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THE EFFECTIVENESS OF A COMPREHENSIVE TREATMENT REGIMEN USING SODIUM THIOSULFATE WITH GASTROINTESTINAL DISEASES IN CALVES WITH INTOXICATION SYNDROME

The aim of the research was to study the dependence of the severity on the degree of endogenous intoxication and the effectiveness of complex treatment of calves using sodium thiosulfate-based drugs for gastrointestinal diseases. Studies were carried out under production conditions in cattle farms of the Vitebsk, Liozno and Gorodok districts. As preparations based on sodium thiosulfate, the veterinary drug "Averon" produced by LLC Belekotekhnika RB and the veterinary preparation Antitox manufactured by ImmCont GmbH, Germany, were used. These drugs as an antitoxic agent, were administered once a day, intravenously, slowly at a dose of 25 ml, until the clinical signs of the disease disappeared in addition to the basic treatment taken in the farms with gastrointestinal diseases.

The data obtained as a result of the analysis of the literature and the conduct of our own research showed that in the pathogenesis of gastrointestinal diseases of the calves, the link to the pathogenesis, which significantly determines the severity of their course and prognosis, is endogenous intoxication. It was found that in patients with calves, the MW content was higher at the height of the disease – 1.75–2 times with moderate severity and 1.94 and 2.47 times with severe. Laboratory criteria were established for predicting the severity of dyspepsia and abomasoenteritis in calves of 14 to 30 days of age. So, at a level higher than 0,120 conv. units in 100% of such calves, dyspepsia or gastroenteritis proceeded in a severe (toxic) form. The significant direct correlations between the concentration of MWS and LPO products ($r \geq 0.650$) revealed at the height of the disease indicate the significance of LPO as a source in the development of endotoxication in gastrointestinal diseases in calves. It has been established that the use of drugs with antitoxic action based on sodium thiosulphate in the complex therapy of calves of patients with dyspepsia and abomasoenteritis can reduce the severity and lethality of calves with dyspepsia by 5% to 10%.

Key words: calves, blood, endogenous intoxication, abomazoenteritis, dyspepsia, therapeutic efficacy, treatment.

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Problem statement, analysis of basic research and publications. The basis of the pathogenesis of gastrointestinal disorders in young cattle of any origin is indigestion of the received feed, the development of dysbacteriosis and metabolic disorders [1–4, 13–16]. Endogenous intoxication is also a significant link in the pathogenesis of these diseases [5–7, 10–12], often determining their severity and outcome [8–11, 6–9]. Endogenous intoxication in gastrointestinal diseases develops by several mechanisms, but the most significant, according to many authors, is metabolic, i.e. due to metabolic disorders, namely the predominance of catabolism over anabolism, and is a complex pathogenetic complex, including disorders in almost all organs and systems of the body [3, 4, 12–16, 1, 2, 15–19]. It should also be considered as a change in the regulation of metabolism or the metabolic response of the body to any aggressive factor [17–19, 3–5].

Important in the development of endotoxicosis belongs to lipid peroxidation (LPO). Intermediate products of lipid peroxidation are toxins and make a significant contribution to the development of endotoxication [20, 21].

To eliminate the endogenous intoxication of metabolic origin, drugs are used that promote biotransformation and subsequent elimination of toxins. In veterinary practice, for this purpose, often use drugs with oxidative properties (for example, sodium hypochlorite [22] and other electroactivated solutions of sodium chloride, etc.) [23, 24].

The purpose of the research is to study the dependence of the course of severity on the degree of endogenous intoxication and the effectiveness of complex treatment of calves using sodium thiosulfate-based preparations for gastrointestinal diseases.

Materials and research methods. Studies were carried out under production conditions in cattle farms of the Vitebsk, Liozno and Gorodok districts. In the serum of newborn calves with dyspepsia

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(n = 18); calves 14-30 days old (n = 23) and 2-3 months of age (n = 16), patients with gastroenteritis selected during the primary study and at the height of the disease (3-4 days), determined the concentration of medium molecular weight substances (MWS) [25] – as an integral marker of intoxication and LPO products: malonic dialdehyde (MDA) and diene conjugates (DC). To interpret the results of laboratory studies of calves, depending on the severity of the clinical manifestations of toxicosis syndrome, divided into 3 groups: mild, moderate and severe [25–27].

Further, in the conditions of Municipal unitary agricultural enterprise (MUAE) "Im. Sverdlov "Gorodok district conducted a study of the comparative therapeutic efficacy of various integrated treatment regimens of calves with gastrointestinal diseases. It was created 6 groups of experimental animals, 20 animals each. The first group consisted of calves suffering from dyspepsia with basic treatment, the second group with the additional administration of the veterinary Antitox preparation manufactured by ImmCont GmbH, Germany, once a day, intravenously, slowly at a dose of 20 ml; in the third – with the additional administration of the veterinary drug "Averon" produced by LLC Belakotekhnika, Belarus, once a day, intravenously, slowly at a dose of 20 ml; the fourth group consisted of calves, patients with abomasoenteritis at the age of 14–30 days with basic treatment, the fifth group – with the additional administration of the veterinary drug "Antitox" produced by "ImmCont" GmbH, Germany, once a day, intravenously, slowly at a dose of 25 ml, until the disappearance of clinical signs of the disease; in the sixth – with the additional administration of the veterinary drug "Averon" produced by LLC Belakotekhnika, Belarus, once a day, intravenously, slowly at a dose of 25 ml. Averon and antitox was administered until the disappearance of clinical signs. The basic treatment was the use of diet therapy, antimicrobial (with abomasoenteritis) and rehydration therapy. On the 4th day of treatment, blood was collected from calves to determine MWS.

Research results. It was found that the severity of intoxication largely determines the severity of gastrointestinal diseases in calves. Thus, a significant correlation dependence ($r \geq 0.85$) was found between the concentration of MW and the duration of the disease in the calves of all experimental groups. The concentration of SMV, depending on the severity of the disease is presented in Table 1.

Table 1 – **MWS, depending on the severity of gastrointestinal diseases of calves, conv. units** (M ± m)

Severity	Blood taking time	Group of calves		
		Patients with dyspepsia	14-30 days, abomazoenteritis	2-3 months, abomazoenteritis
Easy	1	0,084±0,0061	0,077±0,0054	0,065±0,0029
	2	0,095±0,0054[1]	0,093±0,0073[1]	0,080±0,0044[1]
Average	1	0,107±0,0093[2]	0,106±0,0102[2]	0,073±0,0053
	2	0,196±0,0183[1, 2]	0,167±0,0128[1, 2]	0,125±0,084[1, 2]
Heavy	1	0,133±0,0114[2]	0,125±0,0084[2]	0,080±0,0062
	2	0,235±0,0185[1, 2, 3]	0,184±0,0135[1, 2, 3]	0,175±0,0084[1, 2, 3]

Note. [1] P <0.05 (compared with the first blood collection); [2] P <0.05 (compared with mild severity of the disease), [3] P <0.05 (severe form compared to the average).

Analysis of the data presented in table 1, allows you to see several trends. First, in newborn calves and calves of 14-30 days of age, the content of MWS at the onset of the disease directly correlates with the subsequent severity of its course. So, at a level higher than 0,120 conv. units in 100% of such calves, dyspepsia or gastroenteritis proceeded in a severe (toxic) form. In the calves of 2-3 months of age, this trend was no longer noted. This may be due to the etiological role of metabolic disorders in the development of these diseases [10]. Secondly, the concentration of MWS significantly increases depending on the severity of the course of gastrointestinal diseases of calves. So, in calves, patients with dyspepsia, it was higher at the height of the disease – 2 times with moderate severity and 2.47 times with severe. And with gastroenteritis in 14-30-day calves – 1.75 and 1.94 times with moderate and severe degrees of course, respectively. In 2-3-month-old calves, the trend is similar, but less pronounced. And thirdly, the intensity of the content of MWS with endotoxicosis caused by gastrointestinal disease decreases with age.

As it is known, in calves with the development of acute gastrointestinal diseases, there is a tendency to enhance LPO [16], which was also detected by us. This was manifested in the increase in the

content of both primary and secondary LPO products. Moreover, the tendency to an increase in the concentration of LPO products was similar to that of the MWS content (Table 2).

Table 2 – **LPO products, depending on the severity of gastrointestinal diseases of calves, cond. units** (M±m)

Severity	Blood taking time	Group of calves		
		Patients with dyspepsia	14-30 days, abomazoenteritis	2-3 months, abomazoenteritis
MDA, μmol/l				
Easy	1	2,24±0,132	1,67±0,133	1,35±0,094
	2	2,65±0,106[1]	2,05±0,184[1]	1,66±0,102[1]
Average	1	2,17±0,284	1,75±0,169	1,53±0,085
	2	2,99±0,087[1, 2]	2,18±0,093[1]	2,02±0,102[1]
Heavy	1	2,83±0,123[2]	1,83±0,125	1,58±0,133
	2	3,65±0,206[1, 2, 3]	2,67±0,136[1, 2, 3]	2,23±0,142[1, 2]
DC, D_{232}/ mg lipids				
Easy	1	0,284±0,168	0,234±0,076	0,225±0,159
	2	0,345±0,197[1]	0,285±0,214[1]	0,249±0,193
Average	1	0,305±0,235	0,256±0,093	0,233±0,160
	2	0,386±0,164[1, 2]	0,307±0,193[1, 2]	0,275±0,208[1]
Heavy	1	0,313±0,211	0,275±0,111	0,240±0,193
	2	0,435±0,365[1, 2, 3]	0,349±0,084[1, 2, 3]	0,315±0,127[1, 2, 3]

Note. [1] P <0.05 (compared with the first blood collection); [2]P <0.05 (compared with mild severity of the disease); [3] P <0.05 (severe form compared to the average).

As can be seen from table 2 in calves with gastrointestinal diseases, the intensity of the LPO increases, which is manifested by the accumulation of both intermediate (DC) and final reaction products (MDA). In calves, both in dyspepsia and abomazoenteritis, their concentration depends on the severity of the disease. Correlation analysis showed the presence of a significant direct relationship between the concentration of MWS and MDA (at the primary study in calves with dyspeptic patients r = 0.673, and at the height of the disease – r = 0.756), between MWS and DC (at primary research in calves with dyspeptic patients r = 0.712, and in the midst of the disease - r = 0.791). This indicates the importance of the LPO in the development of endotoxin in gastrointestinal diseases of calves.

In calves, which, in addition to the basic treatment, antitoxic drugs were used, by the 4th day of treatment, the MWS level was significantly lower and was: in calves, patients with dyspepsia in the baseline treatment group – 0.184 ± 0.0149 conv. units, in the treatment with the veterinary drug "Aveyron" – 0,147 ± 0,0131 conv. units, in the treatment with the drug veterinary "Antitoks" – 0,140 ± 0,0118 conv. units, and in calves, patients with abomazoenteritis in the group of basic treatment – 0.171 ± 0.0125 conv. units, with the treatment with the veterinary drug "Aveyron" – 0.122 ± 0.0097 conv. units, in the treatment with the drug veterinary "Antitoks" – 0,117 ± 0,0112 conv. units It was found that the use of sodium thiosulfate in the therapeutic regimen can significantly reduce the severity and duration of the disease of the calves with gastrointestinal diseases. So, in the group of basic treatment of calves with dyspepsia, the duration of treatment was 5.6 ± 0.54 days, mortality – 15%, the number of cases with severe course (toxic dyspepsia) – 25%. In the groups using Averon and antitox, these indicators were respectively: the disease duration was 4.0 ± 0.36 and 3.7 ± 0.35 days, the mortality rate was 5 and 10%, the number of severe cases (toxic dyspepsia) was ten percent. In the experimental groups, where anti-toxic drugs were used, the positive dynamics of recovery was observed already on the second day in most calves, which was manifested by a decrease in the intensity of diarrhea, on the third to fourth days in all animals of the experimental group, the main clinical sign disappeared – diarrhea. In calves, there was a recovery in appetite and water intake returned to normal. And in the group of basic treatment of calves with abomazoenteritis, the duration of treatment was 4.8 ± 0.43 days, mortality – 10%, the number of cases with a severe course – 20%. In the groups using Averon and antitox, these indicators were respectively: the duration of the disease was 4.1 ± 0.29 and 3.9 ± 0.30 days, the mortality rate was 5%, the number of cases with severe disease was 10%.

Conclusion. The data obtained as a result of the analysis of the literature and the conduct of our own research show that in the pathogenesis of gastrointestinal diseases of calves, the link of pathogenesis that significantly determines the severity of their course and prognosis is endogenous intoxication. The use of dyspepsia and abomasoenteritis in the complex treatment of calves of patients with dyspepsia, drugs with sodium thiosulfate antitoxic action, reduces the severity and mortality in calf dyspepsia by 5–10%, and in abomasoenteritis by 5%. In the dynamics of therapy, along with a positive effect on clinical symptoms, a significant decrease in the concentration of SMV was observed (at the level of significant differences – $p < 0.05$) as a marker of endotoxication.

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Ефективність комплексної схеми лікування з використанням препаратів натрію тіосульфату при шлунково-кишкових хворобах телят з синдромом інтоксикації

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Метою досліджень було вивчення залежності складності перебігу шлунково-кишкових хвороб телят від ступеня ендогенної інтоксикації та ефективності комплексного лікування із використанням препаратів на основі натрію тіосульфату. Дослідження проводили у виробничих умовах у скотарських господарствах Вітебського, Ліозненского і Городоцького районів. Використовували препарати на основі натрію тіосульфату, а саме: препарат ветеринарний «Аверон» виробництва ТОВ «Белекотехніка» РБ і препарат ветеринарний «Антітокс» виробництва «ImmCont» GmbH, Німеччина. Ці препарати, як антитоксичний засіб, вводили один раз на добу, внутрішньовенно, повільно в дозі 25 мл, до зникнення клінічних ознак хвороби додатково до базового лікування, прийнятого в господарствах за шлунково-кишкових хвороб.

Отримані в результаті аналізу літератури та проведення власних досліджень дані показали, що в патогенезі шлунково-кишкових хвороб телят ланкою, що зумовлює складність перебігу і прогноз, є ендогенна інтоксикація. Встановлено, що у хворих телят вміст СМВ був вище в розпал хвороби – в 1,75–2 рази за середнього ступеня тяжкості і у 1,94 і 2,47 рази – за тяжкого. Визначені лабораторні критерії прогнозу тяжкості перебігу диспепсії і абомазоентериту у телят 14–30-добового віку. Так за рівня вище, ніж 0,120 ум. од., у 100 % таких телят диспепсія або гастроентерит перебігали у важкій (токсичній) формі. Виявлені в розпал хвороби значущі прямі кореляційні залежності між концентрацією СМВ та продуктами ПОЛ ($r \geq 0{,}650$) свідчать про значущість ПОЛ як джерела розвитку ендоінтоксикації за шлунково-кишкових хвороб у телят. Встановлено, що застосування в комплексній терапії телят, хворих на диспепсію і абомазоентерит, препаратів на основі натрію тіосульфату, дозволяє знизити тяжкість перебігу і летальність за диспепсії телят на 5–10 %, а за абомазоентериту – на 5 %.

Ключові слова: телята, кров, ендогенна інтоксикація, абомазоентерит, диспепсія, терапевтична ефективність, лікування.

Эффективность комплексной схемы лечения с использованием препаратов натрия тиосульфата при желудочно-кишечных болезнях телят с синдромом интоксикации

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Целью исследований было изучение зависимости тяжести течения желудочно-кишечных болезней телят от степени эндогенной интоксикации и эффективности комплексного лечения, с использованием препаратов на основе натрия тиосульфата. Исследования проводили в производственных условиях в скотоводческих хозяйствах Витебского, Лиозненского и Городокского районов. В качестве препаратов на основе натрия тиосульфата использовали препарат ветеринарный «Аверон» производства ООО «Белэкотехника» РБ и препарат ветеринарный «Антитокс» производства «ImmCont» GmbH, Германия. Данные препараты, в качестве антитоксического средста, вводили один раз в сутки, внутривенно, медленно в дозе 25 мл, до исчезновения клинических признаков болезни дополнительно к базовому лечению принятому в хозяйствах, при желудочно-кишечных болезнях.

Полученные в результате анализа литературы и проведения собственных исследований данные показали, что в патогенезе желудочно-кишечных болезней телят звеном патогенеза, значительно определяющим тяжесть течения и

прогноз, является эндогенная интоксикация. Установлено, что у больных телят содержание СМВ было выше в разгар болезни – в 1,75– 2 раза при средней степени тяжести и в 1,94 и 2,47 раза – при тяжелой. Определены лабораторные критерии прогноза тяжести течения диспепсии и абомазоэнтерита у телят 14–30-суточного возраста. При уровне выше чем 0,120 усл. ед. у 100 % телят диспепсия или гастроэнтерит протекали в тяжелой (токсической) форме. Выявленные в разгар болезни значимые прямые корреляционные зависимости между концентрацией СМВ и продуктами ПОЛ (r≥0,650) свидетельствуют о значимости ПОЛ как источника в развитии эндоинтоксикации при желудочно-кишечных болезнях у телят. Установлено, что применение в комплексной терапии телят, больных диспепсией и абомазоэнтеритом, препаратов, обладающих антитоксическим действием на основе натрия тиосульфата, позволяет снизить тяжесть течения и летальность при диспепсии телят на 5–10 %, а при абомазоэнтерите – на 5 %.

Ключевые слова: телята, кровь, эндогенная интоксикация, абомазоэнтерит, диспепсия, терапевтическая эффективность, лечение.

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