Effect of foot and mouth disease on haematological and biochemical profile of cattle

J. Barkakati, S. Sarma and D. J. Kalita*

Department of Veterinary Biochemistry, College of Veterinary Science, Assam Agricultural University, Guwahati, Khanapara-781 022, India.

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ABSTRACT

Present study was undertaken to know certain haematological and serum profile in FMD affected and recovered cattle. The RBC count in FMD affected, recovered and apparently healthy group were 5.18±0.11, 5.50±0.13 and 5.68±0.10 x 10^6/µl respectively. The RBC count was found to be decreased significantly (P<0.05) in affected animals than the apparently healthy group. The WBC count, haemoglobin and PCV in FMD affected, recovered and apparently healthy animals did not differ significantly. Serum protein (P<0.01), albumin (P<0.05) and blood urea nitrogen (P<0.01) significantly decreased in FMD affected animals. Blood glucose concentration in FMD affected group (47.58±2.28 mg/dl) showed a significant (P<0.01) increase as compared to recovered (40.43±1.73 mg/dl) and apparently healthy group (39.63±1.68 mg/dl). The serum calcium was significantly (P< 0.01) decreased in the FMD affected group (7.67±0.10 mg/dl). From this study, it can be concluded that, FMD causes significant decrease of RBC count, total protein, albumin, BUN, calcium and significant increase of glucose.

Key words: Biochemical profile, Blood, Cattle, Foot- and -Mouth Disease (FMD).

INTRODUCTION

Foot-and-mouth disease (FMD) is characterized by fever, depression, anorexia and excessive stingy or foamy salivation with vesicles or blisters appearing on the tongue. Some infected animals remain asymptomatic, but they carry FMD virus and can transmit it to other animals. Initial diagnosis is usually done on the basis of clinical signs. But in endemic regions the partial signs are generally overlooked due to natural or vaccinal immunity (Kitching, 2002). The level of certain metabolites indicates the different disease condition and degree of stress of animal (Payne, 1973). But very scanty literature is available on the effect of FMD on blood and serum profile of indigenous cattle of Assam. Therefore the present study has been undertaken to elucidate the effect of FMD on certain blood and serum biochemical parameters in the indigenous cattle of lower Brahmaputra valley of Assam.

MATERIALS AND METHODS

Blood samples, 30 each were collected from non vaccinated FMDV affected, recovered and apparently healthy (which were considered as control animals) indigenous cattle within 2-4 years age of lower Brahmaputra valley of Assam, maintained under similar nutritional status. All the animals selected for the present experiment were dewormed routinely and was free of any parasitic infection. EDTA and sodium fluoride were used as anticoagulant for estimation of haematological parameters and glucose respectively. Total red blood cell (RBC), white blood cell (WBC) count was done by standard method. Packed cell volume (PCV) and haemoglobin (Hb) level was determined using Wintrobe’s method and Sahli’s acid haematin method respectively. Total serum protein and albumin was estimated by Biuret method as described by Plummer (1971). Urea concentration was estimated by Diacetyl Monoxime method as described by Varley (1975). Glucose, calcium and phosphorus were estimated using commercially available kits. Data generated from the experiment were analyzed statistically using SPSS (version 16.0) software.

RESULTS AND DISCUSSION

Blood profile: The concentration of different haematological constituents (mean ± SE values) is presented in Table 1. The red blood cell (RBC) count in FMD affected, recovered and apparently healthy animals were 5.18±0.11, 5.50±0.13 and 5.68±0.10 x 10^6/µl respectively. Statistical analysis revealed a significant (P<0.05) difference of RBC count between the affected and apparently healthy group. However there was
no significant difference of RBC count between the affected and recovered group as well as between the apparently healthy and recovered group. The decreased level of RBC in the affected animals than the apparently healthy group might be due to reduction of the process of erythropoesis. The occurrence of anaemia could be attributed to endocrinopathy occurring secondary to viral infection (Gokce et al., 2004). The significant reduction in RBCs due to endocrinopathy is also reported by Radostits (1994). Ghanem and Hamid (2010) also reported a significant (P<0.05) decrease in RBC count in FMD affected Holstein cows. The white blood cell (WBC) count in FMD affected, recovered and apparently healthy groups were 6.55 ± 0.07, 6.73 ± 0.07 and 6.84 ±0.09X10⁴/µl respectively. The white blood cell (WBC) count in FMD affected animals showed a non significant decrease as compared to recovered and apparently healthy animals. Similarly, the concentration of haemoglobin is none significantly lower in affected (9.29±0.17 gm %) than that of recovered (9.51±0.16 gm%) and apparently healthy group (9.51±0.15 gm%). Similar findings was also observed by different workers in FMD infection (Gokce et al., 2004; Mohan et al., 2008; Mohamed et al., 2010) and this might be due to the absence of haemorrhage and haemolysis in cattle with FMD infection. The value of PCV in FMD affected, recovered and apparently healthy animals did not differ significantly and our findings are corroborated with the observation made by Gokce et al. (2004), Mohan et al. (2008) and Mohamed et al. (2010).

**Serum profile:** The concentration of different serum biochemical constituents (mean ± SE values) are presented in Table 2. The average value of total serum protein in FMD affected, recovered and apparently healthy animals were 5.95±0.57, 6.56±0.78, 7.07±0.72 g/dl respectively. Concentration of total protein is significantly (P<0.01) decreased in FMD affected animals. Significant (P<0.01) difference was also recorded for protein between the affected and recovered group. Decrease in the total serum protein concentration in FMD affected animals might be due to the anorexia and may result from insufficient intake of protein. Roussel et al. (1997) reported that decrease of total protein concentration is associated with hepatic and renal damage, starvation, enteropathies resulting in protein loss. Protein requirement increases in the presence of any lesions in the body (Kaneko et al., 1997). Low protein concentrations may also be due to alterations in pancreatic β-cell functions developed during the clinical course of FMD (Barboni et al., 1966). The serum albumin concentration showed a significant (P<0.05) difference between the affected and apparently healthy animals as well as between the affected and recovered group. However, there was no significant variation between the recovered and apparently healthy animals. Reductions in serum albumin have been reported to be associated with hepatic and renal damage, starvation, enteropathies resulting in protein loss (Roussel et al., 1997) which are inconsonance with our observation. Gokce et al. (2004) also reported the decrease of serum albumin concentrations is due to lesions on the oral mucosa and interdigital regions. Further, albumin is an acute phase protein and its concentration also decreases in inflammation (Mohamed et al., 2010). Blood urea nitrogen (BUN) concentration showed a significant decrease (P < 0.01) in the affected group (16.92±0.44 mg/dl) as compared to recovered (18.94±0.33 mg/dl) and apparently healthy group.

### TABLE 1: Haematological parameters (Mean± S.E) in FMD Affected, Recovered and Apparently Healthy group (Control) of cattle

<table>
<thead>
<tr>
<th>Parameters</th>
<th>FMD Affected</th>
<th>Recovered</th>
<th>Apparently Healthy</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBCX10⁴/µl</td>
<td>5.18±0.11</td>
<td>5.50±0.13</td>
<td>5.68±0.10</td>
<td>4.5430*</td>
</tr>
<tr>
<td>WBCX10⁴/µl</td>
<td>6.55±0.07</td>
<td>6.73±0.07</td>
<td>6.84±0.09</td>
<td>3.170</td>
</tr>
<tr>
<td>Hb gm%</td>
<td>9.29±0.17</td>
<td>9.51±0.16</td>
<td>9.51±0.15</td>
<td>0.587</td>
</tr>
<tr>
<td>PCV (%)</td>
<td>30.8±2.13</td>
<td>31.9±1.89</td>
<td>32.17±2.07</td>
<td>0.13</td>
</tr>
</tbody>
</table>

*Significant (P < 0.05)

Means ± SE in the same row with different superscripts are significant.

### TABLE 2: Biochemical parameters (Mean± S.E) in FMD Affected, Recovered and Apparently Healthy group (Control) of cattle

<table>
<thead>
<tr>
<th>Parameters</th>
<th>FMD Affected</th>
<th>Recovered</th>
<th>Apparently Healthy</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Protein (g/dl)</td>
<td>5.95±0.57</td>
<td>6.56±0.78</td>
<td>7.07±0.72</td>
<td>65.1**</td>
</tr>
<tr>
<td>Albumin (g/dl)</td>
<td>3.96±0.16</td>
<td>4.52±0.18</td>
<td>4.65±0.18</td>
<td>4.300*</td>
</tr>
<tr>
<td>BUN (mg/dl)</td>
<td>16.92±0.44</td>
<td>18.94±0.33</td>
<td>20.19±0.68</td>
<td>10.63**</td>
</tr>
<tr>
<td>Glucose (mg/dl)</td>
<td>47.58±2.28</td>
<td>40.43±1.73</td>
<td>39.63±1.68</td>
<td>5.21**</td>
</tr>
<tr>
<td>Calcium (mg/dl)</td>
<td>7.67±0.10</td>
<td>7.98±0.10</td>
<td>8.12±0.09</td>
<td>6.310**</td>
</tr>
<tr>
<td>Inorganic phosphorus (mg/dl)</td>
<td>6.10±0.13</td>
<td>5.96±0.15</td>
<td>5.81±0.12</td>
<td>1.172</td>
</tr>
</tbody>
</table>

*Significant (P < 0.05)  **Significant (P < 0.01)

Means ± SE in the same row with different superscripts are significant.
(20.19±0.68 mg/dl). It might be due to hypoproteinemia in affected group. However, Nahed (2010) reported non-significant change in the BUN level in FMD affected and recovered cattle. Glucose concentration was significantly (P< 0.01) increased in affected (47.58±2.28 mg/dl) group as compared to recovered (40.43±1.73 mg/dl) and apparently healthy animal group (39.63±1.68 mg/dl). Increased level might be due to the hypocalcaemia which inhibit the secretion of insulin from the pancreas during FMD infection (Kaneko et al., 1997). An increase concentration of glucose is also a common finding in cattle affected by the stress in systemic disease (Yeotikar et al., 2003; Gokce et al., 2004 and Paalberg et al., 2002).

In the present experiment, significant (P<0.01) decrease of calcium was recorded in the affected group. Significant decrease in serum protein levels and severe anorexia in cattle with FMD might lead to hypocalcaemia (Kaneko et al., 1997 and Moore, 1997). Slight increase in the level of inorganic phosphorus in the present experiment in FMD affected cattle was not significant. The higher serum inorganic phosphorus level in affected group might be due to rapid respiration, higher pulse rate, tissue oxidation and acidosis due to lack of excretion (Gattani et al., 2011). Mullick (1949) also reported high phosphorus level in FMD affected cattle. The non significant increase in the level of phosphorus in diseased group was similar to that reported by Mohapatra et al. (2005). The increased level of inorganic phosphorus could also be attributed to increased salivation with the resultant dehydration and decreased renal blood flow (Gruenberg et al., 2005).

From the present study, it can be concluded that during FMD there is significant decrease of RBC count, total protein, albumin, blood urea nitrogen, calcium level in serum whereas there is significant increase of blood glucose concentration in cattle. However, no significant alteration was observed in WBC count, PCV, haemoglobin and serum inorganic phosphorus.

REFERENCES


