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BEHAVIORAL REACTIONS AND INDICATORS OF METABOLIC STATUS OF BODIES AND COWS-PRIVATE COWS FOR ATTACHED METHODS OF KEEPING**Varpikhovskiy R. L.**

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The biochemical composition of the blood of heifers, first-born cows with the physiological course of calving was studied using different methods of keeping animals using zootechnical analysis, laboratory studies and monitoring of behavioral reactions during the day.

It was found that the mobility of first-born cows in relation to heifers decreases by 7.1%, and the method of keeping more mobile animals of the experimental group under conditions of keeping them loose on deep litter, and the group of first-born cows animals kept free. with rest in boxes.

Observations obtained experimentally indicate that the postpartum period in them was without complications, and methods of retention do not affect the biochemical composition of the blood, compared with the prenatal period. In primiparous cows, a decrease in the content of globulins, total bilirubin, urea, creatinine, cholesterol, triglycerides and an increase in glucose, total protein, albumin concentration was found.

Key words: *heifers, first-born cows, method, content, biochemistry, blood composition, chronometry, reaction, behavior.*

Introduction. The intensification of livestock and the transition to industrial technology has greatly changed the living conditions of animals. Therefore, one of the reserves to increase productivity is the realization of the genetic potential of farm animals on the basis of rational use of ethological indicators. It is established that the change of external conditions leads to the restructuring of the adaptive behavior of animals, their motor activity, which allows the use of ethological properties to assess the state of the organism in different methods of production.

In-depth study of the causes of variability of farm animals will assess the adequacy of their habitat and develop the most rational and economical systems of interaction with technical means, feeding factors and other realities of industrial technology. Ethological research is necessary primarily to create optimal housing conditions for both industrial livestock complexes and traditional farms. Many domestic and foreign scientists have studied the behavior of cattle. The study of behavioral reactions of animals of different breeds makes it possible to find ways to increase their productivity in specific conditions of feeding and keeping. At the same time, animal behavior, as one of the important factors in increasing livestock productivity, is still poorly understood.

Reproductive capacity is one of the important functions of the body, which throughout life is influenced by various factors that under adverse conditions adversely affect the reproductive capacity of livestock - reducing the genetic predispositions of reproductive groups [1].



Review of literature sources. The reasons for prolonged infertility of heifers are the impact of stress factors such as insufficient feed supply, unbalanced feeding rations, lack of exercise with constant tethered maintenance, lack of care and distribution, use of pastures in the winter-stable period for hardening and adaptation to environmental conditions, as well as spontaneous selection of underdeveloped repair heifers for reproduction of the herd for violation of the technology of their insemination [3, 5, 10, 16, 19].

To optimize the physiological course of the postpartum period should end with successful fertilization and birth of a calf, which under adverse conditions increases its duration, which leads to the development of temporary or acquired infertility. Prevention of pathology of the genital system is the subject of study by many scientists [8, 9, 11, 17, 20, 28].

According to researchers [12, 13, 22, 23, 28] that globulins are proteins of the acute phase of inflammation, but the increase in their concentration in the physiological state of the body can be explained by the response of the mother cow to fetal development, because it is the immune system one of the first to control the appearance in the body of antigens, which is the fetus in relation to the mother's body.

As indicated in their works [13, 23], a slight increase in urea in the blood of heifers in the month before calving occurs due to the concentration of globulins, because urea is the end product of protein metabolism.

Creatinine, which is a derivative and end product of creatine metabolism, is involved in the formation of compounds that are a source of energy needed for contractile function of uterine muscles, and its content reflects changes not only in the fetoplacental complex but also in smooth muscle fibers uterine lining [4, 23]. As labor approaches, the position of the fetus in the uterus changes, with the contraction of its muscles, which consumes creatine, which causes an increase in creatinine in the blood [22]. It is known that all sex hormones are steroids, which include fatty acids and cholesterol, some researchers [4, 22, 23] believe that the increase in cholesterol occurs in accordance with changes in the concentration of sex hormones.

In the conditions of a commodity dairy farm, the technology of directed breeding of heifers is introduced for expanded reproduction of high-yielding dairy cattle of Ukrainian black-and-white dairy breed due to Holstein blood transfusion due to selection of animals' resistance to different methods of keeping and operation innovative approaches [2, 3, 29, 30].

The environment has a direct impact on the health and productivity of farm animals, and the air has a direct impact on the process of thermoregulation, which allows to maintain the "relative" constancy of body temperature of animals [33, 34].

In addition, from the scientific work of some scientists [33, 35, 36] it is known that the body temperature of cattle can vary between 37.5-41.5 °C and depends on the season, time of day, physical exposure and stress, which changes the frequency and depth of respiration according to the amount of air required for air exchange to saturate the body with oxygen, as well as heart rate in the range of 40-80 beats per minute.

The purpose and objectives of the study. Today, directed breeding of heifers requires not only a full balanced feeding of animals at different ages, but also to



ensure appropriate housing conditions [27] and European standards [31]. The choice of the most effective ways to keep heifers is not possible without sound research of clinical indicators and behavioral responses, where special attention should be paid to thermoregulatory processes and maintaining the body's indifference to the conditions of detention [24].

The aim of the research was to study the physiological parameters, biochemical composition of blood and behavioral reactions of heifers of the Ukrainian black-and-white dairy breed in different ways of keeping before and after calving.

Research methodology. The research was conducted in the stall period (autumn, winter, spring) in the Vinnytsia region on the basis of the farm "Shcherbych" Lityn district - 330 heads of dairy herds of cows of the Ukrainian black-and-white dairy breed. The live weight of the experimental groups of heifers at the beginning of the experimental period after fertilization was 420-440 kg, and after the birth of calves - 510-530 kg. Cattle were kept in modern cowsheds - light type.

Two groups of heifers of 20 heads each were selected for the experiment on the principle of analogous groups. The first group is the control with loose restraint in deep bedding (LDL), the second group is the experimental group with loose tethering (LB). Blood samples for laboratory and diagnostic tests were taken from animals 30-40 days before and on the 30-40th day after calving. The gestational age was recorded according to the data from the records of the registers and insemination of heifers, as well as examinations based on the results of the veterinarian's rectal examination of hotels [4].

Animals for prophylaxis after hotel complications were injected subcutaneously in the scapular region 6 hours after the birth of calves, four times with an interval of 7 days, 40 ml of tissue preparation fetoplacentate. The day before blood sampling, the general physiological condition of the animals was determined by temperature, pulse and respiration. Blood was collected by laboratory technicians from the jugular vein in the morning before feeding at 6 o'clock. The study was conducted in the laboratory [6, 31].

Body and skin temperature, heart rate and respiration in each group of heifers and first-born cows were studied three times a day for two consecutive days. For the first time an hour before morning feeding. The second time three hours after morning feeding and after evening. The sessions lasted five minutes, and the measurements were made in the fourth minute.

Indicators of the physiological state of animals, body temperature, skin, pulse and the number of respiratory movements, were determined by generally accepted methods in clinical practice, described by V. Yu. Chumachenko and others. [4].

A medical thermometer and an electronic thermometer of the Beurer FT-09 type were used to determine the body temperature of the animals. The body temperature of the animals was monitored using an infrared non-contact thermometer ThermoSpot "Laserlinez" [36].

Pulse rate in experimental animals was recorded on the submandibular artery per unit time [37].

The number of respiratory movements of animals was controlled by the frequency of chest contractions. To determine the above indicators of physiological



condition, the animals were fixed using a three-end leash or a specially designed machine.

The metabolic status of animals was monitored by determining a number of blood parameters, for the study of which used a biochemical analyzer Noninvasive Hemogram Analyzer AMP (China) and guidelines [13].

These methods allowed to control the content of glucose, proteins, triglycerides, total lipids, cholesterol, urea, creatine, calcium, inorganic phosphorus in the blood or plasma.

Climate microclimate parameters were determined using modern diagnostic devices Environment Meter 5 in 1 and Dosimeter Terra-P MKS-05 from the laboratory of the Department of Veterinary Hygiene, Sanitation and Expertise of Vinnytsia National Agrarian University.

The behavior of animals was controlled by the method [22, 26, 37] by measuring time for food consumption, rest standing in a section or group cage, or lying in a stall, combi box, box or deep litter. The motor activity of animals in loose housing with rest in combi boxes, boxes or deep litter, as well as on the playground in tethered housing was also monitored. The duration of chewing was also determined in animals [7, 14, 18, 25].

The diet of animals consisted of haylage - 27%, roughage - 23%, concentrated feed - 22%, corn silage - 28%. The nutritional value of the diet was not less than 12 feeds. from with a dry matter content of 13.2 kg, digestible protein 1350 g, sugar 540 g, starch 950 g, calcium 80 g, phosphorus 40 g

There may be several options for housing animals, but it is necessary to preserve the essence of the new technology of feeding and keeping, taking into account the physiological state, the possibility of milking, timely insemination, healthy offspring and its preservation [6].

It is important to create the necessary conditions for keeping animals, which is possible only if you comply with certain zoohygienic requirements for the premises. Premises should be warm and bright, well ventilated, comfortable to house and care for animals.

When organizing the feeding of cows on foraging grounds or in the stall in modern conditions, feed tables are often used without arranging feeders. This provides better access of cows to feed, facilitates the process of cleaning the feeding area, so that animals consume only fresh, unspoiled feed. However, the surface of the feed table should be smooth so that the cow does not damage the tongue, because when consuming feed and the side of the tongue that is most easily damaged, touches the surface of the feed table [15, 35].

It was found that the body temperature of the animals, pulse and respiration the day before the study fluctuated within physiological limits. Therefore, the general condition of the animals for blood sampling was satisfactory.

Research results. As required by European Union standards, the animal quarters must have the required interior height and volume, as well as the appropriate number of places and boxes corresponding to the number of animals. The size of the places for cows should correspond to their breed and size. Some cowsheds must have appropriate lighting (natural and artificial), ventilation, sewerage, water. The house



should protect animals from adverse weather conditions and create an opportunity for recreation.

The microclimate in the cowshed must meet the following parameters: optimum air temperature - + 10-15 ° C, relative humidity - 70%.

Excessive humidity in the room at high temperatures inhibits heat transfer, causes overheating, heat stroke, and low temperatures are the cause of excessive consumption of food, reduced growth and productivity, colds and skin diseases. Humidity can be reduced by using hygroscopic bedding (crushed winter straw or peat), in a place inaccessible to animals to put a box of quicklime.

Studies of physiological parameters of heifers are shown in table 1.

Table 1 - Clinical indicators of the physiological state of heifers and first-born cows, $M \pm m$; $n = 20$

The way to keep the group	Study period, month				
	November	December	January	February	March
Pulse rate, times / min					
LDL	65,3±1,21	66,1±0,93	66,3±0,92	66,2±0,81	66,7±0,84
LB	65,2±1,32	66,2±1,14	66,4±1,06	68,1±1,32	67,0±0,81
Respiratory rate, times / min.					
LDL	18,9±0,32	19,8±0,72	19,9±0,58	19,9±0,74	20,87±0,58
LB	18,9±1,35	19,3±0,81	19,8±1,06	19,6±0,86	20,40±0,42
Body temperature, °C					
LDL	38,2±0,12	38,5±0,13	38,1±0,22	38,4±0,13	38,30±0,24
LB	38,6±0,24	38,7±0,25	38,5±0,81	38,4±0,22	38,40±0,13

As can be seen from Table 1, the increase in heart rate and respiratory movements in animals is observed at the end of the study period in spring, while in autumn it is lower, indicating the intensity of animal movement, anxiety and increased need for food, while body temperature within the physiological norm of 38.1-38.7 ° C.

Time-based observations of loose housing showed that almost all animals, regardless of housing conditions and productivity, approached the feed table and began to eat immediately after the feed was mixed and picked up.

According to ethological observations, the duration of rest of animals is one of the main indicators in choosing the most optimal in terms of comfort for heifers method of keeping. It turned out that the longest resting time lying in heifers for loose and boxing, slightly less than this figure for loose housing in deep bedding (Table 2).

Comparing the mobility of heifers with first-born cows, it can be noted that the mobility decreases by 7-12%, staying in one place standing - increases by 4-6%, lying down 2-3% longer in first-born cows. According to the method of keeping, the heifers of the group are more mobile in the deep litter, and the first cows of the group are kept loose with rest in the boxes.

In terms of chewing feed (chewing gum), the indicators within the age group did not differ much, but in cows the duration of rumination was slightly longer by 0.6-1.4%, and lying down was 4-6% more time per day than heifers.

**Table 2 - Behavioral reactions of experimental groups of cattle, $M \pm m$; $n = 20$**

The way to keep the group	Behavioral reactions of animals									
	moving		consumes food		chews gum		worth it		lying	
	min.	%	min.	%	min.	%	min.	%	min.	%
<i>Heifers 30-40 days before calving</i>										
LDL	400± 7,36	27,7	140± 8,54	9,7	230± 9,72	16,1	170± 10,46	11,8	500± 14,42	34,7
LB	370± 10,38	25,7	150± 11,25	10,4	220± 9,63	15,3	180± 10,28	12,5	520± 15,47	36,1
divergence	-30	-2,0	10	0,7	-10	-0,8	10	0,7	20	1,4
<i>First-born cows after calving for 30-40 days</i>										
LDL	220± 7,76	15,3	170± 11,23	11,8	240± 8,36	16,7	260± 9,41	18,1	550± 15,42	38,2
LB	260± 9,82	18,0	180± 10,34	12,5	240± 8,52	16,7	230± 10,11	16,1	530± 14,37	36,7
divergence	+40	2,7	+10	0,7	0	0	-30	-2,0	-20	-1,5

With the loose-box method of keeping in the modular-group cage, the number of feed consumption by heifers per day was 3 times less, and water by 1 time. They rest several times a day standing and chewing food, but rest standing and lying down and get up from rest lying down the same number of times (Table 3).

The changes in the frequency of individual behavioral reactions of heifers in loose housing with rest on the litter or in the boxes, probably due to the microclimate of the livestock, which was confirmed by further studies.

Table 3 - The frequency of manifestation of individual behavioral reactions of heifers in different ways of keeping in a modular group cage, once a day, $M \pm m$; $n = 20$

Indicator	Regulatory values	Keeping in a modular group cage	
		loose on deep bedding	loose in the boxes
Feed consumption	8-12	10±0,59	7±1,12*
Water consumption	4-10	8±0,95	7±1,12
Chewing gum	14-20	7±1,12	8±0,96
Rest standing	8-15	9±0,85	11±0,65
Lying down and getting up	7-20	18±3,05	16±2,18

Примечание: * - a significant difference ($p \leq 0.05$), compared with the indicators of the loose method of keeping animals in deep litter.

It was also found that before calving, the content of glucose, total protein, albumin, total bilirubin, triglycerides, total calcium and inorganic phosphorus fluctuated within the physiological limits of the studied blood parameters, and the concentration of globulins, urea, creatinine and cholesterol was higher. 4, 5).



Table 4 - Indicators of the biochemical composition of the blood of heifers 30-40 days before calving, $M \pm m$; $n = 20$

Indicator	Research groups	
	LB	LDL
Glucose	2,76±0,017	2,72±0,026
Total protein	74,80±0,183	75,63±0,334
Albums	38,24±0,104	38,23±0,175
Globulins	61,66±0,107	61,64±0,177
Bilirubin	3,55±0,048	3,59±0,046
Urea	5,80±0,047	5,82±0,049
Creatine	141,77±0,038	141,82±0,035
Cholesterol	3,73±0,026	3,85±0,028
Triglycerol	0,39±0,009	0,43±0,021
Calcium	2,60±0,011	2,61±0,009
Phosphorus	1,46±0,017	1,51±0,033

It was found that after calving the biochemical composition of blood in first-born cows during the physiological course of calving was characterized by fluctuations in physiological limits of glucose, total protein, albumin concentration, total bilirubin, urea, creatinine, cholesterol, triglycerides, total calcium and inorganic.

The obtained data give reason to believe that the postpartum period was uncomplicated, and the methods of retention on the biochemical composition of blood is not affected, compared with the prenatal period in first-born cows found a decrease in blood globulins, total bilirubin, urea, creatinine, cholesterol triglycerides slightly, and total calcium and inorganic phosphorus, increased glucose, total protein, albumin concentrations.

Table 5 - Indicators of the biochemical composition of the blood of first-born cows on 30-40 days after calving, $M \pm m$, $n = 20$

Indicator	Research groups	
	LB	LDL
Glucose	2,98±0,016	2,94±0,027
Total protein	80,60±0,184	81,42±0,324
Albums	38,37±0,106	38,34±0,176
Globulins	56,77±0,106	56,75±0,173
Bilirubin	3,33±0,045	3,37±0,047
Urea	5,12±0,050	5,15±0,051
Creatine	121,01±0,043	121,05±0,045
Cholesterol	3,16±0,027	3,25±0,027
Triglycerol	0,30±0,008	0,33±0,016
Calcium	2,70±0,008	2,71±0,008
Phosphorus	1,38±0,014	1,40±0,034

Thus, at the birth of a calf in the mother's body the concentration of globulins in the blood decreases, after birth the need for intensive contraction of the uterus



disappears, which causes a decrease in creatinine in the blood as antigens.

The biochemical composition of the blood of groups of first-born cows after calving compared to heifers before birth was characterized by a decrease in the concentration of total bilirubin, urea, creatinine, cholesterol, triglycerides, total calcium and inorganic phosphorus, increased glucose, total protein.

On the 30-40th day after calving, compared to all animals from 11 indicators of biochemical composition of blood, almost all were within the physiological norm (see Table 4), which indicates the restoration of sexual function and readiness of the body for insemination, but in 2 animals from the group of first-born cows with loose housing in deep litter there was an increase in blood concentrations of globulins on the 30-40th day after calving, which indicates a lack of immune protection.

Therefore, they are recommended to use 4 times a day for 28 days fetoplacental to first-born cows to prevent postpartum complications stimulates the involution of the genitals and helps to restore their reproductive function.

Discussion. Existing milk production technologies [3, 24] are based on the use of a number of new elements of internal equipment that can meet hygiene standards and veterinary and sanitary requirements for systems of keeping, growing, feeding, watering and caring for young animals, heifers and other age groups.

Nevertheless, the clinical performance of heifers and heifers under different types of loose housing has not changed significantly. The obtained results were in accordance with the studies of other authors [4, 11, 22, 23] and within the values characteristic of this species.

Comparing the duration of individual elements of the behavior of heifers in the loose-box method [25, 26, 32, 37], we can conclude that it is a promising option for housing animals, because they are in a more comfortable environment, as evidenced by the time that accounted for feed consumption. At the same time, with the frequent manifestation of certain elements of behavior in the studied methods of keeping heifers, no significant difference was found.

In addition to reproductive ability, analysis of maternal qualities of experimental animals showed that immediately after calving in the maternity ward all cows are active lick your calf for 35-36 minutes. In less than an hour, the calf rises to its feet and immediately actively shows a sucking reflex. Cows of all genotypes are good feeders. The calf in the first month after birth sucks the mother an average of 8 times a day.

Conclusions. The biochemical composition of heifer blood 30-40 days before calving was characterized by fluctuations within the physiological norm of activity of indicator enzymes, metabolism of fats, carbohydrates, total calcium and inorganic phosphorus. Four times the introduction of fetoplacental to the first-born cows during the retention of manure caused a decrease on the 30-40th day in the blood concentration of globulins, which indicates the completion of involutionary processes in the body. Increased activity in first-born cows after calving with retention of manure indicates the absorption of decay products of the fetoplacental complex in the blood and their toxic effects on hepatocytes.

It is established that the behavior of heifers at different sizes of the box for animal rest mostly depends on the depth of the structure, less - on its length and



width. The most optimal boxing depth for heifers is 1.2-1.6 m. Boxing with a depth of 1.8 m is less comfortable for them.

Heifers in the loose-bed boxing mode compared to deep litter, rested more standing, consumed less food, but did not differ in the number of times consumed water, chewing gum, lying down and getting up from rest.

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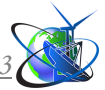
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