Iraqi Journal of Veterinary Sciences

www.vetmedmosul.com

Effectiveness of using probiotic Batcinel-K® and CEVAC SET-K® vaccine on some blood parameters in chickens

A.R. Al-Aqaby[1], A.A. Glaskovich[2] and P.A. Kracochko[3]

[1]Department of Veterinary Public Health, College of Veterinary Medicine, University of Al-Qadisiyah, Al-Qadisiyah, Iraq, [2]Department of Microbiology and Virology, [3]Department of Epidemiology and infectious Diseases, Vitebsk State Academy of Veterinary Medicine, Vitebsk, Belarus

Article information

Article history:
Received May 18, 2020
Accepted October 10, 2020
Available online October 1, 2021

Keywords:
Batcinel
Hematological
Biochemical
Probiotics
Broilers

Correspondence:
A.R. Al-Aqaby
aamar.alaqaby@qu.edu.iq

Abstract

In the current study, probiotic Batcinel-K® and CEVAC SET-K® vaccine are used to determine their effects on some hematological and biochemical parameters of broiler-chickens. Three hundred broilers chicks "Ross-308" at one-day old were divided into six groups of 50 chicks /each. Blood was taken at 56th, 63rd and 112nd days old. The count of erythrocytes and leukocytes was calculated. Hemoglobin and total serum protein, serum albumin and globulins concentration was determined. Results show that these selected probiotic can improve some of the blood indexes of birds, especially in combination with the vaccine. At the 63rd day old of broilers chicken, globulin parameters in 4th and 5th treatment groups were higher by 2.97% ($P<0.01$) and 5.19% ($P<0.05$) respectively, compared to the control group. Moreover, at the 112nd day, level of total protein in the 4th group at the end of the experiment was higher than in control group at 8.1% ($P<0.05$), as well as in the 5th group by 3.96% ($P<0.01$). In addition to the concentration of albumin and globulin that were higher relatively concerning the control.

DOI: 10.33899/ijvs.2020.127018.1439, ©Authors, 2021, College of Veterinary Medicine, University of Mosul.

Introduction

Probiotics were initially added to the feed for enhancing animal productivity and improve their health, resulting in increased disease resistance. The inhibitory activity of probiotic against gut infections is due to metabolites such as hydrogen peroxide, organic acids and other inhibitory substances such as bacteriocins produced by probiotic bacteria (1,2). Moreover, supplementation of probiotic enhances immune system and inhibit pathogens (3). Probiotic "Vetlactoflorum-M" can use for reducing the infection of birds with pathogenic microflora, including salmonella, by 20.0% (4). The use of probiotics to enhance productivity in poultry is currently of great interest. Probiotics and prebiotics may improve health by stimulating production of antibody (5). Researchers showed that probiotics in feed and water have a therapeutic and prophylactic effect. The growth-stimulating effect was also noted. In the same way, the feed conversion coefficient when antibiotics were added to the feed and the use of probiotics in feed and water was significantly better in the birds of the experimental groups than in the control group (6). Furthermore, probiotic effect positively on hematological, biochemical and immunological parameters of blood in broiler-chickens (7-9), additionally it improves meat quality (10), natural resistance (11) and productivity of broiler-chickens (12). The number of *E. coli* decreased in chickens treated aerosol with *Enterococcus faecium* also *E. coli* in turkeys decreased when they received the *Enterococcus faecium* strain with drinking water once a week (13). Both monoprobiotics and a combination of probiotics with organic acids, when added to rations, reduce the number of pathogenic bacteria in the ileum and cecum (14).

Our study aimed to estimate the effectiveness of the use of the probiotic Batcinel-K® and vaccine against salmonellosis CEVAC SET K® on broiler chickens. The following tasks were set for us, to study the effect of the preparation on natural resistance of organism on broiler chickens.

Materials and methods

In the current experiment have been studied the prophylactic effectiveness of the Batcinel-K®, the effect of this probiotic preparation and CEVAC SET K® were studied, an inactivated avian salmonellosis vaccine made from formalin-inactivated cultures of the strains *Salmonalla typhimurium* and *Salmonalla enteritidis*, for the natural resistance in broiler chickens.

Batcinel-K® is liquid preparation of spore-forming bacteria *Bacillus subtilus* BIM- B 454 D. Probiotic prepared by the staff of Institute of Experimental Veterinary Medicine named S.N. Vysheleskovo and Institute of Microbiology of the Belarusian National Academy of Science. We purchased 300 chicks of Ross-308 from Vitebsk Broiler chickens farm in Belarus and divided them into 6 groups of 50 birds each one (M = 40g), chicks reared on litter and fed *ad libitum*.

In laboratory conditions, we studied the effect of the biologically active supplement probiotic Batcinel-K® on some physiological indexes on the organism of birds with an optimal dose of the drug. Randomly the chicks (of both sexes) were divided into six groups; first group broilers of the 1st control group were fed only standard full feed. Seond group broiler chickens of the 2nd experimental group were supplied only a probiotic Batcinel-K® with drinking water at a dose of 0.1-0.2 cm^3/bird starting at one-day-old for 5 days daily, in 9 cycles with an interval of 7-10 days until the end of the experiment. Third experimental group vaccinated only by inactivated CEVAC SET K® vaccine against avian salmonellosis at the 7th week once subcutaneously in the upper third region of the neck at the dose of 0.5 cm^3 and revaccinating on 14th week of age subcutaneously in the region of the upper third of the neck at 0.5 cm^3. Fouth experimental group starting from a day old, supplemented with probiotic Batcinel-K® for 5 days daily, until the 5th week of age with drinking water in a dose of 0.1-0.2 cm^3/bird in 4 cycles with an interval of 7-10 days. Probiotic Batcinel-K® was added to drinking water from the 6th week in a dose of 0.2 cm^3 /bird once daily for 5 days, (a week before the 1st vaccination). In the 7th week, birds were vaccinated subcutaneously in the upper third of the neck at a dose of 0.5 cm^3 by the first vaccination. From 13 until 14 weeks of age, a probiotic Batcinel-K® was added to drinking water at a dose of 0.3 cm^3/bird within 5 days daily (5 days before revaccination). At 14th week of age 2nd vaccination (revaccination) subcutaneously in the upper third of the neck at a dose of 0.5 cm^3. Fifth experimental group, starting from one-day old until 5 weeks of age, were supplied with a probiotic Batcinel-K® with drinking water at a dose of 0.1-0.2 cm^3/bird/day during 5 days daily in 4 cycles with an interval of 7-10 days. From 6th week of age, probiotic Batcinel-K® was added in a dose of 0.2 cm^3/bird/day for 3 days (a week before the 1st vaccination). On the 7th week, 1-st vaccination is applied in the upper third region of the neck subcutaneously, at a dose of 0.5 cm^3. From the 7th until the 13th week of age, probiotic Batcinel-K® was added at a dose of 0.3 cm^3/bird/day for 3 days with an interval of 7-10 days. 2nd vaccination (revaccination) was applied at the 14th week, subcutaneously in the upper third region of the neck at a dose of 0.5 cm^3. Sixth experimental group, starting from a day old to 3 weeks' old supplied a probiotic Batcinel-K® daily with drinking water at a dose of 0.1-0.2 cm^3/bird during 5 days in 2 cycles with an interval of 7 days. On the 4th week, probiotic was added in a dose of 0.2 cm^3/bird/day for 2 days (a week before the 1st vaccination). On the 7th week, 1-st vaccination was applied subcutaneously in the upper third region of the neck at a dose of 0.5 cm^3. From 7th until the 13th week, probiotic was added at a dose of 0.3 cm^3/bird/day for 2 days with an interval of 7-10 days. At 14th week, 2-nd vaccination was applied subcutaneously in the upper third region of the neck at a dose of 0.5 cm^3.

To study hematological parameters, blood was taken at 56th, 63rd and 112nd days old. Day-old broiler chickens had standard biochemical parameters. Blood was carried out according to (15). The blood was obtained by decapitation and from the heart and axillary vein in compliance with aseptic and antiseptic rules in two sterile tubes at 56th, 63rd and 112nd days old (15). In one of them, the blood was stabilized with trilon B anticoagulant (disodium EDTA - ethylenediaminetetraacetic acid) at the rate of 0.1-0.2 ml of a 10% solution per 10 ml of blood, the other was used to obtain serum. Blood serum was obtained after blood coagulation at a temperature from 18-20ºC, followed by centrifugation at 1500 rpm for 10-15 min. To accelerate the separation of serum, coagulated blood was separated from the walls of the tube with stainless steel spoke and placed in a thermostat at a temperature of from 37ºC to 38ºC for 45-60 min (16).

The count of erythrocytes and leukocytes was calculated in the Goryaev chamber, the hemoglobin content was determined by a unified colorimetric method using a KFK-ZOM photoelectrocolorimeter, Russia. The leukogram was displayed based on counting 100 cells in blood smears stained according to Pappenheim (17).

The total serum protein was determined by the biuret method on an Eurolyser automatic biochemical analyzer (spectrophotometer- SF 2000-M) using reagents from the Cormany kit (Poland), the protein content was expressed in g/l. according to (18). The determination of serum albumin concentration was determined by a unified method by reaction with bromocresol green. The content of albumin and globulins was expressed in g/l. Studies of the indicated parameters of blood serum were carried out on a Eurolyser biochemical analyzer using diagnostic kits from Cormany (Poland) at laboratories of Vitebsk State academy of Veterinary Medicine (17,18).

The digital material of experimental studies is subjected to mathematical and statistical processing on a personal computer by methods of variation statistics. The arithmetic means of each variational series, standard deviations of the average, degree of probability of the null hypothesis are determined in comparison with the control by calculating the Student-Fisher criterion. At P<0.05, the difference in the arithmetic mean of the compared variation series was considered significant (19,20).

Results

The results of general biochemical and hematological blood parameters of broiler chickens (Table 1-3). The data in Table 1 shows that during the technological cycle of growing chickens, there was a general tendency to increase hemoglobin, erythrocytes and leukocytes levels. The hemoglobin level at 56 day of old in the 4th experimental group was 22.35% higher than the control group. By the 63 day of old, in the 4th group in comparison to the control group higher by 17.40%, in the 5th - by 15.95% and the 6th - by 16.78%. By the 112 day of old in the 4th group, compared to the control group, this indicator was higher by 12.18% in the 5th - by 11.21% and the 6th - by 11.27%.

The level of red blood cells on 56th day of old in the 4th experimental group was higher than in the control group by 33.49%, at 63 day of old in the 4th - by 29.60%; in the 5th - by 24.00% and the 6th - by 21.60%. At 112 day of old in the 2nd experimental group, the content of erythrocytes was higher - by 9.03%; in the 3rd - by 9.69%, in the 4th - by 31.94%, in the 5th - by 15.20% and the 6th - by 10.57%.

The leukocyte level at 56 day of old in the 4th group was higher - by 8.14%; in the 5th - by 7.13% and the 6th - by 6.01%, at 63 day of old in the 4th - by 24.47, in the 5th - by 16.04 and the 6th - by 12.42%. At 112 day of old, the leukocyte count in the 2nd experimental group was higher by 10.66, in the 3rd - by 12.71, in the 4th - by 25, 28, in the 5th - by 17.47 and the 6th - by 16.62%.

The data in table 2 indicate a significant increase in the content of protein metabolism throughout the trail in the experimental groups 2, 4, 5 and 6. So, on the 56 day of old, the level of total protein in the 2nd experimental group was higher than in the serum of the blood of chickens of the control group by 15.85, in the 4th by 24.52%; in the 5th group - by 19.70%; in the 6th - by 18.09%.

At 63 day of old, the level of total protein in the 2nd experimental group was higher in blood serum of birds than in the control group by 14.73, in the 3rd group - by 22.26, in the 4th group - by 29.55%; in the 5th group - by 26.29%; in the 6th group - by 25.92%. On the 112 day of old, the level of total protein in the 2nd group was higher in blood serum of birds than in the control group by 12.44%; in the 3rd group - by 14.85, in the 4th group - by 25.83, in the 5th group - by 20.44%; in the 6th group - by 20.75% (Table 2). Albumin content in the chickens of the treatment groups was higher concerning the control group. At 63 day of old, the albumin level in the 2nd experimental group was higher in blood serum of chickens than of the control group by 12.78% 4 in the 4th - by 16.93% 4 in the 5th - by 15.39 and in the 6th - by 16.83%. At 112 day of old, in the 2nd experimental group, the albumin content was higher in the blood serum of chickens than of the control group by 19.79%; in the third - by 24.35%; in the 4th, by 20.89%; in the 5th, by 22.80; in the 6th, by 25.55% (Table 2).

Table 1: Hematological parameters of broiler (Mean± SE)

Age	Group	Hemoglobin (G/L)	Erythrocyte ($\times 0^{12}$/L)	Leukocyte ($\times 0^{9}$/L)
56 Days (8 weeks)	1	46.53±3.18	2.12±0.26	16.65±0.87
	2	49.77±2.69*	2.62±0.33*	15.98±0.36*
	3	46.67±3.50	2.1±0.12	16.94±0.58*
	4	56.93±6.49***	2.83±0.11**	16.01±0.66*
	5	56.62±6.29***	2.57±0.32*	16.32±1.03
	6	56.96±5.57***	2.63±0.24*	16.29±0.59
63 Days (9 weeks)	1	69.08±2.10	2.50±0.25	16.93±0.58
	2	72.76±2.37*	2.97±0.33*	16.26±0.36*
	3	69.63±3.87	2.51±0.12	17.19±0.45
	4	81.10±5.54***	3.24±0.11***	16.22±0.70*
	5	80.10±5.35***	2.94±0.32*	16.6±0.54
	6	80.67±5.38	3.04±0.25**	16.61±0.52
112 Days (16 weeks)	1	99.06±2.55***	4.54±0.25	23.7±0.83
	2	103.11±2.92***	4.95±0.34**	20.60±0.31
	3	99.64±0.75***	4.51±0.10	21.38±0.45*
	4	111.15±5.01***	5.23±0.13***	21.22±0.70*
	5	110.03±5.43***	4.93±0.30**	21.61±0.54**
	6	110.73±5.55***	5.02±0.30***	21.62±0.52**

* Significant with control at P<0.05; ** Significant with control at P<0.01; *** Significant with control at P<0.001.

Table 2: Biochemical parameters of blood serum broiler (Mean± SE)

Age	Group	Total Protein (G/L)	Albumin (G/L)	Globulin (G/L)	A/G
56 Days (8 weeks)	1	29.08±0.99	20.17±0.79	8.96±1.035	2.31±0.31
	2	30.51±0.68	20.35±0.49	12.32±2.34***	1.80±0.39**
	3	34.34±0.73***	21.22±0.67**	14.54±1.59***	1.49±0.16***
	4	36.21±2.07***	19.01±0.51**	16.47±1.02***	1.26±0.13***
	5	34.81±2.12***	19.36±1.80**	15.70±0.84***	1.26±0.12***
	6	33.69±0.93**	18.16±1.10**	15.29±0.67***	1.18±0.12***
63 Days (9 weeks)	1	35.75±2.51	18.76±0.43	10.60±0.33	1.77±0.089
	2	37.62±1.361**	21.32±0.47***	15.64±1.64***	1.58±0.09
	3	40.09±1.86***	22.80±0.86***	17.63±0.57***	1.30±0.08**
	4	42.48±1.63***	22.10±0.56***	19.69±0.54***	1.13±0.03***
	5	41.41±1.27***	21.89±0.69***	18.92±0.46***	1.16±0.07***
	6	41.29±0.76***	21.61±0.63***	18.52±0.44***	1.17±0.04***
112 Days (16 weeks)	1	38.75±2.51	20.16±0.30	12.26±0.24	1.26±0.07**
	2	40.66±1.38**	21.75±0.29**	18.38±0.68***	1.19±0.03***
	3	43.29±1.86***	21.33±0.79*	17.96±0.55***	1.19±0.03***
	4	45.98±1.63***	26.52±0.64***	21.89±0.12***	1.21±0.03**
	5	44.84±1.30***	23.32±1.099***	21.58±0.88***	1.08±0.08***
	6	44.66±0.82***	22.89±0.57***	20.52±0.43***	1.12±0.02***

* Significant with control at P<0.05; ** Significant with control at P<0.01; *** Significant with control at P<0.001.

Table 3: Parameters of enzymes metabolism in the serum of broiler (Mean± SE)

Age	Group	AST (microkat/L)	ALT (microkat/L)
56 Days (8 weeks)	1	184.11±6.42	9.11±0.51
	2	167.78±6.80	8.3±0.64**
	3	186.41±4.23	8.43±0.67**
	4	182.11±4.58	8.14±0.49**
	5	189.05±20.85	8.39±0.19**
	6	163.42±22.51*	8.44±0.23**
63 Days (9 weeks)	1	175.05±5.65	6.14±0.37
	2	155.79±6.98*	6.12±0.57
	3	174.68±4.48	6.13±0.18
	4	170.87±4.47	5.95±0.25
	5	177.26±21.04	6.03±0.58
	6	151.65±22.30*	6.03±0.55
112 Days (16 weeks)	1	137.89±3.43	6.14±0.37
	2	118.37±4.36*	6.12±0.57
	3	126.89±4.24	6.13±0.18
	4	121.65±4.69	5.95±0.25
	5	123.99±8.50	6.03±0.58
	6	122.67±4.30	6.03±0.55

* Significant with control at P<0.05; ** Significant with control at P<0.01; *** Significant with control at P<0.001.

At 56, 63 and 112 day of old in broiler chickens, the globulin levels in the experimental groups were higher than the control value. So, on the 7th day after the 1st vaccination, the level of globulins in the 2nd experimental group was higher by 24.49% (P<0.05), on the 4th - by 46.66%; in the 5th - by 39.80%; in the 6th - by 36.15% (P<0.001). At 63 day of old, the globulin levels in the 4th experimental group were higher 48.05%; in the 5th - by 42.26%; in the 6th - by 39.25% (P<0.01). At 112 day of old, in the 4th experimental group, globulin content was higher by 34.21% (P<0.001), in the 2nd - by 5.01%; in the 3rd - by 5.26% (P<0.05), in the 5th - by 18.02%; in the 6th - by 15.84% (P<0.01).

At the 112th day, total protein levels in the 4th group to the end of the experiment was higher than in control group to 8.1% (P<0.05) in the 5th group by 3.96% (P<0.01). The concentration of albumin was higher relative to the control group. Similarly, results of globulins were higher than the control group. In the 63rd day of broilers chicken, globulin content was as high by 2.97% (P<0.01) and 5.19% (P<0.05) in 5th and 4th treatment groups compared to the control group, respectively (Table 2).

In chickens of all groups observed a decrease of alanine aminotransferase (ALT) activity. In the 14th day after the 1st vaccination of broiler chickens, the aspartate aminotransferase (AST) level in the 2nd group was lower than the control group - by 11.90% (P<0.05), also there was a decrease on the aminotransferase enzymes level AST, ALT in the serum at 112 day of old of experimental chickens (Table 3), the content of AST in the 2nd group was lower than in the control group - by 10.08%; 3rd - by 7.98% (P<0.05), 4th - by 13.67% (P<0.01), 5th - by 11.78%; 6th - by 11.04% (P<0.05) (Table 3).

Throughout the observation period, there is increasing activity of aminotransferase enzymes in the blood serum of experimental chickens was noted (Table 3).

Discussion

Increased hemoglobin and mean MCHb values might be due to the probiotics which might have enhanced hematopoiesis. Onifade *et al*. observed improved Hb and MCHb concentration in the animals fed diets containing probiotics (21). Enhanced leukocyte might be due to the production of more immune cells (22) that play a vital role in protecting against infectious agents (23). Furthermore, Paryad and Mahmoudi reported higher level of leukocyte in animals fed variant concentrations of probiotics than those fed diets without probiotics (24).

The importance of using probiotics includes increasing survival ratio in birds, enhancing the immune response, reducing gastro-intestinal upsets, increasing growth rates, and improving feeding efficiency. The use of probiotics from *Lactobacillus* spp., Yeast, etc. a lot of attention goes away. Adding these substances to feed improves feed utilization (25,26). Nahanshon *et al.* found that the addition of Lactobacillus in laying hens increases the saturation with cells of Peyer's plaques in the ileum, indicating a stimulation of the mucosal immune system that responds to antigenic excitation and releases immunoglobulin A (15). According to many scientists, probiotics improve the immune response in birds, increase the effectiveness of vaccinations as well as digestion (27). The liver plays an important role in metabolic processes, so, AST and ALT are indicators for normal liver function. Metabolic activity of the liver is essential for normal cell functioning.

The results show that the probiotic Batcinel-K® throughout the entire growing cycle has a positive effect on the natural resistance of the blood serum of broiler chickens. However, results of another studies show that probiotic supplementation to fish ration under heat stress significantly improve some of hematological indexes of experimental groups compared to control (28). Moreover, feed additives can decrease effect of heat stress in broiler-chickens (29). A high level of aspartate aminotransferase indicates an increase in the synthesis of oxalacetic acid, which is necessary for energy production. The activity of alanine aminotransferase in the blood serum of chickens of all groups did not exceed the normal values.

Probiotic Bacteria showed an inhibitory effect against Salmonella sp. (30). However, using of probiotics possess positive effect against infection with hydatid disease in mice, so may be applied as an alternative method against various parasitic infestation (31). Addition of organic acid and essential oil to bird ration with different doses enhanced growth performance and intestinal histomorphology as well as hypocholesterolemia effects and could be used as growth promoters (32).

Conclusion

Blood test results in chickens show that the probiotic Batcinel-K® during the entire rearing cycle has a positive effect on the biochemical parameters of blood serum. However, the most pronounced changes were observed in the experimental groups, supplemented with probiotic Batcinel-K® with the inactivated vaccine CEVAC SET K® against avian salmonellosis.

Acknowledgments

This study supported by College of Veterinary Medicine, University of Al-Qadisiyah.

Conflict of interest

No conflict.

References

1. Gilliland SE, Speck ML. Enumeration and identity of lactobacilli in dietary products. J. Food Prot. 1977;40:760-762. DOI: 10.4315/0362-028X-40.11.760
2. Fuller R. Probiotics in man and animals. J Appl Bacteriol. 1989;66:365-378. DOI: 10.1111/j.1365-2672.1989.tb05105.x
3. Vijayaram S, Kannan S. Probiotics: The marvelous factor and health benefits. Biomed Biotech Res J. 2018;2(1):1-8. DOI: 10.4103/bbrj.bbrj_87_17
4. Glaskovich AA, Al Aqaby AA. Preventive and therapeutic efficacy of the probiotic Vetlactoflorum-M in broiler chickens experimentally infected with *Salmonella enteritidis*. Vet J Belarus. 2016;1:12-15. [available at]
5. Savage TF, Cotter PF, Zakrzewska EI. The effect of feeding mannan oligosaccharide on immunoglobulins, plasma IgG and bile IgA of Wrolstad MW male turkeys. Poul Sci. 1996;75(1):143. [available at]
6. Mountzouris KC, Tsirtsikos P, Kalamara E, Nitsch S, Schatzmayr G, Fegeros K. Evaluation of the efficacy of a probiotic containing *Lactobacillus*, *Bifidobacterium*, *Enterococcus*, and *Pediococcus* strains in promoting broiler performance and modulating cecal microflora composition and metabolic activities. Poul Sci. 2007;86:309-317. DOI: 10.1093/ps/86.2
7. Al-Aqaby Aamer Rassam Ali, Glaskovich AA. Effect of probiotic "Vetlactoflorum" on some physiological parameters of broiler chickens. Kufa J Vet Med Sci. 2014;5(2):134-142. [available at]
8. Alaqaby AA, Glaskovich AA, Kapitonova EA, Losev E. Study the effect of using probiotic (Vetlactoflorum) on some of biochemical and

immunological parameters of broiler chickens. Basra J Vet Res. 2014;1(1):166-179. DOI: 10.33762/bvetr.2014.88137

9. Al-Aqaby AA, Glaskovich AA. Effect of probiotics "Vetlactoflorum-M" and Vetlactoflorum-C" on some serum blood biochemical parameters of broiler chickens. Kufa J Vet Med Sci. 2014c;5(2):143-153. [available at]
10. Al-Aqaby AA, Glaskovich AA, Kapitonova EA, Losev E. Effect of Probiotic Supplementation "Vetlactoflorum" on the biological value of broiler meats. Al-Qadisiay J Agr Sci. 2013;3(2):1-10. [available at]
11. Glaskovich AA, Kapitonova EA, Pritychenko A, Alaqaby Aamer RA. The dynamics of the natural resistance of broiler chickens supplemented probiotic "Vetlactoflorum". Sci Prac J. 2012;48(1):56-61. [available at]
12. Glaskovich AA, Kapitonova EA, Al-Akabi AA, Loseva EO. Results of studying the influence of the biologically active probiotic additive "Vetlactoflorum" on the productivity of chicken - broilers. Vet Med. 2013;49(1):55-59. [available at]
13. Kacaniova M, Kmet V, Cubon J. Effect of *Enterococcus faecium* on the digestive tract of poultry as a probiotic. Turk J Vet Ani Sci. 2006;30:291-298. [available at]
14. Gunal M, Yayli G, Kaya O, Karahan N, Sulak O. The effects of antibiotic growth promoter, probiotic or organic acid supplementation on performance, intestinal microflora and tissue of broilers. Inter J Poul Sci. 2006;5:149-155. DOI: 10.3923/ijps.2006.149.155
15. Nahanshon SN, Nakaue HS, Mirosh LW. Performance of single comb white leghorn layers fed with a live microbial during the growth and egg laying phases. Ani Sci andTechnol. 1996;57:25-38. DOI: 10.1016/0377-8401(95)00852-7
16. Dubina IN. Guidelines for the selection of biological material for laboratory research. Vitebsk. 2008. 20 p.
17. Dubina, IN, Kurdeko AP, Fomchenko IV, Smilgin II.Guidelines for biochemical study of animal blood using diagnostic kits. Vitebsk. 2008. 20 p.
18. Birman BY, Nasonov IV, Kotovich IV, Baran VP, Rumyantseva NV, Kholod VM, Vysokiy AE, Savelyeva TA, Lysenko AP, Kolomiychuk TV. Guidelines for monitoring the condition of metabolism in broiler chickens. Minsk. 2003. 23 p.
19. Smuneva VK, Bogdanovich VI, Vidasova TV, Lebedev SG, Loponogova TN. Biometrics in animal husbandry and veterinary medicine: textbook. Vitebsk. 2006. 38 p.
20. Sevryuk IZ, Motuzko NS, Borisevich MN. Fundamentals of statistical analysis in veterinary medicine: textbook. Vitebsk. 2006. 89 p.
21. Onifade AA, Odunsi AA, Babatunde GM, Olorede BR, Muma E. Comparison of the supplemental effects of *Saccharomyces cerevisiae* and antibiotics in low- protein and high-fiber diets fed to broiler chicken. Arch Ani Nut. 1999;52:29-39. DOI: 10.1080/17450399909386149
22. LaFleur-Brooks M. Exploring medical language: A student-directed approach. 7th ed. USA: Mosby Elsevier; 2008. 398p.
23. Paulo RL, Machado Maria Ilma, Araújo AS, Lucas Carvalho, Edgar M. Carvalho. Immune response mechanisms to infections. Anais Brasileiros de Dermat. 2004;79(6):647-664. [available at]
24. Paryad A, Mahmoudi M. Effect of different levels of supplemental yeast (*Saccharomyces cerevisiae*) on performance, blood carcass characteristics of broiler chicks. Afr J Agr Res. 2008;3(12):835-842. [available at]
25. Nocek JE, Kautz WP, Leedle JAZ, Allman JG. Ruminal supplementation of direct-fed microbials on diurnal pH variation and in situ digestion in dairy cattle. J Dairy Sci. 2002;85:429-433. DOI: 10.3168/jds.S0022-0302(02)74091-5
26. Rose AH. Responses to the chemical environment. London: Academic Press; 1987. 5-40 p.
27. Sokolova KYa, Soloviev IV, Grigoryev GI. Scientific rationale for the use of probiotics in poultry farms. Bio. 2005;11:6-7. [available at]
28. Ismail RH, Al-Hamdani AH. Effect of probiotic (Poultrystar®) and heat stress on some blood parameters in common carp (*Cyprinus carpio* L.). Iraqi J Vet Sci. 2019;33(2):221-225. DOI :10.33899/ijvs.2019.125539.1061
29. Hassan AA, Asim RA. Effect of vitamin C and acetylsalicylic acid supplementation on some hematological value, heat shock protein 70 concentration and growth hormone level in broiler exposed to heat stress. Iraqi J Vet Sci.2020;34(2):357-363. DOI: 10.33899/ijvs.2019.125950.1195
30. Jaafar RS. Bioremediation of lead and cadmium and the strive role of *Pediococcus pentosaceus* probiotic. Iraqi J Vet Sci. 2020;34(1):51-57. DOI: 10.33899/ijvs.2019.125581.1092
31. Yousif SY, Ali AA. Effect of probiotic acidophilus plus against infection with secondary hydatid disease in BALB /c mice. Iraqi J Vet Sci. 2020;34(1):115-121. DOI: 10.33899/ijvs.2019.125613.1104
32. Maty HN, Hassan AA. Effect of supplementation of encapsulated organic acid and essential oil Gallant+® on some physiological parameters of Japanese quails. Iraqi J Vet Sci. 2020;34 (1):181-188. DOI: 10.33899/ijvs.2019.125732.1142

فعالية استخدام المعزز الحيوي ®Batcinel-K واللقاح ®CEVAC SET-K على بعض المؤشرات الدموية في الدجاج

عامر رسام العقابي[١]، الفتينا ابلايكاسيفنا كلاسكفج[٢] و بيوتر البينوفج كراسجكا[٢]

[١]فرع الصحة العامة البيطرية، كلية الطب البيطري، جامعة القادسية، القادسية، العراق، [٢]فرع الأحياء المجهرية والفيروسات، [٣]فرع الوبائيات والأمراض المعدية، أكاديمية فيتبسك الحكمية للطب البيطري، فيتبسك، بيلاروسيا

الخلاصة

استخدم باتسنيل-ك وسيفاك سيت-ك في هذه الدراسة لمعرفة تأثيرها على بعض المعايير الدموية والكيميائية الحيوية في دجاج اللحم. أخذت ثلاثمائة فرخ من سلالة (روس- ٣٠٨) في عمر يوم واحد وقسمت إلى ست مجموعات من ٥٠ كتاكيت/لكل منها. أخذ الدم في أيام ٥٦ و ٦٣ و ١١٢. تم حساب عدد كريات الدم الحمراء والكريات البيض. تم تحديد الهيموجلوبين وبروتينات المصل الكلية وألبومين المصل وتركيز الكلوبيولين. أظهرت النتائج أن البروبيوتيك المستخدم يمكن أن يحسن بعض مؤشرات الدم للطيور، خاصة في حال الإعطاء سوية مع اللقاح. في اليوم الثالث والستين من العمر كان تركيز الكلوبيولين في مجموعات المعالجة الرابعة والخامسة أعلى بنسبة ٢,٩٧ و ٥,١٩٪ على التوالي، مقارنة بمجموعة السيطرة. كان مستوى البروتين الكلي فيعمر ١١٢ يوم في المجموعة الرابعة أعلى منه في مجموعة السيطرة عند ٨,١٪، وكذلك في المجموعة الخامسة بنسبة ٣,٩٦٪ بالإضافة إلى تركيز الألبومين والكلوبيولين التي كانت أعلى نسبياً مقارنة بالسيطرة.