ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Improvement Of Calf Livability By The Use Of Immunostimulants In Combination With Mineral Feed Additive.

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ABSTRACT

The problem of livability of young animals is still relevant which is associated with wrong feeding that causes hypovitaminosis and hypotrophy with persistent bacterial and viral infections, secondary immune deficiencies and other factors.This article presents the results of the study of the effect of immunostimulants “Ribotan”, “Immunoferon” and “Treatment and prophylactic immunoglobulin” in combination with the mineral feed additive "Felutsen" on hematologic and biochemical blood indicators of springing cows and calves produced by them. The results of the research on the effect of these preparations on the milk producing ability of cows, daily weight gain and livability of calves are presented. When the immunostimulants and mineral feed additive were combined, hematologic and biochemical blood indicators were normalized incows and calves. Milk producing ability was higher in cows in the experimental groups than in the control group by 13.1-18.3%. Size and daily weight gain of calves produced by the cows in the experimental groups were higher than in the control group by 5.5-6.2% and 30-35.8%, respectively. The livability of calves in all experimental groups was 100%, in the control group –70%. Thus, immunostimulants “Ribotan”, “Immunoferon” and “Treatment and prophylactic immunoglobulin” in combination with the mineral feed additive "Felutsen" can be used in livestock enterprises to improve livability of calves and normalize their metabolism.

Keywords: immunostimulant, livability, calves, feed additive, springing cows, biochemical blood indicators.

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ISSN: 0975-8585

INTRODUCTION

The state of the immune system, like any other organ, is characterized by a complex of morphological, functional and clinical indicators that determine the immune status[1,2,3,4]. The change in any of these indicators shows a poor immune status, that is, it is not normal and treated as immune deficiency [5,6,7].

The problem of immune deficiency is of interest to veterinarians because of steady growth of infectious and inflammatory diseases that can become chronic against the background of low effectiveness of basic therapy, bacterial and viral diseases that cause a high incidence of a disease, and even mortality [8,9].
The aim of theresearch was to study the effect of the preparations “Ribotan”, “Immunoferon” and “Treatment and prophylactic immunoglobulin” in combination with the mineral feed additive "Felutsen" on livability of calves.

MATERIALS AND METHODS

The studies were carried out in LLC“Dairy products”in the Sovetsky district in the Republic of Mari El. On the principle of analogues, four groups of springing cows were made, 5 heads in each. The animals of the first group were injected intramuscularly with “Ribotan” at a dose of 5 ml twice with an interval of 48 hours 30 days before calving. The animals of the second group were injected intramuscularly with “Treatment and prophylactic immunoglobulin” at a dose of 20 ml twice with an interval of 48 hours. The third group was injected intramuscularly with “Immunoferon”at a dose of 5 ml twice with an interval of 24 hours. The animals of experimental groups received “Felutsen” daily with feed, 50 g per animal. The fourth group was control and was kept on a regular diet.

Hematological and biochemical blood tests were performed on the Express Plus Chemical Analyzer (USA).

RESULTS AND DISCUSSION

Studies have shown that on 15^{th} day the level of hemoglobin in the blood of cows in the first group increased by 1.1% ($p<0.001$), in the second group –by 1.2% ($p<0.001$) and in the third group – by 1.5% ($p< 0.001$). On 45^{th} day, its concentration was 123.3 ± 2.33; 121.8 ± 1.95 and 127.3 ± 1.21 g/L in the first, second and third groups, respectively. On $60^{th}$and 75^{th}days, the hemoglobin concentration was higher than the baseline. On 90^{th}day, the level of hemoglobin in the first group was higher than the baseline by 16% ($p<0.001$), in the second group – by 20.2% ($p<0.001$) and in the third group – by 15.6% ($p<0.001$) and was 124.7 ± 0.74; 125.3 ± 1.04 and 127.0 ± 2.09 g/L, respectively. On 90^{th} day, this indicator in the control group was 113.7 ± 1.78 g/L.

On 15^{th} day, the concentration of red blood cells was 6.45 ± 0.18 ($p<0.01$) in the first group, 6.89 ± 0.12 ($p<0.001$) in the second group and 5.94 ± 0.14 $\times 10^{12}$/L($p<0.001$)in the third group. On 45^{th} day, this indicator was higher than the baseline by 8.9; 7.0 and 9.6% in the first, second and third groups, respectively. On 60^{th} day, the concentration of red blood cells was 6.65 ± 0.10 ($p<0.001$) in the first group, 6.77 ± 0.08 ($p<0.001$) in the second group and 7.15 ± 0.06 $\times 10^{12}$/L($p<0.001$) in the third group. On 90^{th} day, the concentration of red blood cells was higher in the first group than the baseline by 10.2% ($p<0.001$), in the second group – by 7.3% ($p<0.001$) and in the third group – by 26.9% ($p<0.001$).

The concentration of white blood cellswas also increasing during the study and on 90^{th} day it was 8.43 ± 0.09 ($p>0.05$)in the first group, 8.95 ± 0.16 ($p<0.01$) – in the second group, 8.61 ± 0.08 $\times$ 10^{9}/L ($p<0.05$) – in the third group, that was higher than the baseline by 7.6; 8.7 and 10.9%.

Hematocrit level increased ($p<0.05$) in all experimental groups and on 90^{th} day, it was 0.42 ± 0.02; 0.41 ± 0.02 and 0.42 ± 0.03 g/L in the first, second and third groups, respectively.

In the control group, the level of red blood cells, white blood cells and hematocrit did not change significantly.

Analysis of the leukocyte count with fulldifferential has shown that the animals had a low level of lymphocytes and high level of segmented neutrophils. During the experiment, the concentration of lymphocytes was increasing in all experimental groups: on 90th day, it was higher in the first group than the baseline by 44.3% ($p<0.01$), in the second group by 29.8% ($p<0.01$), in the third group by 17.5% ($p<0.01$).

On 90th day, the concentration of segmented neutrophils decreased and was less in the first, second and third groups than in the control group by 27.1; 32.0 and 24.6%, respectively. In the control group, this indicator exceeded the background level by 8.1%.

On 90th day, the level of eosinophils increased ($p<0.05$) in the first group by 11.3%, in the second group by 20.3% and in the third group by 18.5%.

The concentration of stab neutrophils and monocytes in all experimental and control groups increased insignificantly ($p>0.05$).

Throughout the study, the level of total protein ($p>0.05$) in the serum of cows was between 70 and 90 g/L that corresponds to normal level.

The concentration of albumin was increasing ($p<0.05$) during the experiment in all experimental groups and on 90th day, it was 40.0 ± 0.80 g/L in the first group, 37.0 ± 0.94 g/L in the second group and 39.1 ± 0.73 g/L in the third group, that was higher than the baseline by 23.5; 17.1 and 36.5%, respectively.

On 90th day, the concentration of alpha and beta globulins also increased in the first group by 31.4% ($p<0.05$) and 20.7% ($p<0.05$), in the second group by 32.4% ($p<0. 01$) and 15.4% ($p>0.05$), in the third group by 44.5% ($p<0.05$) and 13.9% ($p<0.05$).

In the control group, the concentration of alpha and beta globulins did not change significantly.

The concentration of gamma globulins increased ($p<0.01$) in the first group by 21.9% (29.6 ± 0.65 g/L), in the second group by 17.7% (30.2 ± 0.31 g/L) and in the third group by 24.6% (30.9 ± 0.25 g/L) on 15th day. The same changes were on other days. On 90th day, the level of gamma globulins was higher than the baseline by 41.1% ($p<0.001$); 38.7% ($p<0.001$) and 40.5% ($p<0.001$) in the first, second and third groups, respectively, in the control group this indicator was 37.3 ± 0.27 g/L.

On 90th day, the concentration of lactic acid increased in the first group by 14.4% ($p>0.05$), in the second group by 9.2% ($p<0.05$), in the third group by 18.2% ($p<0.05$) and in the control group by 5.2%.
On 90th day, the state of vitamin metabolism was analyzed by the concentration of vitamins A and E. The concentration of vitamin E increased ($p<0.001$) and was 2.48 ± 0.02; 2.50 ± 0.04 and 2.40 ± 0.05 µmol/L, in the first, second and third groups, respectively.

On 90th day, the concentration of vitamin A increased in the first, second and third groups by 19.4% ($p<0.001$); 19.7% ($p<0.001$) and 8.3% ($p<0.01$). In the control group, its level was 0.66 ± 0.006 µmol /L at the end of the experiment.

On 15th day, the level of glucose in the blood was 1.37 ± 0.008 ($p<0.001$) in the first group,1.46 ± 0.004 ($p<0.001$) in the second group, 1.39 ± 0.003 mmol/L ($p<0.001$) in the third group. On 45th day, the glucose level was higherthan the background level ($p<0.001$) by 9.7; 13.3 and 8.5% in the first, second and third groups, respectively. The same changes wereon 60thand 75th days of the research. On 90th day, this indicator was 1.48 ± 0.006 ($p<0.001$) in the first group, 1.52 ± 0.008 ($p<0.001$) in the second group and 1.47 ± 0.006 mmol/L($p<0.001$) in the third group.

In the blood serum of cows in all groups, a high concentration of indirect and direct bilirubin was found which indicated liver damage. On 15th day, the concentration of indirect and direct bilirubin in the first group was 7.11 ± 1.05 ($p<0.05$) and 0.84 ± 0.005 ($p<0.05$), in the second group – 8.55 ± 1.23 ($p<0.001$) and 0.61 ± 0.007 ($p<0.01$), in the third group – 7.88 ± 0.87 ($p<0.05$) and 0.73 ± 0,004 ($p<0.01$), in the control group – 7.55 ± 0.83 µmol/L and 0.55 ± 0.002 µmol/L. On other control days, the concentration of indirect bilirubin decreased and was lower in the first group than the baseline by 41.5% ($p<0.001$), in the second group by 45.4%

(p<0.001), in the third group by 44% (p<0.001) on 90th day.In the control group, the concentration of indirect bilirubin was 7.80 ± 0.33 µmol/L.

On 75thand 90th days,direct bilirubin was not found in the serum of cows in the first, second and third groups, while in the control group its level was 1.01 ± 0.001 µmol/L.

When analyzing the background level of ketone bodies,a high concentration of them was in the serum of cows in all groups,at the rate of 0.3-1.2 mmol/L. During the research, its level was reducing (p<0.001) and on 90th day it was 0.70 ± 0.002 in the first group, 0.65 ± 0.007 in the second group and 0.73 ± 0.004 mmol/L in the third group. In the control group, the concentration of ketone bodies in the blood serum was 1.62 ± 0.006 mmol/L.

At the end of the studies, the level of urea was higher than the baseline by 33.5% (p<0.001); 42.0% (p<0.001) and 40.9% (p<0.001) in the first, second and third groups, respectively.

Analysis of the alkaline reserve in animals has shown that there was a shift in this indicator towards acidosis at the rate of 19-27 mmol/L. During the research this indicator was increasing and at the end of the experiment it was higher (p<0.001) than the background level in the first group by 27.6% (19.22 ± 0.95 mmol/L), in the second group by 27.8% (19.11 ± 1.55 mmol/L), in the third group by 30.5% (20.01 ± 1.13 mmol/L), in the control group this indicator was 14.82 ± 0.90 mmol/L.

The level of total cholesterol increased by 48.3; 54.8 and 47.7% in the first, second and third groups on 90th day of the experiment.

The level of iron, total calcium and inorganic phosphorus was not changing significantly in the blood of cows throughout the study and was within the limits of the physiological norm.

On 90th day, the zinc level rose significantly (p<0.001) by 82.3%; copper level –by 68.7%; cobalt level – by 154.5%; selenium level –by 514.2%; iodine level – by 138% and magnesium level – by 101.7%in the first group, in the second group –by 67.6%; 82.8%; 132.4%; 66.4%; 80.9% and 95%, in the third group – by 105.5%; 97.9%; 183.9%; 170.3%; 71.9% and 41.6%, respectively.

In the control group, the level of copper, zinc, cobalt, selenium, iodine and magnesium in serum of cows did not change significantly.

In calves produced by experimental cows, the concentration of total bilirubin was within the limits of the physiological norm and was 13.30 ± 0.06 (p<0.001); 14.38 ± 0.08 (p<0.001) and 14.36 ± 0.15 µmol/L (p<0.001) in the first, second and third groups, respectively, on 30-32 days of the studies.

The concentration of vitamin A was significantly higher in calves of experimental groups than in the control group throughoutthe research and on 30-32 days the level of vitamin A was higher in the first group than in the control group by 128.5% (p<0.05), in the second group by 142.8% (p<0.05), in the third group by 157.1% (p<0.05).

At the end of the research, the concentration of alkaline reserve was 23.9 ± 1.25 mmol/L (p<0.01) in the first group, 25.0 ± 2.11 mmol/L (p<0.01) in the second group,26.7 ± 1.96 mmol/L (p<0.01) in the third group, 18.9 ± 2.42 mmol/Lin the control group.

The urea concentration in the blood serum of the calves in the experimental groups was also significantly higher than in the control group throughout the study and was 2.74 ± 0.22-2.99 ± 0.23 mmol/L (p<0.05), and in the control group it was 2.05 ± 0.16-2.18 ± 0.09 mmol/L at the rate of 1.5-6.0 mmol/L.

On 8-10th days, the concentration of iron in the serum of calves both in the experimental and control groups did not differ significantly and was unreliable (p> 0.05). On the following days, the result was the same.

On 8-10th days, the level of zinc was higher in the first group than in the control by 84.2% (p<0.001), copper – by 72.2% (p<0.001), cobalt – by 181.3% (p<0.001), selenium – by 118.8% (p<0.001), magnesium by –

115.6% (p<0.001), iodine – by 176.1% (p<0.001),in the second group (p<0.001)– by 91%; 75.5%; 200%; 115.6%; 113.3% and 104.7%, in the third group –by 82.2%; 77.1%; 175%; 128.1%; 124.4% and 161.9%,respectively. On 15-17th days, the level of trace elements in all experimental groups was also higher than in the control group. On 30-32 days, the concentration of zinc in the first group was 18.1 ± 0.85 µmol/L (p<0.001), copper – 16.7 ± 0.56 mmol/L (p<0.001), cobalt – 0.42 ± 0.03 mmol/L (p<0.001), selenium – 0.77 ± 0.03 mmol/L (p<0.001), magnesium – 1.04 ± 0.006 mmol/L (p<0.001) and iodine – 0.69 ± 0.002 µmol/L (p<0.001). In the second group, these indicators were higher than in the control (p<0.001) by 94.6%; 57.8%; 138.8%; 125.7%; 129.2% and 227.3%, respectively.

Similar results were observed in the calves in the third group while analyzing the concentration of trace elements.

In the control group, the concentration of the traceelements was below the lower limit of the physiological norm throughout the study.

The concentration of total calcium and inorganic phosphorus in the serum of calves in all groups did not change significantly and was within the physiological norm.

The daily weight gain of calves (Table 1) produced by the cows in the first group was 0.632 ± 0.34 kg, by the cows in the second group – 0.660 ± 0.28 kg, by the cows in the third group – 0.657 ± 0.35 kg, which is higher than the daily weight gain of calves produced by cows in the control group by 30%; 35.8% and 35.2%, respectively (p<0.05).

Table 1: Milk producing ability of cows and daily weight gain of calves, n = 5

Group	Milk yield per cow,kg	Body weight of a calf, kg	Daily weight gain of a calf,kg
First	17.6±0.60	29.0±0.32	0.632±0.34
Second	17.3±0.55	28.6±0.21	0.660±0.28
Third	18.1±0.58	28.8±0.42	0.657±0.35
Control	15.3±0.70	27.3±0.37	0.486±0.40

The livability of the calves produced by the experimental cows was 100%, while in the control group 3 calves from 10 died and their livability was 70% (Table 2).

Table 2: Livability of calves in the experiment

Group	The number of calves	Died by 60th day		Livability, %
		Total	Including noninfectious deseases	
First	10	-	-	100
Second	10	-	-	100
Third	10	-	-	100
Control	10	3	3	70

The autopsy of the dead calves in the control group revealed the signs of bronchopneumonia and liver dystrophy.

ISSN: 0975-8585

CONCLUSION

Thus, it is necessary to note that the use of immunostimulants “Ribotan”, “Immunoferon” and “Treatment and prophylactic immunoglobulin” in combination with the mineral feed additive “Felutsen” for springing cows contributes to normal metabolism in calves, increases their weight gain and livability.

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