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Influence of ovarian follicular cysts on reproductive performance in the cattle of new Ukrainian red dairy breed

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The aim of the study was to compare the efficiency of offspring reproduction of the new Ukrainian red dairy breed cows with the normal morphological and functional ovaries and those treated for ovarian follicular cysts. The study was performed at a pedigree reproducer of Ukrainian red dairy breed, it was an industrial dairy complex with 650 milking cows located in Odessa region during 2017–2018 years. The maintenance dairy cattle was in accordance to modern zoohygienic requirements. Total mixed ration diet with high-protein ingredients was designed to get 29 kg of milk per day, however, an actual milk yield was 19–20 kg/cow. The analysis of the blood serum biochemical content of the controlled livestock showed disorders cows metabolism at a subclinical level during all physiological periods (milking, mid-lactation, dry period). There was a significant imbalance in the level of glucose in the blood of cows (on 44.65% below the minimum level). The level of urea head also increased significantly. It was 15.91% above maximum level. Large subclinical failure in cholesterol, triglycerides, alkaline phosphatase rates have been noted also. This indicated the chronic disorders nature of protein-fat metabolism caused by protein overfeeding. As a result, follicular ovarian cysts of lactating cows (42.37%) have been diagnosed (n=177). It has been established experimentally that ovarian follicular cysts reduce cows reproductive efficiency. This resulted in a reduction of the number of newborn calves by 10,67%; an increase in prenatal losses by 15.53%; an increase in the service-period by 69.92 days; an increase in the number of repeated inseminations by 1.9 times (compared with cows with morphologically normal ovaries). The results of our studies showed that follicular ovarian cysts worsens the number and viability of offspring. This was caused by significantly deteriorated, the biological inferiority of the eggs and the embryos from the affected ovaries.

Keywords: Cows of the new Ukrainian red milk breed; Ovaries; Follicular cysts; High protein diet; Metabolism; Ovine inferiority

Introduction

During the last decades, there have been large changes of the different dairy technologies, such as breeding, maintenance, feeding and operating the livestock. Due to this fact in all countries the efforts have been made to provide dairy enterprises with specialized dairy breeds adapted to industrial technologies (FAO ..., 2010; Sharapa & Kuzebnyi, 2015; Hladii et al., 2016).

Owing to the agricultural crisis in Ukraine, the effectiveness of large-scale breeding in cattle has been reduced due to a shortage of breeding stock of newly created domestic cows. This also applies to Ukrainian red dairy breed (URD), which was approved by the State Expert Commission in 2003. Now days the population of a new breed is in active genetical transformation. Its gene pool significantly improves each following generation mainly through the artificial selection (Hladii et al., 2016; Bomko et al., 2018; Borshch et al., 2020). In the process of creating URD breed was combined in this genotype with the breeding methods adaptability to the natural and economic conditions of the arid south of Ukraine. This breed has features of both original domestic red steppe breed, and the high technological and productive qualities of red-pied foreign Holstein.

According to the State Register data for 2006-2017 years a new breed had a significant increase of milk productivity from 4,277 kg to 5,892 kg per lactation, significantly exceeds the yield of red steppe cows by 751 and 1989 kg, respectively (Sharapa & Kuzebnyi, 2015; Hladii et al., 2016). Reproduction of genetic resources is based on the biological characteristics of cattle breeding. The ovary is a gland of mixed secretion, it performs generative and hormonal functions (Studentsov, 1961; Erickson, 2000; Davydova, 2001; Melnyk & Sidashova, 2013; Buhrov, 2014). Many scientists carried out the study of the pathology of cows ovaries as the main reason of the infertility of dairy cattle as well as the factors failuring to ovarian cystogenesis (Tarasevich, 1935; Studentsov, 1961; Turkov et al., 1984; Hooijer et al., 1985; Djul'ger & Shipilov, 1989; Djul'ger & Burov, 1990; Vassena et al., 2003; Bartolome et al., 2005; Vanholder et al., 2006; Djul'ger & Nezhdanov, 2006; Baban et al., 2009; Baban et al., 2016).

Cysts are gynecological diseases of a non-inflammatory or functional nature. Now days, there is no consensus among researchers regarding the etiology and pathogenesis of follicular ovarian cysts in cows and heifers. Numerous studies have noted that the occurrence of cysts is caused by lack of secretion of luteinizing hormone during the stage of the sexual cycle excitement. This is

caused by inability of the hypothalamic-pituitary system to adequately respond to estrogen stimulation through positive feedback mechanisms (Alanko et al., 1980; Vassena et al., 2003; Djul'ger, 2007).

Echographic scanning of follicular cysts are defined as single or multiple thin-walled, fluid (anechogenic) formations of a round, oval or irregular shape with an echo amplification zone along the posterior surface with a diameter of 27.7 ± 0.80 mm. The average number of follicular cysts is 1.56 ± 0.13 per cow (Djul'ger & Nezhdanov, 2006).

Ashmawy et al. (1990) and Erickson G. F. (2000) established that ovarian follicular cysts are formations of a transitory nature. After the loss of functional activity they are replaced by a new dominant ovarian structure that ovulates or transforms into a new cyst (the phenomenon of changing one cyst to another). This is the influence of inflammatory processes in the tissues of the of cows reproductive organs on the functional activity failure of the ovaries and cystogenesis has been determined (Djul'ger, 2007; Kasimanickam et al., 2016). Cystic ovarian disease has a polyetiological nature and is a common pathology; it is revealed in 3.8-6.5% of infertile cows. The frequency of occurrence of cysts is significantly influenced by a number of factors: breed, stall maintenance, number of calving, the duration of the previous and the stage of current lactation. The Ayrshire cows were diagnosed ovarian cysts 1.7 times more often than in cows of the black-pied breed – 6.5% versus 3.8% (Djul'ger & Nezhdanov, 2006). Self-recovery of cows with cysts vary between 13 to 40% (Stevenson et al., 1987; Ashmawy et al., 1990; Djul'ger & Nezhdanov, 2006).

Skipping the reproductive cycles and unsuccessful insemination also influence on cystogenesis. Nevertheless link between the pathogenesis and consequences of degenerative changes in the tissues of the ovaries, as well as the cysts type has not been revealed (Studencov, 1961; Djul'ger & Burov, 1990; Djul'ger, 2007; Melnyk & Sidashova, 2013). Due to the fact that there is no data about influence of this pathology on the delivery of viable offspring, we compared a number of rates of cows reproduction with the cystic and normofunctional ovaries under industrial conditions on a high-protein diet. The breeding progress of dairy herds depends on the biological peculiarities of the female and the duration of the pregnancy. It is limited to quantity and quality of offspring and the efficiency of furthermore reproductive performance.

The aim of our study was to compare the rates of reproduction performance of the new Ukrainian dairy breed cows with normal folliculogenesis and treated for cystic ovarian disease.

Materials and Methods

The studies were conducted at a pedigree reproducer of new Ukrainian red dairy breed cows located in the Odessa region. The livestock is of the fat-milk type. During the last fifteen years by Holsteinization of the genotype of the original base red steppe breed has been made. The farm the artificial insemination of cows and heifers with cryopreserved imported sperm by producers of red-pied Holstein breed, produced by leading breeding centers of the USA and Canada (Sharapa & Kuzebnyi, 2015).

During the research period (2017–2018) 650 dairy cows were kept in free-stall type barns with continuous year-round industrial milk production (average milk yield during lactation was 6.450 kg of milk per cow with a fat content of 4.10%).

The feeding technology included a total mixed ration (monocorm) on the feed tables twice a day. The choice of feeding system was associated with a herd production level and modern norms of feeding different sex and age groups . The diet of milking cows during was designed to get 29 kg of milk per day and it had the following composition: corn silage – 14 kg (5 kg CB); bean-cereal haylage – 11 kg (4 kg NE); lucerne hay – 1 kg; barley straw – 0.5 kg; water – 5 kg; soda – 0.2 kg; compaund feed – 11.1 kg. The composition of the compaund feed had the following structure: maize – 40.5%; wheatgraund – 18.0%; sunflower meal – 18.0%; soybean meal – 18.0%; premix for cattle DMVKRS D – 1.9%; protected Nutripid fat – 1.8%; technological feed additive Acido Zim – 1.4%; salt – 0.4%. In accordance with the calculation, the diet ensured the ingestion of 15.8% crude protein and 6.7 MJ of energy (NEL) at the peak of cows lactation. The same components with some changes were included into the ration of the group of highly productive cows. Lactating dairy cattle were fed according to milk production and physiological periods.

The results were analyzed with comparative analytical and statistical methods. The control and experimental groups were formed according to the principle of analogs. Clinical and gynecological examination of noninseminated cows was carried out on animals with a lactation period of more than 65 days and the absence of metropathy. The morphological and functional study of the cows ovaries and uterus was performed by the rectal palpation method used to differentiate cysts from corpora lutea and cyst type (Sidashova & Gumenny, 2017; Sidashova et al., 2018) and the ultrasonic sonographic method using the Scanner 100S apparatus in B mode (Baban et al., 2009 ; Melnyk & Sidashova, 2013; Buhrov, 2014).

In order to restore normal sexual activity of cows with follicular cysts the animals were treated (5.0 ml of Surfagon injected intramuscularly for 3 days) and hormonal treatment regimens was applied using (standard Ovsynch), PreSynch (Stevenson et al., 1987; Melnyk & Sidashova, 2013). The artificial insemination was carried out in accordance with the standard instructions. All biotechnological methods were performed on fixed animals and their health was not harmed during the procedures.

The cows blood samples were taken according to commonly accepted method, the biochemical parameters of blood serum were determined in a multisectoral biochemical laboratory of the faculty of veterinary medicine and biotechnologies of Odessa State Agrarian University (semi-automatic analyzer Evolution 3000).

Zootechnical records were taken from the farm computer database ("Dairy Plan") and processed in accordance with methodological recommendations (Kuzebnyi et al., 2018): the index of inseminations per cow, units; % of the total conception rate of cows in the group; heals offspring, goals; the duration of the lactation and service period, days; number of viability calves in groups, %. Statistical processing of the results was carried out according Lakyn (1990).

Results and Discussion

Clinical and gynecological examination of the ovaries of a group of artificially uninseminated cows (n=177) with a starting of more than 65 days after calving were diagnosed with ovarian follicular cysts in 75 animals, representing 42.37% of the cows total number has been performed) (Table 1, Figure 1). Two groups of animals were formed: 1st – cows treated for cystic ovarian disease (experimental group); 2nd – animals with normal ovaries (control group).

As a result of our studies, it was established the conception ability in cows treated for cystic ovarian disease (COD). Cows with cystic ovarian disease, compared with healthy animals under similar conseption rates (73.33% and 72.55%, respectively) after the hormonal therapy, 10.67% less calving was received and 15.53% less live newborn calves in the next financial year (Table 1). The dynamics of reproductive efficiency is presented in Figure 2.

Table 1. Results of ultrasound examination of the cows ovaries in a herd.

Indicators		Experimental group (n=75)	Control group (n=102)
Average lactation period	days	152.71 ± 13.10*	93.29 ± 5.69
Level of calving during the financial year	goals	55	74
	%	73.33 ± 5.84	72.55 ± 5.21
Number of viable calves from examined cows	goals	42	68
	%	56.00 ± 14.14*	66.67 ± 5.28
Total viable calves from inseminated cows	%	55	74
		76.36 ± 8.20	91.89 ± 8.22
Prenatal offspring losses	goals	13	6
	%	23.64 ± 4.72	8.11 ± 5.28
I I (index of inseminations per pregnancy)	units	4.37 ± 0.48*	2.47 ± 0.185
SP (service period)	days	240.89 ± 17.58*	170.97 ± 11.73
The total number of calves in financial year	%	43.51	68.07

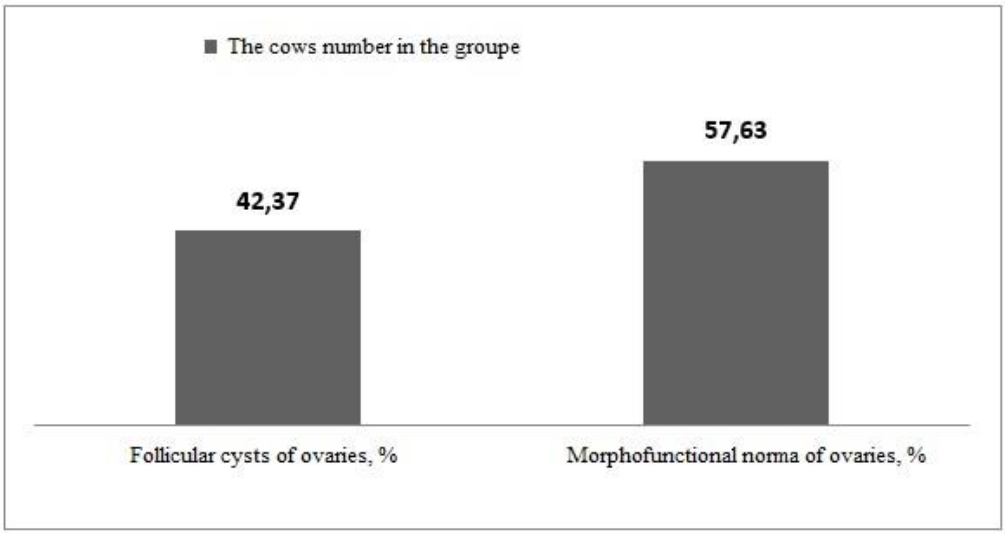

Figure 1. Incidence of follicular ovarian cysts of the new Ukrainian red milk breed cows' in a herd (n=177).

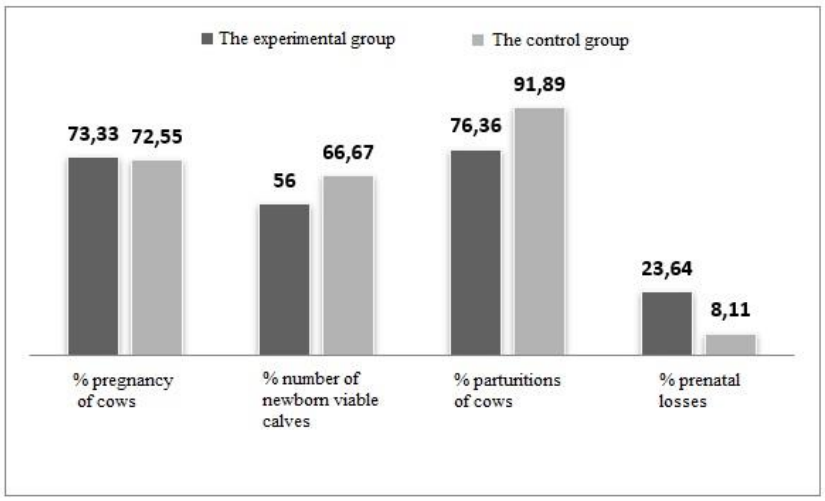

Figure 2. The efficiency of reproduction in the group of cows with follicular cystic ovaries and morphofunctional state (n=177).

At the same time, it was also established that a significant increase in prenatal losses in the cows of the experimental group, such as: the number of stillborn calves and abortions were 23.64%, which is 15.53% in cows with intact ovaries higher than those in control group. Numerous studies (Hacker et al., 1985; Zulu et al., 2003; Bartolome et al., 2005; Djul'ger & Nezhdanov, 2006) have shown that cystogenesis is associated with metabolic disorders caused by excessive protein feeding with insufficient micronutrient intake. The lack of iodine in lactating cow organisms causes a hypofunctional state of the thyroid gland and the hypothalamic-pituitary system disfuction. This decreases the hormonal activity of the ovaries. The mature follicle persists and transforms into a cyst with subsequent degeneration.

The ration of the controlled milking herd was designed for the secretion of 29 kg of milk per day with an actual milk yield of 19–20 kg. Such a diet contained an elevated protein feed: crops, products of technological processing of oilseeds (bagase and schrot), technological protein and vitamin feed additives, high-tech feed products with increased ability to absorb in ruminants through gastrointestinal tract (protected fats). This leads to nutritional intoxication. The microflora of the preventriculus is not able to bind the entire volume of released ammonia under excessive intake of protein. The liver is not able to neutralize the ammonia and alimentary toxemia occurs. Degenerative changes in the liver weaken its detoxifying function (Figure 3).

With an increase of the protein norm, the need for easily digestible carbohydrates (sugars) increases. Their lack leads to the accumulation of ketone bodies, which have a strong general toxic and immunodepressant effect. During the study, the analysis of the biochemical parameters of the cows blood serum in different physiological periods has been made (Table 2). A low blood glucose level was detected in all technological groups of cows. The high-protein feeding causes an imbalance in the absorption of sugars and proteins by the organisms. The glucose content was 67.88–81.74% compared with the lower limit of normal. If the content of total protein in the cows blood serum was within normal limits (on average, 83.35; 97.98 and 98.46 mmol/l in the dry, lactational periods and at the peak of lactation respectively), then the urea level as shown in Figure 4, would increase dynamically at the time of start-up (from 6.55 mmol/L to 10.15 mmol/L) till mid-lactation. Liver enzymes level in individual cows also indicate a disorder of protein-fat metabolism. Thus, an increase of AST levels to 140.1 units/l was noted in the middle of lactation in a number of samples; up to 152.1 units/l – in the dry period (at a standard level of 10.0–100.0 units/l).

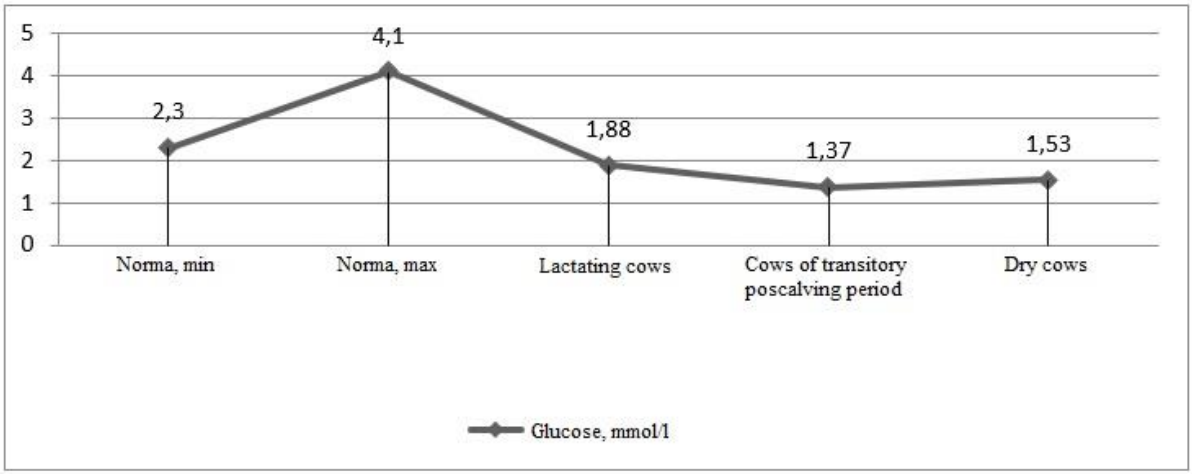

Figure 3. The dynamics of the glucose level in the cows blood during different physiological periods.

Table 2. Biochemical contents of cows blood serum in the herd.

Indicators	Number of samples	Average (M ± m)	Lim min	Lim max	Norma
Lactating cows					
ALT, units./l	7	31.59 ± 3.081	16.9	40.3	10.0-50.0
AST, units./l	7	98.46 ± 10.63	70.6	140.1	10.0-100.0
Glucose, mmol/l	7	1.88 ± 0.18	1.27	2.67	2.3-4.1
Total protein, mmol/l	7	83.59 ± 3.03	69.9	92.0	31.0-98.0
Albumin, mmol/l	7	26.61 ± 1.84	20.0	35.4	28.0-50.0
Globulin, mmol/l	7	56.71 ± 4.12	34.5	66.5	29.0-49.0
Albumin / Globulin	7	0.59 ± 0.09	0.32	1.03	0.8-1.2
Urea, mmol/l	7	10.15 ± 1.64	4.6	16.5	2.8-8.8
Creatinine, mmol/l	7	153.51 ± 23.71	81.9	239.5	56.0-162.0
Cholesterol, mmol/l	7	5.80 ± 1.11	3.63	11.8	1.6-5.0
Triglycerides, mmol/l	7	1.04 ± 0.15	0.69	1.63	0.3-0.6
Alkaline phosphatase, units./l	7	86.14 ± 25.58	11.4	178.7	18.0-153.0
Alkaline reserve, мг%	7	262.86 ± 31.90	80	340	460-540
Dry cows					
ALT, units./l	6	34.15 ± 4.45	21.1	41.0	10.0-50.0
AST, units./l	6	97.98 ± 18.59	70.6	152.1	10.0-100.0
Glucose, mmol/l	6	1.53 ± 0.41	0.4	2.33	2.3-4.1
Total protein, mmol/l	6	83.05 ± 3.15	76.6	90.9	31.0-98.0
Albumin, mmol/l	6	28.10 ± 1.46	24.9	31.7	28.0-50.0
Globulin, mmol/l	6	54.95 ± 7.83	49.8	59.2	29.0-49.0

Albumin / Globulin	6	0.52 ± 0.02	0.46	0.54	0.8-1.2
Urea, mmol/l	6	6.55 ± 0.79	4.8	8.3	2.8-8.8
Creatinine, mmol/l	6	101.03 ± 14.79	81.9	145.1	56.0-162.0
Cholesterol, mmol/l	6	4.69 ± 0.49	3.32	5.43	1.6-5.0
Triglycerides, mmol/l	6	0.95 ± 1.11	0.76	1.19	0.3-0.6
Alkaline phosphatase, units./l	6	189.50 ± 68.88	23.6	348.6	18.0-153.0
Cows in transitory postcalving period					
ALT, units./l	5	22.50 ± 7.30	15.2	29.8	10.0-50.0
AST, units./l	5	80.15 ± 6.95	73.2	87.1	10.0-100.0
Glucose, mmol/l	5	1.37 ± 0.67	0.7	2.04	2.3-4.1
Total protein, mmol/l	5	83.35 ± 3.05	80.3	86.4	31.0-98.0
Albumin, mmol/l	5	23.40 ± 2.40	21	25.8	28.0-50.0
Globulin, mmol/l	5	59.95 ± 5.45	54.5	65.4	29.0-49.0
Albumin / Globulin	5	0.39 ± 0.08	0.32	0.47	0.8-1.2
Urea, mmol/l	2	6.90 ± 0.80	6.1	7.7	2.8-8.8
Creatinine, mmol/l	5	93.65 ± 18.95	74.7	112.6	56.0-162.0
Cholesterol, mmol/l	5	6.99 ± 3.22	3.77	10.2	1.6-5.0
Triglycerides, mmol/l	5	1.36 ± 0.69	0.66	2.05	0.3-0.6
Alkaline phosphatase, units./l	5	127.50 ± 28.30	99.2	155.8	18.0-153.0

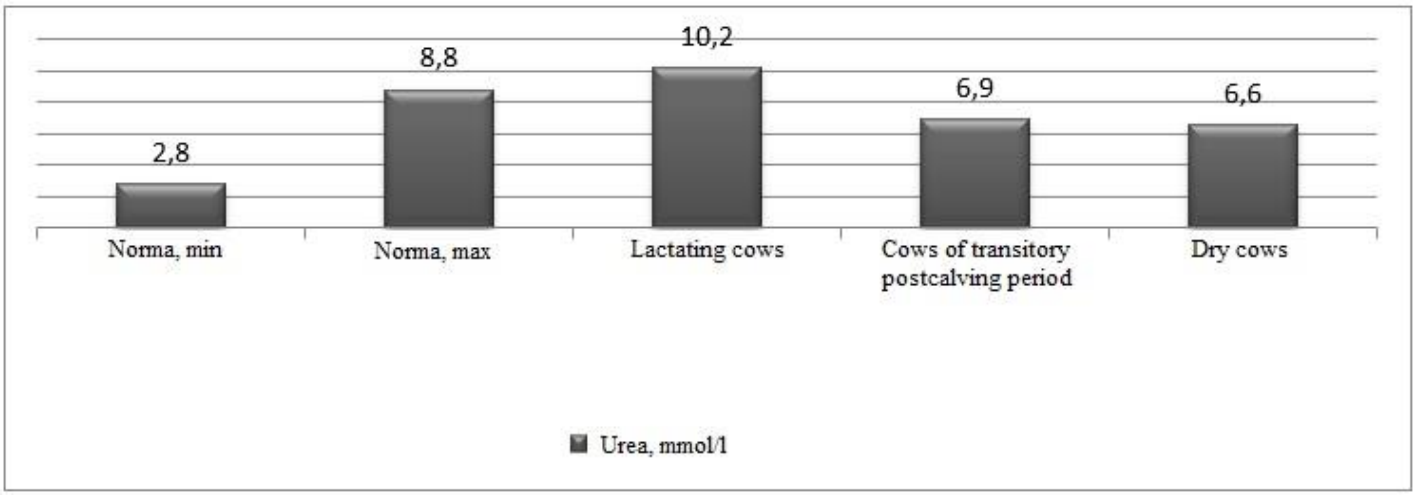

Figure 4. The dynamics of the urea level in the cows blood in different physiological periods.

Variations in the lipid-containing elements of cows blood serum are revealed in different physiological periods: an increase in deviations cholesterol and triglycerides in the metabolism of dairy cows as intermediate stages of protein-fat metabolism (Figures 5 and 6). The amount of cholesterol is significantly higher (by 58.33%) even during the period of postlactational involution of the mammary gland. The concentration of cholesterol and triglycerides in the transition period, when the metabolism of lactating cows is most intense and labile, was also higher than the norm by 39.80% and by 2.33 times respectively.

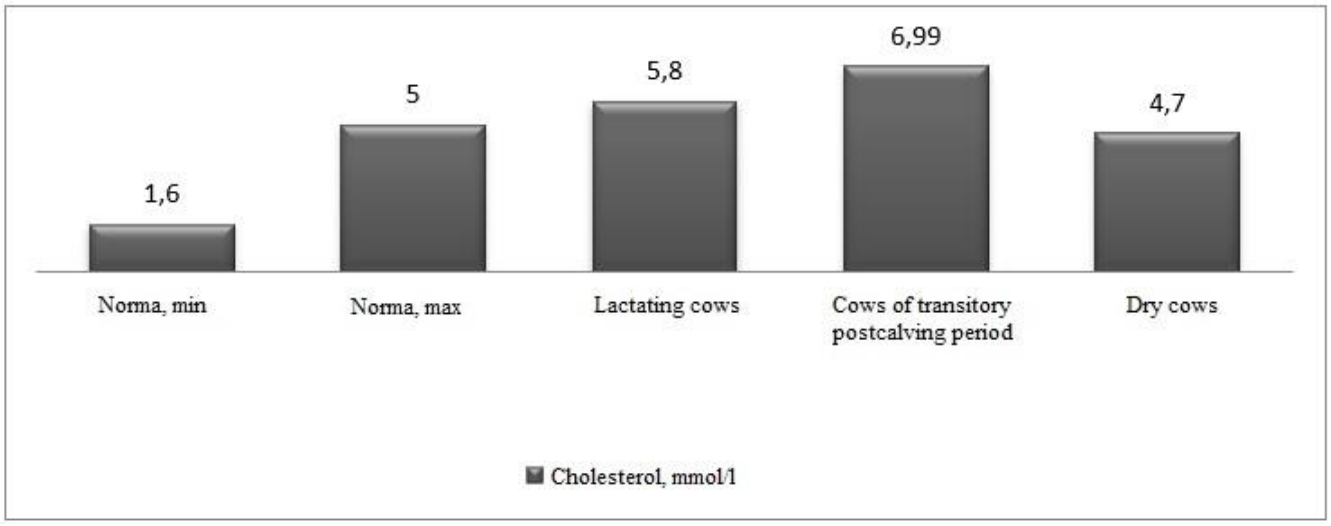

Figure 5. The dynamics of cholesterol level in the cows blood in different physiological periods.

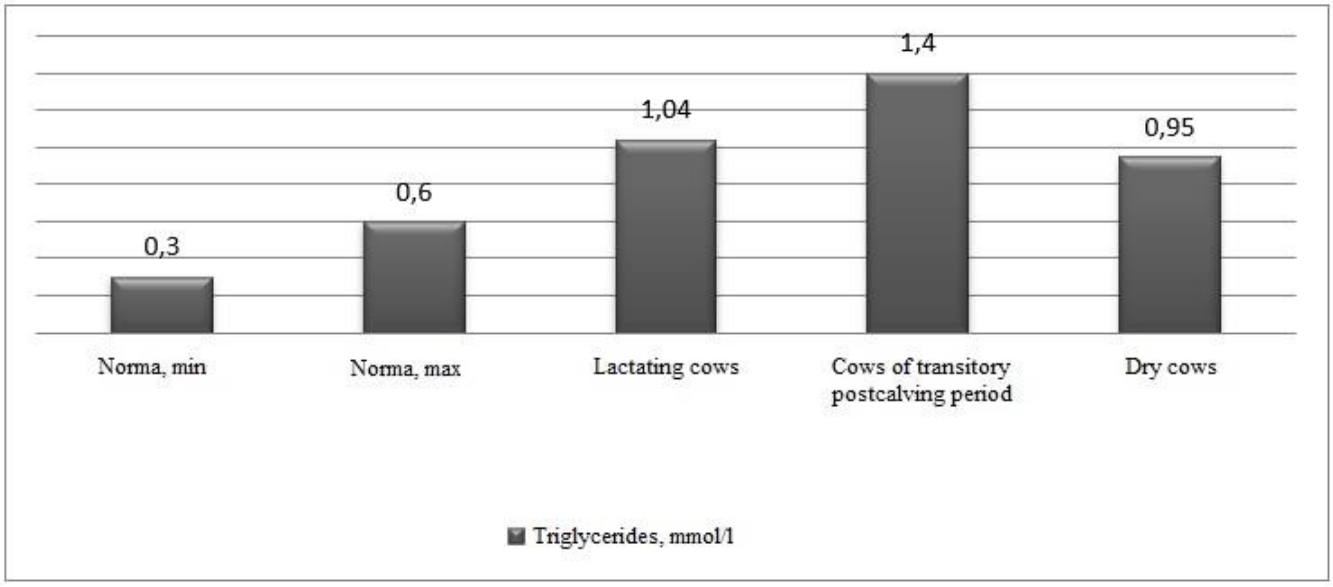

Figure 6. Dynamics of the amount of triglycerides in the cows blood in different physiological periods.

The dynamics of the ratio of blood protein fractions reflected of the symptoms of the immunodeficiency state of cows of the controlled herd cows: the ratio of albumin to globulin was significantly lower than normal during the entire physiological cycle (Figure 7).

In industrial exploitation of livestock with insufficiently consolidated genotype there had been a significant decrease in the alkaline reserve of lactating cows blood (48.70–57.17% of the norm) indicates a weakening of the organisms resistance. This is typical of the accelerated breeding process of creating a new highly productive animal population.

A significant increase in alkaline phosphatase indicates endotoxic processes in lactating cows. Thus, during the starting up, the average alkaline phosphatase was significantly higher than normal and amounted to 189.50 units/l (at a standard level 18.0–153.0). In some samples, the excess of alkaline phosphatase was from 16.79% to 2.28 times, which indicates significant metabolic disorders of animals.

Long-term chronic subclinical disorders in the metabolism of dairy cows, contribute to the formation of follicular cysts are signal signs of significant degenerative changes in the tissues of the reproductive organs, in particular, in the ovaries. Disorders of the cortical layer trophism affect the processes of fertilization, the formation of a zygote, the development of the embryo and the fetus. The data of the Table 1 and Figures 8 and 9 confirms this. This occurs more often during a period of intense lactational activity, which is also an important reproductive cycle of the female physiology.

Service period in the cows group with cystic ovarian disease: up to 240.89 ± 17.58 days compared to those with normal gonads – 170.97 ± 11 days ($P<0.001$). At the same time, a decrease in the number of viable offspring was found in cows with multiple follicular cysts (more than one cyst with a diameter of 0.5 to 1.0 cm on one ovary or both simultaneously).

The differential diagnosis was carried out using an integrated technique (Sidashova et al., 2019).

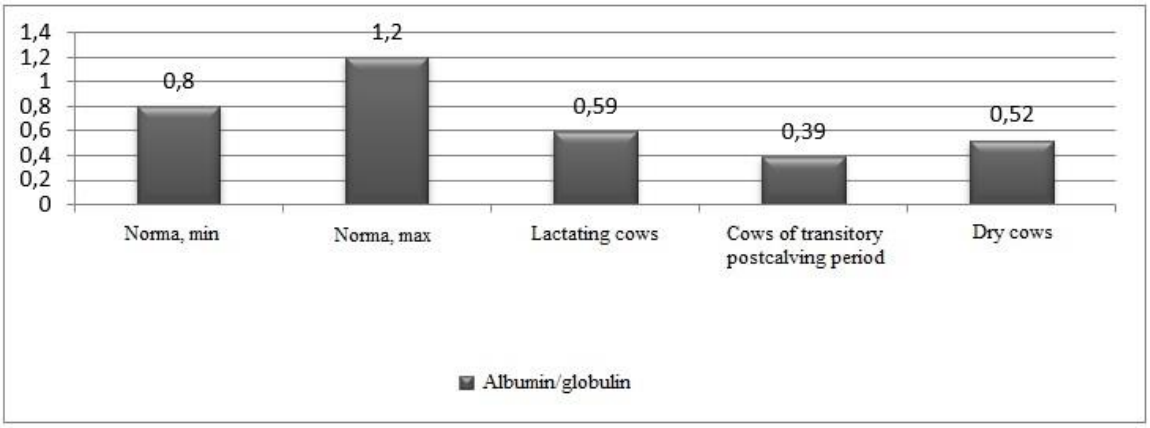

Figure 7. The dynamics of the ratio of albumin and globulin in the cows blood in herd.

The biochemical composition disorders of the cows blood may cause of pathological changes in the tissues of the uterus and ovaries. This leads to the formation of follicular cysts and, therefore, worsening the conditions for the formation of oocytes in the ovarian cortical layer.

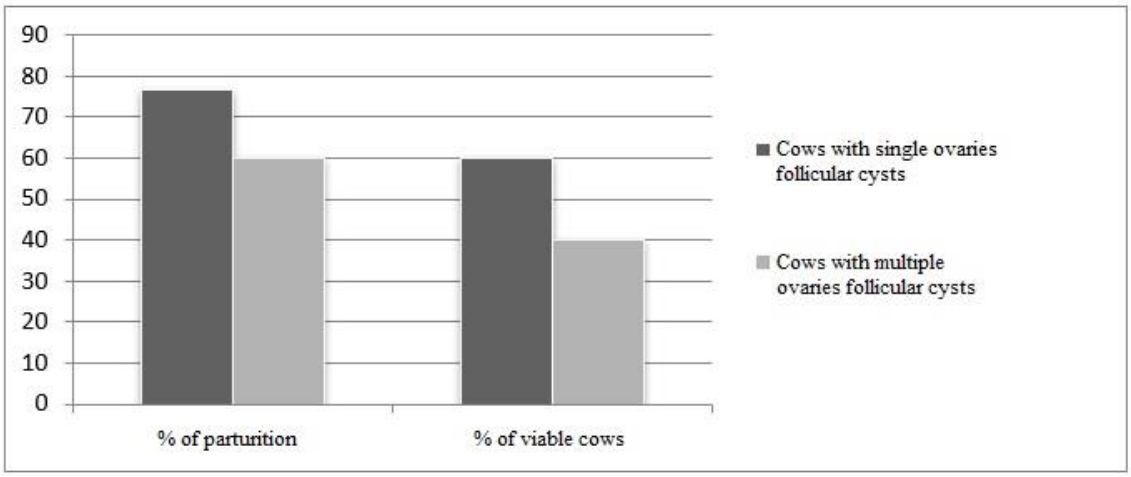

Figure 8. The level of calving and viable offspring in cows with different number of follicular cysts.

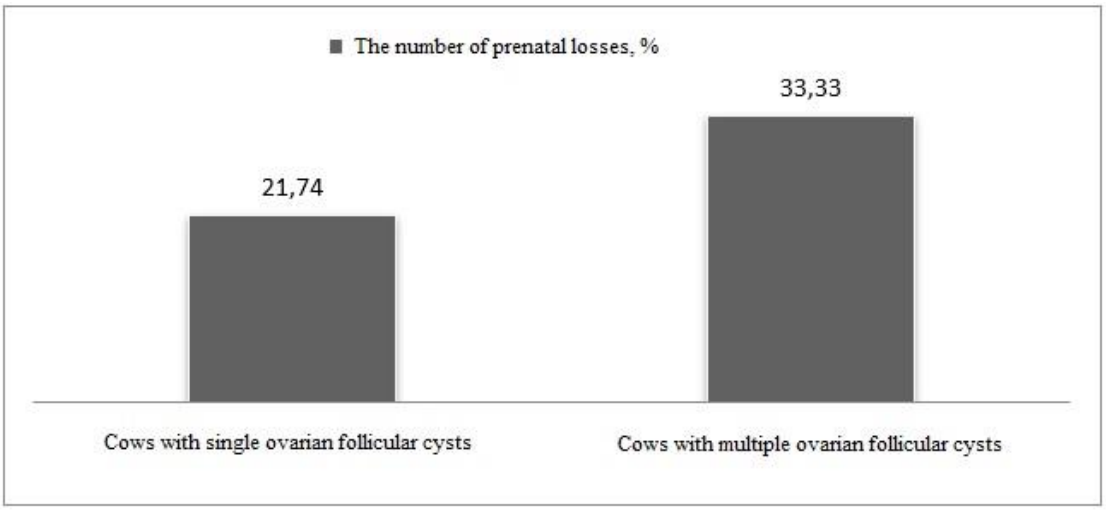

Figure 9. Prenatal losses in cows group with follicular cysts.

Scientists (Baban et al., 2009; 2016) pathomorphologically revealed follicular atresia due to the development of venous hyperemia and fatty infiltration, follicular deformity, follicles with completely destroyed granulosa cells were encountered. Persistance of preovulatory follicle, its transformation to follicular cysts and its effect on the histostructure of ovarian tissue need to be throughly investigated.

Cystic ovarian disease leads not only to cows fertility decreases long-lasting infertility, lengthening of the period between calving, disorders of the reproduction rhythm of head, but also reduces the number of calves and its viability. The metabolic processes in a lactating cows affect directly the trophism of the ovaries cortical layer and folliculogenesis, and afterwards the qualitative characteristics of oocytes and eggs.

The concept of inequality and heterogeneity of germ cells was introduced for the first time by the outstanding Ukrainian scientist A. Kvasnitsky. in 1946 in experiments on pigs. The results of an in-depth study of this problem were described by scientists from Poltava Research Institute of Pig Breeding in a number of publications (Kvasnickij, 1949; Martynenko et al., 1965). Their findings were based on data from a study of the morphology of eggs and of pigs and cows embryos. The authors attached grate importance to the variability of the structure eggs (variability), the presence of a period of embryo development, when it existed due to its own nutrients. It was further established that the morphological heterogeneity of germ cells characterizes only the external manifestations of their physical, biological, and physiological inequality (Martynenko et al., 1965). According to the author, differences in the quality of gametes could become the cause of embryonic mortality and different quality of offspring. These studies have confirmed the importance of biological inequality and heterogeneity of gametes, but the embryos and offspring that comes from them. Most likely the qualitative and quantitative composition of ooplasm is the dominant sign of the heterogeneity of a fertilized egg. The intensity of biochemical processes also influence the growth and development of the embryo. The ooplasm of the ovine is a self-sufficient formation during a certain period in the zygote development. This happens created combination of hereditary information remains in the process of integration and does not affect the course of physiological processes (Lobchenko, 1986; 2013).

Heterogeneity of zygotes, forms under the influence of chronic subclinical disorders in the metabolism of lactating cows. This disorders cows of ovarian cystogenesis. Heterogeneity afterwards leads to the formation of embryos with reduced adaptibility. As a result the calves are born with reduced growth and productive abilities. This leads to inhibition of breeding progress and to significant economic damages. Below we demonstratesd the calculation of the economic efficiency of research (Table 3). This calculation shows that cystic pathologies of the ovaries of a new specialized breed of dairy cows significantly decreases the potential

for breeding improvement. Current market value of one breeded heifer is in the range of 1600 euros and above. Our study showed that ovarian follicular cysts in cows lead to a significant financial losses and loss of genetic resources. Now days new Ukrainian red dairy breed is in active genetic variability. This significantly influences the formation of productive, reproductive and economically useful qualities of animals as a biological system.

Table 3. Economic efficiency of research.

Indicators	Groups of cows		Product allowance, %
	Cows with ovarian follicular cysts, n=75	Cows with morfofunctional normal ovaries, n=102	
% calving during financial year	73.33 ± 5.84	72.55 ± 5.21	-1.08
% viable calves during financial year	56.00 ± 14.14	66.67 ± 5.28	+16.01
% viable calves from successfully inseminated cows	76.36 ± 8.20	91.89 ± 8.22	+20.34

Since the follicular ovarian cysts significantly reduce the efficiency of cows reproduction, etiology of this pathology and methods for its correction should be further investigated.

Conclusions

We established, that cows with ovarian follicular cysts, during the financial year had a significantly low rates of reproduction, whereas the number of viable offspring was as follows compared with the cows with normal morphofunctional state of gonads:

- Number of offspring was lower by 24.56%;
- Number of viable calves was lower by 10.67% than in artificially inseminated cows (this were 73.33 and 72.52%, respectively);
- Prenatal offspring losses were higher by 15.53%;
- The rate of inseminations per pregnancy was higher by 1.9 timee;
- The service period was longer by 69.92 days.

This pathology limits the efficiency of breeding stocks of new domestic dairy cows. Further study of the factors influencing the high-quality and biological inferiority of oocytes, eggs and embryos, development methods for the prevention of this pathology and increasing the efficiency of reproduction and dairy industrial prduction is necessary.

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