Studies on hematological parameters in broiler chicken treated with Amoxidem 50%

Studii privind parametri hematologici la pui broiler trataţi cu Amoxidem 50%

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Abstract

Hematological response was studied in broiler chicken body as a consequence of treatment with Amoxidem 50% soluble powder. Under investigation were two batches of broiler chicken: control batch A and experimental batch B that received Amoxidem 50% soluble powder 46mg/Kg weight/day. Blood sampling was performed 7 days after treatment. The data were statistically analyzed using Student-Fisher method. The number of red blood cells showed no changes in statistical terms, the difference between batches being insignificant (p <0.5). Hemoglobin concentration in batch B increased significantly distinct (p <0.01) compared with batch A. Haematocrit showed similar values in both batches, the difference between them being insignificant (p <0.5). Constant erythrocyte MCV and MCHC values were statistically insignificant in the two batches (p <0.5). HEM concentration increased statistically significantly in batch B compared with batch A (p <0.05). The number of leukocytes in batch B showed an increase from batch A, the difference between them being statistically significant (p <0.05). The statistical difference between the two batches regarding the mean percentage of monocites is insignificant (p <0.5). In batch B there were changes that increase (p<0,001) of neutrophils (heterophils) and highly significant decrease (p<0,001) of eosinophils.

Key words: Amoxidem 50%, hematological parameters, broiler chicken

Rezumat

S-a studiat reacţia hematologică a organismului la pui broiler ca urmare a aplicării tratamentului cu Amoxidem 50% pulbere hidrosolubilă. Au fost supuse investigării două loturi de pui broiler: lotul A de control şi lotul B experimental la care s-a administrat Amoxidem 50% pulbere hidrosolubilă 46mg/Kg greutate vie/zi. Prelevarea probelor de sânge s-a efectuat la 7 zile după tratament. Datele obţinute au fost prelucrate statistic prin metoda Student–Fisher. Numărul de eritrocite nu a prezentat modificări din punct de vedere statistic, diferenţa dintre loturi fiind nesemnificativă (p<0,5). Concentraţia de hemoglobină la lotul B a crescut distinct semnificativ (p<0,01) comparativ cu lotul A. Hematocritul a prezentat valori similare la ambele loturi diferenţa dintre ele fiind nesemnificativă (p<0,5). Valorile constantelor eritrocitare VEM şi CHEM au fost statistic nesemnificative la cele două loturi (p<0,5). Concentraţia HEM a crescut statistic semnificativ la lotul B comparativ cu lotul A (p< 0,05). Numărul de leucocite a prezentat la lotul B o creştere faţă de lotul A diferenţa dintre ele fiind statistic semnificativă (p<0,05). Diferenţa statistică între cele două loturi în ceea ce priveşte valorile medii procentuale ale monocitelor este nesemnificativ (p<0,5). La lotul B s-au produs modificări în sensul creşterii înalt semnificative (p<0,001) şi a scăderii înalt semnificative (p<0,001) a eozinofilelor.

***Cuvinte-cheie**:* Amoxidem 50%, parametri hematologici, pui broiler

Introduction

In modern chicken growing industry the antibiotics were used not only in therapy and prevention of microbial diseases, but also as growthing promoters in feed add (1).

In some countries antibiotics were used in broilers annually administering the antibiotic 430 mg/kg (2).

Though antibiotics are recommended to be prescribed only to treat bacterial infections, researchers have studied also the effect on hematological and immunological parameters of the body (4, 8, 9).

Hematological profile in animals is an important indicator of physiological or pathophysiological status of the body (5).

The values of blood parameters vary by race, age, gender, stress, bacterial and viral infections, poisoning (3, 5, 6).

Studies on the evaluation of hematologic response after inoculation in broiler chicken with estradiol revealed a highly significant difference between control and experimental group as decline in the number of erythrocytes and hemoglobin.

Among chickens between 40 days and 50 days old there were differences in the values of RBC count, hemoglobin and hematocrit (5).

Ashayerizadeh et al. (2009) studied the effect of food supplementation with antibiotics (Flavomycin), probiotics (Primalac) prebiotics (Biolax-MB) and a mixture of Primalac and Biolex-MB on haematological parameters in broilers. The highest values were recorded in

chickens whose diet was supplemented with Flavomycin, while lower values were recorded in chickens receiving Primalac (1).

Mayah et al (2005) have managed to place for chicken, 1-5 days old, in drinking water, ampicillin, and amoxicillin and enrofloxacin for 5 consecutive days. They noticed that there have been changes to the amount of hemoglobin, white blood cell count, erythrocyte and erythrocyte constants. The results showed a decrease in hematological values in chicks aged 1-5 days while in chickens aged 22 to 27 days these values were within normal physiological limits (2).

The literature presents reference values of hematological and biochemical profile for the bird breeds *Gallus domesticus*, *Gallus gallus*, etc. *Tympanuchus cupido attwateri* as well as for wild birds (Falco peregrinus, U.S. *Rhea*, etc.) in order to define the physiological status and disease (6, 7, 8, 10).

Study objectives

In this paper we wanted to study the extent to which antimicrobial therapy using amoxicillin soluble powder 50% (Amoxidem) influences hematological parameters in broiler chickens bred in intensive system.

Material and methods

Birds

The research was conducted in a broiler farm, on 3-4 months old chickens bred intensively. The chicks were divided into two groups: batch A (n=10) used as a control batch and batch B (n=10) treated with experimental Amoxidem 50% soluble powder at a dose of 46mg/kg body weight/day for 5 days consecutively.

Sampling

Blood samples were collected in anticoagulant solution ($EDTA_{Na}$) from the crest in 7 days after the last administration.

Hematological parameters

We determined the total number of:

- erythrocytes (E),
- the total number of leukocytes (L),
- hemoglobin concentration (Hb),
- haematocrit (Ht),
- average cell volume (MCV),
- mean erythrocyte hemoglobin (HEM),
- the average amount of hemoglobin in red blood cells (MCHC) in an automatic analyzer type BC Dray 2800 Vet Min.

Leukocyte formula for expressing the percentage of lymphocytes, monocites, neutrophils (heterofiles) eosinophils and basophiles was performed by staining slides with May-Grumwald Giemsa solution.

Statistical analysis

It was performed by averaging (x) and standard deviation (SD). The values obtained for the two batches were compared using: Student T-test. Level of significance was reported to the p values.

Results and discussion

Tables 1 and 2 reveal individual and average values of erythrocytes, hemoglobin, haematocrit and erythrocyte constants MCV, MCHC HEM and in chicken batches A and B. In these batches the number of red blood cells showed no changes in statistical terms, the difference between batches being insignificant ($p < 0.5$) as follows: in batch A, x ± SD = 2.38 ± 0.12 and in batch B, x ± SD = 2.38 ± 0.19 mil/m^3 (figure 1).

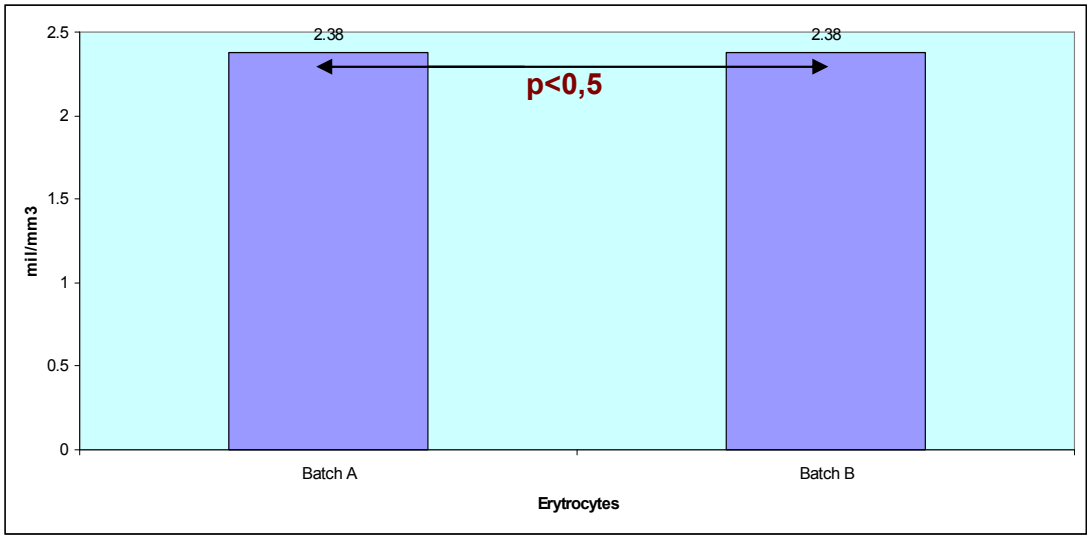

Figure 1. Mean total number of erythrocytes (mil/mm^3) in the two batches of chickens investigated

Hemoglobin concentration in batch B (x ± SD = 11.36 ± 0.71 g/dl) increased significantly distinct (p <0.01) compared with batch A (x ± SD = 9.09 ± 0.75 g dl) (figure 2).

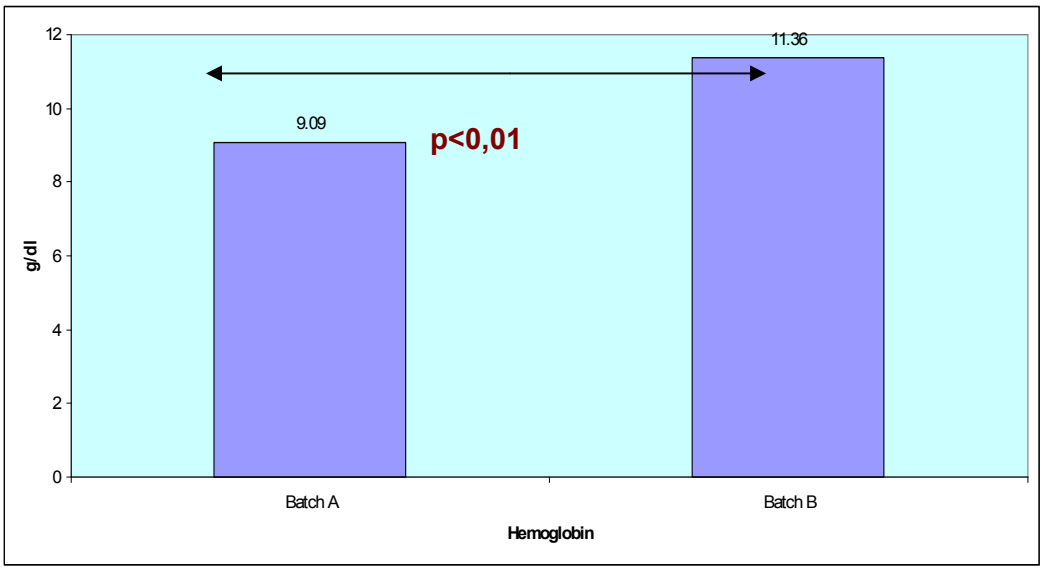

Figure 2. Average concentration of hemoglobin values (g/dl) in batches A and B

Haematocrit in both batches showed similar levels (batch A: x ± SD = 37.9 ± 3.28%, batch B x ± SD = 37.8 ± 3.72%), the statistical difference between batches being insignificant (p <0,5).

Mean corpuscular volume (MCV) was statistically insignificant (p <0.5) in samples from batch A (x ± SD = 164.8 µ3 ± 9.05) in comparison with batch B (x ± SD = 164.7 ± 13.9μ^3).

In batch B, treated with 50% Amoxidem, the mean values of erythrocyte hemoglobin (HEM) (x ± SD = 39.3 ± 7.68 µg) increased statistically significantly (p<0.05) compared with levels in batch A (x ± SD = 36.5 ± 6.11 µg) (figure 3).

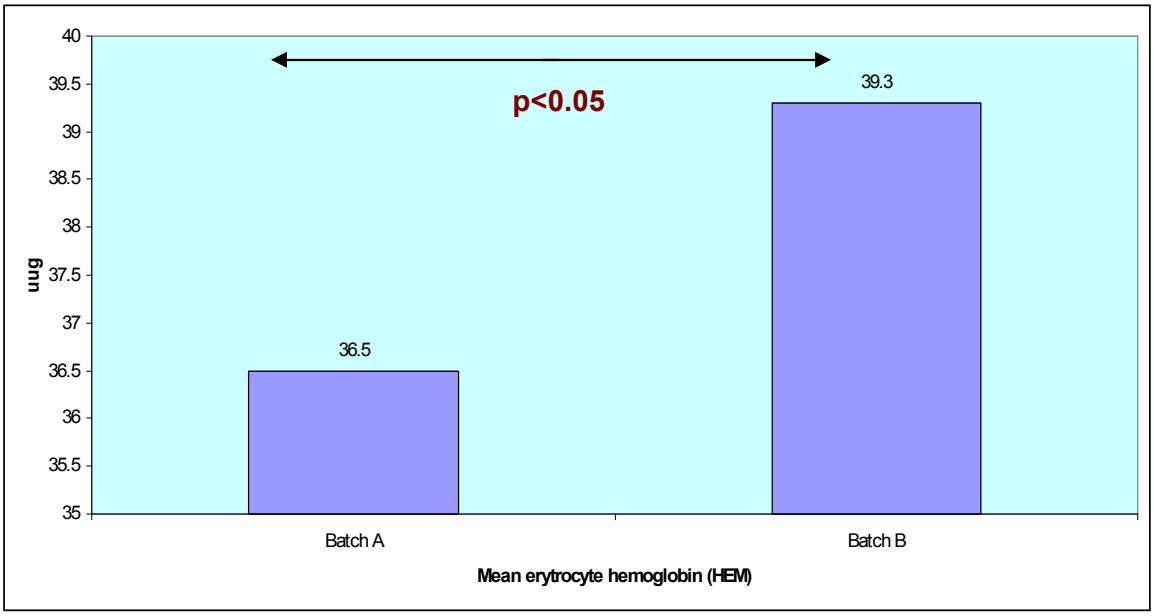

Figure 3. Mean values of erythrocyte hemoglobin (HEM) in the investigated batch

The average amount of hemoglobin in red blood cell (MCHC) in batch A (x ± SD = 23.8 ± 2.17 g / dl) was statistically insignificant (p < 0.5) compared to batch B (x ± SD = 24.5 ± 3.34 g / dl).

Table 1.

Individual values of erythrocytes (E), hemoglobin (Hb), haematocrit (Ht) and red blood cell constants (MCV, MCHC and HEM) in broiler chickens in control batch A and experimental batch

Sample No	E mil/mm^3 Batch		Hb g/dl Batch		Ht % Batch		MCV μ^3 Batch		HEM μμg Batch		MCHC g/dl Batch	
	A	B	A	B	A	B	A	B	A	B	A	B
1	2,62	2,60	7,46	8,25	32,2	30,4	160	158	47	55	27	27
2	2,50	2,52	9,92	10,04	42,4	42,2	163	162	41	38	22	23
3	2,61	2,25	9,26	9,02	39,7	40,4	162	161	32	36	23	26
4	2,49	2,60	9,01	8,90	39,5	39,7	169	176	36	39	23	23
5	2,40	2,22	9,53	9,83	41,7	42,4	160	155	40	41	22	25
6	2,30	2,56	9,02	9,97	36,4	35,2	162	158	36	37	23	25
7	2,20	2,15	9,46	10,08	38,2	38,7	171	192	38	33	24	21
8	2,31	2,40	8,27	9,90	35,9	36,5	186	184	24	42	21	18
9	2,26	2,29	9,02	9,13	33,9	34,6	152	185	38	27	28	29
10	2,13	2,23	9,96	10,56	39,2	38,0	163	158	33	46	25	28

Table 2.

Mean (x ± SD) values of hematological parameters in chicks of batches A and B and statistical significance of differences between batches

Parameter	Batches (x±ds) A	B	Statistic Significance (p)
Erythrocytes (mil/mm^3)	2,38 ± 0,12	2,38 ± 0,19	(p< 0,5)
Hemoglobin (g/dl)	9,09 ± 0,75	11,36 ± 0,71	(p<0,01)
Hematocrit (%)	37,9 ± 3,28	37,8 ± 3,72	(p< 0,5)
MCV (μ^3)	164,8 ± 9,05	164,7 ± 13,19	(p< 0,5)
HEM (μμg)	36,5 ± 6,11	39,3 ± 7,68	(p< 0,05)
MCHC (g/dl)	23,8 ± 2,17	24,5 ± 3,34	(p< 0,5)

Individual values and average values of some leukocyte parameters (WBC, leukocyte formula) in the studied batches were summarized in tables 3, 4 and 5.

As is clear from these data there is an increase in the number of leukocytes in batch B treated with Amoxidem 50% (x ± SD = 31.18 ± 3.12 mii/m^3) than in the control batch (x ± SD = 26, 52 ± 3.39 mii/m^3).

The statistical difference between groups is significant (p <0.05). It is to note that the number of leukocytes in the two batches fall within the normal range for this species.

Table 3. Individual values of some leucocyte parameters in control batch A

Sample No	Leucocyte Number thousands/m^3	Blood Count (%) Lympho cytes	Mono cytes	Eosino phils	Baso phils	Neutro phils
1	22,3	68	0	3	0	29
2	25,5	67	1	4	0	29
3	24,6	70	1	2	0	27
4	22,9	70	0	6	0	24
5	28,4	66	2	3	0	29
6	32,4	70	1	4	0	25
7	26,6	63	1	6	0	30
8	30,1	67	1	3	0	29
9	23,3	69	1	4	0	26
10	29,1	73	3	1	0	23

Studying the blood count in batches A and B, lymphocytes were found to predominate (batch A: x ± SD = 68.3 ± 1.63% and batch B: x ± SD = 53.5 ± 6.94%), results confirmed by literature data as well (N. Avram, 2004).

Table 4.

Individual values of some leucocyte parameters of broiler in batch B treated with 50% Amoxidem

Sample No	Leucocyte Number thousands/m^3	Blood Count (%) Lympho cytes	Mono cytes	Eosino phils	Baso phils	Neutro phils
1	26,4	52	1	5	0	42
2	31,2	49	0	4	0	47
3	32,0	45	1	0	0	54
4	30,4	50	2	2	0	46
5	27,2	43	1	1	0	55
6	32,8	55	0	2	0	43
7	28,8	56	0	3	0	41
8	34,4	61	0	4	0	35
9	31,8	64	1	1	0	34
10	36,8	60	0	1	0	39

Table 5 shows the average percentage values of monocites (batch A: x ± SD = 1.1 ± 0.87, batch B: x ± SD = 0.6 ± 0.69%) statistical difference between groups was insignificant (p <0.5). Lower percentage of monocites from normal values (3-8%) is observed. Mean eosinophils is within normal limits (1-4%), statistical difference between batch A x ± SD = 3.6 ± 1.5% and batch B x ± SD = 2.3 ± 1.63% was highly significant (p <0.001).

Compared with the control batch, the mean percentage of neutrophils (heterofiles) in batch B was significantly higher (p <0.001) (batch A: x ± SD = 27.0 ± 2.40%, batch B: x ± SD = 43.6 ± 7.0 (figure 4).

Table 5.

Mean leukocyte profile of broiler chicken batch A and B and statistical significance of differences between batches

Parameter	Batches (x±ds) A	Batches (x±ds) B	Statistic Significance (p)
Leucocytes (mii/mm^3)	26,52 ± 3,39	31,18 ± 3,17	(p< 0,05)
Lymfocytes (%)	68,3 ± 1,63	53,5 ± 6,94	(p<0,05)
Monocytes (%)	1,1 ± 0,87	0,6 ± 0,69	(p< 0,5)
Eozinofile (%)	3,6 ± 1,57	2,3 ± 1,63	(p< 0,001)
Bazofile (%)	0	0	-
Neutrophils (Heterophils) (%)	27,0 ± 2,40	43,6 ± 7,08	(p< 0,001)

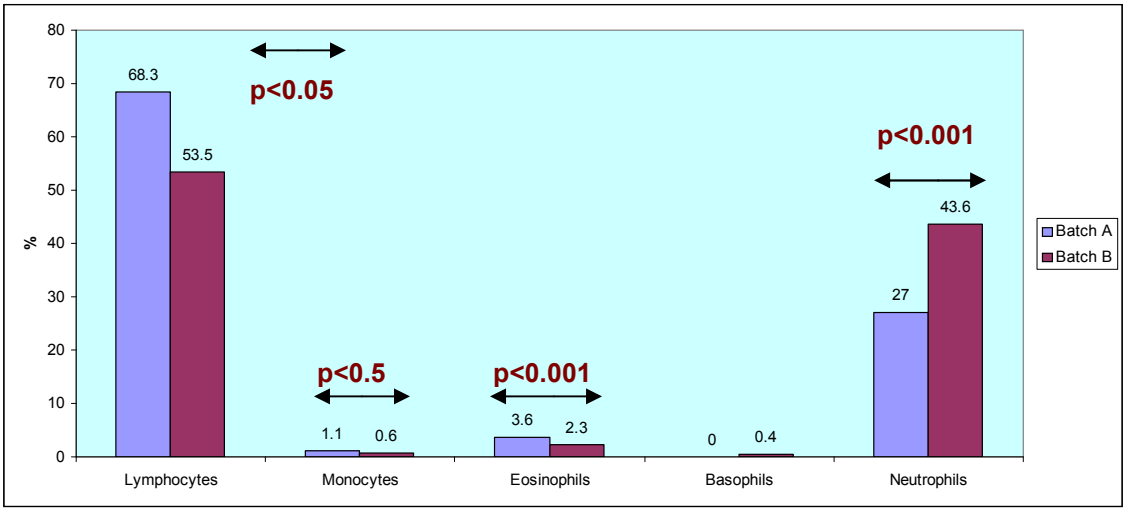

Figure 4. Mean leukocyte subpopulations (%) in broilers in batches A and B

Conclusions

1. Investigations were conducted on broiler chickens raised in an intensive farm enjoying appropriate microclimate conditions;
2. There were changes in the experimental batch which means higher average of neutrophils (heterofiles) and a highly significant decrease in the average values of eosinophils;
3. In the experimental batch the number of leukocytes and HEM concentration showed a significant increase compared to the control batch, the average mean were over the normal physiological limits;
4. Erythrocyte count, hemoglobin and erythrocyte constants MCV and MCHC had a similar pattern in both batches during the experiment with Amoxidem 50% and the difference between them was insignificant.
5. At the investigated batches the monocites showed small variations, the statistical difference between them was insignificant.

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The work was conducted under research contract no. 1554/2009 signed with S.C.Delos Impex 96 S.R.L. Bucharest