

Treatment of cows with rumen atony

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Abstract. Under certain conditions, the main source of energy in the diet of cattle can be concentrated feed, such as cake, meal and legumes. When there is an excess of them in the rumen, acidic metabolic products that block the reproduction of normal microflora are formed during the digestion process. Therefore, acidic silage and excess of concentrates in the diet contributes to the development of rumen acidosis. Rumen acidosis leads to a number of diseases, such as atony of the proventriculus, osteodystrophy, ketosis, hepatitis. All these pathologies are accompanied by a decrease in milk production. The purpose of this work was a comparative analysis of various treatment regimens for cow rumen acidosis. We conducted two series of experiments on cows with rumen acidosis. In the first series, we studied the effectiveness of oral administration of sodium acetate in doses of 0.4 g/kg, 0.5 g/kg and 0.6 g/kg body weight for rumen acidosis. In the second experiment, we studied the effectiveness of oral administration of calcium acetate in doses of 0.2 g/kg, 0.3 g/kg and 0.4 g/kg body weight. In the first experiment, it was found that the effectiveness of sodium acetate for rumen acidosis was almost identical for concentrations of 0.5 and 0.6 g/kg., a single use of sodium acetate led to recovery in 83.3% of cases. The average duration of restoration of rumen motility was 410 minutes. It was revealed that, in comparison with sodium acetate, calcium acetate is significantly more effective after 1-2 applications of calcium acetate at a dose of 0.3 g/kg. With oral administration of sodium acetate and calcium acetate in cows with acute rumen atony, it is possible to normalize the motor function of the rumen, rumen digestion in general, alkaline reserve, and glucose levels. The duration of the period to restore the rumen motility when using sodium acetate is six to eight hours, when using calcium acetate - two to three hours.

1 Introduction

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At the present stage, the main features of dairy farming development are the high intensity of production processes, the use of modern technological solutions and the use of highly effective breeding techniques aimed at increasing milk production. [1-3]. Optimal housing and feeding conditions are formed on the basis of scientific achievements, while the genetic potential of animals is increased by selection methods. At the same time, internal non-communicable bovine diseases are widely spread in Russia and abroad [4, 5].

Among such diseases, a special position is occupied by laminitis, metabolic disorders, endometritis, ketosis, mastitis, milk fever, liver dystrophy and acidosis. Due to the functional stress of the body, disturbances in metabolic processes occur. They also occur when the diet is unbalanced.

Rumen atony mainly occurs when housing and feeding regimes are violated, diets contain a significant proportion of feed that is of poor quality and finely ground [6, 7].

The use of insulin has a positive effect. However, it does not stimulate the ruminant process. Since the action of ruminators is aimed at enhancing contractions of all groups of smooth muscles, it is not advisable to use these drugs in all cases of the disease [8, 9].

Positive results are also not always achievable if hypertonic solutions of sodium and calcium chloride are used. Recovery occurs on the fourth to sixth day if enzyme preparations are used and a novocaine suprpleural blockade is performed. Accordingly, there is a need to look for new highly effective drugs and new ways to treat acute rumen atony [10-12].

The work was aimed at development of highly effective method of treating animals with acute rumen atony.

2 Materials and methods

A total of 68 cows with acute rumen atony were studied. In two experiments, the effect of oral administration of various doses of sodium acetate and calcium acetate on rumen motility and their effect on the processes of ruminal digestion were studied.

The therapeutic effectiveness of sodium acetate was studied in 24 cows with acute rumen atony, which were divided into four groups. Animals of the control group were treated by subcutaneous administration of white hellebore tincture in a dose of 5 ml per head. Experimental groups I, II and III were treated by oral administration of sodium acetate in doses of 0.4 g/kg, 0.5 g/kg and 0.6 g/kg body weight, respectively. Hellebore tincture was administered once a day until the animals recovered. Sodium acetate was used in the form of a 10% solution; if necessary, it was re-administered after 10-12 hours.

In the second experiment, the therapeutic effectiveness of calcium acetate was studied on cows with rumen atony, divided into four groups. In this case, sodium acetate at a dose of 0.5 g/kg body weight was administered orally in the form of a 10% solution in the control group. The drug was re-prescribed 10 hours after its first use.

In animals of experimental groups I, II and III, calcium acetate at doses of 0.2 g/kg, 0.3 g/kg and 0.4 g/kg body weight was administered orally in the form of a 10% solution 1-2 times a day. The drug was re-prescribed 4 hours after its first use.

The following parameters were determined in the blood serum: the number of erythrocytes and leukocytes, ESR, the content of total calcium, inorganic phosphorus, the level of alkaline phosphatase, the concentration of total protein, reserve alkalinity. The research results were subjected to statistical processing using the Microsoft Excel software package.

3 Results and discussion

All three doses of sodium acetate (0.4 g/kg, 0.5 g/kg and 0.6 g/kg) administered orally in the form of a 10% solution induced a decrease in blood glucose level. The administration of sodium acetate at a dose of 0.4 g/kg live weight lowered the blood glucose level by 0.3 mmol/l, i.e. on 10%. The blood glucose level returned to its initial value after 60 minutes. When sodium acetate was administered orally at a dose of 0.5 g/kg body weight, the glucose level decreased by 0.6 mmol/l, i.e. by 20%. It restored after 70 minutes. When using the third dose - 0.6 g/kg, the concentration of glucose in the blood decreased by 1 mmol/l. Glucose levels returned within 90 minutes. The results of studying the therapeutic effectiveness of sodium acetate for acute rumen atony are presented in Table 1.

Table 1. Therapeutic effectiveness of oral administration of sodium acetate in the case of acute rumen atony.

Parameter	Group			
	control	I- experimental	II- experimental	III- experimental
Single dose of the drug	5 ml hellebore tincture	0.4 g/kg sodium acetate	0.5 g/kg sodium acetate	0.6 g/kg sodium acetate
Recovered after using the drug, %				
First time	50	66.6	83	84
Second time	33.3	33.5	17.7	16
Third time	16.7	-	-	-
Recovery time after using the drug, min				
First time	680-720	360-480	360-450	350-480
Second time	450-530	300-370	260	250
Third time	430	-	-	-

In accordance with the data presented in the table, the proportion of those who recovered in the control group after using hellebore tincture was 50%. The duration was six hundred and ninety minutes. After the second use, the values were 33% and four hundred and eighty minutes, 16.7% and four hundred and twenty minutes.

Taking into account a single dose of the drug per day, the weighted average duration of treatment was about twenty-five hours (one thousand five hundred thirty-five minutes). When using sodium acetate, there was no need to use the drug for a third time in each of the groups.

The effectiveness of sodium acetate was almost identical when using doses of 0.5 and 0.6 g/kg. In this regard, it seems that the first dose is optimal.

In 83.3% of cases, a single use led to recovery. The average duration of recovery of rumen motor function was four hundred and ten minutes. Double application led to recovery of the remaining 16.7% of animals. The duration of restoration of rumen motility was eight hundred and fifty minutes.

Thus, the value of weighted average duration of treatment was four hundred eighty-three minutes. This result was 3.2 times less compared with the use of hellebore tincture.

Based on the data presented, we came to the conclusion that in case of acute rumen atony sodium acetate significantly shortens the course of treatment compared to hellebore tincture. As a result, in the next series of experiments, where calcium acetate should had been used, we used sodium acetate to treat animals in the control group.

Table 2. Assessment of the therapeutic effectiveness of calcium acetate in the case of acute rumen atony.

Parameter	Group			
	control	I- experimental	II- experimental	III- experimental
Single dose of the drug, g/kg body weight	0.5	0.2	0.3	0.4
Recovered after using the drug, %				
First time	83.3	66.7	83.3	100
Second time	16.7	33.3	16.7	-
Recovery time after using the drug, min				
First time	354-170	167-181	136-163	108-122
Second time	245	68	52	32

In the control, the course of treatment was almost identical to the previous series of experiments (dose of sodium acetate - 0.5 g per kg of body weight). The recovery rate was also almost the same.

It was revealed that calcium acetate is significantly more effective in comparison with sodium acetate (Table 2). The percentage of recovered animals after 1-2 applications of calcium acetate at a dose of 0.3 g/kg was similar to the control. At the same time, a significantly more rapid restoration of rumen motility was noted after the use of calcium acetate. Thus, restoration of rumen motility after the first and second application of calcium acetate occurred after one hundred and fifteen and thirty-two minutes, respectively. After administration of calcium acetate at a dose of 0.4 g/kg, the rate was 3.6 times higher in comparison with sodium acetate - restoration of rumen motility occurred after the first application of calcium acetate at a given dose in 100 percent of sick animals for a hundred and fifteen minutes.

It was found that VFA and pH levels increased after changing the therapeutic dose of calcium acetate (0.4 kg). However, the severity of these changes in the control group was less pronounced.

In the blood of animals from the experimental group, the alkaline reserve and total calcium increased significantly, while the activity of alkaline phosphatase and the level of glucose decreased. The change in control occurred in the same directions, but its severity was less pronounced.

Accordingly, the therapeutic effectiveness of calcium acetate was more significant in comparison with sodium acetate.

Compared with sodium acetate, the use of calcium acetate in an optimal therapeutic dose induced more significant positive changes in processes associated with rumen digestion and biochemical parameters.

4 Conclusions

- When administered orally, sodium acetate and calcium acetate provide the opportunity to normalize rumen motor function, rumen digestion in general, alkaline reserve, and glucose levels in cows with acute rumen atony.

- Sodium acetate and calcium acetate are characterized by therapeutic effectiveness equal to 100%. The restoration of the motor function of the rumen occurred from six to

eight hours when treated with sodium acetate, and from two to three hours when treated with calcium acetate.

- A method has been developed to inhibit the motility of the digestive tract using glucose as a therapeutic agent. The method demonstrated high efficiency.

- A highly effective method for treating animals with acute rumen atony has been developed. The duration of treatment was reduced by two to three times when using calcium acetate compared to sodium acetate.

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