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Realization of the Genetic Potential of Imported Holstein Cattle in Agricultural Enterprises of Primorsky Krai of Russia

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ABSTRACT
Currently the main goal of Russian agricultural industry is to provide the citizens with high-quality competitive domestic production. This goal can be also achieved with the help of dairy husbandry development. Production of high-quality dairy products depends on many factors: fodder supply, housing, climate factors and the genetic potential of animals. Improvement of cattle gene pool in farms of Primorsky Krai is provided by import of foreign highly-productive Holstein cattle from Northern America, Canada, Europe (Germany, Hungary, Holland). The experience of working with foreign dairy cattle in Khankaysky agro-industrial complex "GreenAgro" is represented in the article. The analysis of "GreenAgro"`s work let make a number of recommendations for farm enterprises and other forms of agricultural enterprises, which plan to run dairying. These recommendations are development of homegrown fodder supply for high-yielding dairy cows, using the semen of Holstein breeding bulls for insemination of local cattle for the purpose of getting offspring with 50 % chance of being pure blood and improvement of breed characteristics of local cattle.

Keywords: Holstein cattle, Genetic potential, Production performance, Artificial insemination, Technology stress, Milk producing ability.

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INTRODUCTION

Nowadays because of imposition of sanctions, Russian agricultural industry sets a goal to supply the citizens with domestic production. In order to achieve this goal, it needs to complete a number of tasks. In dairy husbandry these tasks are development of homegrown fodder supply, an increase of milk producing ability in cattle and improvement of the genetic pool. The last task is completed by a purchase of foreign highly-productive Holstein cattle from the countries such as Northern America, Canada, Europe (Germany, Hungary, Holland).

Milk production world records belongs to Holstein cattle, that's why this breed of cattle is known to all livestock breeders around the world. Holstein cattle has the highest genetic potential of milk producing ability and a set of characteristics, that provides faster adaptation to manufacturing process of milk production. With the help of the genetic potential Holstein cattle became a leader in improvement of domestic dairy cattle breeds (Weary, 2012)

For improvement of cattle breed in many countries the gene pool of Holstein cattle is just used. Besides, the studies, which were done in 90-s of the 20th century, have shown a beneficial impact of Holstein cattle on adaptation of improved cattle. In this context some authors point out negative impact of Holsteinization (using the semen of Holstein cattle). For example, crossbred animals from Holstein cattle, depending on pedigree level, have lower content of fat and protein in milk, weakening of body composition, extension of open period and other (Short, Lawlor, 1992; De Jong, 1994; Butler, 2000; Lucy, 2001; Rajala-Schultz, 2003).

Brood animals, which were raised in particular environmental conditions, have a good balanced metabolism (Von Keyserlingk, 2012; Weary, 2012). In case of the animals' transportation in conditions, which strongly differ from the conditions of their origin, their adaptive behavior changes. Adaptation starts a number of biogeochemical and physiological processes in organism of animals. These processes are aimed to keep homeostasis in new housing conditions. One of the most important factors of acclimatization is stress. Change of some factors such as feeding, housing, change of seasons, stocking density, exploitation and transportation in other climate zones, can make animals experience stress (Paccard and Tillie, 1986; Schmidt et al., 1989; De Rensis and Scaramuzzi, 2003). Young, brood and high productive animals usually go through technology stress. Sensitivity of animal organisms to technology stress increases because of long-time negative effect of natural climate factors and also during simultaneous or consistent effects of two or several stress-factors.

According to the date of many studies, animal stress condition in 70-80% depends on feeding and housing and only in 20-30% on genetic materials. Adaptation of farm animals leads to realisation of phenotype, which is optimal to environmental state; the genotype realizes the phenotype without physical efforts, thereby it releases adaptation resources. In modern cattle farms the impact of stress-factors is tried to minimize (De Rensis and Scaramuzzi, 2003; Soydan et al., 2005; William, 2009).

Low quality of food doesn't let animals adopt to their new conditions in a short period of time and they can't implement the genetic potential of milk producing ability. As noted by N.D. Shabelnik (2017), the percent of factors, which influence on milk producing ability, is indicated by the following data: feeding – 60-70%, breeding – 20-30%, housing conditions –10-20%. By comparison in the USA: feeding –35%, breeding –25%, housing conditions – 0%, age and season of the year -15%, physical condition – 25%. Mishenko V.A. with co-author consider that in 59% milk producing ability of cattle is determined by food factor, in 35 % by breeding and in 6% by technology of dairy cattle breeding management (2005).

Thus agricultural producers faced problem of choice: to import necessary number of foreign high-yielding dairy

Holstein cattle or to realize breeding of Holstein among local black-and-white cattle.

MATERIALS AND METHODS

The investigations, represented in this article, are analytical. The material for the studies was livestock of foreign Holstein dairy cattle in Khankaysky agro-industrial complex "GreenAgro".

The assessment of housing conditions and feeding quality of cattle in above-noted farms was done. The quality of feed was evaluated with the help of organoleptic method. Organoleptic testing of feed contains determination of moisture, uniformity, structure, color, flavor of feed, concentration of mechanical impurities, mold and sigh of decomposition in feed. Feed samples for laboratory examination are regularly selected by the specialists of farms and sent to accredited laboratories. Quality control of feed was conducted according to the results of the laboratories' reports.

For health assessment of foreign cattle stock clinical examination was carried out, and also blood draw was done for morphological and biochemical examinations. During clinical examination state of skin cover, visible mucous membranes, constriction were identified, also thermometry was conducted and so on. Blood examination was done according to common methods.

Comparative analysis of obtained results of the investigations and zootechnical and economic indicators of Khankaysky agro-industrial complex "GreenAgro" was conducted.

RESULTS

Foreign dairy cattle were imported in the next agricultural enterprises of Primorsky Krai: "Milogradovskoe-1", "Victoria", "Rakovskoye" and Khankaysky agro-industrial complex "GreenAgro". Genealogical structure in the breeding farms of Primorky Krai is represented by 6 lines of black-and-white and Holstein black-and-white color type: Vis Ideal, Inka Supreme Reflection, Montivic Chieftain, Author, Reflection Sovereign, Siling Trijune Rocket.

Farms, which purchase such kind of cattle, face a number of problems:

- Acclimatization of animals to new housing conditions;
- Development complete fodder supply for high yielding dairy cows;
- Lack of qualified personnel.

In 2012 on the territory of Primorsky Krai a big agricultural enterprise Khankaysky agro-industrial complex "GreenAgro" was established. In August of 2012 due to public limited company "Rosagrolizing" Holstein cattle were imported from America at the rate of 899 animals. The second lot of 600 animals was imported from Germany. At the present time there are 3000 animals in the farm (complex). The farm covers all production system: forage conservation, its storage, milk processing in the city milk factory "Artemovskiy" (Artem city, Primorsky Krai), selling in retail store chain in various cities of Primorsky Krai.

Khankaysky agro-industrial complex are completely fit with equipment of "DeLaval" company. The complex was built on the base of an industrial lactorium Cascade 2*32, which falls into parallel type.

By 2017 "GrinAgro" has already had fifteen thousand hectares, where it cultivates its own fodder supply – grain and fodder crops, soybeans. In the complex "GrinAgro" basic diet for cattle consists of corn silage, ryegrass haylage, barley haylage, small amount of cracked and rolled grains (barley) are added in feed, sunflower seeds cake, soybean cake and rapeseed cake, vitamins and minerals. All ingredients are thoroughly measured out according to animal food diet depending on their groups. Dispensation of obtained mixture in the form of mono feed is conducted by mixer-wagon "Silaking".

Organoleptic testing of mono feed ingredients has shown that these ingredients meet the requirements to these types of feeds. Regular laboratory examinations of feeds let correct food rations. Such proper method to animal feeding helps high-yielding dairy cows realize their genetic potential. There are top performers among cows, which give about 12000 liters per year.

The production performance of the farm is represented in Table 1.

Comfortable cattle housing is provided in the complex. Characteristics of microclimate in livestock housing are investigated by us. They met the specified requirements. The exception was an increase of air humidity in the monsoon season in the second part of July. Dairy cows can move freely in the farm. There is feeding space, places for animals' rest with special mattresses, group and individual drinking-bowls and swigging brush in the complex. Manure removal is carried out by manure scraper systems.

Currently on the agricultural enterprise 78 % of animals consist of cows which were bred with help of artificial insemination. Artificial insemination of cows is conducted with retrocervical method. Heifers are inseminated when they gain 380 kg. The semen of American servicing bulls is used. After calves birth in the complex only female calves are kept.

One of the requirements to young breeder is equality of growth and physiological development of organism. For dairy cows it is better to reach precocity, because in that case they can early reach the period of practical use. Replacement heifers in the complex have such kind of precocity.

The level of heifers feeding during raising is indicated by body weight index of cows. It is found, that there is the connection between fatness of cows (body weight), reproduction index, milk yield and milk composition.

The ratio of milk yield per lactation to body weight (milkability index) is characterized by economic efficiency of milk production. The most yielding cows produce 1000 kg of raw milk per 100 kg of body weight. Milkability index of first calf-heifers was 1182 (in 2015 – 1221), of animal stock – 1141 (in 2015 – 1105). Average age of the first calver in "GrinAgro" was 737 days.

In order to start own business some big commercial dairy farms of PrimorskyKrai begin to import necessary Holstein cattle head. However, for their further development, they

need to conduct breeding by themselves. In the case of small farm enterprises, which have small number of cattle, it is more rational to conduct breeding connected with holsteinization of black-and-white and Simmental cattle.

At the present time there are 5 multiplication farms which using dairy cattle in Primorsky Krai: agricultural enterprise "Dalnevostochnoye", agricultural industrial complex "Krasnorechenskiy", farm "Milogradovskoe – 1", farm enterprise "Barhatnoe", Khankaysky agro-industrial complex «GreenAgro».

Among numerous environmental factors, which effect on individual animal development, the most important factors are an adhering to feeding schedule, the quality of feeds and comfortable animal housing. Poor feeding, bad conditions of housing and bad veterinary treatment make a negative effect on realization of the genetic potential of milk producing ability. Sick heifers obtain low potential of future milk producing ability. Slow developing heifers have later calving period, because of this the cost of cattle raising is increased. For raising of fast-growing, high producing cows with strong body composition, which can realize their immanent inherited potential and endure big physiological loadings connected with lactation, breeding and housing conditions, it needs that body weight of heifers at the moment of insemination is 390-430 kg. The earlier optimal body weight of heifers is gained, the earlier heifers are inseminated and put into operation.

The study of the production performance in the agricultural enterprises of Primorky Krai, which working with foreign cattle, has shown that realization of the genetic potential of cattle productivity in succeeding generations is possible in the case of using the semen of Holstein bulls and balanced feeding.

In order to determine the level of adaptation of imported cattle, we studied the blood indicators. The morphological indicators of blood are shown in Table 2.

The results of studies of cows` blood in classical methods (the number of erythrocytes, leukocytes, hemoglobin, ESR) coincide with the data of blood tests by a hematologizer. Analyzing the obtained data, we found out that of 17 blood samples, leukopenia in 1 case (5.9%); erythropenia in 5 cases (29.4%), hemoglobin deficiency also in 5 cases (29.4%), while it coincides with erythropenia in 4 (23.5%) samples, which corresponds to anemia. In two cases (11.8%), anemia is pronounced, coincided with a low content of red blood cells, and a low indicator of the amount of hemoglobin (3.5 samples). However, the low hemoglobin in erythrocyte (MCH) and the low concentration of hemoglobin (MCHC) in the presence of anemia in these samples are not noted, therefore, anemia is not iron deficient. The index of distribution of red blood cells by volume (RDW) in 13 cases (76.5%) below the norm limits in accordance with the norm of the averaged volume of erythrocytes speaks about normocytic anemia. It can also signal an early stage of iron deficiency, vitamin B12 or folic acid. It is possible in two animals (samples 3 and 5) hemoglobinopathy with anemia. Reduction of hematocrit was detected in 5 blood samples, while in samples 3 and 5 it coincides with signs of anemia (low level of erythrocytes and hemoglobin), which indicates a pronounced dehydration (possibly, toxicosis of animals). Thrombocytopenia was noted in 5 animals, and again in samples 3 and 5 the lowest platelet count.

Eosinophilia was noted in three cases (17.6%), with the highest indices in samples 3 and 9. The parameters of the erythrocyte sedimentation reaction in only three samples (17.6%) correspond to the norm limits. In 8 animals (47.1%) ROE was exceeded in 2-2.7 times, which indicates possible pathological processes in the body of an inflammatory nature. On the basis of the revealed changes in blood, it can be concluded that in the blood of two animals serious shifts begin, signaling serious pathological changes and, consequently, poor adaptation to environmental conditions. In other animals, in our opinion, the body begins to adapt to climatic and operational conditions.

Determination of the clinical status of the imported cows allowed to conclude that the morpho-physiological parameters of the animals are within the norm. Out of the 44 evaluated features, 40 scored points corresponding to good clinical status, therefore, only external signs of animal health state do not give a complete picture of the adaptation of cows to the conditions of Primorsky Krai.

Thus, only a comprehensive assessment of the health status of animals, including assessment of clinical status, hematological and biochemical blood tests, milk research, research of feeds, and longer studies of at least one year, will make it possible to conclude about the adaptation of cattle to the conditions of Primorsky Krai. These indicators are presented in Table 3.

The analysis of the obtained data of the carried out researches revealed the following. During the quarantine period of imported animals, biochemical studies of blood serum of 10% of the livestock (17 heads) showed that ketone bodies are absent. The total protein in 5 cows was below normal; 2 - slightly above the norm; the rest - within the limits of the norm. Alkaline reserve in all animals was below the norm, and in 5 cows this indicator was close to the lower limit of the norm (42.1-45.7 total %). The calcium content in 9 cows is slightly below the norm (2.2-2.4 mmol / l), in others - within the norm (2.5-2.8 mmol / l). The content of phosphorus in only two cows is below the norm (1.32-1.42 mmol / l), the rest - within the limits of normal. The content of sugar and magnesium in all animals under study is below normal. The carotene content of all animals tested was in accordance with the norm.

Biochemical studies of blood serum 10% of livestock (17 heads) of imported livestock 5 months after delivery showed that ketone bodies are also absent. The total protein is also 5 cows below the norm; one has a slightly higher norm; the rest - within the limits of the norm. Alkaline reserve in all animals is also below normal, and in three cows this indicator is the lowest (28.4-29.3%). The calcium content of all the animals studied was in accordance with the norm, and in only three cows it was equal to the lower limit of the norm. The content of phosphorus in all animals has become higher than normal, with 5 cows this rate is 2 times higher than normal, and 8 - 20% higher than the upper limit of the norm. The content

of calcium and magnesium rose to normal. The picture of sugar content changed - in 9 animals this indicator remained below the norm; in 7 - rose to normal, one cow - above the norm (4.4 mmol / l). The indices of carotene content in all animals studied correspond to the norm.

The creatinine content of 12 cows is higher than normal, and 5 is at the upper limit of the norm. Urea content in 10 animals is below normal; 1 - within the normal range; in 6 - significantly higher than the norm. The lack of ketone bodies in the blood serum and protein content within the limits of the norm, as well as an increase in the sugar content in comparison with the initial indices, in turn, indicates a balanced diet for the sugar-protein ratio.

Increased creatinine and urea, a decrease in alkaline reserve, an increase in phosphorus indicates a violation of kidney function. In addition, such a change in these indicators indicates a violation of intestinal digestion. M.A. Medvedev (2008) notes that creatinine is a non-threshold substance - it is secreted only by the glomerulus of nephrons and is not reabsorbed. Doubling the creatinine in the blood serum (which is noted in the animals under study) corresponds to a decrease in renal filtration by 50% and is characteristic of renal pathology. In addition, hyperphosphatemia is also observed in diseases of the kidneys, especially with tubular failure.

Reduction of alkaline reserve (reserve alkalinity) in the blood is below 40% of total CO2, which indicates a shift in the acid-base balance towards acidosis. Metabolic acidosis is noted with a high-concentration type of feeding cows, secondary osteodystrophy, disorders of the gastrointestinal tract and kidney function, inflammation.

The presence of inflammatory processes in the body of animals after 5 months after delivery is indicated by an increase in the rate of erythrocyte sedimentation, revealed in morphological studies of blood: only in three samples (17.6%) ESR corresponded to the norm limits, in 8 animals (47.1%), RoE exceeded in 2-2.7 times. In this case, leukocytosis is expressed only in one animal (5.9%), in others the number of leukocytes is within the limits of the norm (4,0-12,0x103 / ml), the values of the leukocyte formula are also within the limits of the norm. Assessment of the clinical state of animals did not reveal abnormalities characteristic of acute inflammatory processes - body temperature, pulse and respiration rate within physiological norms, shiny wool coat, good fatness, animals are mobile, eager to eat food, drink plenty. Consequently, biochemical parameters of blood serum speak of hidden chronic inflammatory processes in the kidneys. We associate this with a decrease in the resistance of the organism of the examined animals after delivery and in connection with the intensive milk yield, which increases in the service period. This also signals a stressful state of the body, i.e. about the crisis period in the process of adaptation (acclimatization). The organism of imported animals for the past 5 months has not yet adapted to the conditions of economic use of cows, and it does not appear outwardly.

DISCUSSION

In the opinion of R.M. Babaevskiy (1979) at the beginning of adaptation of animals to new conditions of existence there is a disruption of homeostasis at the level of exchange of information, energy and substance in a whole organism, which can not yet be attributed to certain organs or systems. Changes in individual organs and systems can already be expressed more strongly in this phase than in others, but they are not yet pathological in nature and can manifest themselves sporadically. In this phase, using appropriate methods of research, it is already possible to determine which pathological processes will prevail in the future. Our biochemical blood tests confirm this and allow us to make a conclusion about the further progression of kidney pathology (nephritis, pyelonephritis), as well as possible violation of intestinal digestion.

The second stage lasts two months, during which there is a metabolic adaptation to stress and the formation of immunity that meets the requirements of a specific area. In this period, there is an adaptation to a constant diet. At this stage, hypotension of the prednis is often recorded in deep-stannostate babies, the severity of which increases with the approach of calving and is the reason for the culling during the first two months after delivery. At the heart of this pathology is a violation of mineral nutrition and, first of all, an imbalance of calcium, magnesium and zinc.

The duration of the third stage, according to V.Yu. Sidorovaya, eight months, its end forms a stable metabolic profile of the body. The fourth stage allows to determine the usefulness of the correspondence between the expected dairy productivity and the existing conditions of maintenance and feeding. The full value of its formation determines the economic and biological efficiency when breeding and maintaining imported elite breeds of livestock. It is believed that the animal is well adapted, if it has not impaired the function of reproduction and high dairy productivity.

CONCLUSION

The analysis of dairy farming in Khankaysky agro-industrial complex “GreenAgro”, which is a big milk producer in Primorsky Krai, using imported Holstein cattle, lets formulate a number of conclusions for farm enterprises and other types of farms, which owners want to run dairying, can be recommended the following:

- Develop homegrown fodder supply for high-yielding cows;
- For cattle breeding use local breed of cattle and the semen of Holstein breeding servicing bulls in the purpose of getting offsprings with 50% chance of being pure blood;
- Use breeding, housing and exploitation technology of raised young cattle with 50 % of pure blood from Holstein breed.

Also, the analysis of biochemical indicators of blood imported Holstein cattle showed that acclimatization of animals to the conditions of cattle breeding Primorsky Krai – a long process. With the positive dynamics of adaptation to external clinical signs, biochemical blood indices can reveal internal pathological processes that arise as a result

of the stressful state of animals. Biochemical studies allow us to predict the pathology of the animal organism and make adjustments to the work of veterinarians.

ETHICS

The authors confirm there are no ethical issues involved.

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TABLES AND FIGURES

Table 1. Production performance of Khankaysky agro-industrial complex "GreenAgro"

Production performance	Value per year		
	2014	2015	2016
Produced unpasteurized milk per year, tons	7634	11732	13140
Number of cattle, total animals	2108	2365	2867
Average number of milking herd, number	1300	1400	1500
Amount of lactations	2,6		
Average milk yield of marketable milk per 1 milked cow, liter/cow	22,4	24,1	28,7
Production ability –milk yield for 1 forage-fed cow per year, litter	7318	7549	7712
Calf crop, %	80		
Fat content of milk, %	4,0-4,2		
Protein content of milk, %	3,4-3,45		

Table 2. Morphological indicators of blood of Holstein cows

Indicator, unit of measure	Sample No. 1	2	3	4	5	6	7	8	9
WBC, x103/ml	8,3	13,1	4,8	7,8	3,4	7,7	5,7	8,1	11,7
RBC, x106/ml	5,92	6,45	3,58	5,58	2,90	6,37	4,98	4,99	5,13
HGB, g/dl	87	96	51	91	48	99	90	86	76
HCT, %	26,3	28,7	14,9	27,1	14,5	29,4	27,0	25,5	22,5
MCV, fl	44,4	44,5	41,6	48,6	50,0	46,2	54,2	51,1	43,9
MCH, pg	14,7	14,9	14,2	16,3	16,6	15,5	18,1	17,2	14,8
MCHC, g/dl	331	334	342	336	331	337	333	337	338
PLT, x103/ml	254	346	31	229	32	271	128	294	402
RDW, %	15,3	17,5	15,5	15,2	15,2	16,6	16,0	15,4	15,1
PCT, %	0,09	0,13	0,01	0,08	0,01	0,12	0,07	0,11	0,14
MPV, fl	3,7	3,7	4,2	3,5	4,5	4,3	5,2	3,6	3,6

PDW, %	15,0	14,3	16,0	15,4	18,0	15,4	17,7	16,2	15,5
Leukocyte formula									
Lymphocytes %	60	52	60	68	59	66	70	66	54
Eosinophils %	10	6	21	10	9	7	9	8	18
Staphylococcus neutrophils %	2	0	0	0	2	0	0	1	2
Segmented neutrophils %	28	42	19	22	30	27	21	25	26
Monocytes %	0	0	0	0	0	0	0	0	0
Erythrocyte sedimentation reaction, mm/hr	3,2	4,9	5,2	3,8	1,8	2,9	4,3	5,0	4,3

Table 2. Morphological indicators of blood of Holstein cows (continuation)

Indicator, unit of measure	Sample No. 10	11	12	13	14	15	16	17	Indicators of the norm*
WBC, x103/ml	8,8	11,6	9,1	6,4	7,2	9,6	7,4	7,3	4,0-12,0
RBC, x106/ml	5,52	5,47	6,53	4,94	4,53	5,29	5,31	5,47	5,0-10,0
HGB, g/dl	82	90	90	76	65	81	86	78	80-120
HCT, %	24,3	26,4	26,9	22,6	19,0	23,9	25,3	23,0	24-46
MCV, fl	44,0	48,3	41,2	45,7	41,9	45,2	47,6	42,0	37-51
MCH, pg	14,9	16,5	13,8	15,4	14,3	15,3	16,2	14,3	13-18
MCHC, g/dl	337	341	335	336	342	339	340	339	330-370
PLT, x103/ml	297	337	290	335	186	192	356	278	200-730
RDW, %	14,7	14,8	14,7	15,5	15,1	14,9	15,8	13,8	16-24
PCT, %	0,11	0,13	0,11	0,11	0,06	0,08	0,12	0,10	
MPV, fl	3,7	4,0	3,8	3,4	3,4	4,3	3,4	3,6	4,5-6,7
PDW, %	16,2	15,8	15,0	15,4	16,7	16,6	15,4	14,9	
Leukocyte formula									
Lymphocytes %	59	53	54	69	62	64	60	61	47-67
Eosinophils %	14	11	9	8	7	8	11	11	4,0-10,5
Staphylococcus neutrophils %	0	3	2	0	0	0	0	0	2-6
Segmented neutrophils %	27	33	35	23	31	28	29	28	14-42
Monocytes %	0	0	0	0	0	0	0	0	3,0-8,5
Erythrocyte sedimentation reaction, mm/hr	3,3	4,1	5,4	3,2	1,6	3,0	1,7	4,5	0,5-2,0

Note: * Haematological indicators of the blood`s norm of cattle in the study on a haematolyzer are given according to D. Meier and J. Harvey (2007) and Yu.G. Vasilyev et al. (2015) [1,2,3].

Table 3. Biochemical indicators of blood of imported cattle

№	Biochemical indicators of blood	Time of taking blood during the quarantine period	5 months after delivery	Indicators of the norm
1.	Ketone bodies	neg.	neg.	neg.
2.	Total protein, g /L	76,45±3,80*	76,09±1,45*	72-86
3.	Alkaline reserve, total% CO2	41,5±0,89*	37,99±1,44*	46-66
4.	Calcium, mmol / L	2,42±0,08*	2,69±0,03*	2,5-3,13
5.	Phosphorus, mmol / L	1,70±0,11**	3,03±0,15*	1,45-1,94
6.	Sugar, mmol / L	1,66±0,12*	2,07±0,23	2,2-3,3
7.	Magnesium, mmol / L	0,76±0,02*	0,90±0,01*	0,82-1,23
8.	Carotene, mg /%	1,14±0,08*	1,87±0,01*	0,9-2,8
9.	Creatinine, мкмоль	Not investigated	68,79±3,45**	39,6-57,2
10.	Carbamide, mmol / L	Not investigated	6,26±1,39*	3,3-6,7

Note: confidence level* - p<0,001;** - p<0,05.