

Age-Related Changes in the Blood Digestive Enzyme Amylase in Pheasants (*Phasianus Versicolor*) In Ontogenesis

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Abstract:

The work presents age-related data on changes in the digestive enzymes of the blood in pheasants in ontogeny. The research is devoted to the artificial breeding of one of the subspecies of pheasants of our wild fauna (the emerald pheasant - *Phasianus versicolor*). The aim of the work was to determine the digestive enzyme amylase content in the blood plasma of pheasants in post-embryogenesis in comparison with the indicators in the chicks of the original line when using a complex of vitamins and anti-stress drugs. As a result of experimental studies, a change in the blood plasma digestive enzyme amylase of pheasants from the moment of hatching and up to 2 months of age was revealed, with the complex use of vitamins (A-20000 IU, D3 -1250 IU, E-50 mg), as well as anti-stress preparations of succinic acid at a dose of 0.02 g, 0.03 g, 0.05 g per 1 kg of body weight per day. The determination of activity of the digestive enzyme amylase of the blood was carried out spectrophotometrically according to the method of Karavea, Spectrophotometer Specol 1500 (Analytik Jena), at a wavelength of 690 nm. Amylase activity indices in 1, 5, 10, 20, 30, and 60-day-old pheasants correspond to 517.8 ± 12.3 , 402.5 ± 9.6 , 273.1 ± 10.5 , 161.6 ± 12.8 , 254.5 ± 23.4 , 210.7 ± 14.3 U/l. It was found that the activity of the enzyme in 1-day-old pheasants significantly exceeds the activity of amylase in 5, 10, 20, 30 and 60-day-old pheasants by 1.3, 1.9, 3.2, 2.0, 2.5 times, respectively.

Keywords: phasianus versicolor; spectrophotometer; digestive enzyme amylase; blood plasma

Introduction:

Biochemical blood tests make it possible to monitor the functional state of the body, the functioning of the liver, kidneys, pancreas and other organs, as well as control the processes of protein, carbohydrate, fat and mineral metabolism. According to the literature data, the authors for the first time performed a study of the activity of digestive enzymes in the blood plasma of birds, and simultaneously all the main enzymes: amylase, lipase and trypsin, which made it possible to establish a correlation between them in the blood and duodenal contents. It is noted that there is a multilateral relationship between the digestive system and metabolism, which is provided due to the transport and regulatory functions of blood. It is expressed not only in the fine coordination of digestive activity and metabolism due to nervous and hormonal regulation, but also in the presence of special functions of the gastrointestinal tract that contribute to the flow of chemical processes in tissues. The link between the digestive system and tissues is blood, which performs a diverse role in the body, which is closely related to the secretory and enzymatic function of the digestive tract. The presented experimental data confirm the scientific hypothesis about the circulation of digestive enzymes and their presence in blood plasma. The literature contains data on the age-related dynamics of pancreatic enzymes in the pancreatic tissue and blood plasma in broiler

chickens, which are the basis for physiological and biochemical monitoring of the health status and nutrition of poultry. It is known that changes in blood biochemical parameters occur in chickens with age, however, research data on this issue are few and contradictory, and in a comparative aspect between the initial lines of meat chickens and hybrids, they are practically absent. Assessment of physiological indicators, one of which is blood biochemistry, is an important component of breeding work in the creation of new breeds and their successful introduction to the market. At the same time, the determination of the physiological status makes it possible to carry out diagnostics and morpho-biochemical blood tests in poultry under stressful and pathological conditions [1–8].

Thanks to the transport and regulatory functions of the blood, a multilateral connection is provided between the digestive system and metabolism. It is expressed not only in the fine coordination of digestive activity, but also in the presence of special functions of the gastrointestinal tract, which contribute to the implementation of chemical processes in tissues. These experimental data confirm the scientific hypothesis about the circulation of digestive enzymes and their presence in blood plasma [9, 10].

The biochemical parameters of the blood of birds are distinguished by constancy with the stability of the composition of the internal system of the body, which are important in determining the state of health of birds and which change with age.

Literature sources provide insignificant data on biochemical parameters and activity of blood digestive enzymes in chickens in ontogeny. The authors noted that the activity of amylase decreased by 100, 52 and 50 times [11, 12].

To solve the problem of stress, it is necessary to develop and introduce therapeutic and prophylactic agents that have an adaptogenic effect and meet the requirements of safety and efficiency, which allow maintaining the productivity and quality of the products obtained under extreme conditions. To reduce the negative load of cultivation and maintenance technologies, it is necessary to use stress correctors or adaptogens. Adaptogens can be substances of natural, modified or synthetic origin, which, under the negative effects of external factors, are able to regulate the mechanisms of homeostasis, reducing the harmful effects on the body, while they should not accumulate in organs and tissues, thereby reducing product quality. The use of adaptogens allows you to use the energy potential of the body and improve the general condition, due to the effect on metabolism, and their use partially prevents disorders caused by extreme [13].

The activity of the digestive enzymes in blood serum was studied in chicken using modern biochemical methods. The enzymatic activities in serum were found to be associated with the respective activities in the intestine. Trypsin was found to be the most volatile digestive enzyme since its activity changes substantially in 1 hour after the feed ingestion. Authors proposed an index of serum activities of the digestive enzymes (as a ratio of summary amylase and lipase activities to trypsin activity) for the characterization of physiological condition and health of the digestive system in animals and poultry [14, 15].

Based on the foregoing and data from the literature, the purpose of this study was to identify the effect of vitamins and anti-stress drugs on the activity of digestive enzymes in the blood of emerald pheasants

Research Results:

The determination of activity of the blood enzymes was carried out spectrophotometrically according to the method of Karavea, Spectrophotometer Specol 1500 (Analitik Jena), at a wavelength of 630-690 nm [16].

Blood samples were also collected by puncture with the addition of heparin as an anticoagulant. The activity of α -amylase was judged by the decrease in color intensity measured on a spectrophotometer. The optimum pH for enzyme activity was in the range of 6.5–7.5 [17].

Live weight and safety of birds were taken into account. Blood samples were taken from the cubital vein of the wing (vena cutanea ulnaris superficialis) in 35 pheasants, whose age corresponded to 1, 5, 10, 20, 30, 60 days. 0.5 ml of whole blood was taken from each bird and placed in blood collection tubes containing a heparin solution.

0.5 ml of blood plasma was placed in a graduated glass tube, 0.5 ml of a substrate-buffer solution was added, placed in a test tube, and heated for 5 minutes at 37°C. Next, 0.1 ml of the studied blood serum was added and incubated for 5 minutes at 37°C.

Immediately after incubation, 4 ml of hydrochloric acid working solution and 0.3 ml of iodine working solution were added.

Spectrophotometry was performed in a cuvette 10 mm thick at a wavelength of 630-690 nm against distilled water.

The control sample was placed in the same way as the experimental one, but the blood serum was added after incubation with 0.01 N iodine solution. Spectrophotometry was carried out under the same conditions as the test sample against distilled water.

Measurements of the optical density of the samples were carried out on a Specol 1500 spectrophotometer (Analitik Jena) at a wavelength of 690 nm. Quantitative data on the determination of activity of blood enzymes are given in table 1.

Amylase activity in blood plasma, U/l		Live weight, g.	
control	experience	control	experience
1-day allowance			
415,3 ± 10.1	517,8 ± 12.3	21,5±0,15	21.93
5-day allowance			
302,6±8.5	402,5±9.6	24,1±0,40	25.62
10-day allowance			
163,4±8.3	273,1±10.5	39,5±0,65	41.93
20-day allowance			
61,6±6.2	161,6±12.8	85,2±1,44	86.60
30-day allowance			
134,5±3.5	254,5±23.4	143,0±2,60	153.15
6-day allowance			
109,7±6.5	210,7±14.3	377,1±12,60	378.60

Table 1: The activity of the digestive enzyme amylase in blood plasma in pheasants depending on age ($M \pm m$). So, in the control groups of pheasants, which lacked vitamins and succinic acid in the diet, the activity of the digestive blood enzyme amylase was significantly lower compared to the experimental groups.

It follows from the data in the table that the indicators of enzyme activity in 1-day-old experimental groups of pheasants significantly exceed the data on amylase activity in 5, 10, 20, 30, and 60-day-old pheasants. Amylase activity in 20-day-old pheasants is 3.21 times lower than in 1-day-old ones.

However, there is a slight increase in the activity of amylase by 1.58 times compared with the 20-day indicators of the activity of the digestive enzyme in the blood of pheasants. Subsequently, by the age of 60 days, a decrease in the activity of the digestive enzyme by 1.2 times is again observed.

As a result of experimental studies, a change in the digestive enzyme

amylase of the blood plasma protein of pheasants from the moment of hatching and up to 2 months of age was revealed, with the complex use of vitamins (A-20000 IU, D3 -1250 IU, E-50 mg), as well as anti-stress preparations of succinic acid at a dose of 0.05 g per 1 kg of body weight per day.

As a result of experimental studies, a change in the digestive enzyme amylase of the blood plasma protein of pheasants from the moment of hatching to 2 months of age was revealed with the complex use of vitamins (A-20000 IU, D3 - 1250 IU, E - 50 mg), as well as anti-stress preparations of succinic acid in dose of 0.05 g per 1 kg of body weight per day (figure.1).

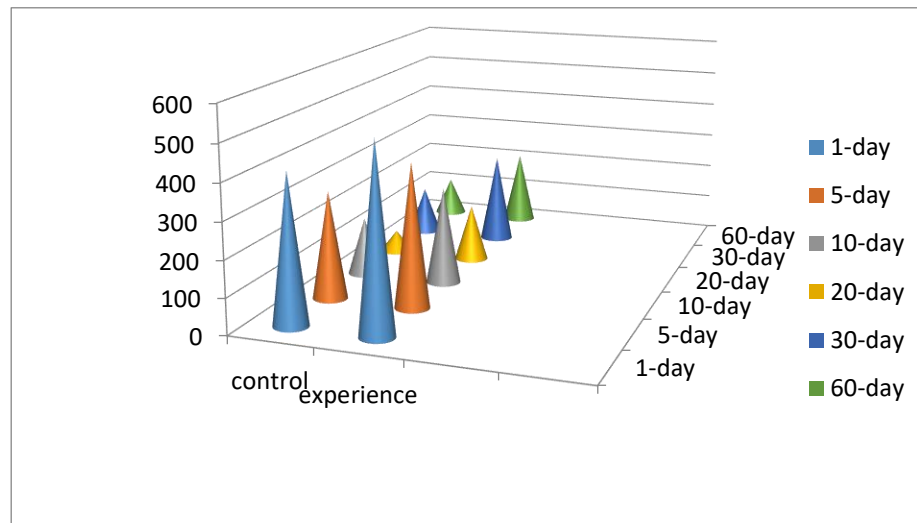


Figure 1: Kinetics of changes in the digestive enzyme amylase in the blood plasma of pheasants with the complex use of vitamins and the anti-stress preparation of succinic acid at a dose of 0.05 g per 1 kg of body weight per day

Probably, the relative decrease in the activity of the digestive enzyme amylase in the blood plasma with age indicates a decrease in the intensity of metabolic processes in the body and indicates, in all likelihood, that enzymes, especially amylase, perform the regulatory functions of the body. The indicator of activity of the enzyme amylase relative to the live weight of pheasants decreases by 1.3, 1.9, 3.2, 2.0, 2.5 times, respectively.

Conclusions:

- It was experimentally revealed that the activity of amylase in 20-day-old pheasants is 3.21 times lower compared to the activity of amylase in 1-day-old chickens.
- It was revealed that the enzyme activity of 1-day-old pheasants significantly exceeds the amylase activity in 5, 10, 20, 30 and 60-day-old pheasants by 1.3, 1.9, 3.2, 2.0, 2.5 times, respectively.

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