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Plasma Concentrations of lipids and lipoproteins in newborn kids and female Baladi goats during late pregnancy and onset of lactation.


Summary

Concentrations of blood lipids and some lipoproteins were investigated in normal female Baladi goats during late pregnancy, parturition and onset of lactation as well as in newborn kids during the first two weeks of life. A total number of 60 heparinized blood samples was collected during the first two weeks of life from 4, 5, 6, 7, 8 and 9 kids per day prior to parturition, during the last two weeks of pregnancy, from 4, 5, 6, 7, 8, 9 and 10 kids per day at 1, 2, 3, 4 and 5 days post-partum, respectively. In addition, blood samples were also collected from their newborns during the first two weeks of life (day of birth, 1, 2, 3, 4 and 5 days of age). Plasma was separated and analysed for the following lipid components: total cholesterol, triglycerides, phospholipids, non-esterified fatty acids (NEFA) and some lipoproteins (high density lipoprotein cholesterol (HDL-C) and low density lipoprotein cholesterol (LDL-C)).

The obtained results revealed that there was a significant decrease in plasma level of total lipids at one week after parturition. Plasma level of triglycerides was significantly higher at 4, 3 and 2 weeks before parturition. This increase became very highly significant one week before parturition. Meanwhile, plasma phospholipids concentration showed a significant decrease of about 10% after parturition, followed by a significant increase at 2 and 3 weeks after parturition and highly significant increase at 4 weeks after parturition. The concentration of plasma NEFA showed a significant increase at 4 weeks before parturition followed by a very highly significant increase at 2 and 1 weeks before parturition. On the other hand plasma NEFA was not detected at 2, 3 and 4 weeks post-partum when compared with the value reported at day of parturition. Regarding plasma lipoprotein concentrations, the obtained results showed that there was a significant increase in plasma HDL-C level at 2 and 3 weeks after parturition, followed by a very highly significant decrease at the fourth week post-partum. However, plasma LDL-C level showed a significant decrease of about 3% at 1 and 2 weeks before parturition, followed by a further highly significant decrease at 1 and 2 weeks post-partum.

In newborn kids plasma concentrations of total lipids, total cholesterol, phospholipids, HDL-C and LDL-C were markedly increased at 1 and 2 weeks of age. However, plasma triglyceride concentrations showed a highly significant decrease at 1 and 2 weeks of age. The concentration of plasma NEFA showed a very highly significant decrease at 2 weeks of age whereas, at one week after parturition plasma NEFA were not detected in comparison with first day of life.

Zusammenfassung


Materials and Methods

The present study was carried out in a private farm in Fakira, Sharkia Governorate. Five apparently healthy, non-lactating Baladi-Ziegen, 4 years of age, and their newborn kids were used in this study. The animals were clinically normal and of good external form, and were well fed and in good body condition. During the period of the experiment all animals were kept in a clean and constant environmental and nutritional conditions and water was supplied ad libitum.

Blood samples were collected from the jugular vein into clean centrifuge tubes containing heparin.

Blood lipid levels and their changes especially during pregnancy and lactation have been poorly investigated in goats. Generally, three factors can alter lipid metabolism and blood lipids in ruminants which are well documented in reviews about cows: diet, pregnancy-lactation (HERDT, 1998) and ketosis (ANDERSSON, 1998). Diet-induced changes in lipid metabolism and particularly noticeable in newborn kids, which are not yet ruminating and ingest milk or replacer (UR, 1990). In 1-month-old kids fed a replacer, supplementation with various types of fat demonstrated an increase of plasma cholesterol from about 3 to more than 7 mmol/l over 2 weeks. In those animals, nortic atherosclerotic lesions were observed and it was suggested sucking young goats could be a useful model for the study of atherogenesis (DIERSSEN, SCHADE et al., 1984). This increase was mani...
Results:
The obtained data table 1 and figure 1 indicated that in normal female Baladi goats plasma total lipid concentrations were not significantly decreased around parturition (at 3, 2, and 1 weeks before parturition). On the other hands, plasma lipid levels at one week after parturition was significantly decreased and remained lower but not significantly at 3, 2, and 4 weeks after parturition in comparison with the value reported at day of birth. The mean value of total cholesterol concentration in plasma at 4 and 1 weeks before parturition showed a non significant increase, followed by a non significant decrease at 3 and 2 weeks before parturition. Furthermore, plasma level of total cholesterol showed a non significant decrease at 1 and 2 weeks after parturition followed by a non significant increase at 3 and 4 weeks after parturition.

Plasma concentration of triglycerides revealed a significant increase at 4, 3, 2 and 1 weeks before parturition, followed by a very highly significant increase at one week before parturition. On the other hand, after parturition the mean triglyceride concentration in plasma was non significantly decreased at 2 weeks after parturition and slightly at 3 and 4 weeks after parturition.

A highly significant increase of phospholipids concentration in plasma was reported at 4, 2 and 1 weeks before parturition, followed by a highly highly significant increase at 3 weeks before parturition. On the other hand, a non significant increase in plasma level of phospholipids was noticed at one week after parturition, and this increase became significant at 3 weeks after parturition.

Plasma level of non esterified fatty acids (NEFA) revealed a significant increase at 4 weeks before parturition, followed by a very highly significant increase at 2 weeks before parturition. On the other hand, at 3 weeks before parturition a non significant increase in plasma NEFA was observed. At one week after parturition plasma NEFA was non significantly decreased at 2, 3 and 4 weeks after parturition plasma NEFA was not detected.

A non significant decrease in plasma HDL-C (high density lipoprotein-cholesterol) was recorded at 4 weeks before parturition, followed by a non significant increase at 3, 2 and 1 weeks before parturition. Furthermore, HDL-C concentration in plasma was non significantly increased at 1 week after parturition. This increase became highly significant at 2 and 4 weeks after parturition.

A non significant increase in plasma concentration of LDL-C (low density lipoprotein-cholesterol) was observed at 4 weeks before parturition. However, a significant decrease was noticed at 3, 2, and 1 weeks before parturition. Furthermore, a non significant decrease in plasma level of LDL-C was recorded at all 4 weeks before parturition. This decrease became very highly significant at 1 and 2 weeks after parturition, followed by a non significant increase at 4 weeks after parturition.

The obtained data table 2 and figure 2 indicated that in neonate kids during the first two weeks of the life the mean value of total lipids, total cholesterol, low density lipoprotein-cholesterol (LDL-C), high density lipoprotein-cholesterol (HDL-C) and phospholipids concentrations in plasma were markedly increased at 1 and 2 weeks of age. On the other hands, plasma concentration of triglycerides was highly significantly decreased at one and two weeks of age. Furthermore, plasma NEFA level was not detected at one week of age whereas at 2 weeks age plasma NEFA revealed a very highly significant decrease in comparison with the value observed at day of birth.

Discussion:
Blood lipids in female goats The obtained data revealed that in female Baladi goats plasma total lipid concentrations remained low around parturition but were not noticeably different from the value reported at day of parturition. Such decrease of plasma total lipids became significantly at one week post-partum. The results were nearly similar to those of RAPHEL et al. (1973) who observed that serum lipid concentrations in Holstein-Friesian cows were lower during early lactation and non-lactating pregnancy than during peak of lactation and lactating pregnancy. On the contrary, IRANISH and TANDON (1978) found that concentration of blood serum lipids fell gradually as parturition approached and rose steeply after parturition. Also HUSSEN et al. (1995) reported that plasma level of total lipids decreased during late pregnancy, followed by an increase after calving in female buffaloes. The lowering of total lipid concentrations in plasma during late pregnancy may be attributed to the onset of lactogenesis I (production of precocritum), that occurs at mid-gestation in goats, whereas in cows at 10 days before calving (RUEBLEDUSCH et al. 1991).

The lowering of total (p) concentrations in plasma during early lactation may be due to the onset of lactogenesis II (first release of colostrum that begins during the last 2 to 7 days of gestation) that is associated with copious synthesis and secretion of fat, protein and carbohydrates. Moreover, colostrum contains about 50% more fat than normal milk.

Regarding plasma triacylglycerol concentrations the obtained data demonstrated a significant increase at 4, 3 and 2 weeks before parturition.
Table 2: Changes of lipid and some lipoprotein concentrations in plasma of newborn kids during the first two weeks of life (mg/dl).

<table>
<thead>
<tr>
<th>lipid/protein</th>
<th>0d</th>
<th>1w</th>
<th>2w</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglycerides</td>
<td>400</td>
<td>300</td>
<td>200</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>200</td>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>HDL-C</td>
<td>50</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>LDL-C</td>
<td>150</td>
<td>120</td>
<td>100</td>
</tr>
</tbody>
</table>

Results are presented by mean ± SD.

Comparisons for the day of birth by Mann-Whitney u-test (p < 0.05).

Fig. 2: Mean values of plasma lipid and lipoprotein concentrations (mg/dl) in newborn kids.

Concerning plasma concentration of non-esterified fatty acids (NEFA) the present study demonstrated a significant increase at 4 weeks before parturition, followed by a marked decrease at 1 and 2 weeks before partum. However, during lactation at 2, 3 and 4 weeks after partum non-esterified fatty acids were not detected in plasma. The increased plasma NEFA during late pregnancy may arise from the excessive mobilization of fatty acids from adipose tissue in response to a negative energy balance (NASCER et al., 1985) resulting from increased demands placed on maternal energy supplies by fetal growth and milk production leading to a greater flux of NEFA to the liver for increased hepatic triglyceride synthesis (EFFICOTT and FIELD, 1985). In addition, this response may be exacerbated in late gestation by development of peripartum insulin resistance to the action of insulin (FOWDEN et al., 1984). On the other hand, plasma NEFA increased during lactation as observed in sheep (LÉAT, 1974), cows (SÖDER...