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## Influence of Antibiotics Treatment on Hematological Aspect in Chickens

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**Abstract:** Two experiments were described in which sixty one-day old (IPA) chicks were distributed into four equal groups, three for treatment & the other for control. Ampicillin, Enrofloxacin or Amoxicillin were used for five consecutive days via drinking water for treatment for at the first and twenty second day of life. Five birds from each group were slaughtered on 6 and 28 days post treatment and hematological examinations performed on blood samples collected just prior to slaughter. Changes in PCV, HB, RBC, WBC, MCV, MCH and MCHC were observed. The investigations demonstrated a fall in hematological values in body chicks, Whereas in older ages these values were analogous with normal ranges. The changes were not substantiate the presence of anemia. They might be an indications of an incidental haemodilution in the hematological observed in this study.

**Key words:** Antibiotics, hematology, chickens

### Introduction

Antibiotics are used in the livestock industry not only to treat diseases but also to promote growth and increase feed efficiency in less than ideal environmental conditions (Doyle, 2001).

However, certain antibiotics recently have been shown to exert diverse effect on different elements of the blood.

Some agents are known to cause thrombocytopenia, anemia or leucopenia. Some agents (e.g., Chloramphenicol) may cause pancytopenia. The agents most likely to associated with leucopenia are beta-lactams, Vancomycin, and trimethoprim-Sulfamethazole (TMP-SMX). Relatively few agents are associated with pure depression of red blood cells precursors, and chloramphenicol is the classic antimicrobial in this category (Caldwell and Cluff, 1974). Thrombocytopenia is the most common antibiotic associated hematological side effect encountered in clinical practice. Commonly associated agents are the beta lactams, TMP- SMX, vancomycin, and linezolid. Members who are investigating antibiotic - associated side effects should remember that non antibiotics are also common causes of thrombocytopenia. Some antibiotics particularly the beta- lactams as a class, as well as TMP-SMX and vancomycin, may cause combined cytopenias (Thrombocytopenia with leukopenia) (Cunha, 2001).

In the modern poultry industry antibiotics are also used in high quantities not only for therapy and prevention of bacterial diseases, but also as antimicrobial growth promoters (AMGPs) in poultry feed. However, in certain countries 26% of the veterinary used antibiotics were intended for poultry, mainly broilers, resulting in yearly exposure of 430 mg of antibiotics /kg/ year for poultry

(Bogaard *et al.*, 2002).

Although antibiotics therapy is often prescribed for treatment of bacterial infection in chickens, reports on its side effect are present. It was therefore the purpose of this study to investigate the hematological aspect of treatment with various antibiotics which are frequently prescribed for birds on the course of infection.

### Materials and Methods

A total of sixty one-day old (IPA) chicks were used in this study. The birds were distributed randomly into four equal test groups (A,B,C, and D). Group D was used via the drinking water at 1-5 and 22-27 days of age with ampicillin (Ampivet 20%, Doxal Italia spa, Italy) enrofloxacin (Arco- floxacin 10%, MADMAK, Jordan) or Amoxicillin (Vamaster vet 20%, MADMAK, Jordan) respectively as shown in Table 1. (George *et al.*, 1982) Two blood samples were taken from each group. Samples were taken after the first and second duration of treatment at 6 and 28 day of age respectively. Five birds has been taken randomly from each group and bled by incision of the jugular vein at each time of blood collection. A constricted blood flow was allowed to accumulate to plastic tubes containing an (EDTA) anticoagulant for hematological studies. The hematological examination carried out on the un clotted blood of each sample were included estimation of packed cell volume (PCV), the hemoglobin concentration (Hb) and red blood cells count (RBCs). The mean value of these five samples was considered. From these were calculated the mean cell volume (MVC), the mean cell hemoglobin (MCH) and the mean cell hemoglobin concentration (MCHC). The white blood cell count (WBC) was also performed (Ross *et al.*, 1976).

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Table 1: Experimental Design

Groups of Birds	Scientific Name of Antibiotic	Trade Name of antibiotic	Duration of treatment	Day when bled	No. of birds in each group	Mortality
A	Ampicillin	Ampivet 20%	1-5 and 22-26	6 and 28	15	3
B	Enrofloxacin	Arco-floxacin 10%	1-5 and 22-26	6 and 28	15	2
C	Amoxicillin	Vmaster Vet 20%	1-5 and 22-26	6 and 28	15	2
D	Control		1-5 and 22-26	6 and 28	15	5
Total					60	12

Table 2: Mean hematological values in chicks treated with antibiotics from 1-5 days of life

Groups	PCV %	Hb g/dl	RBC Million/ mm <sup>3</sup>	WBC Thousand/ mm <sup>3</sup>	MCV C.□	MCH pg	MCHC %
A	27.3* (1.23) <sup>a</sup>	6.1* (2.1)	2.2* (0.26)	19.4* (1.51)	111.0* (9.5)	24.0* (3.41)	20.1* (2.23)
B	26.8* (3.8)	6.2* (1.96)	2.1* (0.3)	18.8* (2.11)	112.0* (11.7)	24.1* (2.93)	20.5* (1.97)
C	26.9* (4.3)	6.0* (1.87)	2.05* (0.02)	18.1* (2.33)	111.1* (8.99)	23.8* (1.88)	20.3* (2.11)
D	30.4 (2.11)	8.9 (2.12)	3.1 (0.29)	21.9 (3.13)	114.9 (6.7)	26.1 (2.5)	22.6 (3.8)

Data are means of five samples for each parameter analyzed. <sup>a</sup>Standard deviation. \* 5% Level of significance of difference from control

Antibiotic treatment was similar to regimen used in commercial chicken production, which included utilization of antibiotic at 1st day of life for treatment of yolk sac infection following vaccination. Various antibiotics which were used in this study were tested at their usual oral dosage. Drinking water treatment was used because oral administration of drugs is the most practical way for treating birds.

### Results and Discussion

The hematological values determined on the birds treated at 1-5 days of life are shown in Table 2. This Table displays significant drop ( $P < 0.05$ ) in all hematological values after 5 days of continuous treatment with antibiotics in comparison with untreated control birds. The erythrocytes were microcytic in those antibiotic treated birds therefore it seems that antibiotics have an affinity to produce microcytosis as well as anemia this investigation demonstrated that antibiotics causes fall in hematological values at early age of life. These results were in agreement with that of (Burke and Cunha, 2003) who stated that various antibiotics exert diverse effects on different elements of blood, some agents produce anemia or leukopenia and some may cause pancytopenia.

The rapid onset of the anemia does not suggest an a plastic anemia while the absence of hemorrhages at postmortem examination and the presence of microcytosis would not support a diagnosis of hemorrhagic anemia. The results therefore suggest that this is not a true anemia and the occurrence of hemodilution in circumstances perhaps favoring hemoconcentration must be considered (Gleckman and Borrego, 1997). This would require more detailed studies of blood volume and red cell mass changes resulting in this incidental haemodilution following treatment with antibiotics.

Onifade and Odunsi (Onifade and Ordunsi, 1998) obtained a superior hematological indices in broilers fed diet included high fibrous ingredients and penicillin which indicates nutritional adequacy of the diets that's was most probably mediated by penicillin addition. This is because blood parameters are frequently lowered by high inclusion of fibrous ingredients due to their inferior nutritional quality, and the authors concluded that the addition of of procaine pencillin supported adequate blood profile in broilers fed high concentrations of cheap fibrous feed stuff comparably with control and they were recommended that antibiotics supplementation represent a feasible strategy to expand dietary inclusion of such alternative feedstuff beyond the current practice. Odunsi *et al.* (1999) and Odunsi and Onifade (1998) stated that the hematological values incase of virginiamycin and zinc bacitracin supplementation in the broilers diets are analogous with the normal ranges which suggests adequate and healthy nutrition, and the preponderant values in the antibiotic supplemented groups justifies the established positive relationship between hematological parameters and performance of the birds.

The diversity between the results of present study and those previously mentioned studies might be due to the differences in age breed and method of administration. Table 3 displays the effect of antibiotics treatment during 22-27 days of age on hematological values in chicks. The hematological parameters (PCV, RBC, HB, WBC, MCW, MCH and MCHC) values were numerically decreased in comparison with that of the control group but the differences were not significant. These hematological values were analogous with that of the control group but the differences were not significant. These hematological values were analogous with that of the normal ranges mentioned by (Bell and Sturkie, 1965) whostated that the normal values of hematological

Table 3: Mean hematological values in chicks treated with antibiotics from 22-27 day

Group	PCV %	Hb g/dl	RBC Million/ mm <sup>3</sup>	WBC Thousand/ mm <sup>3</sup>	MCVC.□	MCH pg	MCHC %
A	29.9 (0.80) <sup>a</sup>	6.4 (1.70)	2.6(0.08)	20.8 (2.12)	114.8 (3.26)	25.4 (1.91)	21.6 (1.88)
B	30.0 (2.11)	6.2 (0.43)	2.5 (0.32)	21.1 (1.04)	114.9 (2.01)	25.8 (3.01)	20.9 (2.27)
C	30.1 (3.01)	6.3 (1.02)	2.7 (0.03)	21.6 (1.22)	115.1 (0.45)	26.1 (2.03)	21.8 (0.97)
D	30.5 (1.81)	7.1 (0.98)	3.0 (0.81)	22.9 (1.01)	116.0 (2.56)	26.9 (1.04)	22.1 (1.05)

Data are means of five samples for each parameter analyzed. <sup>a</sup>Standard deviation. Means in the same row without a common superscript are not significantly different.

parameters are as follows : PCV = 30.6%, RBC = 2.5-3.2 millions\mm<sup>3</sup>, Hb = 6.5-9 g\100 ml, WBC = 20-30 thousands /mm<sup>3</sup>, MCV = 115-125 C.μ, MCH = 25-27 pg and MCHC = 21-23% .

These data demonstrated the effect of antibiotic treatment on blood parameters at tow different ages in chickens. The investigations revealed a fall in hematological values in baby chicks (1-5 day) whereas in older ages (22-27 day) these values were analogous with normal ranges. This is may be due to incomplete development of haemopoitic system. The rapid fall in hematological values and absence of postmortem hemorrhage as well as the presence of microcytosis discussed earlier were not substantiating the presence of haemolytic or hemorrhagic anemia. They might be an indications for the role of antibiotics in a production of an incidental haemodilution in the hematological changes observed in this study rather than anemia.

## References

- Bell, D.J. and P.D. Sturkie, 1965. Chemical constituents of Blood. In *Avian Physiology*. p:32. Edited by Paul D. Sturkie comstock publishing associates a division of Cornell University Press, Ithaca, New York.
- Bogaard, A.E., R. Willems,N. London, J. Top and E.E. Stobb Eringh, 2002. Antibiotic resistance of faecal enterococci in pultry, poultry farmers and poultry slaughterers. *J. Antimicrob. Chemo.*, 49: 497-505.
- Burke, A. and M.D. Cunha, 2003. Principles of antibiotic formulary selection for Pandt committees. *Med. Clin. North. Am.*, 28: 594-596.
- Caldwell, J.R. and L.E. Cluff, 1974. Adverse reactions to antimicrobial agents. *JAMA*, 230: 77-80.
- Cunha, B.A., 2001. Antibiotic side effects. *Med. Clin. North. Am.*, 85: 149-185.
- Doyle, M.E., 2001. Alternative to antibiotics use for growth promotion in animalhusbandry. *Food Research Institute*, April, 1-12.
- George, B.A., C.L. Quarles and D.J. Fagerberg, 1982. Virginiamycin Effects on controlling Necrotic Enteritis Infection in Chickens. *Poult. Sci.*, 61: 447-450.
- Gleckman, R.A. and F. Borrego, 1997. Adverse reactions to antibiotics. *Postgrad. Med.*, 101: 97-98.
- Odunsi, A.A., A.A. Onifade and G.M. Babatunde, 1999. Response of broiler chicks to virginiamycin and dietary protein concentration in the humid tropics. *Arch. Zootec.*, 48: 317-325.
- Onifade, A.A. and A.A. Ordunsi, 1998. Efficacy of procaine penicillin as growth promoter in broiler chicks fed low and high fibre diets in the tropics. *Arch. Zootec.*, 47: 621-628.
- Ordunsi, A.A. and A.A. Onifade, 1998. Effect of zinc bacitraicin supplementation of broiler chick diets containing a low or high vegetable oil concentration in the tropics. *Trop. Vet.*, 16: 51-57.
- Ross, J.G., G. Christie, W.G. Halliday and R.M. Jones, 1976. Determination of hematology and blood chemistry values in healthy six-week-old broiler bybrids. *Avian Pathol.*, 5: 273-281.