Some studies on Stiff Lamb Disease in Qassim region in Saudi Arabia.

1: Enzymatic profile in free, subclinically and clinically affected lambs both before and after treatment with vitamin E and selenium preparation

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Abstract

On studying the enzymatic profile of serum muscle specific enzymes (ALT, AST, LDH and CPK) in two sheep flocks one free while the other was endemic with stiff lamb disease it was found that: (1) Serum muscle specific enzymes levels were significantly increased in lambs of the endemic flock when compared with those from the non-endemic one. (2) Vitamin E and selenium administration was followed by significant decrease in enzymes levels in subclinically affected lambs of the endemic flock, while no changes occurred in lambs of the control, non-endemic flock one-week after administration. (3) Lambs in the endemic flock were born with relatively high serum enzyme levels, which began to increase significantly and gradually from the second week of life and up, reaching maximum levels at the fourth week of age. At this age, most of the lambs began to show typical symptoms of the disease. (4) Clinical improvement accompanied with pronounced drop in levels of these enzymes occurred after treatment with vitamin E and selenium preparation in clinically affected lambs. © 2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

It is now evident that several diseases of farm animals are caused by or associated with deficiency of selenium and/or vitamin E. Nutritional muscular dystrophy is one of these diseases which is of economic importance particularly in domestic ruminants (Gallo-Torres, 1972; Hadlow, 1974). Subacute enzootic muscular dystrophy (stiff lamb disease, SLD) is the most common form of this disease in young lambs (Radostitis et al., 1995). Characteristic signs of clinical cases of SLD suggest the underlying problems of vitamin E and/or selenium deficiency. Subclinical deficiencies are more difficult to recognize. Early metabolic disturbances can be diagnosed by biochemical means. Activity of muscle specific enzymes in the serum show marked increase above normal before clinical disturbances occur (Tollersrud, 1971; Farrell and Olson, 1973; Feldheim, 1973; Radostitis et al., 1995).

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Only the administration of vitamin E and selenium is considered to be a suitable treatment for nutritional muscular dystrophy (NMD). Sometimes NMD responds to vitamin E alone and in other cases to selenium. Under field conditions it is clearly impossible to determine whether, in a given case, the chance of success is better with vitamin E or selenium; for this reason it must be assumed that a combination of vitamin E and selenium offers the best chance of a positive effect (Adams, 1972).

Recent experiments showed that serum enzymes diagnosis is capable of detecting subclinical stage of this deficiency (Bostedt, 1976; EL-Newehey, 1982; Radostitis et al., 1995). This disease may represent part of problem of locomotion disturbance among lambs in our clinic. This study planned to throw some light on the enzymatic profile in SLD-free, subclinically and clinically affected Najdi lambs before and after treatment with vitamin E and selenium preparation in Qassim region in Saudi Arabia.

2. Materials and methods

A total number of 58 suckling native Najdi lambs belonging to two sheep flocks were used in the present investigation. They were classified into three groups. The first group was of 20 apparently healthy suckling lambs. These lambs was chosen from a flock with no history of frequent occurrence of SLD to be used as control group.

The second group, was of 18 apparently normal lambs but was chosen from other flock endemic with SLD and was suspected to be subclinically affected. Another 20 lambs forming the third group were chosen from the same endemic flock. Lambs of the third group were put under both clinical and biochemical observation at weekly intervals from birth till weaning. At about the fourth week of age, most lambs of this group began to show locomotion disturbances in the form of stiffness, difficulty standing and ataxic movement, with pronounced muscle tremors especially when forced to stand for long periods. Some showed dyspnea, with abdominal type of respiration. All were of good appetite when helped to reach the dams. These lambs were suspected to be affected with SLD which was confirmed later enzymatically.

Lambs of both the first and second groups, were given a single dose (3 ml) of vitamin E and selenium preparation (Injacom E–Selenium, Roche, Switzerland; each millilitre contains 150 mg DL-α-tocopherol acetate + 0.5 mg sodium selenite pentahydrate) at 21 days of age. Four daily successive similar doses were given to clinically affected lambs of the third group. Blood samples of the first and second groups were collected twice only, one at 21 days of age before treatment and the second one week after treatment. Lambs of the third group were sampled at weekly intervals from the first week of life until the appearance of signs of the disease (at the 4th week). Another sample was collected one week after the last dose of the treatment trials (at the 5th week). Blood samples were collected by jugular venipuncture. The blood was immediately centrifuged at 3000 g for 10 min to harvest the serum. All the above mentioned serum samples were used for determination of serum muscle specific enzymes.

Serum levels of alanine transaminase (ALT), aspartate transaminase (AST), lactic dehydrogenase (LDH) and creatine phosphokinase (CPK) were measured by standard methods (Reitman and Frankel, 1957; Wroblewski and Duean, 1955; Forester, 1970, respectively) using commercial diagnostic kits (bioMérieux, France). The samples showing absorbance for ALT > 125, AST > 165, LDH > 0.01 and CPK > 0.25 were diluted with normal saline and reassayed.

Statistical analysis of the present data was performed using the Student-\(t\) test according to Snedecor and Cochran (1976).

3. Results

Table 1 shows that the level of serum muscle specific enzymes were significantly high \((p < 0.0001)\) in Najdi lambs from endemic flock when compared with those from non-endemic ones.

Table 2 illustrates that there is gradual increase \((p < 0.001)\) in serum enzyme levels from the second week of life and reaches maximum level \((p < 0.0001)\) at the fourth week of age. Vitamin E and selenium administration was followed with marked decrease in enzyme level one week later at 5th week of age (to levels of one week of age). Similar effects
Table 1
Serum muscle specific enzymes (iu/L) in normal (Group 1) and in SLD subclinically affected (Group 2) Najdi lambs before (pre) and one week after treatment (wk) with vitamin E–selenium preparation (values are mean ± SE)

<table>
<thead>
<tr>
<th>No.</th>
<th>ALT (Pre wk)</th>
<th>AST (Pre wk)</th>
<th>LDH (Pre wk)</th>
<th>CPK (Pre wk)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (Group 1)</td>
<td>20</td>
<td>7.44 ± 1.78</td>
<td>25.84 ± 2.66</td>
<td>678.0 ± 261.42</td>
</tr>
<tr>
<td>SLD subclinical (Group 2)</td>
<td>18</td>
<td>52.1 ± 18.6**</td>
<td>468.46 ± 168.2**</td>
<td>1814.18 ± 354.0**</td>
</tr>
</tbody>
</table>

* P < 0.05 vs. control.
** P < 0.0001 vs control.
were recorded in SLD subclinically affected lambs (Table 1).

4. Discussion

Serum muscle specific enzymes were high in Najdi lambs from an endemic SLD flock when compared with those from a non-endemic one, a finding which may indicate they were subclinically affected with stiff lamb disease. (Bostedt, 1976; EL-Neweehy, 1982; Radostitis et al., 1995). Similar results were obtained by Kiroloss et al. (1985) in subclinically affected NMD lambs in Egypt. On the other hand, while vitamin E and selenium administration led to significant decrease in enzymes level in subclinically affected lambs, their levels were unchanged in treated lambs of the control NMD free flock. These findings agree with those reported by Forenbacher et al. (1975) and Radostitis et al. (1995).

The behavior of muscle enzymes levels in lambs of SLD-endemic flock from birth and upwards (Table 2) showed gradual increase in their levels from second week of life and reached their maximum levels at the 4th week of age. At this age most lambs began to show typical signs of SLD. These findings were nearly similar to those reported by Tollersrud (1971) who noted that the activity of muscle specific enzymes in the serum in lambs showed marked increases above normal before clinical disturbance occurred. Administration of vitamin E and selenium preparations was accompanied with both improvement of clinical signs of the disease and marked decrease in serum muscle specific enzymes level, one week after treatment. These findings were nearly similar to those reported by Adams (1972), Forenbacher et al. (1975), Bostedt (1976) and Radostitis et al. (1995). Bostedt (1976) reported significant elevation in muscle specific enzymes (ALT, AST, LDH, CPK) in lambs of an endemic flock although they were clinically healthy and a return to normal levels within one week after single injections of vitamin E and selenium.

From the above mentioned study, it could be concluded that the subclinical form of SLD, could be detected by screening of serum muscle enzymes. In our study, SLD occurred naturally among Najdi lambs around the 4th week of age. Vitamin E and selenium administration was not only accompanied with improvement of clinical signs of the disease but also with significant decrease in serum muscle specific enzymes level in both clinical and subclinical forms of the disease.

References


