Serum $\alpha_1$-Acid Glycoprotein in Cattle with Inflammatory Disease and that after Operation
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Alpha$\_1$-acid glycoprotein ($\alpha_1$AG), which is a main component of seromucoid, belongs to the family of acute phase proteins [15]. In human, elevation of serum $\alpha_1$AG level is known to be associated with such diseases as neoplasma, inflammation and rheumatoid arthritis as well as post-surgery states [1, 3, 5, 6, 10, 12, 13]. The measurement of serum $\alpha_1$AG levels is useful for evaluation of diseased condition and prognosis. Bovine $\alpha_1$AG was isolated by Iwata et al. [7] and Tamura et al. [16]. They also reported that serum $\alpha_1$AG concentration of diseased cattle was much higher than that of healthy ones [8, 9, 16, 17].

On the other hand, it is important to establish the quantitative indicators to evaluate the post-operative condition in cattle, since the degree of surgical stimulation is responsible for the prognosis. However, the changes of serum $\alpha_1$AG value in cattle with inflammatory disease or those after operation have little been reported. The present paper deals with the changes in levels of serum $\alpha_1$AG in cattle with inflammatory disease and those after operation.

Cattle affected with inflammatory disease were divided into 2 groups (Table 1). In group I, 8 cattle were treated with antibiotics and fluid therapy for 1 to 3 days and all of them were recovered. In group II, 2 cattle were treated with the same medicines as group I at intervals of 1 to 3 days for 80 days, but these cattle were not recovered. The remained 6 cattle were treated with antibiotics and unrecovered from inflammatory disease were submitted to autopsy 10 to 50 days after the onset of the diseases. Autopsy revealed purulent pneumonia, periarthritis, endocarditis, or purulent mastitis in these cases. In the 3rd group with laparotomy, 4 cattle affected with displacement of abomasum (Nos. 19–22) and two healthy cattle (Nos. 17 and 18) were laparotomied under local anesthesia. The displacement of abomasum was repaired by incision of the abomasum under local anesthesia, removal of the gas and fluid accumulated in the abomasum and attachment of the abomasum to the abdominal wall. In the healthy cattle (Nos. 17 and 18) with exploratory rumenotomy, the contents in the rumen were removed, and then the abdominal wall was sutured to be closed. After operation they were treated with injection of a Ringer’s solutions with 5% glucose, and with continuous administration of antibiotics for 7 days.

The blood sample was collected from the jugular vein into 10 ml vacuumb tube at intervals during the investigation period, and the separated sera were stored at –20°C until assay. Serum $\alpha_1$AG concentrations were determined by single radial immunodiffusion method [16].

In group I, 6 of 8 cattle (Nos. 1–5 and 8) showed almost the same levels of serum $\alpha_1$AG as normal cattle throughout the investigation period (Fig. 1). The other 2 cattle suffering from parturial fever and mastitis (Nos. 6 and 7) showed high levels at the 1st and 2nd examina-

![Fig. 1. Serum $\alpha_1$-AG levels in cattle in group I.

- No. 1, -; No.2, ○-; No.3, -×--; No.4, -□--; No.5, -▲--; No.6, -Δ--; No.7, -■--; No. 8. (n=8). ......; normal upper limit.](image-url)
Fig. 2. Serum $\alpha_1$-AG levels in cattle in group II.

- $\Delta$: No. 9; $\bullet$: No. 10; $\circ$: No. 11; $\circ$: No. 12; $\times$: No. 13; $\bigcirc$: No. 14; $\square$: No. 15; $\blacksquare$: No. 16. (n=8).

*: slaughtered and autopsied. ......; normal upper limit.

Fig. 3. Serum $\alpha_1$-AG levels in cattle with after and before surgery.

- $\Delta$: No. 17; $\bullet$: No. 18; $\triangle$: No. 19; $\circ$: No. 20; $\blacksquare$: No. 21; $\bigcirc$: No. 22. (n=6).

*: autopsied. ......; normal upper limit.

tion after the onset of the disease. The high levels returned to the normal levels according to the improvement of clinical symptoms. Serum $\alpha_1$-AG levels at the initial examination were high in 8 cattle (Nos. 9–16) in group II, and 2 (Nos. 9 and 10) of 8 cattle maintained high levels of about 1,000 $\mu$g/ml during the observation period. Four (Nos. 13–16) of the remaining 6 cattle showed high serum $\alpha_1$-AG levels (1,500–2,200 $\mu$g/ml) at the initial examination, and thereafter the levels
Table 1. Clinical features of cattle with inflammatory diseases

<table>
<thead>
<tr>
<th>Group</th>
<th>Case No.</th>
<th>Age</th>
<th>Clinical Findings</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1</td>
<td>2M(a)</td>
<td>T. 40°C-41°C</td>
<td>Pneumonia</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>2M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>4Y(b)</td>
<td>Induration of the udder</td>
<td>Mastitis</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>5Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>5Y</td>
<td>Swelling of the udder, retained Placenta</td>
<td>Puerperal fever and mastitis</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>6Y</td>
<td>T. 39.6°C-41°C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>6Y</td>
<td>Swelling of the hock of a right rear leg T. 39°C</td>
<td>Arthritis</td>
</tr>
<tr>
<td>II</td>
<td>9</td>
<td>2M</td>
<td>Cough T. 40°C-41°C</td>
<td>Pneumonia</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>2M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>2M</td>
<td>Tachypnea, Cough T. 40°C-41°C</td>
<td>Purulent Pneumonia(c)</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>3M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>3M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>6Y</td>
<td>Swelling of the hock T. 41°C</td>
<td>Purulent pneumonia, periartthritis and endocarditis</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>5Y</td>
<td>Swelling and induration of the udder</td>
<td>Purulent mastitis(c)</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>6Y</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Months.  
(b) Years.  
(c) Diagnosed by autopsy.

were rapidly increased. These animals were slaughtered or autopsied within a short period (10–15 days) after the initial examination. The serum α1AG levels of the remaining 2 cattle (Nos. 11 and 12) decreased or showed plateau curve for 20 days, but the levels were rapidly increased again 20 days after the initial examination. In the 3rd group with laparotomy (Fig. 3), the serum α1AG levels of almost recovered cattle (Nos. 17–20) reached a maximum 3–7 days after operation, and thereafter recovered to the preoperative or normal level 15–40 days after operation. In the case (No. 21) with purulent peritonitis at the cutaneous areas, the serum α1AG level showed re-elevation 15 days after operation, but the level was decreased to the preoperative level or lower by 40 days after operation. In the case (No. 22) with postoperative peritonitis, the high serum α1AG level was maintained high until autopsy. On the day before autopsy, the level was further increased.

In group I, most cattle showed no changes, or gradual decrease in the serum α1AG level. These results suggested that the cattle affected with inflammatory disease were recovered by treatment with antibiotics and fluid therapy. In group II, the serum α1AG levels were increased and never returned to normal level. From the results, it was considered that the treatment by medicines was not effective in these cases. Particularly when the value of initial determination was more than 1,000 μg/ml and was thereafter increased, it seemed necessary to observe the morbid condition carefully and to make countermeasures. Laparotomy is done to treat diseases of the digestive system. In the present study, the
changes in serum α1AG level in inflammation cases were observed, which means that bioreaction in laparotomized cattle is regarded as one form of local traumatic inflammation. As a result, the change in serum α1AG level showed a definite pattern in laparotomized cattle during postoperative period till repair. Motoi et al. [14] recognized transient increases in sialic acid and mucoprotein, which are acute phase substances, after the operation of displacement of abomasum and fix of ruminal cannula. Mitaka et al. [10] observed a transient increase in serum α1AG level after operation in patient with cancer. Further, in patients with laparotomy, the acute phase protein level was increased 3–5 days after operation [11]. Considering the results from these reports, the elevation of the serum α1AG level observed after operation seemed to be caused by injury of tissues and surgical stress. In the case with peritonitis, the level was increased remarkably and did not returned to the normal range. It is presumed that the change of this case was caused by postoperative infection.

Those results suggest that serum α1AG level in recovered cases was not increased, while it was high in unrecovered cases. As an indicators for the diagnosis of inflammatory disease, the assay of serum α1AG seemed to be very useful for evaluation of an appropriate treatment and of condition of postoperative course in cattle.

REFERENCES


要約

炎症性疾患牛および手術における血清α1-酸性糖蛋白濃度（伊藤・村田・田村）：伊藤・村田・田村（農業畜産部留学牧場）——炎症性疾患牛及び手術を施行した牛の血清α1-酸性糖蛋白（α1AG）濃度の変動を観察した。1～3日の治療で癒創した群では治療後、殆どの例で正常値内を移動したが、一部異常値を示した例では、症状の回復に従って減少した。非抑制治療または用塩群では、観察期間中高値を示した。開腹手術例では、術後α1AG値が一過性に上昇し、約2～6週間で術前の値に帰った。しかし、術後に腹部炎を併発した例では、剖検時まで高値を持続した。