

Dynamics of the Secretory Activity of the Female Moose Mammary Gland During the First Lactation at the Sumarokovskaya Moose Farm

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Abstract: - For the first time, comprehensive research have been conducted to study the morphology and function of the mammary gland of domesticated first-calf moose. The mammary gland is an organ of dense consistency, consisting of four grouped hills divided into left and right halves, in which, in turn, the anterior and posterior lobes are distinguished, consisting of glandular (62.8%) and connective tissues (37.2%). Data on the secretory function duration, which varies from 120 to 42 days, and the productive qualities of the mammary gland (175.7 and 20.3 liters, respectively) in female moose with different activities of coming to the farm for milking are presented and systematized. The clarified features of the activity of the secretory system of the mammary gland of the moose-heifer represent the "standard." Thus, they are essential to analyze species characteristics, comparative morphology, and physiology of lactation as a standard criterion for improving animal productivity at the stage of domestication, as well as to organize measures for the prevention of breast diseases in moose. The object of the study is elk cows of the first lactation (n= 221 heads). Depending on the activity of moose coming to the farm during lactation, they were divided into four groups: 1st - with 100% activity, 2nd – 99-80%, 3rd - 79-50%, and 4th – with 49% activity or less. The scientific information presented in the paper was obtained using morphological, histological, zootechnical, and statistical methods. Morphometric analysis showed the ratio of parenchyma and stroma in the mammary gland in domesticated moose 1.7:1. The glandular apparatus of the udder in the studied female moose secreted significantly higher in animals of the first (duration of lactation 120 days, lactation milk yield – 175.7±3.36 l) and the second groups (109 days and milk yield 122.9 ± 2.31 l) compared to the animals of the third (96 days and a yield of 80.4 ± 3.77 l) and fourth (42 days and a yield of 20.3 ± 1.06 l) groups. The analysis of the secretory activity of the mammary gland in female moose with different activities of coming to milking during the first lactation showed that domestication is a complex and lengthy process. There is still a long and purposeful work to be done to improve the issues of morphology, physiology of the lactation process, and regulation of growth and development of the mammary gland. Moreover, it is essential to organize and improve measures for the raising of moose replacements to transfer them to a milking herd. This will not only domesticate the moose on the farm and strengthen their attachment to humans but also prepare the animals for the upcoming productive period.

Key-Words: - Domestication, mooses, mammary gland, parenchyme, stroma, lactation, activity, milk yield.

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1 Introduction

The biological prerequisite for the development of issues of mammary gland secretory and excretory function, as well as the organization of preventive measures and mastitis diagnostics is the study of the patterns and specific features of the milk-forming organ in domesticated moose at the stage of training them to milking.

The mammary gland is one of the complexly organized and easily changing organs, consisting of several tissues, among which there are secretory, closely related to the mammary system (parenchyma), myoepithelial, smooth muscle, connective (stroma), fatty tissues, as well as blood and lymphatic vessels, nerves and nerve endings. Nevertheless, in the size, shape, localization of the mammary glands, like the organ functional

manifestations – the chemical composition of milk, the peculiarities of milk production, and the duration of the lactation period – significant differences can be observed in different species even within the same order, [1], [2], [3], [4].

More detailed studies of the mammary gland were conducted in cattle. Even though a lot of scientific literature has been devoted to the study of the morphology, function, and resistance to breast diseases, some issues of the secretory activity of this organ in domesticated animals, including the amount of milk secreted during the lactation period at the stage of training them to milk, have not been sufficiently studied, [5], [6]. The mammary gland is one of the external secretion organs, its activity is closely related to the function of the female genital organs. The functional activity of the gland determines the productive qualities of animal udder as a whole. This is one of the main breast characteristics. Secretory activity, and accordingly, the amount of milk produced, can vary greatly in the same animal and depends on several factors. In agricultural and domesticated animals, it is the breed, the optimal ratio of parenchyma and stroma, age, month of lactation, health status, feeding, and maintenance, and in domesticated animals, it is their farm attendance for milking, feeding, the duration of upbringing and preparation of female moose for the upcoming productive period, etc., [7], [8], [9].

The beginning of research in the field of mammary gland morphology and function in a comparative aspect in domesticated animals (camel, donkey, eland), which are already involved in agricultural production, was started in the last century. Since then, there have been enough scientific publications devoted to various issues of the structure and physiology of the breast and the regulation of its functions, [8], [9].

Today, large artiodactyl animals – moose – are being domesticated at the Sumarokovskaya moose farm of the Kostroma region of the Central Federal District of Russia, organized in 1963. These animals have always attracted the attention of a wide range of specialists not only as an object of hunting but also as a biological species for domestication, due to the increasing need for more rational use of them in the national economy.

Sumarokovskaya Moose Farm is the second farm in Russia, it is a unique biological research laboratory. Scientific research is carried out here on morphology, physiology, ethology, feeding, maintenance, rearing of replacements, etc. Currently, one of the activities of the moose farm is to obtain a specific dietary product from moose –

milk, which differs from cow milk in chemical compositions and has a wide range of preventive and therapeutic properties, [10].

Despite the available information on moose domestication in the Kostroma region, some aspects of this problem, namely issues related to the disclosure of the secretory activity of the moose mammary gland, are insufficiently studied. Thus, the functional properties of the mammary gland in moose are not fully reflected at the stage of training them to milk, which allow to analyze objectively the secretory activity duration of the glandular apparatus of the animal udder at this stage. In this regard, special attention is paid to the problem of the activity of moose coming to the farm for milking in the morning and evening hours. Insufficient knowledge of this problem cannot qualitatively and objectively characterize the formation of lactation function (lactogenesis) and the maintenance of milk secretion after calving (lactopoiesis), which is closely related to the process of its excretion in moose. It is possible to solve this challenge with the organization and improvement of measures for raising moose replacements to transfer them to a milking herd, [11], [12]. This will not only domesticate the moose on the farm and strengthen their attachment to humans but also prepare the animals for the upcoming productive period.

The purpose of the research was to study the morphology and disclosure of patterns of the mammary gland secretory activity in domesticated female moose during the first lactation.

2 Research Material and Methods

Experimental studies on the secretory activity of the udder glandular apparatus of the moose at the stage of training it to milking were carried out in the period 1995-2021 based on the moose farm OSBI "State Nature Reserve "Sumarokovsky" of the Kostroma region. The object of the study was clinically healthy female lactating moose of the first calving. The maintenance of female moose is loose in the open, i.e. they freely come to the farm, and after milking they go to the forest, where they independently receive the main part of the feed, and a small part, as a top dressing, on the farm. Two-time manual milking of moose has been introduced at the moose farm: in the morning (from 6.00 to 8.00 am) and in the evening (from 6.00 to 9.00 pm). A long-term study of the female moose lactation function at the Sumarokovskaya moose farm allows us to recommend that all days be considered when determining the lactation

duration, even if the moose came once with a two-time milking, this day should also be considered a milking day.

Table 1. The number of studied female moose of the first lactation for the period 1995-2021.

Serial month of lactation	The activity of coming to milking				Total studied, heads
	100%	99-80%	79-50%	49% and less	
	1st group n, heads	2nd group n, heads	3rd group n, heads	4th group n, heads	
1	29	18	3	13	63
2	18	27	3	2	50
3	16	18	7	5	46
4	9	11	11	10	41
5			5	15	20
6				1	1
Total, heads	72	74	29	46	221

Based on the analysis of the activity of the moose arrival to the farm in the morning and evening milking hours, four groups of animals were formed. Since the animal activity changes in the following months, they can move from one group to another and therefore the number of animals in groups varies. Thus, the first group included first-calf female moose, which during the entire lactation, regularly, twice a day came to milking (100% activity of visiting the farm); the second group included animals with 99-80% activity, they extremely rarely, but, missed any one milking during the day; the third group included animals with 79-50% activity, they missed not only any milking but could not come at all for 8 to 15 days a month; the fourth group included animals that rarely visited the farm, their activity was 49% or less (Table 1).

All individual data on each milking female moose – farm attendance and their one-time milk yield in the morning and evening milking hours - were taken from primary accounting documents. Based on these data, the following indicators were calculated in each group: activity of moose arrival at the farm (%), duration of the lactation period (days), average daily milk yield (l), average monthly milk yield (l), milk yield for the lactation period (l).

The biological material for macro- and microscopic studies was the mammary glands of female moose that were in a period of functional activity and dropped out of the herd for reasons unrelated to udder disease (n=3). When studying the morphology and productive qualities of the female moose mammary gland, morphological assessment, and histological and statistical research methods were used.

The research conducted complies with generally accepted moral standards, all the requirements of the current legal and ethical standards were met when using animals in morphological studies, which were carried out by all directives on the protection of animals (ethical approval No. 2 dated March 14, 2023).

3 Results of Own Research

In female moose, the mammary gland is a compact small formation, firmly suspended on ligaments and muscular bands in the inguinal region. The female moose mammary gland is divided into two lateral halves – left and right, which in turn are divided into anterior and more developed posterior quarters, each of which has one main nipple. One nipple canal opens at the nipple tip. Often moose have additional nipples around the main nipples (1-8).

In female moose of the first lactation, the udder is rounded, primitive, underdeveloped, hemispherical, with small, closely spaced nipples (front – 8.7 ± 0.11 , rear – 8.3 ± 0.31 , side – 3.05 ± 0.12 cm). The parameters (length and diameter) of the front nipples are 2.09 ± 0.02 and 0.93 ± 0.01 cm, and the rear ones are 2.27 ± 0.03 and 1.19 ± 0.03 cm. When examining (palpation) the udder, both in the first days after calving and in the middle or end of lactation, it does not protrude from the pubic area, it is covered by the hips. The organ weight varies from 810 to 1845 grams. In the first month of lactation, when the udder is filled with milk, between milking, its volume practically does not increase. The udder skin of female moose is light brown, covered with relatively well-developed hair, but it is absent in the area of the nipple base, on the left half the area of the hairless

zone is on average 52.3 ± 3.8 , on the right – 51.9 ± 4.5 cm². Milk veins are almost invisible.

Female moose are late-maturing animals, puberty occurs in 2.5–3.5 years, nevertheless, there are individuals whose puberty occurs in 16-17 months, respectively, the first calving - in 2-4 years. With the onset of the first pregnancy, the growth, development, and differentiation of breast tissues, although they increase, slightly, visually it is not noticeable, but a week before calving, the udder increases in size as a result of the glandular tissue proliferation.

More intensive development of the mammary gland, its visual increase occurs during calving and in the first days of lactation. During this period, the network of inter-lobular and intra-lobular ducts grows, secretory departments are in the stage of formation, and milk lobules are observed in the thickness of the connective tissue skeleton. It should be noted that the mammary gland has a highly developed connective tissue, in which there are many collagen fibers, as well as fat cells in the form of small islands or lobules that are clearly visible. After milking, the udder volume practically does not decrease, and when palpated and examined before and after milking, it remains elastic, and fleshy. In first-calf female moose during the period of functional activity of the mammary gland, the secretory apparatus accounts for 62.8%, the connective tissue skeleton – 37.2%, the ratio of these components is 1.7:1. The secretory apparatus consists of small milk lobules of two types: functioning and resting, as well as intra-lobular ducts and inter-alveolar layers of loose connective tissue (thickness from 19.3 to 48.5 microns). The lobules contain terminal secretory sections – alveoli of two types: with open lumens, i.e. these are functioning alveoli (diameter – from 45.6 to 72.2 microns) and closed lumens or non-functioning ones (diameter – 42.3 ± 2 microns). It should be noted that during this period, non-functioning alveoli in the milk lobules occur very often.

The secretory activity of the mammary gland is closely interrelated with the function of the female's genitals and is preceded by this process – estrus, pregnancy, and lactation following it. Milk secretion begins in the last two months of pregnancy, but occurs almost imperceptibly, this process increases almost before calving.

Nevertheless, an analysis of the lactation period in 63 first-calf female moose showed that after childbirth, the secretory activity of the mammary glands is not enhanced in all animals. In the first

three days of the lactation period, the daily milk yield varies from 0.1 to 3.7 liters.

It should be noted that the opening, strengthening of milk secretion, and the formation of the lactation period in female moose is preceded by a long preparatory period for raising and training them to milking. Such work begins with the assessment of their mothers, they pay attention to such moments as the calving without complications, the calm reaction of animals to the birth process, to the newborn calf, and the presence of a person during childbirth. It is also important that they actively come to the farm in the morning and evening milking hours. Moose breeders pay special attention to the upbringing and training of moose calves for the replacement and reproduction of the milking herd. It takes quite a long and patient work.

Calving for most female moose takes place in a pen on the territory of a moose farm. The first milking of the female moose is carried out at the calving site, in the presence of the elk calf, it is also allowed to the udder, i.e. milking is interspersed with udder sucking by the elk calf. Then two milking at the calving site is carried out without the elk calf. From the third milking until the end of the lactation period, female moose are milked in the milking room.

A long-term study of the secretory activity of the female moose mammary gland allowed us to characterize them as "wayward, or capricious" animals. In female moose in the process of domestication, even minor changes in climate, feeding regime, maintenance, and milking, as well as a change of milkmaid, the presence of an outsider, etc. slow down the process of milk production, sometimes this leads to its complete cessation.

Certain attention of employees when working with milking female moose is currently caused by the problem associated with the arrival of first-calf female moose on the farm in the morning and evening milking hours.

The analysis of moose farm attendance for the period 1995-2021 showed that only 29 female moose (46%) in the first month of lactation regularly went to morning and evening milking (Table 2). Nevertheless, in the second month, the number of moose with 100% attendance activity decreased to 18 animals (by 11 heads, 38%), in the third one - to 16 heads (2 heads, 11.2%), in the fourth group – to 9 heads (7 heads, 43.8%) compared to the previous month of lactation.

Table 2. Change in the activity of female moose arrival for milking by months of lactation

Month of lactation	Attendance activity of female moose for milking, %								Total n, heads
	1st group		2nd group		3rd group		4th group		
	n, heads	M±m	n, heads	M±m	n, heads	M±m	n, heads	M±m	
1	29	100	18	92.1±0.97	3	65.5±3.84	13	29.9±1.38	63
2	18	100	27	93.0±0.63	3	65.5±4.82	2	30.1±4.71	50
3	16	100	18	91.3±1.30	7	59.0±3.35	5	29.9±8.92	46
4	9	100	11	88.5±1.25	11	61.7±1.75	10	26.0±3.86	41
5	–		–		5	64.0±3.68	15	24.8±2.37	20
6							1	10.0	1
Average activity		100		91.2±1.13		69±3.79		30.1±4.58	

Table 3. Number of milking days during lactation in female moose with different activity of farm attendance, (M±m) days

Month of lactation	1st group	2nd group	3rd group	4th group
1	30	27.7±0.29	21.3±1.15	6.3±0.62
2	30	27.5±0.15	19.7±1,44	9.0±1.41
3	30	27.4±0.29	17.7±1,01	9.0±2.67
4	30	26.5±0.37	18.5±0,60	7.8±1.26
5			19.2±1,11	7.4±0.71
6				3.0±
Lactation duration, days	120	109	96	42

Thus, in 9 female moose, the lactation period was 120 days (4 months, Table 2 and Table 3), in the remaining animals, the activity of coming to milking decreased and during statistical processing, they were assigned to the second, third, and fourth groups.

In the female moose of the second group, the activity of coming to the farm during lactation varied from 93.0±0.63 to 88.5±1.25%, during the month they did not come from 1 to 6 days. The lactation period of these female moose was 109 days.

Nevertheless, in group 3 female moose (with 79-50% activity), the secretory apparatus of the mammary gland is not always able to respond with increased secretion after calving to milking. Such animals skip regular milking for up to 15 days every month during lactation, while the secretory activity of the udder decreases sharply, but these animals can come to milking even in the fifth month of lactation. The duration of lactation is 96 days.

It should be noted that in 13 (20.6%) female moose (group 4, with attendance activity of 49% or less) after calving, the secretory function of alveolar cells is inhibited, and they came to the farm less and less often. Thus, in female moose of this group, the number of milking days in the first month varied from 1 to 10, in the second – from 7 to 11, in the third – from 2 to 14, in the fourth – from 3 to 14, in the fifth – from 2 to 13, in the sixth

it was 3 days (Vasilisa moose, calving 17.04.2014). In general, the duration of lactation in animals was

42 days. Activities carried out by moose breeders to habituate and increase the milk yield of moose cows after the first calving (udder massage before milking and manual milking) often do not give the desired result, it is not always possible to try to obtain higher milk yield from female moose and develop a conditioned reflex in them - attachment to the farm, so that they actively come for morning and evening milkings.

As a result, long-term studies of the mammary gland in female moose during the functional activity period in the process of domestication revealed a different degree of milk formation intensity. The amount of secreted milk during the first lactation is influenced by many factors, including heredity, the state of health and individual characteristics of the animal, the development of the udder glandular apparatus, the activity of the arrival of animals to the farm, the lactation month, the grass state, etc.

One of the indicators characterizing the functional activity of the mammary gland secretory apparatus in female moose at the stage of training them to milk is the average daily milk yield, which underlies the purposeful formation of a female moose milking herd. A comparative analysis of the average daily milk yield dynamics in female moose with different farm attendance activity during

lactation showed that it is significantly higher in female moose with 100% attendance activity, and lower milk yield per day in female moose with activity of 49% or less.

During the lactation period, the average daily milk yield of female moose with different activities coming to milking undergoes significant changes. It should be noted that the female moose has a fairly well-expressed reaction to the milking process and within 30 seconds after the udder preparation for milking begins, the milk comes, the udder becomes more elastic, and the milking process begins. The change in milk yield per day during lactation in general for each group can be observed by the lactation curve (Figure 1).

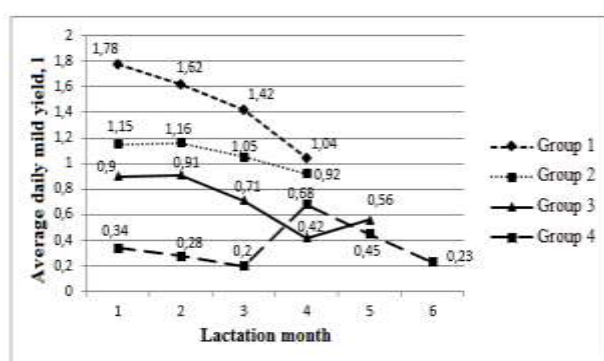


Fig. 1: Dynamics of average daily milk yield in female moose during lactation

As a result of the conducted studies, it was noticed that the average daily milk yield of female moose with different activities of coming to the farm varies during lactation. For example, in animals in the first group, it ranged from 0.58 to 2.53 liters; in the second group, it ranged from 0.26 to 2.2 liters; in the third, it ranged from 0.15 to 2.34 liters; and in the fourth, it ranged from 0.1 to 1.49 liters. Thus, in each group, the most productive is the first lactation month, during which the moose gives on average from 1.78 ± 0.08 liters (group 1) to 0.34 ± 0.03 liters of milk (group 4). Further, there is a decline in the lactation curve until the end of lactation. Compared with the previous month, in female moose with farm attendance activity of 100% in the second month of lactation, the average daily milk yield decreases, is 9%, in the third month – 12.4%, in the fourth – 26.8%; in animals with 99-80% activity, in the second month milk yield was at the level of the first, in the third – decreases by 9.5%, in the fourth – by 12.4%; in animals with 79-50% activity, milk yield in the second month was at the level of the first, in the third – decreases by 22%, the fourth – by 40.9%, in the fifth – increases by 33.3%; in animals with 49%

activity and less – milk yield in the second month decreases by 17.7%, in the third – by 28.6%, in the fourth it increases by 3.4 times, then in the fifth and sixth months it decreases by 33.8% and 48.9% ($P \leq 0.001$).

Thus, in female moose during domestication, the activity of the secretory apparatus of the cytoplasm of alveolar cells manifests only in the first month of lactation, and from the second and further, it decreases. In general, the difference between the average daily milk yield of the first and last month of lactation is 41.6% in animals of the first group, 20% in the second, 37.8% in the third, and 32.4% in the fourth ($P \leq 0.001$).

One of the activities of the moose farm is the assessment of milk productivity for lactation, which varies significantly among female moose with different farm attendance activities. To get the maximum amount of milk from female moose after the first calving, it is necessary to carry out several measures, among which important attention should be paid to the identification of hidden forms of breast diseases, the development of the udder glandular apparatus, the reaction of the female moose to the milking process, as well as to consider factors such as the farm attendance activity of female moose for milking, fodder base, etc.

When studying milk yield during the lactation period in first-calf female moose with different activities of arrival for milking, it was found that it can vary significantly (Table 4). Thus, the high milk yield for lactation was in female moose with 100% activity, which amounted to 175.7 liters, respectively, with 99-80% activity – 122.9 liters, with 79-50% activity – 80.4 liters, with 49% and less – 20.3 liters.

Research conducted to study the secretory activity duration of the female moose mammary gland during the first lactation made it possible to establish the different nature of individual deviations in animals, even within the same group. Nevertheless, moose cow Yasma went to the farm in the morning and evening milking hours regularly (100% activity) during lactation, its lactation function duration is 120 days, and milk yield per lactation is 141.1 l, but in moose cow, Vasilisa lactation was longer (136 days) and more productive (223.7 l), the number of milking days by lactation months varied from 30 (first) to 3 days (sixth). From the first to the third month of lactation, moose cow Vasilisa went to the farm with 100% activity, in the fourth - the activity of its arrival was 90%, in the fifth - 53%, in the sixth - 10%. Slightly lower these indicators (108 milking days in the first lactation and milk yield of 136.1 l),

its activity of coming to the farm during lactation was 100% in the first month, 73% in the second, 100% again in the third, 80% in the fourth, and 7% in the fifth month (Table 5).

Table 4. Dynamics of average monthly milk yield in female moose during lactation (M±m), l

Month of lactation	Amount of milk							
	1st group		2nd group		3rd group		4th group	
	l	%	l	%	l	%	l	%
1	53.5±2.49	30.4	34.6±2.02	28.2	26.9±7.5	33.5	6.5±0.31	32.0
2	48.5±2.19	27.6	34.8±2.25	28.2	19.1±4.61	23.7	2.1±1.41	10.4
3	42.5±2.82	24.2	28.7±2.12	23.4	14.0±2.17	17.4	1.9±0.98	9.4
4	31.2±5.92	17.8	24.8±2.57	20.2	8.5±2.08	10.6	5.5±1.56	27.1
5	–	–	–	–	11.9±2.49	14.8	3.6±0.57	17.7
6	–	–	–	–	–	–	0.7	3.4
Milk yield per lactation	175.7±3.36	100	122.9±2.31	100	80.4±3.77	100	20.3±1.06	100

Table 5. Manifestations of individual deviations in the female moose productive qualities depending on their farm attendance activity during lactation

Month of lactation	Yasma		Vasilisa			Nezhenka		
	milk days	milk yield, l	milk days	milk yield, l	group, No.	milk days	milk yield, l	group, No.
1	30	47.2	30	65.9	1st	30	66.3	1st
2	30	43.5	30	53.1	2nd	22	28.2	3rd
3	30	33.3	30	52.4	1st	30	22.9	1st
4	30	17.1	27	37.7	2nd	24	17.7	2nd
5			16	13.6	3rd	2	1.0	4th
6			3	1.0	4th			
Total	120	141.1	136	223.7		108	136.1	

Consequently, emerging evidence has been obtained on the morphofunctional condition of the mammary gland in domesticated moose during the first lactation. The clarified features of the activity of the secretory system of the mammary gland of the moose-heifer represent the “standard.” Thus, they are essential to analyze species characteristics, comparative morphology, and physiology of lactation as a standard criterion for improving animal productivity at the stage of domestication, as well as to organize measures for the prevention of breast diseases in moose. The obtained results were also reflected in the breeding work on the formation of a milking herd at the Sumarokovskaya moose farm.

Analysis of the secretory activity of the mammary gland in female moose with different activities of coming to milking during the first lactation showed that there is still prolonged and targeted work to improve the issues of the morphofunctional condition of the moose udders of the Sumarokovskaya moose farm at the stage of taming them to milking.

The obtained data on the functioning dynamics of the glandular system of the moose udder and the

varying extent of activity of coming to the farm during milking hours suggest the following features. The preparation of the mammary gland for lactation, as well as the triggering of the secretory process in alveolar cells, the periodic excretion of milk, the sustainment of the secretion that has begun after calving at a certain level, and the mammary involution in animals during domestication occur with varying intensity.

New approaches and methodologies for revealing the organ’s secretory system in domesticated animals can be developed based on the morphometric evaluation of breast indicators in moose heifers and their functional properties.

The studies performed are fundamental. In the area of comparative and specific morphology in domesticated ruminant artiodactyls, they supplement and expand the data currently available on the morphology and function of the mammary gland.

4 Conclusions

1. In female moose during the first lactation, the mammary gland is a complex organ consisting of

two tissue types of different origins: glandular and connective, the tissue ratio is 1.7:1 ($P < 0.001$). In shape, the udder is rounded, primitive, underdeveloped, and hemispherical, with small, closely spaced nipples. The mass of the organ in individual animals is from 810 to 1845 grams.

2. Not all first-calf female moose show proper activity in visiting the farm in the morning and evening milking hours. Therefore, the conditioned milking reflex does not always lead to positive results. According to research data, regular visits to the farm in the first lactation month were observed in 54% of animals. The 100% activity of female moose coming to the farm is preserved only in 9 animals (14.3%).

3. The duration of the first lactation in female moose with different activities varies from 120 days (activity 100%) to 42 (activity 49% or less). For dairy first-calf moose with 99-80% attendance activity, the duration of lactation was 109 days, and with 79-50% activity – 96 days.

4. The value of the average daily milk yield in female moose with different activities of coming to milking during the lactation period is variable, and varies widely (from 1.78 ± 0.08 to 0.34 ± 0.03 liters). The average daily milk yield during lactation is higher in female moose with 100% and 99-80% activity.

5. The most productive during the first lactation are female moose with 100% attendance activity (175.7 l) and with 99-80% activity – 122.9 l, less productive were female moose with 79-50% attendance activity – 80.4 l and with 49% attendance activity and less – 20.3 l.

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Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

Solovyova L.P. prepared the experimental part of the research, carried out statistical processing of digital material, summarized it, made conclusions and conclusions. Ugodskaya E.K. was responsible for providing biological material.

The joint work of the authors consisted of morphological assessment of preparations, preparation of histological preparations and their morphometric processing.

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The authors have no conflicts of interest to declare.

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