conducted: Potassium, Sodium, Magnesium, Calcium, and anions: chlorides, sulfates, phosphates, nitrates by capillary electrophoresis according to working instructions, based on the methods the company of "Lumex".

To prepare the control solution of cations and anions standard samples of the company "ICN", USA were used.

Using 500 mg/dm^3 Iodine Potassium content in dry matter of *Lemna Minor* prevailed control data at 0.47 % ($p<0.05$). Increasing Iodine content in nutrient environment to 1000 mg/dm^3 conduced to accumulation of Potassium in the biomass of algae. The content of the element was higher than in control on 1.04 %. The difference had reliable nature.

Adding to the nutrient environment 260–500 mg/dm^3 of Iodine led to a tendency to reduce Sodium content in the biomass of *Lemna Minor*. The use of high doses of Iodine – 1000 mg/dm^3 accompanied by a reliable decrease in the concentration of Sodium in the algae biomass. The difference from the control was 0.1 %.

Increasing Iodine content in the nutrient environment from 260 to 1000 mg/dm^3 led to a decrease in Magnesium content in biomass *LemnaMinor* on 0,2 % ($p<0.01$) – 0.22 % ($p<0.001$).

It was found that doses of Iodine 260 and 380 mg/dm^3 most stimulated Calcium accumulation in biomass of *Lemna Minor*. The concentration of element was higher compared to control, respectively, 1.24 and 1.36 % ($p<0.01$).

In biomass from control variant Chloride content was at 1.12 %. This indicator was not detected of Iodine exposure in dose of 40 mg/dm^3. Regularity was established: with increasing Iodine content in the nutrient environment chlorides content in the biomass of *Lemna Minor* reduced. Using nutrient environments containing Iodine 380, 500 and 1000 mg/dm^3 in algae biomass chloride content decreased, respectively, on 0.19 % ($p<0.01$), 0.47 ($p<0.001$) та 0.69 % ($p<0.001$).

It was proved that with increasing Iodine content in nutrient environment concentration of nitrates in biomass of *Lemna Minor* reduced. Using Iodine in the doses of 40, 260, 380 and 500 mg/dm^3 it is tendency to reduce nitrate levels. Using Iodine in the doses of 1000 mg/dm^3 nitrate content in algae biomass decreased on 0.03 % ($p<0.05$).

The use of 260 mg/dm^3 of Iodine in the nutrient environment resulted in increase of phosphates in biomass of *LemnaMinor* on 0.03 %. At high doses of Iodine – 380, 500 and 1000 mg/dm^3 concentration of phosphates in algae biomass increased in 7,0 and 9, 25 times.

The most stimulating dose of Iodine that resulted sulfates accumulation in *Lemma Minor* biomass was 40 mg/dm^3. In this variant sulfates concentration was higher than in control on 0.83 % ($p<0.001$).

Key words: biomass of alga *LemnaMinor*, nutrient environment, Potassium, Sodium, Magnesium, Calcium, chlorides, sulfates, phosphates, nitrates.

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TRANSAMINASES PERFORMANCE IN BLOOD PLASMA AND LIVER OF RABBITS

У результаті проведених досліджень кролів новозеландської, каліфорнійської, радянської шиншили, сріблястої порід встановлено, що найвища активність АсАТ була у плазмі крові кролів породи радянська шиншила – 0,98 мкмоль/год×см^3. Найвища активність АлАТ проявлялась у плазмі крові кролів новозеландської породи. Динаміка активності АлАТ в печінці кролів різних порід, так само як і в плазмі, була найвищою у кролів новозеландської породи 90-добового віку. Зміни активності трансаміназ пов'язані зі структурно-функціональними змінами у клітинах печінки.

Для характеристики стану організму тварин має велике значення вміст загального білка. Найвищий показник був у плазмі крові кролів сріблястої породи і становив 89,7 г/дм^3, в новозеландської – 81,8 г/дм^3, у кролів радянської шиншили – 77,8 г/дм^3, у каліфорнійської – 68,6 г/дм^3, що було найнижче порівняно з кролями інших порід.

Ключові слова: кролі, трансамінази, плазма крові, печінка, аспартатамінотрансфераза, аланінамінотрансфераза, коефіцієнт де Рітіса, загальний білок.

Formulation of the problem. All amino acids, except lysine and threonine, are exposed to aminotransferases action. The main role of aminotransferases in animal body is to participate in the interim amino acids converting, the basic plastic material for the proteins biosynthesis [1]. The most important are two of them – aspartate aminotransferase and alanine aminotransferase. These enzymes carry amino groups from aspartic acid (AST) and alanine (ALT) to α-ketoglutaric acid. They are localized in the cell hyaloplasm and mitochondria. So with little tissue damage their performance in blood increases. Change in serum transaminases performance indicates mostly the damage to hepatocytes and erythrocytes [2]. Abnormal liver function may remain unnoticed for a long time. Damage signs often appear in the later stages of the destructive process, which hampers the aid delivery and reduces its efficiency [5].

The liver role in the body is extremely important. Liver is the central organ that provides protein synthesis [6]. Proteins occupy very important and special place in the metabolism. They are a major component of living matter and the material basis of the organism life processes [3]. Intensive mutual conversion of blood proteins and tissue proteins takes place in animal body. This leads to establishing a relative equilibrium between the number of plasma proteins and protein in tissues. The violation of protein synthesis changes the total protein content of blood plasma [7]. Exchange of proteins in the rabbit body is in close relationship with the growth intensity, productive qualities and is controlled by hormonal and substrate regulatory mechanisms, it is being changed with animal age and depends on genetic factors.

Analysis of recent research and publications. Determination of liver transaminases performance – is one of the most accurate laboratory tests that are used to determine the liver condition. Given the fact that the AST and ALT enzymes performance is the indicator of various changes in the internal organs, their interpretation must be seen in combined aspect when studying a clearly defined organ, especially when there are distinct clinical characteristics. Thus, high ALT performance is detected in liver cells, lower – in the kidney, pancreas, heart and skeletal muscles, and AST performance – in skeletal muscle, heart, and virtually in all parenchymal organs – liver, kidneys, lungs and brain , pancreas, and erythrocytes [5].

The literature highlights the research issues on protein metabolism enzyme performance and protein in White Giant rabbits breed [3], but little was studied on indicators of ALT, AST and total protein content in blood plasma and liver tissues of different rabbit breeds: New Zealand, California, Soviet Chinchilla, Silver.

The research aim – was to study the ALT and AST performance, the de Ritis ratio, the total protein content in blood plasma and liver tissues of rabbit breeds: New Zealand, California, Soviet Chinchilla, Silver.

Material and methods. The study was conducted on the rabbit breeds: New Zealand, California, Soviet Chinchilla, Silver, which were raised in the rabbit farm "Hrehut" Ltd. (in Fastiv district of Kyiv region). There were formed 90 days old groups of different breeds animals. All rabbits were clinically healthy. During the experiment rabbits had free access to water and food. The animal diet was complete and the same type. The blood samples and liver tissue of rabbits were taken before the study. The blood was added with anticoagulant (heparin) and blood plasma was separated by centrifugation (3000 rev./min. for 10 min.). The ALT, AST performance was measured in blood plasma and liver tissues of rabbits by Raytman-Frenkel method, using standard "Felisit" diagnostic sets of reagents. The de Ritis ratio and total protein content in blood plasma and liver tissues of different rabbit breeds was also determined. The study was conducted by conventional methods. The obtained research results are processed by variation statistics methods, using Student t-test [4].

Research results and discussion. The research showed that the highest AST performance was in plasma of Soviet Chinchilla breed rabbits – 0.98 mkmol/h×cm^3 (Fig. 1). The AST performance in Silver breed rabbits was by 2.83 % different as compared with the 90 days old New Zealand breed rabbits.

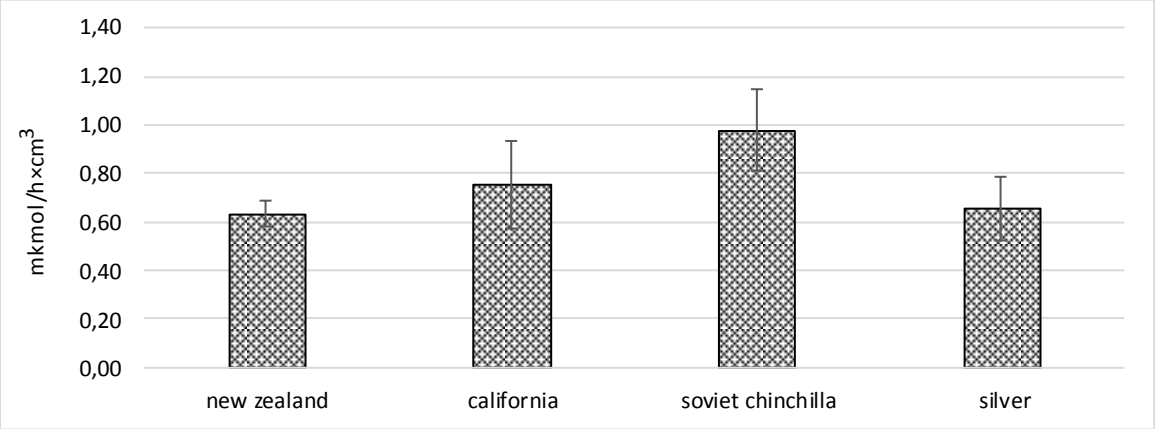

Fig. 1. **The AST performance in plasma of different rabbit breeds** (M±m, n=5).

The AST performance in plasma of New Zealand breed rabbits was the lowest as compared to other animal breeds.

During the study of the ALT performance in plasma of New Zealand Californian, Soviet Chinchilla and Silver rabbit breeds it was found that the highest rate was in the New Zealand breed animals (Fig. 2).

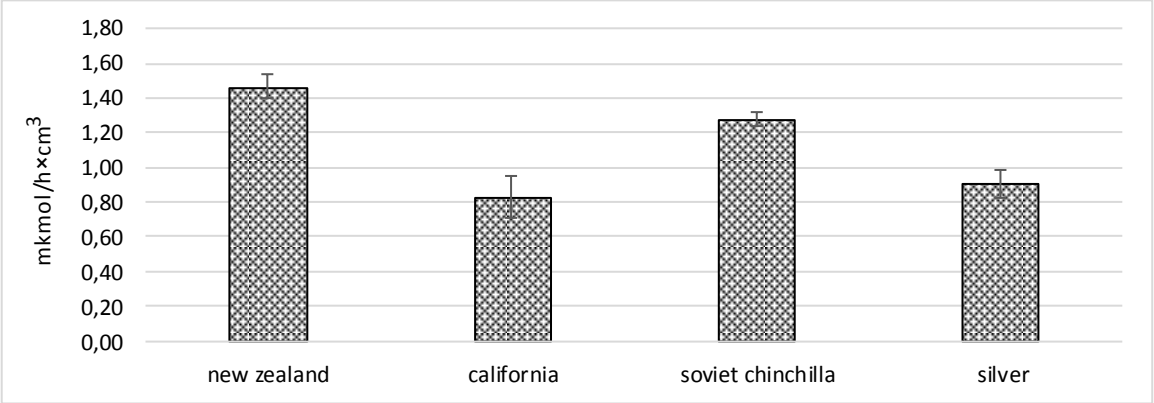

Fig. 2. **The ALT performance in plasma of different rabbit breeds** (M ± m, n = 5).

California breed rabbits ($p<0.01$), Soviet Chinchilla breed rabbits ($p<0.01$), Silver breed rabbits ($p<0.001$) showed lower performance as compared to the New Zealand breed rabbits.

The de Ritis ratio indicates the AST and ALT enzymes performance ratio (Fig. 3). It has a very bright reflection of animal health, indicating the cell integrity of tissue substrates in the body [8, 9, 11].

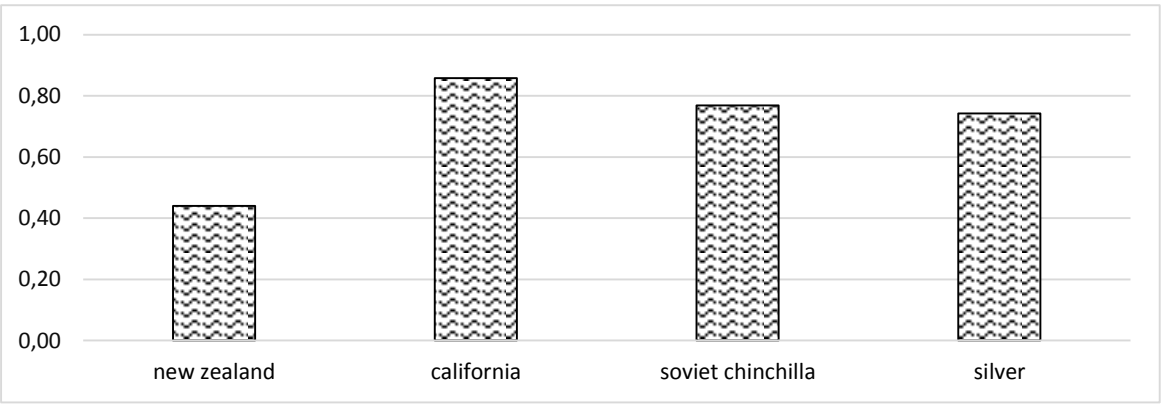

Fig. 3. **The de Ritis ratio in plasma of rabbits** (AST/ALT).

The biggest de Ritis ratio was in plasma of 90 days old California breed rabbits. The most low value, when compared with California, Soviet Chinchilla, Silver rabbit breeds, was in New Zealand rabbits breed.

In liver of New Zealand breed rabbits the AST performance was lower by 18.7 % as compared with California, by 16.8 % – with the Soviet Chinchilla and by 20.5 % – with Silver ones (Fig. 4).

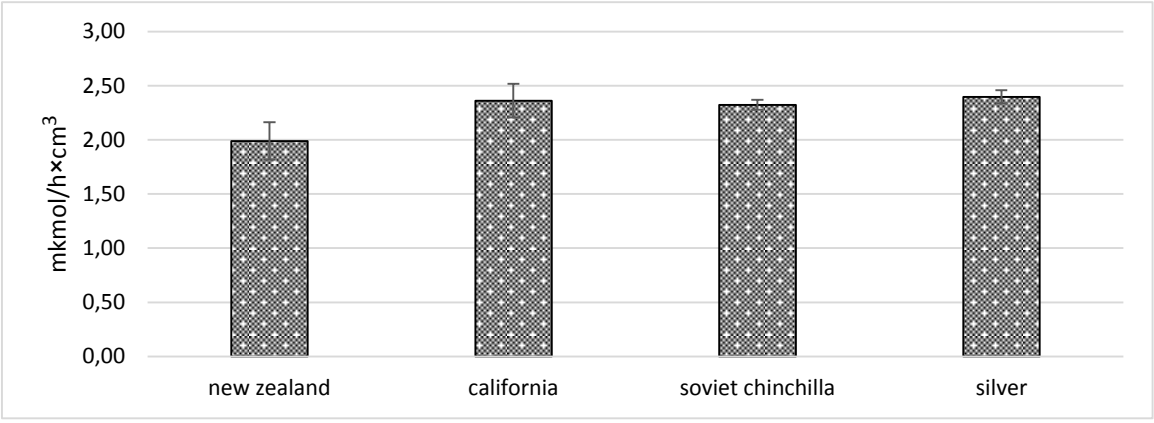

Fig. 4. **The AST performance in the liver of different rabbit breeds** (M±m, n=5).

Transferases are quite sensitive and informative indicators of liver damage. When determining the dynamics of ALT performance in the liver of various rabbit breeds, there was registered that the New Zealand animals breed figure had the highest value. The ALT performance in the liver of New Zealand rabbits breed was by 11.4 % higher as compared with California rabbits breed, by 8.3 % – with Soviet Chinchilla and by 3.8 % – with Silver one (Fig. 5).

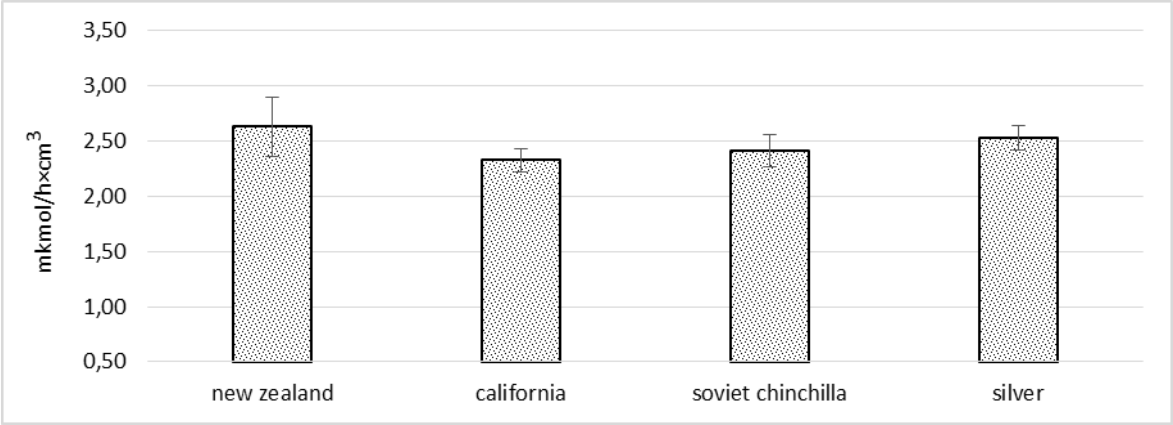

Fig. 5. **The ALT performance in the liver of different rabbit breeds** (M±m, n=5).

The highest de Ritis ratio (Fig. 6) was in liver tissue of California breed rabbits.

The AST and ALT enzymes performance ratio was the lowest in New Zealand rabbits breed.

The proteins decomposition produces amino acids, which then, under the different enzymes performance are exposed to transform to the end products of nitrogen metabolism – ammonia, carbon dioxide and water, with release of energy. [10] Therefore, the total protein content is of great importance to characterize the state of animal body (Fig. 7).

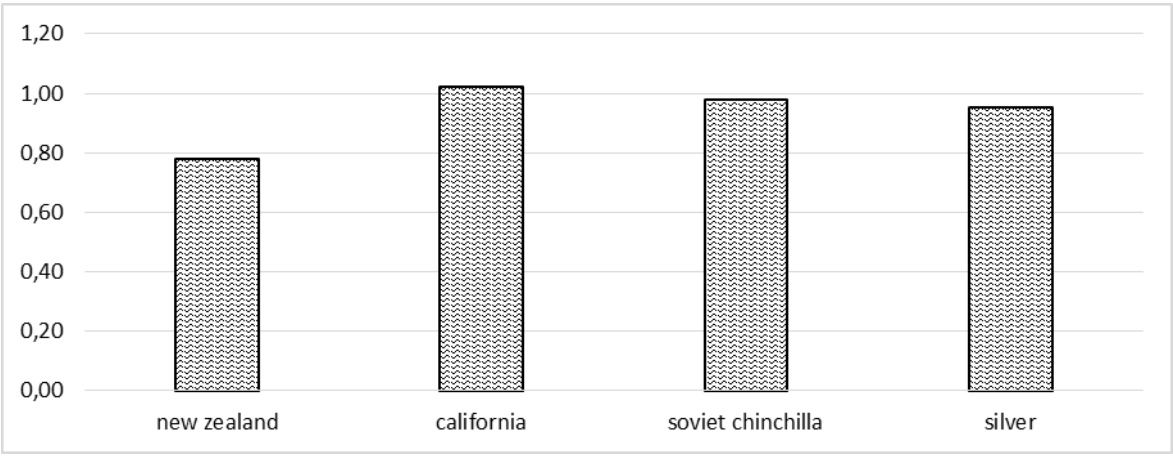

Fig. 6. **The de Ritis ratio in liver tissue of rabbits** (AST/ALT).

Indicators of total protein in the blood plasma of various rabbit breeds were characterized by a certain ambiguity. The highest rate was in Silver rabbits breed and constituted 89.7 g/dm^3, which was by 9.7 % higher, as compared with the New Zealand breed. The California rabbits breed total protein content in blood plasma was recorded at 68.6 g/dm^3, which was lower by 16 %, as compared with the New Zealand breed. This figure was the lowest, when compared with other rabbit breeds.

Such changes of total protein in blood plasma may be due to the breed peculiarities of rabbits.

Protein metabolism is the integrating element of all body systems. Our research results showed that the total protein content in liver tissue of New Zealand breed rabbits was higher by 11 % as compared with California, by 4.2 % – with Silver and by 1.5 % – with Soviet Chinchilla ones (Fig. 8).

Thus changes at the biochemical level in blood plasma and liver tissue in rabbits of various breeds are characterized by physiological specificity of each particular breed.

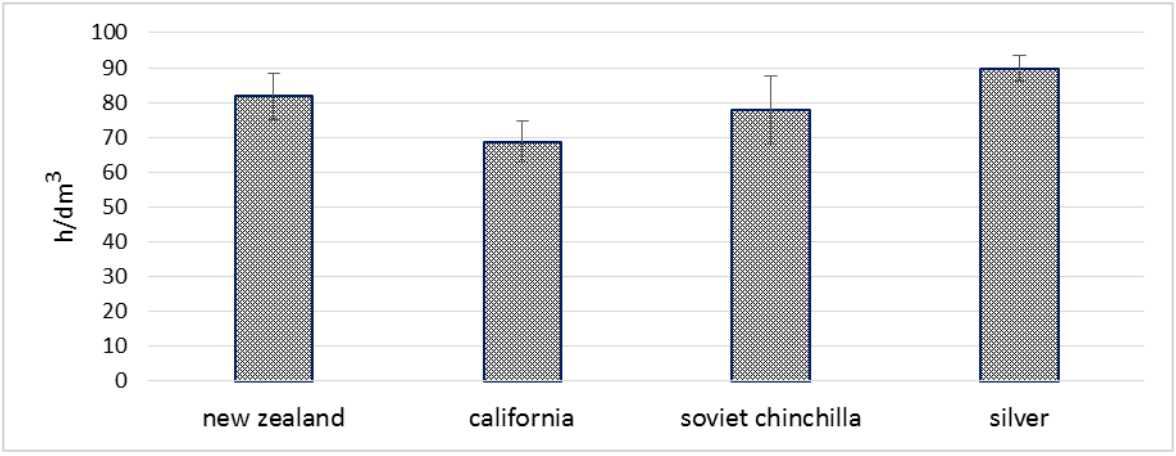

Fig. 7. **The total protein content in blood plasma of rabbits** (M±m, n=5).

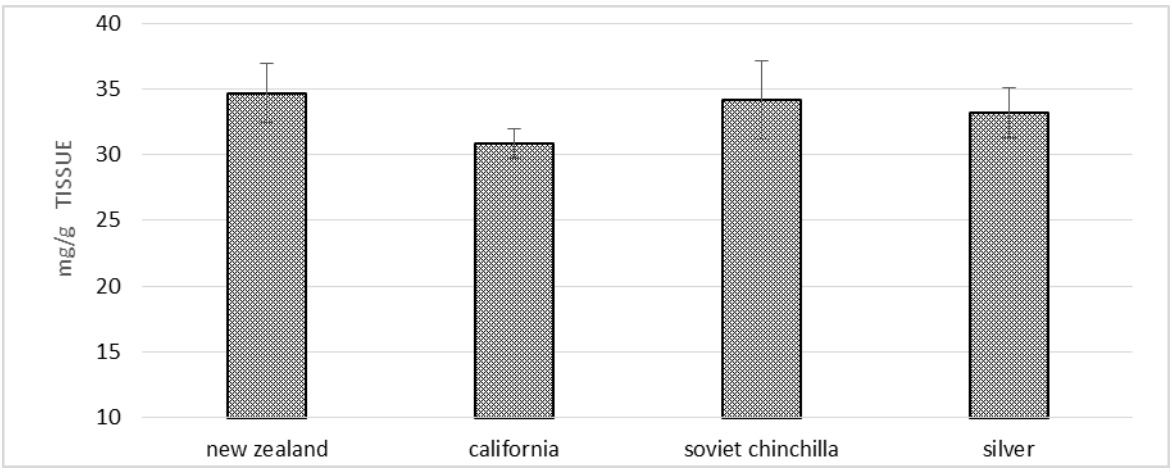

Fig. 8. **The total protein content in liver tissue of rabbits** (M±m, n=5).

Conclusions and recommendations for further research. 1. The AST performance in blood plasma was higher in 90 days old Soviet Chinchilla rabbits and ALT performance – in New Zealand rabbits breed.

2. The highest total protein content was in the blood plasma of Silver rabbits breed, and in liver tissue – in rabbits of New Zealand breed. These changes may be related to breed characteristics, as these breeds belong to different directions of productivity. New Zealand and California rabbits belong to breeds of meat productivity and Soviet Chinchilla and Silver – to meat-skin ones. Therefore we can assume, that these indicators changes testify the heterogeneity of amino transfer biochemical processes in rabbit body tissues cells.

It is advisable to carry out more advanced studies of other organs and systems of different rabbit breeds in age comparative aspect.

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Активность трансаминаз в плазме крови и печени кроликов

М. Н. Федорченко

В результате проведенных исследований на кроликах новозеландской, калифорнийской, советской шиншиллы, серебристой пород установлено, что самая высокая активность АсАТ была в плазме крови кроликов породы советская шиншилла – 0,98 мкмоль/ч×см^3. Самая высокая активность АлАТ проявлялась в плазме крови кроликов новозеландской породы. Динамика активности АлАТ в печени кроликов различных пород, так же как и в плазме, была самой высокой у кроликов новозеландской породы 90-суточного возраста. Изменения активности трансаминаз связаны со структурно-функциональными изменениями в клетках печени.

Для характеристики состояния организма животных имеет большое значение содержание общего белка. Самый высокий показатель был в плазме крови кроликов серебристой породы и составил 89,7 г/дм^3, в новозеландской – 81,8 г/дм^3, у кроликов советской шиншиллы – 77,8 г/дм^3, у калифорнийской – 68,6 г/дм^3, что было самое низкое по сравнению с кроликами других пород.

Ключевые слова: кролики, трансаминазы, плазма крови, печень, аспартатаминотрансфераза, аланинаминотрансфераза, коэффициент де Ритиса, общий белок.

Transaminases performance in blood plasma and liver of rabbits

M. Fedorchenko

The conducted research on rabbits of New Zealand, California, Soviet Chinchilla and Silver breeds showed that the highest AST performance was in plasma of Soviet Chinchilla rabbits breed – 0.98 mkmol/h×cm^3. The highest ALT performance was manifested in plasma of New Zealand rabbits breed. Dynamics of ALT performance in the liver of rabbits of different breeds as well as in plasma was the highest in 90 days old New Zealand rabbits breed. Changes in the transaminases performance are associated with structural and functional changes in the liver cells.

Total protein content is important to characterize the condition of animal body. The highest rate was in the blood plasma of Silver breed rabbits and constituted 89.7 g/dm^3, in New Zealand breed – 81.8 g/dm^3, in Soviet Chinchilla rabbits – 77.8 g/dm^3, in California breed – 68.6 g/dm^3, which was the lowest as compared to other rabbit breeds.

Key words: rabbits, transaminases, blood plasma, liver, aspartate aminotransferase, alanine aminotransferase, the de Ritis ratio, total protein.

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