Changes in the Serum Enzyme Level in Claw Affections in Lactating Cows

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ABSTRACT
Twenty apparently healthy dairy cows from Bangladesh Agricultural University Dairy Farm were selected for estimation of Aspartate Amino-Transferase (AST) and Alanine Amino-Transferase (ALT), 5 weeks before parturition and every 5 weeks upto 20 weeks of lactation to observe correlation of occurrence of different claw affections. The values of AST levels showed significant (p<0.01) increase with the advancement of lactation in which highest AST was observed 10 weeks after parturition. The values of ALT also increased significantly (p>0.01) and ten cows showed different types of claw affections and three were slightly lame. The affections were mostly heel erosion, sole haemorrhage, laminitis and interdigital hyperplasia (limax). Most of the affections appeared at 10-15 weeks after parturition when the values of AST and ALT were significantly (p>0.01) higher. However, it need further study to draw conclusions regarding correlation between serum enzyme level and claw affections in lactating cows.

Keywords : Aspartate Amino-Transferase, Alanine Amino-Transferase, claw affections

INTRODUCTION
In the last 20 years there has been increasing interest in the activity of transaminase enzymes in different tissues of a variety of species, including man, laboratory animals, and farm animals (Boots et al., 1969). The aspartate amino-transferase (AST), previously known as (SGOT) and alanine amino-transferase (ALT), previously known as (SGPT), increase on serum enzyme levels due to claw affections and liver destructions are reported (Maclean (1971; Kaneko, 1989), so, it is difficult to ascertain the correlation between enzyme level and claw affections in lactating cows. The modern dairy industry often severely stresses the productive capacities of cows specially when milk-yielding is very high and may result in metabolic disturbances or nutritional diseases. Many attempts have been made by measuring blood constituents to detect such problems. Disturbances in liver function are fairly common in cattle and buffaloes help to diagnose
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hepato-biliary disorders (Kaneko, 1989). Maclean (1971) showed that AST levels were significantly increased in the adult cattle affected with chronic laminitis concomitant with heel erosion. However, parasitiasis also may increase serum enzyme level due to liver destruction.

During pregnancy and at lactation fat mobilization of the cows is increased and deposited in the liver causing severe malfunctioning. Sommer (1975) observed that analysis of serum was possible to detect cows at risk from parturient disorders eight weeks before calving. So, the objective of this work was to find a correlation between serum enzyme level and claw affections in late pregnancy and in lactating cows.

MATERIALS AND METHODS

A total of 20 cows of different breeds (Shahiwal-cross-9, Chittagnong-6, Holstein-Friesian-1, Holstein-Shindhi-1, Holstein-Jersey-1 and Jersey cross-2) from Bangladesh Agricultural University Dairy Farm were selected for analysis of aspartate amino-transferase (AST) and alanine amino-transferase (ALT). Age of the cows was ranged from 6-12 years and the body weight ranged from 250-300 kg.

All four feet of all cows (in a routine schedule for every cow) were lifted and examined for claw affections (Figure 1). Immediately before blood collection, feet were also examined to see any claw affections and lameness. A prescribed recording sheet was used for different cows. In this study the normal cows (cows without showing lameness and claw affections) were selected for serum analysis. The cows were fed same feed like green grass, straw, wheat bran and oil cake.

Figure 1. Examination of claws manually in indigenous cattle in Bangladesh.
Experimental design

Clinical examination of the cows and collection of blood for the analysis of serum enzyme level were performed in different time interval 5 weeks before parturition and 5 weeks after parturition up to 20 weeks.

Serum enzyme analysis

In a routine manner from each cow at scheduled time, 5 ml of blood was collected by a sterile 10 ml plastic syringe into a number marked tube without using any anticoagulant and shaken gently within an hour.

Serum was collected by centrifugation with 2000 rpm for 5 min using a centrifuge machine (Centra CL\textsubscript{2}, International Equipment Company, Germany).

Immediately before analysis, tube-containing serum was kept outside the freeze for 10 min. By using Reflotron\textsuperscript{®} Pipette, the sample was drawn up avoiding the inclusion of air and a drop of the sample was applied to the centre of the red application zone in the strip without allowing the pipette tip to touch the zone. Within 15 seconds, the flap was opened and the strip was placed on the guide and inserted horizontally. The aspartate amino-transferase (AST) and alanine amino-transferase (ALT) enzyme actively were displayed in IU/L at 37\textdegree C. The enzyme level was measured by Reflotron\textsuperscript{®} (Figure 2) analyser (Manheim, boehringer, Germany).

![Figure 2. Serum enzyme analysis with Reflotron\textsuperscript{®} Precinorm\textsuperscript{®} U (4 \times 2 ml, Cat. No. 745 154)](image)

Quality control

Quality of the strip of AST and ALT was controled by Reflotron\textsuperscript{®} Precinorm\textsuperscript{®} (4 \times 2 ml, Cat No. 745 154).
Statistical analysis

The arithmetic mean of different measurements of serum enzyme was expressed as mean ± SD. The statistical significance of differences between affected and non-affected cows were determined using “paired t test”. Descriptive analysis such as Mean ± SD, frequency distribution and percent were observed. Using a package program, Statistical Package for Social Sciences (SPSS) has performed for all of these analyses.

RESULTS

Lameness in cattle after parturition was recorded in the study. It was found that among the claw affections in dairy cows heel erosion was very common (60% of the cases, in which 20% were severe, 10% were moderate and the rest were slight heel erosion). Most of the heel erosion were found from 10-15 weeks after parturition. Other disease conditions were sole haemarhage (20%) and laminitis and trauma (20%). Breed variation was also recorded and observed that shahiwal were frequently affected followed by Jersey Cross.

The AST values were significantly (p<0.01) different at 10 weeks, and 20 weeks after parturition compared to values before parturition (Table 1). However, the levels of AST between affected and non-affected cows were significantly (p<0.01) different at 20 weeks after parturition.

The ALT activity was higher in early lactating cows. The values of ALT levels were significantly (p<0.01) increased with the advancement of lactation in which highest ALT was found in 10 weeks after parturition. However, the values of ALT were lower before parturition than after parturition or at lactating stage.

Table 1. Serum aspertate and alanine transferase values in cows with or without claw affections. AST (Aspertate amino-transferase and ALT (Alanine amino-transferase) values in cows with or without claw affections

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Values IU/L</th>
<th>5 weeks before parturition</th>
<th>5 weeks after parturition</th>
<th>10 weeks after parturition</th>
<th>15 weeks after parturition</th>
<th>20 week after parturition</th>
</tr>
</thead>
<tbody>
<tr>
<td>With affection</td>
<td>AST</td>
<td>104.4±30.6</td>
<td>109.0±38.1</td>
<td>*132.2±41.0</td>
<td>107.2±31.0</td>
<td>*147.4±35.3</td>
</tr>
<tr>
<td>Without affection</td>
<td>AST</td>
<td>102.5±33.3</td>
<td>111.1±19.0</td>
<td>*148.3±50</td>
<td>117.3±26.6</td>
<td>*125.0±26.4</td>
</tr>
<tr>
<td>With affection</td>
<td>ALT</td>
<td>29.8±7.5</td>
<td>30.1±14.8</td>
<td>*41.6±13.5</td>
<td>*39.0±9.0</td>
<td>*42.4±8.7</td>
</tr>
<tr>
<td>Without affection</td>
<td>ALT</td>
<td>27.4±10.3</td>
<td>31.0±10.7</td>
<td>*38.1±11.3</td>
<td>*40.7±8.3</td>
<td>*432±21.7</td>
</tr>
</tbody>
</table>

* p<0.01; values above are mean ± SD of ten cows
DISCUSSION

Ingole et al. (1999) found that the values of AST (SGOT) decreased highly significantly with advancement of gestation period. They also mentioned that the AST activity was higher in early lactating cows in both the breeds compared to gestation period. In contrary, in this study, the values of AST were higher at 10 weeks after parturition compared to 5 weeks before and after parturition and then fell down. However, investigation was not carried out during the whole gestation period.

In this observation, it was found that the values of ALT (SGPT) was higher at 10 weeks and 20 weeks after parturition than 5 weeks before and after parturition, which differ with the finding of Murtuza et al. (1980) who found decreased activity of ALT with advancing stage of lactation. Stallcup et al. (1967) observed highly significant (p<0.01) negative correlation between AST activity/milli liter serum and days of lactation. A significant increasing trend was found up to 10 weeks of lactation for AST in this study where as ALT increased up to 20 weeks.

Logue et al. (2000) reported that sole affections slowly increased towards parturition and mentioned that sole and white line affections reached to peak after calving. In this study, some of the affections were found in claws in cows (only few showed lameness) between 10 weeks and 15 weeks after calving.

All four feet were examined after the cows were housed. Heel horn erosion affections including pitting of the horn on the heel bulbs, separation of the heel horn from the underlying corium and exposure of the corium of the heel were observed. In early lactation, heel erosions were found. Whereas in another study it was reported that sole haemorrhages were most commonly found 2 to 3 months after calving and was more common in primiparous cows (Peterse, 1980; Bergsten et al., 1986), which corresponds to this study. MacLean (1971) found that AST levels were significantly increased in the adult cattle affected with chronic laminitis concomitant with heel erosion, which also supports to the present study where increased AST at 20 weeks after parturition were observed. This study showed that the level of AST and ALT in case of laminitis, heel erosion, sole haemorrhages, and white line separation were increased only during the period around 20 weeks. This is in agreement with the study reported by McLean (1970) who showed significant increase of AST in adult cattle with laminitis and heel erosion. However, from this study it is difficult to ascertain that enzyme levels were associated with claw affections.

It is reasonable that excessive rates of fat mobilization in early lactation are deleterious for the health and productivity of the cow and for the claw. In all cows both AST and ALT increased in advancement of lactation. However, it did not give a perfect relationship between elevated AST/ALT and occurrence of claw affection in cows. Because, variability of the data in this study did not prove that claw affections might
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exactly be related with increase serum enzyme level. So, more work is necessary to draw this sort of inference.

REFERENCES


