

# Kinetics of Changes in the Blood Digestive Enzyme Amylase in Partridges (*Alectoris Chukar*) In Ontogenesis

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## Abstract

This article presents experimental data on the detection of age-related changes in the blood digestive enzyme blood amylase in partridges (*Alectoris chukar*). The purpose of the work is to determine the kinetics of changes in the blood digestive enzyme amylase in partridges in ontogenesis with the complex use of vitamins and an anti-stress drug. Experimental studies revealed the dynamics of changes in the digestive enzyme amylase in the blood plasma of partridge chicks from the moment of hatching and up to 2 months of age, with the complex use of vitamins (A-20000 IU, D3 -1250 IU, E-50 mg), as well as the anti-stress preparation of succinic acid) at the rate of 0.03 g per 1 kg of mass.

Determination of the activity of the blood digestive enzyme amylase in partridges was carried out spectrophotometrically according to the method of Karavea, on a Specol 1500 spectrophotometer (Analytik Jena), at a wavelength of 690 nm.

It was revealed that the activity of the blood digestive enzyme amylase in 1-day-old control partridges significantly exceeds the activity of this enzyme in 7, 13, 22, 31 and 60-day partridges by 1.6, 1.9, 2.2, 1.9, 1.8 times, respectively.

The activity of the blood digestive enzyme amylase in 1-day experimental groups of partridges significantly exceeds the activity of this enzyme in 7, 13, 22, 31 and 60-day experimental groups of partridges by 1.4, 2.3, 2.6, 1.8, 1.9 times, respectively.

**Keywords:** alectoris chukar; blood; digestive enzyme; vitamins; anti-stress drug; amylase

## Introduction

The literature provides extensive but contradictory material on the biochemistry of chickens [1-3], including when using various additives [4-6] and depending on age [7]. Information about the change in biochemical parameters and digestive enzymes of the blood makes it possible to follow the development of metabolic processes in the body of birds in the postembryonic period. This is especially true in order to identify periods of effective development and provide the birds with adequate nutrition to increase feed conversion into production.

The literature also provides data, which discusses the results of an experiment on the use of rice husks and yeast in micronized form for growing quails. For the experiment, we used chicks at the age of 21 days of the Pharaoh breed, which were fed rice husks and yeast at a dose of 1 g per kilogram of compound feed for two months. During the experiment, blood was taken from the birds to study the activity of enzymes - ALT,

AST, alkaline phosphatase and amylase twice - on the 30th and 60th day of observation.

The results of the study showed that under standard conditions, growing quails have a significant increase in AST by one and a half times, as well as a tendency to increase ALT and amylase, and a tendency to decrease the activity of alkaline phosphatase. Such changes can be explained by the fact that this age period is associated with an intensive growth of the bird and its puberty. Transamination enzymes are activated, as they take part in the exchange of amino acids, changing their qualitative composition.

The use of micronized rice husks has an inhibitory effect on all the studied parameters in this experiment, leading to their decrease by the end of the observation compared to the other groups. Feeding micronized yeast to quails led to a significant increase in the activity of ALT (by 1.55 times) and AST (by 1.35 times) [8].

From literary sources it follows that in poultry farming succinic acid is used in the initial period of the life of birds; at the same time, the daily dose of succinic acid is taken at the rate of 0.03 g per 1 kg of weight, mixed into food or diluted in drink for 2-3 weeks in the period before and after the appearance of offspring. Succinic acid, which has an anti-stress, adaptogenic effect, helps to reduce the incidence in birds and allows you to get environmentally friendly eggs and meat. At the same time, succinic acid is used as a biological additive in the nutrition of birds, which helps to activate adaptation processes in the bird's body and stabilize metabolism, thereby increasing the meat productivity of chickens, as well as the quality of meat [9, 10, 11].

Literature sources provide insignificant data on biochemical parameters and activity of blood digestive enzymes in chickens in ontogeny [12].

Two experiments were performed to evaluate the hematological and blood biochemistry parameters, biometry of digestive organs, enzyme activities, protein content and absolute weight of the pancreas of broilers fed pre-starter and pre-starter diets supplemented or not with amylase from *Aspergillus awamori* [13].

The dietary amylase addition did not affect hematological and blood biochemistry parameters and the biometry of the gastrointestinal tract of 7- and 21-d-old broilers, nor the absolute weight, enzyme activities or protein concentration of the pancreas of 7-d-old broilers [14].

We did not find any studies in literature evaluating the effect of the dietary inclusion of amylase on broiler blood parameters. However, Ahmad et al. (2013), evaluating the dietary addition of xylanase, did not find any effect of the on the hematological and serum biochemical parameters of 28-d-old Ross broilers [15].

Despite the fact that plasma biochemistry analyses are significantly important and widely used in the diagnostic of different illnesses in several birds, a very limited amount of information exists for pheasants, partridges and chukars [16, 17]. Some studies have researched the biochemical parameters in pheasants [18, 19] but the values of plasma chemistry parameters in partridges and chukars are still too insufficient [20, 21]. Because of that, precise and useful biochemical analyses are extremely important and needed.

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. [22, 23].

Those with little data are highly contradictory. Based on the foregoing, the purpose of these studies is to study the kinetics of changes in the blood digestive enzyme amylase in partridges (*Alectoris chukar*) in ontogeny.

## Material and methods

The determination of activity of the blood enzymes partridges was carried out spectrophotometrically according to the method of Karavea,

Spectrophotometer Specol 1500 (Analytik Jena), at a wavelength of 690 nm.

Blood samples from experimental groups of partridges were collected by puncture with the addition of heparin as an anticoagulant.

The determination of the activity of blood digestive enzyme of amylase carried out by the method by the improved Karavea method proposed [24, 25].

## Research results

During the experiment, blood was taken from partridges to study the activity of the amylase enzyme twice - on the 1st, 7th, 13th, 21st, 31st and 60th days of observation. The results of the study showed that under standard conditions in growing partridges there is a significant increase in amylase.

Such changes can be explained by the fact that this age period is associated with an intensive growth of the bird and its puberty. Transamination enzymes are activated, as they take part in the exchange of amino acids, changing their qualitative composition. The use of a complex of vitamins and succinic acid has an inhibitory effect on all the studied parameters in this experiment, leading to their decrease by the end of the observation compared to other groups.

Blood samples were taken from the cubital vein of the wing (vena cutanea ulnaris superficialis) in 45 partridges whose age corresponded to 1, 7, 13, 21, 31, 60 days. Blood was taken from birds in a volume of 0.5 ml and placed in test tubes containing a heparin solution.

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.

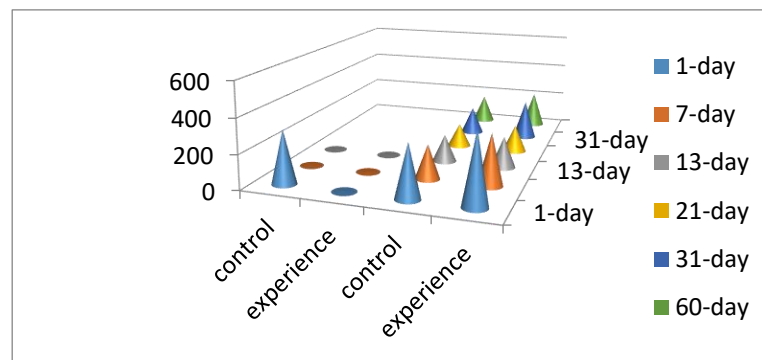
Measurements of the optical density of the samples were carried out on a Specol 1500 spectrophotometer (Analytik Jena) at a wavelength of 690 nm. Quantitative data on the determination of activity of blood enzymes are given in table 1.

Table 1.

Amylase activity in blood plasma, U/l		Live weight, g.	
control	experience	control	experience
1-day allowance			
312.1 ± 10.5	415.5 ± 10.5	14.5±0,10	17.5±0,5
7-day allowance			
201.7±9.5	301.2±10.6	18.1±0,30	19.2±0,6

13-day allowance			
161.3 ±2.3	183.5 ±12.5	37,5±0,55	40.5±1,7
21-day allowance			
141.2 ±2.2	161.9 ±2.6	62,1±1,20	67.5±0,9
31-day allowance			
164.5 ±3.5	234.1 ±13.5	112,6±3,80	117.8±3,8
60-day allowance			
169.7 ±5.2	215.3 ±10.1	270,2±14,50	275.3±5,2

**Table 1:** Age-related changes in the activity of the digestive enzyme amylase in the blood plasma of partridges ( $M \pm m$ )



**Fig.1.** Kinetics of changes in the digestive enzyme amylase in the blood plasma of partridges 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

Amylase activity indices in 1, 7, 13, 21, 31, and 60-day-old *Alectoris chukar* correspond to 312.1, 201.7, 161.3, 141.2, 164.5, 169.7 U/l. From the data presented in the table it follows that the indicators of amylase activity in 1, 7, 13, 22, 31 and 60-day control groups of partridges correspond to 312.1, 201.7, 161.3, 141.2, 164.5, 169.7 U/l. Amylase activity indices in 1, 7, 13, 21, 31, and 60-day-old *Alectoris chukar* correspond to 312.1, 201.7, 161.3, 141.2, 164.5, 169.7 U/l. It was also found that the activity of the blood digestive enzyme amylase in 1-day-old control partridges significantly exceeds the activity of this enzyme in 7, 13, 22, 31 and 60-day-old partridges by 1.6, 1.9, 2.2, 1.9, 1.8 times, respectively.

In the experimental groups of partridges, the amylase activity of the 1-day experimental groups of partridges significantly exceeds the activity of this enzyme in 7, 13, 22, 31, and 60-day partridges and corresponds to 415.5, 301.2, 183.5, 161.9, 234.1, 215.3 U/l.

From the data of experimental studies presented in the table, it follows that the activity of the digestive blood enzyme amylase in 1-day experimental groups of partridges significantly exceeds the activity of this enzyme in 7, 13, 22, 31 and 60-day experimental groups of partridges by 1.4, 2.3, 2.6, 1.8, 1.9 times respectively.

As a result of the experimental studies, age-related changes in the digestive enzyme amylase of the blood plasma protein of partridges were revealed from the moment of hatching to 2 months of age with the complex use of vitamins (A-20000 IU, D3 - 1250 IU, E - 50 mg), as well as the anti-stress preparation of amber acid at a dose of 0.03 g per 1 kg of body weight per day. Apparently, a decrease in the activity of the digestive enzyme amylase in the blood plasma of partridges with age indicates a decrease in the intensity of metabolic processes in the body of

birds, and also indicates the likelihood that the digestive enzyme amylase, the regulatory function of the body, will perform.

## Conclusions

1. The activity of the blood digestive enzyme amylase in 1-day-old control partridges was revealed, which exceeds the activity of this enzyme in 7, 13, 22, 31 and 60-day-old partridges by 1.6, 1.9, 2.2, 1.9, 1.8 times, respectively.
2. It was established that in the experimental group of partridges, the activity of the digestive enzyme blood amylase of 1-day experimental groups of partridges significantly exceeds the activity of this enzyme in 7, 13, 22, 31 and 60-day experimental groups of partridges by 1.4, 2.3, 2.6, 1.8, 1.9 times respectively.
3. It was experimentally revealed that the activity of the amylase enzyme in 1, 7, 13, 22, 31 and 60-day control groups of partridges is 1.3, 1.5, 1.1, 1.2, 1.4, 1.3 times lower compared to the activity of amylase in 1, 7, 13, 22, 31 and 60-day experimental groups of partridges.

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