to find out the blood profile of 28 Jersey crossbred cows at different physiological stages. The physiological stages of the experimental cows such as dry stage, milking and lactating - pregnant conditions. Blood samples were collected once in a month for a period of twelve months and 16 important blood constituents were estimated: All the blood constituents with the exception of only total protein and serum magnesium had differed at highly significant (P<0.01) level between the three physiological stages.

INTRODUCTION

The metabolic profile test is intended to be a measure of balance between ‘input’ in terms of nutrients absorbed from gastrointestinal tract and ‘output’ in terms of requirements of those nutrients for maintenance, pregnancy and lactation (Blowey, 1985). Blood serum constituents which reflect metabolic status have frequently been measured in dairy cattle in the ante-partum, post-partum and breeding periods to assess the effects of different feeding regimens on production and reproduction. Most of these parameters fluctuate with physiological stages, level of feeding, diet composition and change in relative body condition. Keeping these factors in view the present study was undertaken to find out the relationship between blood profile with different physiological stages.

MATERIAL AND METHODS

The study was carried out in the herd of Jersey crossbred cows maintained at Livestock Research Station, Kattupakkam, Tamil Nadu. In total 28 cows of which 21 were clinically normal cows and 7 cows were dry, empty with low breeding efficiency were randomly selected for the study. The cows varied in age from 3 to 13 years with an average age of 8 years. They varied in different stages of lactation and milk yield. They belong to different physiological stages namely dry (7 cows), lactating (8 cows) and lactating and pregnant (13 cows).

All the cows were stall fed and supplied daily with 20 to 25 kg of either hybrid Napier grass or maize fodder and one kg of concentrate mixture as maintenance ration. In addition, one kg of concentrate mixture was given for every 2.5 kg of milk production. The concentrate was given according to the milk yield. Dry cows were fed 1 kg and pregnant cows 2 kg irrespective of their stage of pregnancy. The cows were milked twice daily at 4.00 and 15.00h. The milk yield of the cows on the day of blood sampling was recorded. Weighed quantities of feed was given before milking, individually to the cows.

The blood samples were collected between 13th and 18th of every month for 12 months during the period of study. The blood samples were collected once in a month and between 9.0 and 11.0h from all the 28 cows after feeding. The collected blood samples were examined for the biochemical parameters such as glucose, blood urea nitrogen, total protein, albumin, globulin, cholesterol and SGOT. Haematological parameters are Haemoglobin and packed cell volume and serum mineral profile viz., calcium, phosphorus, sodium, potassium, magnesium copper and iron.

* This forms part of Ph.D. thesis submitted by the first author to Tamil Nadu Veterinary and Animal Sciences University, Chennai – 600 051.
Estimations were carried out using Semi-Auto clinical chemistry analyser-Bio systems BTS 320 in the centralized clinical laboratory of Madras Veterinary College. Serum glucose level was estimated as per the method suggested by Raabo (1969). Blood urea nitrogen was estimated as per the method recommended by Kaplan (1987). Serum total protein and albumin were estimated as per the method used by Doumas (1978). Serum cholesterol was estimated as per the method of Wiebe and Smith (1985). Serum glutamic oxaloacetic transaminase was estimated as per the method suggested by Bergmeyer (1986). Sahli's acid Haematin method was followed for haemoglobin estimation as per Schalm et al. (1975). Percentage of Packed cell volume of blood was determined by Wintrobe Haematocrit as per Schalm et al. (1975). Serum calcium was estimated as per the method used by Zak et al. (1975). Serum phosphorus was estimated as per the method of Morin and Prox (1973). Serum sodium level was estimated as per the method suggested by Trinder (1951). Serum potassium level was estimated as per the method recommended by Terri and Sesin (1958). Minerals like magnesium, copper and iron were estimated by using atomic absorption spectrophotometer, perkin-Elmer model 2380, in the Radio Isotope Laboratory of Madras Veterinary College. Each sample was analysed twice and the average of the two readings were taken as the estimated value. Statistical analysis was carried out as per the methods suggested by Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

The physiological status of the experimental cows such as dry, state, milking and lactating - pregnant conditions had a profound influence on their blood profile as seen from Table 1. The milking cows recorded the highest glucose level of 50.99 ± 1.04, dry cows 46.93 ± 1.19 and pregnant and milking cows the least level of 46.72 ± 0.68 mg per dl of blood. The third category being pregnant were probably in advanced lactation yielding lesser milk compared to milking empty cows and hence received lesser quantity of feed. Already with the strain of lactation and simultaneous pregnancy, not getting sufficient energy through diet, would have badly reflected in bringing down the blood glucose in lactating cows compared to the dry but the findings of Ghislain et al. (1985) was reverse with lower glucose level at the early lactation stage.

The BUN levels were the least in dry cows, intermediary in lactating and highest in pregnant - lactating animals. Wahbi et al. (1981) found BUN level to be very low in dry cows. The total protein levels were almost similar in the three groups but there were highly significant differences in the albumin and globulin fractions between dry, lactating and lactating - pregnant stages, albumin level was highest of 2.93 ± 0.09 g per dl in lactating cows and globulin content of 3.85 ± 0.05 g per dl and was highest in dry cows. Wahbi et al. (1981) reported the least level of albumin in blood during the dry stage so also the globulin content.

Lennon and Mixner (1957) reported that the physiological state of the animal such as parturition, pregnancy and lactation had a profound influence on total plasma cholesterol levels. Such was the case with the experimental cows with highly significant (P<0.01) difference between the stages such as dry, lactating and lactating - pregnant. The cholesterol level was highest as 227.91 ± 6.46 mg per dl in lactating stage and least as 176.17 ± 2.66 mg per dl when the cows were dry and empty. Rowlands et al. (1980) found the cholesterol level to increase two and half fold during lactation than when they were pregnant.

The SGOT activity was very high as 104.60 ± 1.29 I.U per l in dry cows which was significantly (P<0.01) higher than lactating
Table 1. Mean ± S.E. of blood constituents according to physiological stages and its analysis of variance

<table>
<thead>
<tr>
<th>Blood constituents</th>
<th>Physiological stages</th>
<th>'F' value</th>
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<tbody>
<tr>
<td></td>
<td>Dry (7)</td>
<td>Lactating (8)</td>
</tr>
<tr>
<td>Glucose mg/dl</td>
<td>46.93 ± 1.19</td>
<td>50.99 ± 1.04</td>
</tr>
<tr>
<td>BUN mg/dl</td>
<td>10.37 ± 0.19</td>
<td>15.26 ± 0.56</td>
</tr>
<tr>
<td>Total protein g/dl</td>
<td>5.90 ± 0.06</td>
<td>6.18 ± 0.17</td>
</tr>
<tr>
<td>Albumin g/dl</td>
<td>2.04 ± 0.01</td>
<td>2.93 ± 0.09</td>
</tr>
<tr>
<td>Globulin g/dl</td>
<td>3.85 ± 0.05</td>
<td>3.25 ± 0.09</td>
</tr>
<tr>
<td>Cholesterol mg/dl</td>
<td>176.17 ± 2.66</td>
<td>227.91 ± 6.46</td>
</tr>
<tr>
<td>SGOT I.U/l</td>
<td>104.60 ± 1.29</td>
<td>84.49 ± 0.76</td>
</tr>
<tr>
<td>Haemoglobin g/dl</td>
<td>8.84 ± 0.02</td>
<td>11.36 ± 0.14</td>
</tr>
<tr>
<td>PCV per cent</td>
<td>26.39 ± 0.14</td>
<td>32.86 ± 0.49</td>
</tr>
<tr>
<td>Calcium mg/dl</td>
<td>8.42 ± 0.12</td>
<td>11.52 ± 0.21</td>
</tr>
<tr>
<td>Phosphorus mg/dl</td>
<td>4.09 ± 0.05</td>
<td>6.39 ± 0.16</td>
</tr>
<tr>
<td>Sodium mmol/l</td>
<td>134.68 ± 0.55</td>
<td>142.21 ± 0.83</td>
</tr>
<tr>
<td>Potassium mmol/l</td>
<td>4.05 ± 0.01</td>
<td>4.21 ± 0.06</td>
</tr>
<tr>
<td>Magnesium mg/dl</td>
<td>2.37 ± 0.04</td>
<td>2.49 ± 0.03</td>
</tr>
<tr>
<td>Copper mg/dl</td>
<td>62.51 ± 0.25</td>
<td>90.90 ± 2.45</td>
</tr>
<tr>
<td>Iron mg/dl</td>
<td>192.55 ± 4.93</td>
<td>217.66 ± 5.78</td>
</tr>
</tbody>
</table>

Figures in parameters indicates number of observations
** Significant at one per cent level (P<0.01).

and pregnant-lactating animals. It was in close agreement with that of Crist et al. (1967) reported that stage of gestation and stage of lactation had a significant effect on the enzyme activity. Haemoglobin level and PCV percentage were significantly (P<0.01) lower during the dry stage, highest in lactating cows and intermediary in pregnant-lactating cows. Payne et al. (1973) found that haemoglobin content was higher while cows were dry and low when they were high yielding.

Serum calcium was higher in late pregnant cows than in early lactating cows. In the experimental cows the calcium levels in blood significantly (P<0.01) lower 8.42 ± 0.12 mg per dl in dry cows. Phosphorus, sodium and potassium concentrations in serum also differed between dry, lactating and lactating - pregnant cows at a highly significant (P<0.01) level. Phosphorus level was highest (6.56 ± 0.12 mg per dl) in lactating - pregnant cows, sodium in lactating animals (142.21 ± 0.83 mmol per l) and potassium in lactating pregnant cows (4.43 ± 0.05 mmol per l).

The magnesium level did not differ significantly between the three stages. Once again copper and iron content differed at highly significant (P<0.01) level between the three stages, copper was highest (91.52 ± 1.22 mg per dl) in lactating - pregnant animals and iron was highest (217.66 ± 5.78 mg per dl) in lactating animals. As seen in the present study, in an experiment by Payne et al. (1974), the blood level of copper was found to be lower in dry cows than in lactating cows but results obtained with iron was different with highest level in lactating stage whereas, according to Tainturier (1984), iron concentration was relatively high from the third to the seventh month of pregnancy and then it decreased to a minimum when lactation commenced.

REFERENCES