Alteration of serum haptoglobin concentration in normal parturition and dystocia affected cows

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Abstract

This study was designed to investigate the alteration in serum haptoglobin (Hp) concentration in dystocia affected cows in comparison to those having normal parturition. Thirty cows included in this study, seventeen with normal parturition and thirteen with difficult parturition (dystocia). Blood samples, from cows that having normal parturition, were collected every three days during the last two weeks of gestation, at calving, 3, 7, and 10 days postpartum. Blood samples from dystocia affected cows were collected at calving, 3, 7, and 10 days postpartum. Serum Hp concentration was determined using ELISA. The results gradual increase of Hp concentration prepartum from 190±70 mg/L at the 10th day before calving to 250±30 and 260±100 mg/L at 7th and 3rd day prepartum, respectively. At day of parturition, Hp concentration increased to 300±140 mg/L, to reach 330±150 mg/L at 3rd day postpartum. Hp concentration at 7th and 10th day postpartum declined to 230±90 and 220±160 mg/L, respectively. Serum Hp of dystocia affected cows was 360±240 mg/L at calving. At 3rd day postpartum, Hp increased to 660±220 mg/L. At 7th and 10th days postpartum, Hp concentration declined to 510±300 and 400±110 mg/L, respectively. No variation in Hp was observed between the cows giving twins and those giving single calve. There was no significant effect of dystocia causes on serum Hp at calving and at 3rd day postpartum. It be concluded that normal calving and dystocia elevated the serum Hp concentration, and insufficient dilatation of birth canal was the most effective cause of dystocia. Also comparison of serum Hp concentration at 3rd and 7th day postpartum can be used as an indicator for the development of complications.

Keywords: Cows, Dystocia, Haptoglobin, Parturition

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Introduction

Acute phase proteins are group of glycoproteins, which secreted in response to infection, inflammation, trauma and injuries (1). The function of acute phase proteins is to promote production of immunoglobulin, enhancing tissue repair and limiting the damage caused by the infection or inflammation (2). Haptoglobin (Hp) is one of an important acute phase protein. It produced mainly in the liver but it is also produced by lung, adipose tissue, skin, spleen, udder, ovary, uterus and placenta (3-5). Additional to the biological function of Hp in responses to infection and inflammation (6), Hp has other functions such as antioxidant, antibacterial and anti-inflammatory (7-9).

The concentration of serum Hp has been determined in farm animals as an indicator for infection and cells damage. Also it was used as a prognostic indicator for many affections (10-17).

Parturition is a physiological event that includes hormonal and anatomical changes in genital system. Dystocia is defined as abnormal or difficult parturition, which can increase calf losses, cow mortality, delay return to estrus, and decrease conception rates (18).

This study was designed to investigate the alteration in serum Hp concentration in dystocia affected cows in comparison to those having a normal parturition.

Materials and methods

Animals

Thirty cows, aged between 4 and 7 years, were included in this study, seventeen with normal parturition and thirteen with difficult parturition (dystocia). Ten healthy heifers, aged between 7 to 10 months were included as a control group. The cows were bred individually by ten different farmers.

Blood samples

Blood samples were collected once time from cows of control group. Samples from cows that having normal parturition were collected every three days during the last two weeks of gestation, at calving, 3, 7, and 10 days postpartum. Samples from dystocia affected cows were collected at calving, 3, 7, and 10 days postpartum.

Blood samples were kept at room temperature for 30 min to clot, then were kept at 5°C for 24 hours. Serum was collected by centrifugation at 3000 rpm for 15 min. Serum samples were stored at -20°C until assay.

Hp assay

Serum Hp concentration was determined using ELISA as method was described previously by Hiss et al. (19). Standard curve (Figure 1) was prepared to calculate the Hp concentration in samples.

Statistical analysis

Data of study were presented as mean ± SD. T-test and one way analysis of variance (followed by Duncan’s multiple range test) were used to determine the significant differences between groups. SigmaStat (Jandel scientific software V3.1) was used for statistical analyses and P<0.05 was considered as statistically significant.

Results

The mean value of serum Hp concentration in cows of control group was 150±70 mg/L (ranged from 50 to 230 mg/L).

Figure 2 shows the concentration of Hp in cows with normal parturition during the period between the 10th day prepartum and the 10th day postpartum. Hp concentration prepartum showed insignificant gradual increase from 190±70 mg/L at the 10th day prepartum to 250±30 and 260±100 mg/L at 7th and 3rd day prepartum, respectively. At
day of parturition, Hp concentration increased significantly (P<0.05) to 300±140 mg/L, and it continually increased significantly (P<0.01) to reach 330±150 mg/L at 3rd day postpartum. Hp concentration at 7th and 10th day postpartum declined to 230±90 and 220±160 mg/L, respectively.

At calving, Hp concentration in dystocia affected cows showed no significant variation between the cows that giving twins (320±80 mg/L) and those giving single calf (250±90 mg/L). At 3rd day postpartum, Hp concentration in both groups of cows increased significantly (P<0.05) compared with that recorded at calving, but no variation was observed between these two groups (Table 2).

Hp concentration in cows having dystocia due to fault orientation, insufficient dilatation of birth canal and uterine inertia, were 280±60, 320±120 and 190±110 mg/L, respectively. These levels increased significantly (P<0.05) at 3rd day postpartum in dystocia cases caused due to fault orientation and insufficient dilatation of birth canal but not due to uterine inertia. There was no significant effect of dystocia causes on serum Hp at calving and at 3rd day postpartum (Table 3).

Table 1 summarize the results of Hp concentration in dystocia affected cows in comparison to those having normal calving. Serum Hp concentration of dystocia affected cows was 360±240 mg/L at calving. No significant variation in Hp concentration at calving was observed between cows having normal and difficult calving.

At 3rd day postpartum, Hp concentration in cows having dystocia increased to 660±220 mg/L. This level was significantly (P<0.01) higher than Hp concentration at calving also higher than the concentration at 3rd day postpartum in normal calving cows.

At 7th and 10th days postpartum, Hp concentration declined to 510±300 and 400±110 mg/L, respectively. These levels were significantly (P<0.05) higher than Hp concentration at 7th and 10th day postpartum in normal calving cows.

Table 1: Haptoglobin concentration (mean ± SD) in normal calving cows (n=17) and dystocia affected cows (n=13)

<table>
<thead>
<tr>
<th>Calving and postpartum days</th>
<th>Normal calves</th>
<th>Dystocia</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>300 ± 140</td>
<td>360 ± 240</td>
</tr>
<tr>
<td>3</td>
<td>330 ± 150</td>
<td>660 ± 220 **</td>
</tr>
<tr>
<td>7</td>
<td>230 ± 90</td>
<td>510 ± 300 *</td>
</tr>
<tr>
<td>10</td>
<td>220 ± 160</td>
<td>400 ± 110 *</td>
</tr>
</tbody>
</table>

** Significant variation (P<0.01), * Significant variation (P<0.05) between normal calving and dystocia affected cow.

Table 2: Haptoglobin concentration (mean ± SD) in dystocia affected cows which having single and twins birth

<table>
<thead>
<tr>
<th>Type of birth</th>
<th>No. of cows</th>
<th>Hp concentration mg/L At calving</th>
<th>3 days postpartum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>10</td>
<td>250 ± 90</td>
<td>520 ± 180 *</td>
</tr>
<tr>
<td>Twins</td>
<td>3</td>
<td>320 ± 80</td>
<td>670 ± 230 *</td>
</tr>
</tbody>
</table>

* Significant variation (P<0.05) between the concentration at calving and 3rd day postpartum.

Table 3: The effect of dystocia causes on haptoglobin concentration (mean ± SD) in cows

<table>
<thead>
<tr>
<th>Causes of dystocia</th>
<th>No. of cows</th>
<th>Hp concentration mg/L At calving</th>
<th>3 days postpartum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fault orientation</td>
<td>7</td>
<td>280 ± 60</td>
<td>640 ± 170 *</td>
</tr>
<tr>
<td>Insufficient dilatation of birth canal</td>
<td>3</td>
<td>320 ± 120</td>
<td>810 ± 230 *</td>
</tr>
<tr>
<td>uterine inertia</td>
<td>3</td>
<td>190 ± 110</td>
<td>390 ± 170</td>
</tr>
</tbody>
</table>

* Significant variation (P<0.05) between the concentration at calving and 3rd day postpartum.
Discussion

The results indicated that no detectable variation in Hp concentration during the pregnancy. This result agree with previous studies which found no effect of pregnancy on Hp concentration (16,20).

There was an increase in Hp concentration during the last week of gestation. This result was observed previously in cows and mares (11,21). These changes in serum Hp may be occur due to the physiological changes before parturition, especially elevation of cortisone at this period of gestation (18,22). It was reported that increasing serum cortisone concentration is followed by increasing Hp concentration (21).

The results showed that serum Hp increased significantly at calving day. Same observation was recorded in cows (23), mares (11), ewes (12), and does (14). Elevation of serum Hp at calving may be occur due to the changes in estrogen level at this period, it was recorded that Hp level increased with increases of estrogen concentration (11).

Hp was increased significantly at 3rd day postpartum, after that it declined at 7th day and returned to normal value at 10th day postpartum. Peak Hp concentration was observed at 3rd day postpartum because it was produced in response to the uterine tissue damage during parturition (24). Decreasing Hp level at 7th day postpartum and later can be attributed to the low production of Hp and destruction of serum Hp during this period because the half-life of Hp is 3.5 days (25).

Hp in dystocia affected cows was significantly higher especially at 3rd day postpartum, which could reflect the degree of tissue damage in birth canal. Dystocia cases are more susceptible to injuries and trauma in birth canal than normal birth (18).

Conclusions

It be concluded that normal calving and dystocia elevated the serum Hp, and insufficient dilatation of birth canal was the most effective cause of dystocia on health of cows. Also comparison of serum Hp at 3rd and 7th day postpartum can be used as an indicator for the development of complications.

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References