ASSESSMENT OF BLOOD GLUCOSE AND SERUM INSULIN PROFILES AT DIFFERENT STAGES OF GESTATION IN TRIPLE CROSS-BRED CATTLE

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ABSTRACT

Blood glucose and serum insulin were determined in forty four triple cross bred (½ Kankrej X ¼ Jersey X ¼ Holstein Friesian) pregnant heifers (20) and cows (24) on days 90, 150, 210 and 275 of gestation. Blood glucose (mg/dl) levels decreased significantly (P<0.01) as pregnancy advanced in both heifers and cows. Serum insulin (IU/ml) levels increased non-significantly on day 150 from that of day 90 and then decreased non-significantly during advanced stages of gestation in both heifers and cows. Decrease in blood glucose as gestation advances may be due to utilization of glucose for the development and growth of the fetus. Positive correlation existed between glucose and insulin levels at different stages of gestation.

Key words: Gestation, Glucose, Insulin, Triple cross cattle.

Carbohydrates in the form of glucose are the principal source of energy for the life processes of the mammalian cell. All cells require a constant supply of this indispensable nutrient, and only relatively small changes may be tolerated without adverse effects upon the health of the animal (Kaneko, 1980). The blood glucose concentration depends upon a wide variety of factors with insulin playing an important role in the regulation of various phases of its metabolism. Gestation period provides a challenge to the dam to challenge its energy for its maintenance and the growth of the fetus. The current study was undertaken in pregnant triple cross (½ Kankrej X ¼ Jersey X ¼ Holstein Friesian) heifers and cows to understand the metabolism of glucose and regulation of insulin over various stages of gestation.

Whole blood was drawn in sterile blood collection tubes through jugular venipuncture on day 90, 150, 210 and 275 of gestation from 44 pregnant triple cross-bred (1/2 Kankrej x 1/4 Jersey x 1/4 Holstein Friesian) heifers (20) and cows (24) maintained at Livestock Research Station, Anand Agricultural University, Anand. Blood glucose was estimated by Folin-Wu method and hormonal insulin by using kits from BARC, Mumbai (RIAK-1) at Reproductive Biology Research Unit (RBRU), AAU, Anand. Statistical analyses were done using unequal completely randomization design (CRD) and the correlation co-efficient between the characteristics was determined as per Snedecor and Cochran (1994).

The Mean ± SE values of the blood glucose and serum insulin of this study are presented in Table-1. Blood glucose (mg/dl) values in heifers and cows ranged from 55.10 ± 0.96 to 68.00 ± 1.96 mg/dl and 53.27 ± 0.78 to 66.75 ± 2.80 mg/dl, respectively. In both heifers and cows the highest values were observed on day 90 (68.00 ± 1.96 mg/dl and 66.75 ± 2.80 mg/dl, respectively) and the lowest values were recorded on day 210 (55.10 ± 0.96 mg/dl and 53.27 ± 0.78 mg/dl, respectively). Significant (P<0.01) differences were noted at the different stages of gestation both in heifers and cows and also in the overall combined values of heifers and cows for the different stages. However, no significant difference was noted between the cows and heifers at different stages of gestation. The above observation are in line with the findings of Sivaraman et al. (2003) and Tainturier et al. (1984). However, Rao et al. (1981) and Ghose et al. (1991) reported lower glucose values in early pregnancy than that in advanced pregnant cows. The decrease in glucose
values up to day 210 observed in our study, may be due to the higher energy required for fetal anabolism and for the appearance of fetal insulin (Tainturier et al., 1984). The rise of blood glucose level in advanced pregnancy might be due to the release of glucocorticoid having a gluconeogenic and anti-insulin effects (Ghose et al., 1991).

Serum insulin (µU/ml) in heifers and cows ranged between 6.86 ± 3.06 (day 90) to 17.42 ± 2.26 µU/ml (day 150) and 10.09 ± 1.44 (day 210) to 16.16 ± 2.26 µU/ml (day 150), respectively. In heifers, the levels almost tripled at day 150 of gestation from the levels at day 90, though the difference was non-significant. The levels subsequently decreased non-significantly at day 210 and day 275 of gestation. In cows, there was a non-significant increase on day 150 from that of day 90, which then subsequently decreased non-significantly at day 210 and increased non-significantly on day 275. The insulin levels between heifers and cows varied non-significantly on observed days of gestation. The current observations of decrease in insulin levels from day 150 to that on day 210 and day 275 of gestation, agreed with the finding of Chew et al. (1980), Reynolds et al. (1990) and Studzinski et al. (1994) of decreasing insulin levels during late pregnancy in dairy cows.

Glucose is a metabolite which stimulates insulin release. The lower levels of glucose as pregnancy advances, would explain the lower trigger for insulin release resulting in lower insulin levels during this period. Moreover, as the fetus gains in weight by more than 50% during the last quarter of gestation, it has a higher glucose uptake, leading to a fall in maternal glucose levels which is met by facilitated anabolism of beta-cell sensitivity of pancreas (Reynolds et al., 1990). A positive correlation (r=0.068) was found to exist between glucose and insulin at different stages of gestation.

### TABLE 1:

<table>
<thead>
<tr>
<th>Animals</th>
<th>Parameters</th>
<th>Overall</th>
<th>Heifers</th>
<th>Cows</th>
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<tbody>
<tr>
<td></td>
<td>Glucose (mg/dl)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>68.00 ± 3.06</td>
<td>66.75 ± 2.80</td>
<td>1.96 ± 0.56</td>
<td>6.86 ± 2.35</td>
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<tr>
<td></td>
<td>Insulin (µU/ml)</td>
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<tr>
<td></td>
<td>55.10 ± 3.48</td>
<td>61.17 ± 1.11</td>
<td>0.96 ± 0.06</td>
<td>15.90 ± 2.35</td>
</tr>
<tr>
<td></td>
<td>(Mean ± S.E)</td>
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</tbody>
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Note: Heifers: n=20, Cows: n=24, Overall: n=44. Mean values with different superscripts within the row vary significantly (P<0.01) from each other.

Mean values with different superscripts within the row vary significantly (P<0.01) from each other.

Superscripts - a,b,c – Heifers, x,y,z – Cows and i,j,k – Overall.
REFERENCES