

Dynamics of Changes in the Activity of the Lipase Enzyme in the Blood of Emerald Pheasants (*Phasianus versicolor*) with the Complex Use of Vitamins and an Anti-Stress Drug

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Abstract

This paper presents the results of a study of the kinetics of changes in the activity of the lipase enzyme in the blood of pheasants with the complex use of vitamins and an anti-stress drug. Experiments on the study of biochemical parameters of blood were carried out on pheasants for 30 days. A complex of vitamins (A-20000 IU, D3 - 1250 IU, E - 50 mg) and an anti-stress drug (succinic acid) at a dose of 0.01, 0.03, 0.05 g per 1 kg of body weight per day were added to the diet of the experimental groups of birds. The activity of lipase in the blood serum of pheasants was carried out on a Specol 1500 spectrophotometer (Analytik Jena) according to the method of R Rej., M Hoder, U.H Bergmeyer at a wavelength of 540 nm. At the same time, the value of activity in the blood of pheasants tended to increase with the complex inclusion of vitamins and an anti-stress drug in the diet. As a result of experimental studies, it was found that lipase activity in the experimental groups of birds tended to increase on days 1, 3, 5, 7, 10, 15, 18, 20, 25, 30 at 1.06, 1.23, 1.27, 1.26, 1.22, 1.25, 1.34, 1.20, 1.74, 1.38 times, respectively, compared with the lipase activity in the control groups of pheasants. It was experimentally revealed that the activity of lipase in the blood of pheasants reached a maximum value of 38.3 ± 4.8 U/l by 30 days with the complex introduction of vitamins and an anti-stress drug into the diet.

Keywords: Lipase; Blood; Emerald Pheasant; *Phasianus versicolor*; Vitamins; Anti-Stress Drug

Introduction

The introduction of environmentally friendly and safe products makes it necessary to reconsider the bird feeding system. For this reason, in recent years, the issue of the use of new feed products in their feeding, including preparations with biologically active elements, has been considered more important. A balanced intestinal microflora, and thus a healthy digestive tract, is the key to low cost and environmentally friendly poultry farming.

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 [1].

The experiment was carried out on 476 chickens divided into 4 groups, each in seven replications with 17 birds kept in cages in standard environment conditions. The resorption rate of yolk sac and changes of α -amylase and lipase activity in blood serum and

pancreas were estimated. The body weight of chickens was the best in group II, III and IV. Highest level of oil in mixture has reduced the growth after 21 days of life. Addition of fat to feed mixtures for chickens in their first 21 days of life influences the rate of yolk sac resorption, decreases feed intake and activity of α -amylase in the pancreas, while conversely lipase activity in the pancreas increases together with increase in quantity of rape seed oil added [3].

Studies of the analysis of the activity of enzymes in the contents of the small intestine of birds have shown that a change in feed affects not only the processes of synthesis and excretion of substances, but also the hydrolyzing effect of enzymes [4].

It is presently an established fact that the components of the secretion of pancreatic acinar cells including main pancreatic enzymes (amylase, lipase, and trypsin) can enter the bloodstream as well as the intestine [5-7]. These enzymes normally circulate within the bloodstream in definite concentration ranges though physiological functions of the circulatory enzymes especially pancreatic proteases still remain unclear. There was a hypothesis by Laporte and Tremolieres [8] that circulatory proteases can regulate exocrine secretion of the pancreas. The recirculation of proteolytic enzymes was also hypothesized by the analogy of biliary acids [9,10].

The correlations between the activities of pancreatic enzymes in the pancreas and blood serum were studied in pet animals (e.g. dogs) as related to the acute and/or chronic pancreatitis; exocrine pancreatic insufficiencies in poultry are considered less significant and hence these interrelationships in avian species are still understudied [11].

It is presently an established fact that pancreatic enzymes (amylase, lipase, and trypsin) can enter the bloodstream as well as the intestine. These enzymes normally circulate within the bloodstream in definite concentration ranges. There is a lack of available information on the interrelationships between the enzymatic activities in pancreatic juice and blood serum in poultry. The study presented was aimed at the determination of possible correlation between the activities of the digestive enzymes in pancreatic juice or pancreatic tissue and in blood serum in chicken. The study was performed on Leghorn cockerels with chronically fistulated main pancreatic duct, and broiler chicks at different ages (14, 24, 28, and 35 days). Activities of all digestive enzymes in

pancreatic juice in cockerels were found to grow in 1 hr. after the feeding: amylase by 1.8 times, lipase 1.5 times, and proteases 1.3 times compared to basal level (after starving). Activity of trypsin in serum significantly increased by 67.4% in 1 hr. after the feeding ($P < 0.001$) while activities of amylase and lipase remained at their respective pre-prandial levels. The activities of pancreatic enzymes in the pancreas and blood serum in broilers at different ages were positively correlated: $r = 0.54$ for amylase, $r = 0.96$ for lipase, and $r = 0.99$ for trypsin. The strong positive correlation between tryptic activities in the pancreas or pancreatic juice and in blood serum in chicken can be a starting point for further research on the functions of circulatory trypsin which can include the regulation of exocrine pancreatic activity and other vital functions [12]. It has now been established that the components of the secretion of pancreatic acinar cells, including the main pancreatic enzymes (amylase, lipase and trypsin), can enter both the bloodstream and the intestine [5,6,14]. These enzymes normally circulate in the bloodstream in certain concentration ranges, although the physiological functions of circulating enzymes, especially pancreatic proteases, are still unclear.

Thus, in the process of vital activity in the body of a bird, numerous reactions of synthesis, decay and transformation of substances occur. Indicators of the biochemical composition of the blood are an important criterion for assessing the usefulness of the diet of feeding birds and allow you to identify the features of metabolic processes in their body. Depending on the state of physiological and biochemical parameters of blood, it is possible to predict their future productivity.

Based on the foregoing, the factors affecting the activity of blood enzymes are contradictory and at the moment many issues remain insufficiently studied.

The purpose of the study was to study the activity of the lipase enzyme in the blood serum of emerald pheasants. In this regard, one of the objectives of this study was to study the activity of enzymes in the blood plasma of pheasants when vitamins and an anti-stress drug are added to the feed.

Material and Method

Experiments on the study of biochemical parameters of blood were carried out on pheasants, 5 birds each for 30 days. All pheasants were divided into control and experimental groups

(control group of pheasants without the addition of vitamins and anti-stress drug). A complex of vitamins (A-20000 IU, D3 - 1250 IU, E - 50 mg) and an anti-stress drug (succinic acid) at a dose of 0.01, 0.03, 0.05 g per 1 kg of body weight per day were added to the diet of the experimental groups of birds.

The determination of the activity of the lipase enzyme in the blood of pheasants was carried out on a Specol 1500 spectrophotometer (Analytik Jena) according to the method of R Rej, M Hoder, U.H Bergmeyer at a wavelength of 540 nm. The experimental groups of pheasants were divided into three groups: 1-experimental group (a complex of vitamins was added to the food), 2-experimental group (an anti-stress drug was added to the food), 3-experimental group (a complex of vitamins and an anti-stress drug were added to the food). To determine the biochemical parameters in the blood serum of pheasants, blood was obtained from the axillary vein before feeding and one hour after feeding. A freshly prepared solution of sodium citrate was added to the tubes, the blood was centrifuged at 5000 rpm for 5 min, and the resulting plasma was studied by biochemical methods. Blood plasma was examined for lipase activity. The results were expressed in units per liter. Statistical processing of the research results was performed using the Excel computer program, determining the mean value (M) and standard errors of the mean (m). Significance of differences was assessed by Student’s t-test. Differences were considered statistically significant at $p < 0.05$.

Results and Discussions

As a result of experimental studies, it was found that the activity of lipase in the blood serum of the control and experimental groups of pheasants was undulating with a maximum in the control group by the age of 10, 18 days and a minimum at the age of 1, 30 days, which, in all likelihood, was due to as a result of dietary changes. Lipase activity in the experimental groups of birds reached its maximum value by 30 days. It should be noted that the activity in the blood serum of pheasants tended to increase when a complex of vitamins and an anti-stress drug was included in the diet. Lipase activity in all experimental groups increased on days 1, 3, 5, 7, 10, 15, 18, 20, 25, 30 at 1.06, 1.23, 1.27, 1.26, 1.22, 1.25, 1.34, 1.20, 1.74, 1.38 times, although at a slower rate compared to the lipase activity in the control groups of birds. Thus, the activity of the lipase enzyme in the blood serum tended to increase with age (Table 1).

Age in days	Control	1 experienced	2 experienced	3 experienced
1	12.1 ± 0.3	12.0 ± 0.5	12.2 ± 0.8	12.8 ± 0.5
3	13.5 ± 1.1	15.6 ± 1.1	15.1 ± 1.3	16.6 ± 0.9
5	14.6 ± 2.6	17.9 ± 0.5	16.8 ± 0.6	18.5 ± 0.4
7	16.8 ± 3.1	19.4 ± 1.2	19.5 ± 1.5	21.1 ± 1/3
10	23.1 ± 0.9	25.8 ± 2.1	25.0 ± 1.9	28.1 ± 2.4
15	19.3 ± 1.7	23.3 ± 1.9	22.8 ± 1.8	24.2 ± 2.1
18	25.2 ± 4.1	30.1 ± 3.7	26.5 ± 4.1	33.7 ± 3.5
20	23.8 ± 3.6	29.2 ± 4.3	25.4 ± 3.9	28.6 ± 4.1
25	19.5 ± 2.2	32.3 ± 2.7	27.0 ± 4.2	34.0 ± 3.9
30	27.8 ± 1.7	36.2 ± 3.8	34.5 ± 4.0	38.3 ± 4.8

Table 1: The effect of vitamins and anti-stress drug on the activity of pheasant blood serum lipase (U/l) (n = 10, M ± m).

An increase in the activity of the lipase enzyme in the blood serum of pheasants was experimentally revealed with the complex inclusion in the diet of a complex of vitamins (A-20000 IU, D3 - 1250 IU, E - 50 mg) and an anti-stress drug (succinic acid) at a dose of 0.01, 0.03, 0.05 g per 1 kg of body weight per day (Figure 1).

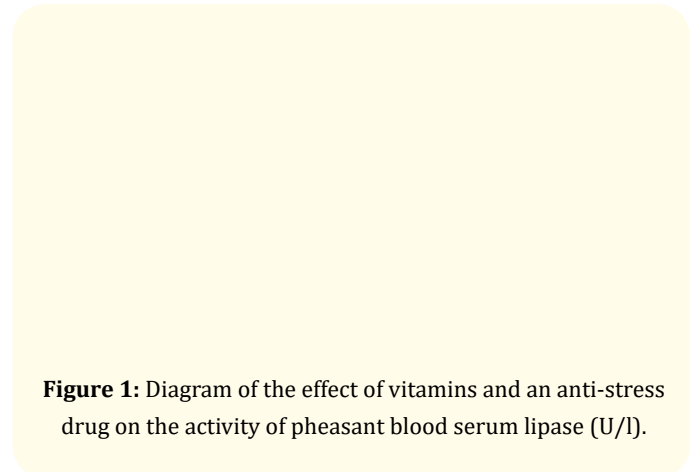


Figure 1: Diagram of the effect of vitamins and an anti-stress drug on the activity of pheasant blood serum lipase (U/l).

By the activity of lipase, we can judge the state of the pancreas. As can be seen from the data in the table, the lipase activity of the blood serum of the control group of pheasants was within the normal range (12.1-27.8 U/l). There were no statistically significant differences between the groups ($P > 0.05$).

As can be seen from the table, when a complex of vitamins and an anti-stress drug are introduced into the diet of pheasants, an increase in the activity of the lipase enzyme is observed, reaching a maximum value of 38.3 ± 4.8 U/l by 30 days from the moment of hatching. At the same time, one of the significant factors affecting the activity of lipase was the inclusion of a complex of vitamins and an anti-stress drug in the diet. The change in lipase activity in all experimental groups of pheasants tended to change in a wave-like manner with maxima by 10, 18 and 30 days, respectively.

It should be noted that a decrease in the activity of the lipase enzyme when a complex of vitamins and an anti-stress drug is used in the diet is an important link in the pathogenesis of various diseases.

This, in turn, directly links the results of our experimental studies, and also allows us to effectively and comprehensively develop a scheme and tactics of treatment for various pathological changes in the digestive system in pheasants. The results obtained make it possible to objectively assess the relationship of metabolic processes in the body of birds. At the same time, the obtained research results are the basis for increasing the meat and egg productivity of pheasants and make it possible to improve the conditions for feeding and keeping birds.

Pheasant lipase is quite active and is a very stable enzyme. Under normal conditions, there are few factors that can significantly change the activity of digestive lipase. Changing the diet is one of the significant factors affecting the activity of enzymes.

The information obtained allows a more objective and reliable assessment of the relationship of metabolic processes in the body of birds, depending on the diet. Knowledge of changes in enzyme activity makes it possible to better understand the pathogenesis of diseases, to reveal the dependence of digestive processes on the diet in sick birds.

Thus, the experimental data obtained by us are of a fundamental nature and can be used for scientific purposes to study the influence of various factors (physical, chemical, biological) on the activity of intestinal digestion enzymes. It is necessary to emphasize the influence and role of enzyme systems in the regulation of growth and development, as well as the formation of the productive

qualities of poultry. Additional introduction of biologically active substances of directional action into the feed diet of pheasants is a significant and important factor in increasing their productivity and safety.

Conclusions

- It was revealed that the activity of lipase in the blood serum of pheasants reaches a maximum value of 38.3 ± 4.8 U/l by 30 days after hatching with strict control of the diet.
- It was experimentally established that the activity of lipase in all experimental groups increased on days 1, 3, 5, 7, 10, 15, 18, 20, 25, 30 at 1.06, 1.23, 1.27, 1.26, 1.22, 1.25, 1.34, 1.20, 1.74, 1.38 times, compared with the activity of blood lipase of the control groups of birds.

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