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V. G. Semenov[1], K. Ye. Yelemesov[2], A. S. Alentayev[3], V. G. Tyurin[4], A. D. Baimukanov[5]

[1]Chuvash State Agricultural Academy, Cheboksary, Chuvash Republic, Russia;
[1]Republican Chamber of Dairy and Combined Cattle Breeds RNO, Nur-Sultan, Kazakhstan;
[3]Zhangir Khan West Kazakhstan Agrarian and Technical University, Uralsk, Kazakhstan;
[4]All-Russian Research Institute of Veterinary Sanitation, Hygiene, and Ecology - a branch of the Federal State Budgetary Institution of Science "Federal Scientific Center - All-Russian Research Institute of Experimentative Veterinary Medicine named after K.I. Scriabin and Ya.R. Kovalenko of the Russian Academy of Sciences, Moscow, Russia;
[5]Russian State Agrarian University - Moscow Agricultural Academy named after K.A. Timiryazev, Moscow, Russia.
E-mail: semenov_v.g@list.ru, palata.ms@mail.ru, alentaev55@mail.ru, potyemkina@mail.ru, aidartaidar98@mail.ru

ADAPTOGENESIS AND BIOLOGICAL POTENTIAL OF CATTLE ON COMMERCIAL DAIRY FARM

Abstract. The possibility of activating adaptive processes and organism resistance of cattle on commercial dairy farms under the influence of biological stimulants (polystim and PV-1) is proved.

Biostimulants reduced the risk of gynecological disorders in cows: they reduced the retention time of placenta and subinvolution of uterus, reduced the endometritis and mastitis occurrence; increased reproductive function: shortened the time of the first estrus coming, increased the fertility, reduced the conception rate and duration of the service period, and improved the physicochemical composition of colostrum.

The used biostimulants contributed to the increase in live weight of calves while increasing the relatively high level of assimilative processes associated with the fact that their forage energy was mainly spent on increasing body weight. At the same time, in calves not injected with biological preparations, it was mainly spent on providing homeothermia (i.e., maintaining constant body temperature), which was especially evident at low external temperatures.

In calves raised in the conditions of intensive technology in winter, after the administration of dostim and polystim, the following indicators were significantly higher: the phagocytic activity of leukocytes by 5.4% - 6.4%, the lysozyme activity of plasma - by 3.0% - 6.2%, the blood serum bactericidal activity - by 7.1% - 9.5% and the content of immunoglobulins - by 2.5 mg/ml - 3.1 mg/ml.

With the adaptive technology, the data of these indicators were higher: in winter period - by 5.2 - 6.4%, 3.1 - 6.2%, 6.0 - 8.7% and 4.7 - 5.7 mg/ml; and in spring-summer period - by 0.2 - 0.6%, 4.6 - 5.7%, 4.9 - 7.2% and 3.4 - 4.8 mg/ml ($P<0.05$-0.001), respectively.

Key words: biological stimulants, adaptive processes, physiological state, gynecological status, calves, nonspecific resistance.

Introduction. Currently, the main producers of animal products are agricultural enterprises with traditional and intensive technologies [1,2].

The importance of intensive technologies in the production of animal products during the agrarian transformations has lowered for many reasons. However, such technologies make it possible to more fully realize the achievements of science and practice, make more efficient use of capital investments, mechanical and automation means, the growth possibility for labor productivity, increasing the total volume and reducing the production prime-cost, and increasing the profitability of production [3-5].

As a result of a mismatch between the biological nature of the living organism, its physiological capabilities, and the environment, animals experience stress reactions that can significantly reduce their adaptive processes and nonspecific resistance, as well as productivity that can lead to withdrawal,

especially of young stock. Therefore, the need to improve such technologies for the production of animal products, taking into account the desirable interaction of animals and their habitat, is obvious [6].

Science and practicum have proved the environmental feasibility and economic efficiency of adaptive technology, by which it is envisaged to raise calves in unheated rooms, i.e. in individual pens and pavilions in the open [7,8].

With this technology, and even more with the use of adaptogens, the nonspecific resistance of young animals and their safety are increased. In this regard, it is advisable to more actively replace the existing concept of animal husbandry with a new one, which would take into account the advantages of adaptive technology. However, under extreme conditions of adaptive technology, stress reactions appear in the animal organism and metabolic stress associated with homeostasis increases, it negatively affects the implementation of the adaptive capabilities of a living organism [9].

Nowadays, the lack of a scientifically grounded system of measures that allows activating adaptive processes and the resistance of animals to extreme keeping conditions inhibits the large-scale implementation of adaptive technology.

One of the ways to increase adaptive processes and animal resistance to low and high temperatures is the application of biological stimulants capable to activate the functions of several organs and systems. The use of appropriate drugs in the "mother - fetus - newborn" system allows for a long time to maintain the constancy of the internal environment of the body in the process of raising young cattle in extreme conditions and to increase resistance to technogenic and environmental factors [10].

The aim of this work is the activation of the adaptive processes and biological potential of cattle in milk production enterprises.

Materials and methods. The experimental work was carried out by Hamburg LLP of the Zhualinsky district of the Zhambyl region. The objects of the research were 400 cows of the black-and-white breed and 120 calves born from these cows. In the experiments, the calves were used from the 1st birthday. The observation period lasted for 120 days.

Cows were watered from individual automatic drinking bowls.

Milking of cows was performed using a machine in the milk line, 2-3 times a day.

Adaptive technology provides for the maintenance of 1-day-old calves (born under conditions of intensive technology) in individual pens installed in the open area.

The dimensions of the pens: length 180-200 cm, width 110-120 cm, the height of the front wall (taking into account the accumulation of a deep non-replaceable litter in winter) - 150 cm, the back wall - 140 cm, the length of the cubicle - 160 - 180 cm, the depth - 150 cm. The houses were built of wood boards and had a ventilation viewing window. The irreplaceable bedding inside them was gradually formed from sawdust, then from straw. The top layer of the bedding with a thickness of at least 5 - 8 cm should be constantly kept dry. In winter, the deep litter is not removed.

Only clinically healthy calves are placed in individual pens. Before being transferred to the pens, the skin of the calves is rubbed with plaited straw or burlap.

From the pens, the calves at the age of 30 days, they are transferred to unheated premises (pavilions) with unchangeable litter, designed for 8-10 animals.

The sizes of pavilions, m: length 3.0; width 6.0; the height of the front wall is 1.6, the back is 1.4. Their walls are made of boards. There are two windows. Window openings are covered with wooden shields. On the front side, the pavilions have an exercising area (cubicle).

In individual pens and pavilions, animals are accommodated according to the principle "all is vacant - all is occupied" with the observance of preventive breaks and sanitation of premises following veterinary and sanitary requirements.

The individual pens and pavilions are located at a distance of 0.7-1.0 m from each other on paved grounds.

The research work was carried out according to diets adopted on farms, taking into account the main indicators provided for by the Norms and diets of animal feeding. When growing calves in individual pens and pavilions at low temperatures, the level of milk feeding was set above the prescribed standards by 20%.

To activate the adaptive processes and the biological potential of dry cows and young animals, the environmentally friendly biogenic preparations were used: previously developed ones - dostim and mastim as well as of new generation - polystim and PV-1.

The research results. Clinical and physiological state of cows. During the observation, it was found that the clinical and physiological state of the control and tested animals in all experiments was within the physiological norms. Moreover, the data of the main indicators varied: body temperature from 39.0±0.12 to 39.3±0.11 °C, pulse and respiratory rate from 80±0.51 to 84±1.16 fluctuations/min and from 23±0.93 to 25±0.51 breaths per minute, respectively. The difference between the values of the control and experimental animals was statistically unreliable (P>0.05).

Gynecological status of cows. The results of the study of the gynecological status of cows using biological stimulants indicate that the application of dostim, mastim and polystim, PV-1 35-30, 25-20, and 15-10 days before calving helped to reduce diseases in cows: retention of afterbirth and subinvolution of uterus, the risk of endometritis and mastitis incurrence. The use of these drugs contributed to enhancing the reproductive function of cows: reducing the time of estrus coming, increasing fertility, reducing the conception rate and the duration of the service period. At the same time, polystim and PV-1 had a higher effect (table 1).

Table 1 – Gynecological state of cows in the postpartum period

Indicator	Animal Groups Data		
	Control[x]	1st experimental[x]	2nd experimental[x]
Terms of the expulsion of afterbirth, h	13.2±1.53 15.8±0.86	7.8±0.86* 9.2±0.86***	8.2±0.97* 10.8±1.07**
Retention of afterbirth, %	20 30	–	–
Subinvolution of uterus, %	10 20	10 20	–
Endometritis, %	20 30	10 10	
Mastitis, %	10 20	–	
Terms of the first estrus, days	27.0±0.84 29.4±0.81	24.6±0.51* 27.8±0.80	23.6±0.60* 26.2±0.58*
Conception rate	2.8±0.39 3.3±0.33	1.8±0.25* 2.2±0.33*	1.6±0.22* 1.8±0.25**
Duration of the service period, days	80.2±7.15 82.8±5.82	57.8±4.39* 68.0±4.06	53.0±4.05* 68.0±4.36
Fertilization of Cows, %:			
1st estrus	20 10	40 30	50 40
2nd estrus	20 10	40 30	40 40
3rd estrus	20 20	20 30	10 20
4th estrus	40 60	– 10	–

[x] In the numerator - in autumn-winter, in the denominator - in winter-spring periods.
* P<0.05, ** P<0.01.

The physiological state of calves born in winter and spring-summer periods. In calves born from the control and experimental cows, body temperature, pulse rate, and frequency of respiratory movements were within physiological norms.

30% of hypotrophic calves were born from cows of the control group, and 10% and 15%, from cows of the 1st and 2nd experimental groups, respectively. Live weight, exterior measurements (height at the withers, oblique body length, chest girth behind the shoulder blades and metacarpus girth) of calves from control cows were lower than from experimental ones. In calves born from control animals, diseases of the gastrointestinal tract and respiratory system were registered, and in experimental animals, they were not found.

The calves received from the cows of the control group had poorly developed muscles, pale mucous membranes of the oral and nasal cavities, dry, inelastic skin, and those born from the experimental cows were more viable, had a well-developed physique, elastic skin with a thick shiny hair.

Calves born in winter and raised under intensive technology, after intramuscular injection of dostim and polystim, grew faster, their live weight and average daily gain over the entire observation period were 6.4 and 9.6 kg higher and 43.2g and 65.2 g compared with the control, and with adaptive technology in winter - by 5.8 and 8.8 kg and 36.7 and 55.2 g, in the spring-summer - by 3.2 and 4.0 kg and 28.2 and 29.7 g ($P<0.05$-0.001), respectively.

When comparing exterior measurements of calves at the age of 120 days, it was established that the difference in the data of measurements of oblique body length, height at the withers, chest girth behind the shoulder blades and metacarpus girth was 4.5 - 8.3% and 2.8 - 10.6% respectively. A similar pattern was revealed in the nature of changes in the growth coefficient of the experimental calves. Thus, the biostimulants contributed to the increase in calves' live weight, while increasing the relatively high level of assimilation processes associated with the fact that their forage energy was mainly spent on increasing body weight. At the same time, in calves not injected with biological preparations, it was mainly spent on providing homeothermia (i.e., maintaining constant body temperature), which was especially evident at low ambient temperatures.

Nonspecific resistance of calves. In calves raised in the conditions of intensive technology in winter, after the injection of dostim and polystim, the following parameters were significantly higher: the phagocytic activity of leukocytes by 5.4 - 6.4%, the lysozyme activity of plasma - 3.0 - 6.2%, serum bactericidal activity - 7.1 - 9.5% and the content of immunoglobulins - 2.5 - 3.1 mg/ml (table 2).

Table 2 – Parameters of nonspecific resistance of calves

Group of animals	Age, days	Phagocytic activity, %	Lysozyme activity, %	Bactericidal activity, %	Immunoglobulins, mg/ml
Using intensive technology in winter					
1	2	3	4	5	6
Control	1	23.4±1.36	6.3±0.64	28.3±1.08	15.1±1.11
	15	32.0±1.14	9.3±0.71	32.8±1.10	14.0±0.90
	30	46.4±1.63	13.0±0.81	40.8±1.03	16.3±0.62
	60	45.6±1.75	15.2±0.79	48.9±1.15	20.7±0.70
	90	50.6±1.03	17.3±0.75	55.1±1.27	22.8±1.21
	120	52.2±1.46	19.6±1.06	59.0±0.97	25.8±0.52
1 experimental	1	25.2±1.11	6.9±0.45	30.1±1.36	16.3±0.91
	15	37.6±1.03**	11.9±0.67*	37.1±0.95*	15.9±1.01
	30	49.0±1.92	15.1±0.78	46.6±1.81*	18.7±1.10
	60	52.2±2.08*	19.2±0.70**	54.7±1.73*	23.9±0.63**
	90	55.4±1.25*	20.1±0.99	61.8±1.45**	27.1±0.81*
	120	57.6±1.40*	22.6±0.76*	66.1±1.39**	28.3±1.04
2 experimental	1	25.8±0.86	7.1±0.59	31.4±1.30	16.5±1.05
	15	40.2±1.24**	12.8±0.83*	39.9±1.17**	16.8±1.09
	30	51.6±2.06	16.2±1.15	50.8±1.31***	20.0±0.90**
	60	54.4±1.80**	21.4±1.17**	58.9±1.55***	25.4±1.24*
	90	56.6±1.80*	22.2±0.62***	65.2±1.64**	27.9±0.72**
	120	58.6±1.86*	25.8±0.77**	68.5±1.01***	28.9±0.79*
using adaptive technology in winter					
Control	1	21.6±1.57	6.2±0.41	29.0±0.98	21.4±1.42
	15	33.2±1.80	10.0±0.54	35.1±1.01	22.4±0.98
	30	47.2±1.20	15.1±0.47	44.6±1.18	24.0±1.24
	60	44.4±1.33	17.2±0.84	50.9±0.92	22.2±1.35
	90	51.8±1.16	18.6±0.59	58.3±1.13	25.7±0.76
	120	53.0±1.45	21.1±0.58	62.9±1.45	26.4±1.02

Continuation of table 2

1	2	3	4	5	6
1 experimental	1	23.8±1.07	7.3±0.46	32.6±1.32	23.8±1.09
	15	40.2±1.50*	13.1±0.65**	40.5±1.42*	26.8±1.07*
	30	51.2±1.36	18.3±0.64**	52.2±1.42**	26.8±0.83
	60	54.4±1.50**	21.3±0.78**	60.8±1.41***	27.0±1.19*
	90	56.8±1.65*	22.2±0.60**	65.9±1.72**	30.2±1.09**
	120	58.2±1.56*	24.2±0.59**	68.9±1.39*	31.1±1.14*
2 experimental	1	25.2±1.77	7.8±0.64	32.4±1.55	24.1±1.22
	15	41.6±1.33**	14.2±0.64***	42.3±1.20**	27.5±1.17*
	30	52.4±1.63*	19.0±0.65**	55.0±1.53***	28.8±0.81*
	60	55.4±1.91**	23.4±0.69***	63.2±1.42***	29.0±1.03**
	90	57.8±1.60*	25.1±0.77***	69.9±1.21***	30.4±0.76**
	120	59.4±1.69*	27.3±0.79***	71.6±1.36**	32.1±1.07**

* P<0.05, ** P<0.01, *** P<0.001.

With the adaptive technology, the data of these parameters were higher: in the winter period - by 5.2 - 6.4%, 3.1 - 6.2%, 6.0 - 8.7% and 4.7 - 5.7 mg/ml; and in the spring-summer period - by 0.2 - 0.6%, 4.6 - 5.7%, 4.9 - 7.2% and 3.4 - 4.8 mg/ml (P <0.05-0.001), respectively.

The research results testify that cell and humoral factors of nonspecific resistance of animals were activated by dostim and polystim. Dostim the most actively stimulated the phagocytic activity and the phagocytic index, and polystim - lysozyme, bactericidal activity and the synthesis of immunoglobulins.

Conclusion. The analysis of the research results on the use of biological preparations to activate the adaptive processes and biological potential of cows and calves born from them when kept under the intensive and adaptive technologies indicates that not only cellular and humoral factors of nonspecific resistance have been activated under the influence of biostimulants in all experimental animals, but gynecological diseases and mastitis in cows were excluded, and their reproductive function was improved, and the growth of calves was accelerated, the live weight and safety were increased. The most pronounced stimulating effect has been exerted by polystim and PV-1.

В. Г. Семенов[1], К. Е. Елемесов[2], А. С. Алентаев[3], В. Г. Тюрин[4], А. Д. Баймұқанов[5]

[1]Чуваш мемлекеттік ауылшаруашылық академиясы, Чебоксары, Чуваш Республикасы, Ресей;
[2]«Мүйізді ірі қараның комбинирленген және сүтті тұқымдарының республикалық палатасы» РОО, Нұр-Сұлтан, Қазақстан;
[3]«Жәңгір хан атындағы Батыс Қазақстан аграрлық-техникалық университеті» КЕАҚ, Орал, Қазақстан;
[4]Бүкілресейлік Ветеринарлық санитария, гигиена және экология ғылыми-зерттеу институты – «К. И. Скрябин және Я. Р. Коваленко атындағы Ресей ғылым академиясы – Федералды ғылыми орталық» федералды мемлекеттік бюджет ғылыми мекемесінің филиалы, Мәскеу, Ресей;
[5]К. А. Тимирязев атындағы Ресей мемлекеттік аграрлық университеті – Мәскеу ауылшаруашылығы академиясы, Мәскеу, Ресей

СҮТТІ-ТАУАРЛЫ ФЕРМАДАҒЫ МҮЙІЗДІ ІРІ ҚАРА МАЛ АДАПТОГЕНЕЗІ МЕН БИОЛОГИЯЛЫҚ ПОТЕНЦИАЛЫ

Аннотация. Жұмыстың мақсаты – сүт өндірісі кәсіпорындарында ірі қараның биологиялық потенциалын және адаптациялық процестерін белсендендіру.

Тәжірибе жұмыстары Жамбыл облысы, Жуалы ауданы «Гамбург» ЖШС-да іске асырылды. Зерттеу нысаны ретінде қараала тұқымының 400 бас сиыры және сол сиырлардан туған 120 бұзау алынды. Бақылау мерзімі – 120 күн. Тәжірибеге 1 күндік бұзаулар қолданылды.

Ғылыми-зерттеу жұмыстары азықтану нормасына сәйкес іске асырылды. Жеке үй және павильондарда төмен температурада бұзау асырау уақытында сүтпен азықтандыру деңгейі белгіленген нормалардан 20% жоғары болды.

Қысыр қалған сиыр және жас төлдің адаптациялық процесін, биологиялық потенциалын белсендендіру үшін экологиялық қауіпсіз биогенді препараттар: бұрын жасалған – достим және мастим және заманауи полистим және ПВ-1 қолданылады.

Бақылау барысында тәжірибе және бақылау тобындағы жануарлардың клиникалық-физиологиялық жағдайы физиологиялық нормадан асқан жоқ. Негізгі шектеу көрсеткіштері: дене температурасы – 39,0±0,12-ден 39,3±0,11 °С дейін, тыныс алу жиілігі 80±0,51-ден 84±1,16 дейін ауытқу/мин және сәйкесінше 23±0,93-тен 25±0,51 дейін қимыл/мин. Тәжірибе жануарлардың және бақылау шегінің арасындағы статистика сенімсіздік тудырды (P>0,05).

Төлдеуге 35-30, 25-20 және 15-10 тәулік қалғанда достим, мастим және полистим, ПВ-1 қолдану жұмыстары мастит пен эндометриттің пайда болу қаупін, сиыр ауруын азайтуға септігін тигізді. Бұл препараттарды қолдану сиырдың келесідей көбею функциясын жоғарылатты: күйлеу мезгілінің жылдам келуі, жүктіліктің жоғарлауы, ұрықтану индексінің азаюы және сервис мерзімінің ұзақтығы. Полистим және ПВ-1 тиімді болып келеді.

Бақылау және тәжірбиелі сиырдан туған бұзаудың дене температурасы, пульс жиілігі және тыныс алу қозғалысы физиологиялық норма шеңберінде көрінді.

Бақылау тобындағы сиырынан 30 % гипотрофик төл, ал 1-2 тәжірбиелі топ бұзауынан сәйкесінше 10 және 15 % туды. Тірі салмақ, дене өлшеміндегі мән (шоқтық биіктігі, дененің қиғаш ұзындығы, көкірек орамы және жіліншік орамы) бақылау барысында азайды. Бақылау тобындағы сиырдан туған бұзаудың асқазан-ішек жолдары және тыныс алу мүшелерінің ауруы анықталды, ал тәжірбиеліде байқалмады.

Бақылау тобынан алынған бұзаудың мускулатурасы әлсіз дамыған, ауыз және мұрын қуысының шырышты қабаты бұлыңғыр, терісі эластикалық емес, құрғақ, ал тәжірбиелі топтарда туған төлдікі өміршең шықты, дене бітімі жақсы дамыған, жылтыр түкті эластикалық терісі бар.

Қыс мезгілінде дүниеге келген, интенсивті технология жағдайында өсірілген бұзаулардың бұлшық етіне достим және полистим енгізгеннен кейін жылдам жетілді, олардың орташа тәуліктік өсімі және тірі массасы зерттеудің барлық кезеңінде бақылаудағыдан басым болды: 6,4 және 9,6 кг және 43,2 және 65,2 г, ал сәйкесінше адаптивті технологияда қыс мезгілінде – 5,8 және 8,8 кг және 36,7 және 55,2 г, көктем – күз – 3,2 және 4,0 кг және 28,2 және 29,7 г (P<0,05-0,001).

120 күнде дене өлшемін салыстырғанда, бақылауда дене өлшеміндегі мәндер (шоқтық биіктігі, дененің қиғаш ұзындығы, көкірек орамы және жіліншік орамы) төмен көрсеткіш көрсетті: 4,5 – 8,3 % және 2,8 – 10,6 %. Осындай заңдылық тәжірбиелі бұзаудың өсу коэффициентінде анықталды.

Түйін сөздер: биологиялық стимулятор, адаптивті процестер, физиологиялық жағдай, гинекологиялық статус, бұзау, спецификалық емес резистентілік.

В. Г. Семенов[1], К. Е. Елемесов[2], А. С. Алентаев[3], В. Г. Тюрин[4], А. Д. Баймуканов[5]

[1]Чувашская государственная сельскохозяйственная академия, Чебоксары, Чувашская Республика, Россия;
[2]РОО «Республиканская палата молочных и комбинированных пород крс», Нур-Султан, Казахстан;
[3]НАО «Западно-Казахстанский аграрно-технический университет им. Жангир хана», Уральск, Казахстан;
[4]Всероссийский научно-исследовательский институт ветеринарной санитарии,
гигиены и экологии – филиал ФГБУН «Федеральный научный центр –
Всероссийский научно-исследовательский институт экспериментальной ветеринарии
им. К. И. Скрябина и Я. Р. Коваленко Российской академии наук», Москва, Россия
[5]Российский государственный аграрный университет –
Московская сельскохозяйственная академия им. К. А. Тимирязева, Москва, Россия

АДАПТОГЕНЕЗ И БИОЛОГИЧЕСКИЙ ПОТЕНЦИАЛ КРУПНОГО РОГАТОГО СКОТА НА МОЛОЧНО-ТОВАРНЫХ ФЕРМАХ

Аннотация. Цель настоящей работы – активизация адаптивных процессов и биологического потенциала крупного рогатого скота на предприятиях по производству молока.

Экспериментальные работы проведены ТОО «Гамбург» Жуалинского района Жамбылской области. Объектами исследований были 400 коров черно-пестрой породы и 120 телят, родившихся от этих коров. В опытах использовали телят с 1-го дня рождения. Срок наблюдения продолжался в течение 120 дней.

Научно-исследовательская работа проведена по рационам, принятым в хозяйствах с учетом основных показателей, предусмотренных Нормами и рационами кормления животных. При выращивании телят в индивидуальных домиках и павильонах в условиях пониженных температур уровень молочного кормления устанавливали выше предусмотренных норм на 20 %.

Для активизации адаптивных процессов и биологического потенциала сухостойных коров и молодняка использовали экологически безопасные биогенные препараты: ранее разработанные – достим и мастим и нового поколения – полистим и ПВ-1.

В процессе наблюдения установлено, что клинико-физиологическое состояние контрольных и подопытных животных во всех проведенных опытах находилось в пределах физиологических норм. При этом данные основных показателей варьировали: температура тела от 39,0±0,12 до 39,3±0,11 °С, частота пульса и дыхательных движений от 80±0,51 до 84±1,16 колеб/мин и от 23±0,93 до 25±0,51 дв/мин соответственно. Разница между величинами контрольных и подопытных животных была статистически недостоверной (P>0,05).

Результаты изучения гинекологического статуса коров при использовании биологических стимуляторов свидетельствуют о том, что применение достима, мастима и полистима, ПВ-1 за 35-30, 25-20 и 15-10 дней до отела способствовало уменьшению заболеваний у коров: задержки последа и субинволюции матки, риска возникновения эндометрита и мастита. Использование этих препаратов способствовало повышению воспроизводительной функции коров: сокращению сроков прихода в охоту, увеличению оплодотворяемости, сокращению индекса осеменения и продолжительности сервис-периода. При этом более высокий эффект оказывали полистим и ПВ-1.

У телят, родившихся от контрольных и подопытных коров, температура тела, частота пульса и дыхательных движений были в пределах физиологических норм. От коров контрольной группы рождалось 30 % телят-гипотрофиков, а от коров 1-й и 2-й подопытных групп – 10 и 15 % соответственно. Живая масса, экстерьерные промеры (высота в холке, косая длина туловища, обхват груди за лопатками и обхват пясти) телят от контрольных коров были ниже, чем от подопытных. У телят, родившихся от контрольных животных, отмечались заболевания желудочно-кишечного тракта и респираторных органов, а у подопытных – они не установлены. Телята, полученные от коров контрольной группы, имели плохо развитую мускулатуру, бледные слизистые оболочки ротовой и носовой полостей, сухую, неэластичную кожу, а, родившиеся от подопытных коров были более жизнеспособными, имели развитое телосложение, эластичную кожу с густым блестящим волосяным покровом. Телята, родившиеся в зимний период и выращиваемые в условиях интенсивной технологии, после внутримышечной инъекции достима и полистима быстрее росли, живая масса и среднесуточный прирост их за весь срок наблюдения были выше по сравнению с контролем на 6,4 и 9,6 кг и на 43,2 и 65,2 г, а при адаптивной технологии в зимний период – на 5,8 и 8,8 кг и на 36,7 и 55,2 г, в весенне-летний – на 3,2 и 4,0 кг и 28,2 и 29,7 г (P<0,05-0,001) соответственно. При сравнении экстерьерных промеров телят в возрасте 120 дней установлено, что разница в данных промеров косой длины туловища, высоты в холке, по обхвату груди за лопатками и обхвату пясти составляла 4,5 – 8,3 % и 2,8 – 10,6 % соответственно. Аналогичная закономерность выявлена в характере изменений коэффициента роста подопытных телят.

Ключевые слова: биологические стимуляторы, адаптивные процессы, физиологическое состояние, гинекологический статус, телята, неспецифическая резистентность.

Information about the authors:

Semenov Vladimir Grigoryevich, Doctor of Biological Sciences, professor, Honored Worker of Science of the Chuvash Republic, professor of the Department of Morphology, Obstetrics and Therapy, Chuvash State Agricultural Academy, Cheboksary, Chuvash Republic, Russia; semenov_v.g@list.ru; https://orcid.org/0000-0002-0349-5825

Yelemesov Kopmagambet Yelemesovich, Doctor of Agricultural Sciences, Professor, Academician of the National Academy of Sciences of the Republic of Kazakhstan, Director of the Republican Chamber of Dairy and Combined Cattle Breeds, Nur-Sultan, Kazakhstan; palata.ms@mail.ru; https://orcid.org/0000-0001-5332-9385

Alentayev Aleidar Saldarovich, Doctor of Agricultural Sciences, Chief Researcher of the Zhangir Khan West Kazakhstan Agrarian and Technical University, Uralsk, Kazakhstan; alentaev55@mail.ru; https://orcid.org/0000-0003-0046-5003

Tyurin Vladimir Grigorievich, Doctor of Veterinary Sciences, Professor, Head of the Laboratory of Zoohygiene and Environmental Protection, All-Russian Research Institute of Veterinary Sanitation, Hygiene and Ecology - a branch of the Federal State Budgetary Institution of Science "Federal Scientific Center - All-Russian Research Institute of Experimentative Veterinary Medicine named after K.I. Scriabin and Ya.R. Kovalenko of the Russian Academy of Sciences, Moscow, Russia; potyemkina@mail.ru, https://orcid.org/0000-0002-0153-9775

Baimukanov Aidar Dastanbekovich, master degree student of the Department of Breeding and Feeding of Farm Animals, Faculty of Zootechnics and Biology, Russian State Agrarian University - Moscow Agricultural Academy named after K.A. Timiryazev, Moscow, Russia; aidartaidar98@mail.ru; https://orcid.org/0000-0001-9669-864X

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