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РЕЗУЛЬТАТЫ РЕАЛИЗАЦИИ ОЗДОРОВИТЕЛЬНЫХ МЕРОПРИЯТИЙ В ХОЗЯЙСТВАХ, НЕБЛАГОПОЛУЧНЫХ ПО ЛЕЙКОЗУ КРУПНОГО РОГАТОГО СКОТА

(✉)**Двоеглазов Н.Г., Агаркова Т.А., Осипова Н.А., Магер С.Н.**
Сибирский федеральный научный центр агробиотехнологий Российской академии наук
Новосибирская область, р.п. Краснообск, Россия
(✉)e-mail: lableucosis@ngs.ru

Изучена динамика проведения оздоровительной работы на примере двух аналогичных по экономическим и производственно-технологическим характеристикам хозяйств Новосибирской области. Приведены данные обстановки по лейкозу на момент начала активной оздоровительной работы и результаты через несколько лет. Проанализированы показатели инфицированности поголовья по разным возрастным группам и на разных отделениях изучаемых хозяйств за 2017–2022 гг. Уровень инфицированности коров в хозяйствах с 2017 по 2019 г. имел тенденцию к незначительному снижению и находился в диапазоне 8–4%. Уровень инфицированности телок составил 5–12%. Регистрация новых случаев реагирования по серологии в группе телят в хозяйстве № 1 снизилась от 9,9 до 4,9%, в хозяйстве № 2 – от 14,2 до 7,1%. Показана положительная динамика реализации плана по оздоровлению с применением для серологической диагностики иммуноферментного анализа (ИФА). После перехода с реакции иммуннодиффузии в геле агара (РИД) на ИФА и первого его применения число вновь выявленных животных увеличилось во всех возрастных группах в обоих хозяйствах по сравнению с предыдущим периодом. В последующих исследованиях процент новых случаев значительно снизился. Физическое разделение групп животных с разным статусом, размещение их на разных отделениях и четкий контроль с моментальным исключением из производственного процесса инфицированных животных привело к заметному улучшению эпизоотической ситуации в хозяйстве. Отмечены аспекты, вызывающие замедление оздоровительной работы, в частности, несвоевременное разделение животных на группы после проведения серологической диагностики и установления их статуса по инфекции. Проведение полной замены инфицированного крупного рогатого скота в неблагополучных стадах или отделениях группами животных, отрицательных по серологии, позволяет значительно сокращать сроки оздоровления, особенно на завершающем этапе.

Ключевые слова: лейкоз, крупный рогатый скот, оздоровительные мероприятия, ИФА, РИД, инфицированность

RESULTS OF THE IMPLEMENTATION OF SANITATION MEASURES IN THE FARMS UNFAVORABLE FOR BOVINE LEUKEMIA

(✉)**Dvoeglazov N.G., Agarkova T.A., Osipova N.A., Mager S.N.**
Siberian Federal Scientific Centre of Agro-BioTechnologies of the Russian Academy of Sciences
Krasnoobsk, Novosibirsk Region, Russia
(✉)e-mail: lableucosis@ngs.ru

The dynamics of recuperation work on the example of two farms similar in economic and production and technological characteristics of the Novosibirsk region were studied. The data on leukemia at the time of the beginning of active recuperation work and the results after several years were presented. The infection rates of the livestock by different age groups and in different parts of the studied farms were analyzed for 2017-2022. The infection rate of cows on the farms tended to decrease slightly from 2017 to 2019 and was in the range of 8-4%. The infection rate of the heifers was 5-12%. Registration of new cases of serology response in the group of the calves in the farm No. 1 decreased from 9.9 to 4.9%, in the farm No. 2 - from 14.2 to 7.1%. The positive dynamics of implementation of the recovery plan using enzyme-linked immunosorbent assay (ELISA) for serological diagnosis was shown. After switching from the immunodiffusion in agar gel reaction (AGID) to ELISA and its first use, the number of newly detected animals increased in all age groups in both farms compared to the previous period. In subsequent studies, the percentage of new cases decreased significantly. Physical separation of the groups of animals with different statuses, placing them in different sections and clear control with the

immediate exclusion of infected animals from the production process led to a noticeable improvement in the epizootic situation on the farm. Aspects causing delay in sanitation work were noted, in particular, untimely separation of animals into groups after serological diagnosis and establishment of their infection status. Complete replacement of infected cattle in unhealthy herds or wards by groups of serology-negative animals can significantly reduce the recovery period, especially at the final stage.

Keywords: leukemia, cattle, recreational activities, ELISA, AGID, infection

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IUNTRODUCTION

Leukosis of cattle remains a pressing issue in a large part of the territory of the Russian Federation (RF), accounting for over 40% of the main infectious diseases in cattle. In 2021, 2070 unfavorable points were identified for leukosis in cattle, and 1398.704 thousand heads of cattle were examined (hematological test), revealing 15,096 positively responding heads, with 15,611 heads sent for slaughter[1]. The situation in the Siberian Federal District (SFD), particularly in the Novosibirsk region, remains steadily tense. The SFD ranks second in Russia in the number of unfavorable points [1, 2].

Currently, serological (AGID and ELISA), gene-molecular (PCR) [3] and hematological methods are mainly used for the diagnosis of cattle leukosis. In the absence of specific methods of treatment and prevention, timely diagnosis and removal from the herd of sick and infected animals are the only effective measure to improve the population from leukosis. Existing methods and techniques yield positive results when implementing health improvement measures [4–7].

In the farms conducting improvement, three groups of animals can be conditionally identified, usually related to separate farms or herds. The first one comprises healthy animals, negative according to serological studies. This group is usually replenished only by serologically negative young animals, typically obtained from healthy cows. The second one is at an intermediate stage of recovery, with most animals also being serologically negative (conditionally healthy), but there is a small proportion of responders. This is due to the need to maintain a certain number in the department for its normal functioning and the limitation of the reserve of young animals for replacement. This group is primarily replenished with healthy young stock, as far as the agricultural enterprise can afford. The terms of recovery often directly depend on these opportunities. The third group comprises the remaining responding (infected) herds, departments, flocks. They concentrate cattle from the first two groups, generally suitable, except for the presence of the leukemia virus, for further exploitation. This group is mainly replenished with infected young stock, and the recovery process in it will proceed only after the complete recovery of the first two.

An important characteristic of health improvement activities is the terms of herd (farm) recovery from infection. They can be very short with a radical way of recovery (complete or par-

[1]Epizootic situation in the Russian Federation 2022 (Quarter 1). URL: https://fsvps.gov.ru/sites/default/files/files/iac/o_31_03_2022_otchet_iac_1_kv.pdf.

[2]Order of the Ministry of Agriculture of Russia from 24.03.2021 № 156 "On Approval of Veterinary Rules for the implementation of preventive, diagnostic, restrictive and other measures, the establishment and lifting of quarantine and other restrictions aimed at preventing the spread and elimination of foci of bovine leukosis" https://fsvps.gov.ru/ru/fsvps/laws/150301.html.

tial replacement of the animal population with animals from favorable agricultural enterprises for leukosis), or they can last for years and even decades. The second variant of events has its reasons, which mainly consist of non-compliance with the regulations of prescribed measures for various reasons. A systematic, comprehensive approach helps increase the efficiency of anti-epizootic measures [8–10].

The purpose of the study is to examine the dynamics and analyze the effectiveness of health improvement measures in agricultural enterprises unfavorable for leukosis based on epizootological indicators.

MATERIAL AND METHODS

The study analyzed the experience of conducting health-improvement work for bovine leukosis in two commercial dairy farms with similar production and economic conditions. Farm No. 1 consists of two farms and six departments, while Farm No. 2 consists of two farms and five departments.

The study was conducted by the employees of the leukosis laboratory based at the Institute of Experimental Veterinary Medicine of Siberia and the Far East, and by the staff of the Siberian Research and Technological Design Institute of Animal Husbandry of the SFSCA RAS. The serological diagnosis was conducted using ELISA test systems to detect antibodies to the gp51 glycoprotein of bovine leukosis (IDEXX Leucosis Blocking Ab Test). In the first stage (2020), a diagnostic study in ELISA of the entire livestock older than 6 months was conducted, except for the departments with AGID-positive cows, which are examined only by hematological method twice a year, with the culling of sick animals.

Plans for carrying out health improvement measures were then developed, involving full coverage of the livestock with serological studies (in this variant - ELISA), dividing the herd into groups with conditionally healthy and infected animals, raising repair young stock free from the virus, and introducing them into the herd in groups. Strict control and registration for all animals was a mandatory condition.

RESULTS AND DISCUSSION

For a primary analysis of the epizootic situation, a comparison of veterinary reporting data for the three previous years (2017-2019), relative to the beginning of active health-improvement work, was conducted. The data are presented in Tables 1 and 2.

Given that the livestock population did not change significantly over the study period and the coverage of studies of different age groups in separate years was incomplete (see Tables 1 and 2), the situation with the registration of new cases of infection did not change fundamentally over the years.

The level of cow infection in Farm No. 1 slightly decreased during the study period and ranged from 6.6 to 4.3%; in Farm No. 2, it ranged from 8.4 to 6.4%. The level of infection of heifers in Farm No. 1 varied from 8.7 to 4.8%, while in Farm No. 2, a slight increase in newly identified responding animals was noted (from 9.4% in 2017 to 12.0% in 2019). The registration of new cases of serological response in the calf group in Farm No. 1 decreased from 9.9 to 4.9%, in Farm No. 2 – from 14.2 to 7.1%. Some

Табл. 1. Результаты серологических исследований в РИД в хозяйстве № 1 за 2017–2019 гг. и в ИФА в 2020 г.

Table 1. Results of serological studies in AGID in farm No. 1 for the period 2017-2019, and in ELISA in 2020

Year	Age groups								
	Cows			Heifers			Calves		
	Number of examined animals, heads	Number of reacting animals, heads	%	Number of examined animals, heads	Number of reacting animals, heads	%	Number of examined animals, heads	Number of reacting animals, heads	%
2017	2645	176	6,6	583	51	8,7	373	37	9,9
2018	4196	248	5,9	1046	74	7,1	885	105	11,8
2019	2784	120	4,3	1126	55	4,8	714	35	4,9
2020	2653	188	7,1	1209	73	6,0	902	87	9,6

Табл. 2. Результаты серологических исследований в РИД в хозяйстве № 2 за 2017–2019 гг. и в ИФА в 2020 г.

Table 2. Results of serological studies in AGID in farm No. 2 for the period 2017-2019, and in ELISA in 2020

Year	Age groups								
	Cows			Heifers			Calves		
	Number of examined animals, heads	Number of reacting animals, heads	%	Number of examined animals, heads	Number of reacting animals, heads	%	Number of examined animals, heads	Number of reacting animals, heads	%
2017	2234	189	8,4	689	65	9,4	190	27	14,2
2018	1890	155	8,2	810	91	11,2	358	30	8,3
2019	1703	109	6,4	583	70	12,0	212	15	7,1
2020	2465	204	8,2	775	109	14,1	437	90	20,6

increase in values in 2020 can be explained by the higher sensitivity of ELISA compared to AGID. A significant increase in the percentage of infected was noted only in the calf group in Farm No. 2. All positively responding calves were transferred to the fattening group, positive heifers, and cows - to groups for replenishing the herd with infected cows.

It is important to note that specific work towards health improvement was carried out in the farms. Over several years, "clean" groups, designated as AGID-negative animals, were formed on two departments in Farm No. 1 and one department in Farm No. 2 (see Tables 3, 4). These departments housed cows, and the heifers obtained from them mainly served as the replacement base for these herds. Heifers from the departments where both AGID-negative and positive cows were kept were also introduced. Since the percentage of responders was relatively low, they began to form new departments in addition to these improved ones, concentrating healthy animals from the herds where groups of animals responding in serology were identified. Positively responding animals were transferred to the second farms in the departments where only infected cows are kept, and also to the second stage departments, which were replaced by heifers after restoring the number of "clean" departments.

The physical separation of animal groups with different statuses, placing them in different departments, and strict control with the instant exclusion of infected animals from the production process led to a noticeable improvement in the epizootic situation in the farm.

By the beginning of 2023, the health improvement work in Farm No. 1 is being completed. Departments 3 and 4 have obtained the first fully negative results according to the serological

Табл. 3. Результаты серологических исследований в ИФА в хозяйстве № 1 «чистых» отделений (1, 2 и 5), и отделений второй очереди (3 и 4) за 2021–2022 гг.

Table 3. Results of serological tests in ELISA in farm No. 1 for the period 2021-2022 "clean" herds - 1, 2 and 5, and the herds of the second stage - 3 and 4

Department	Age groups								
	Cows			Heifers			Calves		
	Number of examined animals, heads	Number of reacting animals, heads	%	Number of examined animals, heads	Number of reacting animals, heads	%	Number of examined animals, heads	Number of reacting animals, heads	%
2021									
"Clean"	1613	2	0,12	720	3	0,4	536	6	1,2
Other	890	16	1,8	415	4	0,9	638	21	3,3
2022									
"Clean"	1804	0	0	693	1	0,1	204	0	0
Other	801	5	0,6	350	1	0,3	310	10	3,2

Табл. 4. Результаты серологических исследований в ИФА в хозяйстве № 2 «чистых» отделений (1 и 3) и отделения второй очереди (5) за 2021–2022 гг.

Table 4. Results of serological tests in ELISA in farm No. 2 for the period 2021-2022 "clean" herds - 1 and 3, and the herds of the second stage - 5

Departments by years	Age groups								
	Cows			Heifers			Calves		
	Number of examined animals, heads	Number of reacting animals, heads	%	Number of examined animals, heads	Number of reacting animals, heads	%	Number of examined animals, heads	Number of reacting animals, heads	%
				2021					
"Clean"	1127	20	1,7	487	5	1,0	302	2	0,7
Other	800	33	4,1	198	12	6,0	150	48	32,0
				2022					
"Clean"	1309	8	0,6	355	56	15,7	171	3	1,7
Other	652	15	2,4	220	27	12,3	113	23	20,3

study. In Department 6, where about 400 infected cows were kept, a one-time replacement of livestock with animals purchased from a healthy farm was carried out.

In the first stage, after a full examination using ELISA of the entire population and isolation of positively responding individuals, the epizootic picture in Farm No. 2 noticeably improved. However, while the recovery dynamics are positive in "clean" departments with cows, an increase in the number of infected animals is noted in the groups of heifers and calves. Upon detailed study, it was found that in the calf group, ELISA-negative animals were kept together with ELISA-positive ones for a long time after establishing the serological status for leukosis, and some seropositive calves remained in the group until the next study and were re-examined. A similar situation occurred with the heifer group – the studied and ELISA-negative heifers, formed into a group for sending to another department, remained in the former for several months. During this time, they were kept in one yard with ELISA-positive ones. From earlier studies, it is known that the joint maintenance and grazing of healthy and infected animals significantly affects the high indicator of infection among heifers [11].

CONCLUSION

Analyzing the epizootic dynamics in two farms with initially similar situations regarding bovine leukosis, it was found that strict adherence to all the points prescribed by the plan plays a significant role in successful health improvement. In Farm No. 1, all prescriptions were strictly followed, and the dynamics of eliminating the leukemia virus from the herd were pronounced and predictable. Visible results were achieved in relatively short terms. After carrying out a one-time replacement of the remaining infected cows in one department with a group of healthy animals regarding leukosis, they reached the final stage of improving the health of the farm as a whole. In Farm No. 2, the recovery was slow. The established dynamics contradicted expectations justified by the logic of the measures outlined in the plan. Upon additional analysis, violations of the execution of recommended measures were identified, which did not allow achieving the expected result.

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ИНФОРМАЦИЯ ОБ АВТОРАХ

(✉)**Двоеглазов Н.Г.,** кандидат ветеринарных наук, старший научный сотрудник; **адрес для переписки:** Россия, 630501, Новосибирская область, Новосибирский район, р.п. Краснообск-1, а/я 8; e-mail: lableucosis@ngs.ru

Агаркова Т.А., кандидат ветеринарных наук, заведующая лабораторией, старший научный сотрудник

Осипова Н.А., кандидат биологических наук, доцент, старший научный сотрудник

Магер С.Н., доктор биологических наук, руководитель подразделения СибНИПТИЖ СФНЦА РАН

AUTHOR INFORMATION

(✉)**Nikolai G. Dvoeglazov,** Candidate of Science in Veterinary Medicine, Senior Researcher; **address:** PO Box 8, Krasnoobsk-1, Novosibirsk District, Novosibirsk Region, 630501, Russia; e-mail: lableucosis@ngs.ru

Tatyana A. Agarkova, Candidate of Science in Veterinary Medicine, Laboratory Head, Senior Researcher

Natalia A. Osipova, Candidate of Science in Biology, Associate Professor, Senior Researcher

Sergey N. Mager, Doctor of Science in Biology, Business Unit Supervisor at Siberian Research Institute of Animal Husbandry SFSCA RAS

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