

Factors Influencing Livability of Simmenthal Rearers from Birth to Transition Period

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Abstract – This research is aimed at studying the diseases and livability of Simmenthal rearers (Kursk oblast, 4011 animals were born in 2012...2017) in a herd with the yield of more than 7 thousand kg of milk per animal. It has been determined that 3.8% of rearers died in the span from birth until the age of 6 months, including the 1.7% death loss in the first nine weeks of life where 0.65% died in the second week, and 0.32% died in the third week of life. In the first six months of life, 8.8...12.9% more rearers died in summer and fall than in spring and winter. The percentage of diseases and death loss in the progeny by the Simmenthal bulls was different from that of the upgrades. For example, the Simmenthal progeny by the red Holstein bulls died along the entire 9 weeks of life, whilst the progeny of the Montbeliarde and Simmenthal bulls dies mostly in the first three weeks. The livability in the female calves is substantially lower than in the male calves.

Key words – *Simmenthal, diseases and death of rearers, season, father bulls.*

I. INTRODUCTION

Currently, the age of cows (both domestically and abroad) constitutes 2.5...2.7 of calving in the intense milking herds. Also, the lack of heifers is one of the key issues in milk production improvement. Therefore, rearing the healthy cattle is the decisive factor in improving the performance of animal husbandry.

Morbidity and mortality of newborn calves are usually due to a set of reasons; the main ones are the following: inadequate and unbalanced feeding of cows and heifers before calving, which leads to the birth of a

weak, physiologically immature, non-viable offspring, as well as to the secretion of grown animals, defective in physical, chemical and biological composition of colostrum and milk.

The condition of a calf and the environment are in a very unstable balance, and if it is disturbed even by a small stressful situation (failure in feeding and maintenance, transportation, hypothermia, labeling, etc.), then the whole mechanism of pathological processes is started. It is important in the preservation of newborn calves to eliminate the social causes of morbidity, i.e. unsatisfactory conditions of feeding, maintenance and care. In animals that have undergone various diseases during pregnancy, temporary or prolonged deterioration of feeding and maintenance conditions and other adverse effects that deplete the body, a weaker and less viable offspring is born.

P.G. Svetlov was the first to scientifically formulate the critical phase theory [1] to state that each such critical phase predetermines the development of body functions and systems for the upcoming stage [2]. It has been discovered that the animal body does not fully implement all possibilities programmed in the genotype at each stage of the development [3].

Thus the focused and reasonable influences on the body on a critical phase may help implement the body's potential. The span from birth to two months of life is the most complicated one for the rearers. The said span may be subdivided into 2 periods: the newborn (colostral feeding) and suckling period (milk or calf milk replacer feeding until the age of two months) [4]. Each such period may be characterized by its specific physiology [5-6]. The early postnatal development is concurred with the involvement of the immune and intestinal systems in calves [7]. The body systems in calves are generally immature and very sensitive to any changing ambience that they live in [8-11].

After birth, the calf from the sterile internal environment of the mother enters the surrounding external world, with various

microflora, including pathogenic. A young organism needs to resist negative factors of environment on the background of the formation of the new independent functions of organs and systems – respiratory, blood, digestion, adaptation, etc. This should happen simultaneously with the formation of the immune system. In the body of newborn calves there are physiological processes that underlie the adaptation of animals to changing environmental conditions for 1-4 weeks.

In that period, the calves are greatly susceptible to ambient impacts and today's commercial livestock production technologies that directly affect the young calves where the immaturity of certain systems makes them highly sensitive to the said factors [12, 13].

It is common knowledge that the newborn animals constitute the majority of the ill and dead rearers [14]. With the large force of the negative factors and low resistance of the body, the pathological process begins and the first clinical signs of animal disease appear. If the negative force of the impact is small and resistance of the body high, then this is a physiological course of stress, but even in this case, stress causes significant damage to the animal and leads to poor health of all species and ages of farm animals. The deterioration of health is due to a decrease in the level of general resistance of the body due to the stress of metabolism and the need to adapt to new conditions of existence.

At the same time, additional adverse effects lead to aggravation or return of exhaustion and, as a rule, to the transition to pathology. Therefore, the cost of technology is the precursor to many diseases. The decrease in growth and development is associated with the additional use of energy resources and biologically active substances entering the body or biosynthesizing in it to maintain homeostasis and the formation of a new, more intense norm of its functioning.

Low safety of animals under stress is a consequence of metabolic disorders in the body and changes in the composition of its organs and tissues.

These are the early postnatal rearers that are mostly susceptible to the diseases and mortality [15]. During the first month of life, the greatest death of young animals is noted. Economic losses are significant not only because of the deaths of calves, but also because of the decrease in the intensity of growth, a longer period of recovery of surviving calves. This fact leads to an increase in costs, both for additional labor costs and veterinary drugs. High mortality rates among newborn calves are more common during the first 2 weeks of life. Later, the percentage of calves' mortality decreases, but it can rise again when changing the type of feed.

This is also caused by a series of fairly objective things where the insufficiently developed immune protection, the inability of the intestine to digest albumen and others play the foremost role [16].

In recent years, numerous messages about the need to take actions to maintain livability of rearers have appeared in domestic literature [13-16, 17]. It is substantially explained by

the fact that the major problem, as some researchers see it, is the neonatal mortality of rearers which varies from 8.7% to 6.4% in cattle worldwide [18]. Martin and Wiggins have counted that 20% mortality in calves resulted in 38% decrease of profit on a livestock farm [19]. The neonatal mortality in calves during the first month of life is as high as 84% of total mortality being the highest in the third week of life [20]. According to Afzal, the mortality in cattle calves has fluctuated between 29.1% and 39.8% [21]. In addition, any regular replacement of low yielders is impossible given there is medium 25% early mortality in rearers [22]. According to the US data, the mortality of dairy female calves constituted 7.8% in 2006, of which 75% die during the first month of life [23].

Even higher mortality during the first three months of life has been observed, too. According to the researchers [24], the mortality in calves constituted 10.2% with 2.2% of dead-borns. In vealers, it varies from 2% to 20% [25].

With respect to the above, the rearers livability issue is becoming increasingly important causing the necessity to study and discover both the selective and paratypical factors that affect livability.

The aim of our research is to study the diseases and livability of rearers by season and gender with reference to Simmenthal upgrade paternal ancestry in a Simmenthal herd with the yield of more than 7.0 thousand kg of milk.

II. OBJECTS AND METHODS OF RESEARCH

The research was performed at Kursk Oblast agricultural business in Simmenthal rearers (n=4011) born in 2012-2017. The livestock was retrospectively divided by first week diseases, seasons, gender, paternal breed.

The medium milk yield in the herd was 7.0...7.5 thousand kg during the study period with 3.97...4.11% of fat and 3.13...3.28% of albumen. The age of cows was about 2.7 ... 3.2 calving.

III. RESULTS AND THEIR DISCUSSION

Out of 4,011 animals included in the research, 47% on average were female calves, and 53% were male calves. The largest female calf birth, in relation to average, was in February and July with the least declining on April and October (Table 1).

The largest epidemic among calves was in February, 16.1% with the highest mortality from the disease constituting 60.9% of its medium value of 34.5% in spring.

As the research has shown, the maximum risk for the rearers occurs in the first weeks of life [11-13-26-27]. According to our data based on the 3.8% of dead animals, the high risk for the rearers occurred in the first 9 weeks where 1.7% of rearers died, whilst 0.65% of animals died when being transferred from colostrum to milk feeding during the second week. And 0.32% of animals died after being transferred from milk to a replacer during week three.

As to the season, the rearers had the most number of diseases in winter and summer (12.4% and 11.3%), and the highest mortality occurred in summer and fall (40.2% and 42.9%) (Table 2).

Depending on the season, the death percentage was the highest in the second and third weeks of life (Table 3, Fig.1).

TABLE I. FEMALE TO MALE CALVES RATIO UPON BIRTH PER MONTH OF THE YEAR

Months of the year:	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
Total born, animals	375	267	413	356	357	377	300	360	333	315	312	246	4011
Including, %	female	46	51	47	42	50	49	51	48	48	44	46	47
	male	54	49	53	58	50	51	49	52	52	56	54	53

TABLE II. DISEASES AND DEATHS OF REARERS BY SEASON

Average per month in 6 years	Born, animals	Sick rearers, 0...6 months old		Died rearers, 0...6 months old		
		animals	%	animals	% of born	% of ill
winter	888	110	12.4	33	3.7	30
spring	1126	108	9.6	37	3.3	34.3
summer	1037	117	11.3	47	4.5	40.2
fall	960	84	8.8	36	3.8	42.9
TOTAL	4011	419	10.4	153	3.8	36.5

The analysis of Simmenthal rearers and calves by the upgrade bulls demonstrated the unstable nature of the disease against the genotype. Thus, the rearers by the Simmenthal bulls were more often ill in the first week of life when transferred from colostral to milk feeding: 5.3%,

which was the same during the three weeks, whilst only 3.0% calves by the Montbeliarde and red Holstein bulls fell ill in three weeks (Table 4).

TABLE III. REARERS LIVABILITY PER SEASON DURING THE FIRST 9 WEEKS OF LIFE

On average in 6 yrs	Born, animals	Index	Age, weeks								
			1	2	3	4	5	6	7	8	9
winter	888	died, animals		11	5	2	2			1	
		died, %		1.24	0.56	0.23	0.23			0.11	
spring	1126	died, animals	4	9	4	1			3	1	1
		died, %	0.36	0.80	0.36	0.09			0.27	0.09	0.09
summer	1037	died, animals	1	3	1	1	3	2	2	2	1
		died, %	0.10	0.29	0.10	0.10	0.29	0.19	0.19	0.19	0.10
fall	960	died, animals	3	3	3			2	1		
		died, %	0.31	0.31	0.31			0.21	0.10		
total	4011	died, animals	8	26	13	4	5	4	6	4	2
		died, %	0.20	0.65	0.32	0.10	0.12	0.10	0.15	0.10	0.05

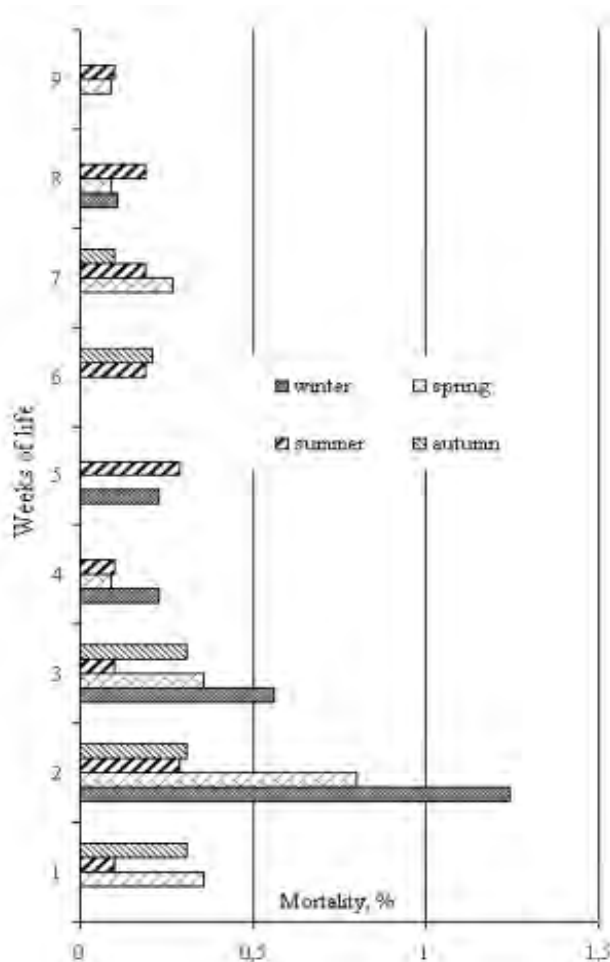


Fig.1 Mortality of calves in the first weeks of life per season

Having focused on the diseases and mortality in the Simmenthal calves descending from both Simmenthal bulls and upgrading bulls, we took tests in the paternal bulls with reference to the issues in question (Table 6). Thus, the progeny fell ill only in 39.4%...48.5% of 33 red Holstein father bulls in the first three weeks of life, and in 15.2...21.2% the progeny fell ill each week of life from birth until week nine (Table.5).

Given the relation to the father's breed, the mortality of Simmenthal rearers per week of life had an unstable character the essence of which is that the progeny of Simmenthal bulls died during the second and third weeks only, which was basically the case also with the progeny of Montbeliarde bulls, and the progeny of red Holstein bulls just died. At the same time, 20...40% of Montbeliarde father bulls (n=5) had ill progeny, and the same amount of bulls had their progeny dead. Any discussion of Simmenthal father bulls would be inaccurate because there were only two of them. The male calves were more viable than females: the mortality rate among the former was 0.2% in the 9 weeks, and in the latter - 3.7% (Table 7).

Therefore, the analysis of the diseases and mortality in the rearers from birth to the transition period demonstrated that the said parameters were dependent on the season, feeding stresses in the first three weeks of life, gender, and origination from either directly Simmenthal father bulls or upgrading bulls. In addition, the progeny falls ill in the first weeks of life not with all paternal bulls.

IV. CONCLUSIONS

Thus, the study of factors affecting the safety of young Simmenthal breed from birth to transition period, which was performed on 4011 animals born within six years in one agricultural enterprise, allowed establishing that the disease and mortality of young animals, which for 6 months was 3.8%, was dependent on a number of factors. So by seasons of the year, when the most frequent disease of calves was observed in winter and summer (12.4% and 11.3% of births), and mortality – summer and autumn (40.2% and 42.9% of births). In addition, feed stress in the first three weeks of life in winter and spring periods adversely affected the safety of animals. After the transfer from colostrum to drinking milk, to the fall in the second week of life led to 0.65% of calves, and in the third week, after the transfer of animals from drinking milk to its substitute – fell to 0.32% of the offspring (1.7% of the fallen in 9 weeks).

TABLE IV. DISEASES IN SEMMENTHAL CALVES BY UPGRADING BULLS IN THE FIRST WEEKS OF LIFE

Father bulls	Calves born, animals	Index	Age, weeks									Total in 9 weeks	
			1	2	3	4	5	6	7	8	9		
Simmenthal (n=2)	114	ill, animals	6			1	1						8
		ill, %	5.3			0.9	0.9						7
Red Holstein, (n=33)	3668	ill, animals	52	42	20	24	15	23	14	17	14	221	
		ill, %	1.4	1.1	0.5	0.7	0.4	0.6	0.4	0.5	0.4	6	
Montbeliarde (n=5)	229	ill, animals	1	3	3		2	1	4	3	1	18	
		ill, %	0.4	1.3	1.3		0.9	0.4	1.7	1.3	0.4	7.9	
Total by 40 father bulls	4011	ill, animals	59	45	23	25	18	24	18	20	15	247	
		ill, %	1.5	1.1	0.6	0.6	0.4	0.6	0.4	0.5	0.4	6.2	

TABLE V. MORTALITY OF SIMMENTHAL CALVES AND CALVES BY UPGRADING BULLS IN THE FIRST WEEKS OF LIFE

Father bull breed	Calves born, animals	Index	Age, weeks								
			1	2	3	4	5	6	7	8	9
Simmenthal (n=2)	114	animals		3	1						
		%		2.6	0.9						
Red Holstein, (n=33)	3668	animals	8	20	11	4	5	4	6	3	2
		%	0.2	0.5	0.3	0.1	0.1	0.1	0.2	0.1	0.1
Montbeliarde (n=5)	229	animals		3	1					1	
		%		1.3	0.4					0.4	
Total by 40 father bulls	4011	animals	8	26	13	4	5	4	6	4	2
		%	0.2	0.6	0.3	0.1	0.1	0.1	0.1	0.1	0.05

TABLE VI. BULLS (FROM N=40), WHOSE PROGENY WAS ILL AND DIED IN THE FIRST WEEKS OF LIFE

Index		Weeks								
		1	2	3	4	5	6	7	8	9
Total bulls whose progeny fell ill (n=40), of which:	animals	18	16	15	10	12	14	11	8	12
	%	45.0	40.0	37.5	25.0	30.0	35.0	27.5	20.0	30.0
- Simmenthal (n=2)	%	50.0			50.0	50.0				
- red Holstein (n=33)	%	48.5	45.5	39.4	27.3	30.3	39.4	30.3	21.2	33.3
- Montbeliarde (n=5)	%	20.0	20.0	40.0		20.0	20.0	20.0	20.0	20.0
Total bulls whose progeny died (n=40)	animals	8	7	9	4	3	6	3	4	2
	%	20.0	17.5	22.5	12.5	7.5	15.0	7.5	10.0	5.0
- Simmenthal (n=2)	%	50.0	50.0							
- red Holstein (n=33)	%	21.2	15.2	21.2	12.1	9.1	18.2	9.1	12.1	6.1
- Montbeliarde (n=5)	%		20.0	40.0						

TABLE VII. MORTALITY OF SIMMENTHAL CALVES PER GENDER

Index		Age, weeks								
		1	2	3	4	5	6	7	8	9
Female calves										
Females born, n= 1,895	animals	6	26	13	4	5	4	6	3	2
	%	0.3	1.4	0.7	0.2	0.3	0.2	0.3	0.2	0.1
Male calves										
Males born, n=2,116	animals	2				1			1	
	%	0.1				0.05			0.05	

The gender characteristic had a significant impact on the safety of young animals in the first 9 weeks of life at a significant superiority of bull-calves, the percentage of disposal of which for this period was 0.2, and heifers - 3.7.

Disease and mortality of offspring in the first weeks of life, depending on the belonging to the bulls of a particular breed, had some features. So 50% of the bulls of the Simmenthal breed offspring were eliminated only at the first and second weeks; in Montbeliarde bulls (20%...40%) the mortality of offspring was in the second and third weeks. Mortality of the bulls of the red Holstein (6.1% ... 21.2%)

offspring was during nine weeks, which shows a different level of viability of offspring, depending on the breed, both Simmenthal and breeds which improve it.

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