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IMMUNOMODULATING EFFECTS OF ANTIBIOTICS IN CHICKENS

Ali A.S.Al-Mayah, Jalaa A., Deena H., Amaal F.,
Jenan A., Hanadi M. , Nagham Y. and Tamather A.

Department of pathology and poultry diseases, College of Veterinary Medicine
,University of Basrah , Basrah , Iraq.
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ABSTRACT

Evaluation of the effect of common antibiotics used in the farm production , on the immune system of chickens during the 21 days of life were investigated. A total of 60, one-day old chicks were divided into four equal groups and was raised for 30 days. Three groups were treated with Ampicillin, Enrofloxacin & Amoxycillin respectively whereas the4thgroup was served as control. Antibiotic treatment was similar to regimen used in commercial chicken production, which included utilization of antibiotic at 1st day of life and after vaccination. Body weight, bursa of fabricius weight and bursa of fabricius to body weight ratio were calculated in order to monitor the growth rate of bursa during the 21 days of life. All birds were vaccinated against ND at 7&21days of age. Blood samples were collected at 14&29 days of age. Blood total protein, albumin and globulin were determined. Antibiotic treatment often resulted in significant decrease ($P<0.05$) bursa of fabricius weight & bursa of fabricius ratio at 14 days of age. Total protein, albumin & globulin were also decreased in the antibiotic treated groups in comparson with control group; but, there were no significant differences among treated groups

INTRODUCTION

It has been more than 50 years, since 1946, reported an improvement in growth when Streptomycin was added to the diet of chickens. Since that time, antibiotics have been widely used in poultry feed to control diseases and more recent to promote growth & improve feed conversion. However the nonprescription use of antibiotics in poultry feeds has been eliminated or severely limited in many countries because of concerns related to development of antibiotic-resistant human pathogenic bacteria and legislative action to limit their use is probable in many others. Therefore, alternatives to antibiotics are of great interest to the poultry industry.(1)

Antibiotics have been shown to affect a variety of immune function in animals, as well as in persons. In rabbits, specific antitoxin production was suppressed when staphylococcal hemolysin and an antibiotic such as oxytetracycline or gentamicin, were administrated simultaneously. (2)

Chlortetracycline was found to similarly affect antibody response in chicken, (3) and gentamicin, tylosin and chlortetracycline were shown to suppress immunity in turkeys.(4)

Therapeutic and subtherapeutic uses of antibiotic are ubiquitous in commercial food animal production, especially in turkeys, therefore; any factor that may interfere with the maturation of any immune system component would adversely affect the overall growth and performance of the immune system. (2)

Chloramphenicol and florfenicol at a concentration of 20 mg /ml altered lymphocyte proliferation. The influence of the antibiotics on polymorpho -nuclear and mononuclear cells phagocytic ability at a higher dose was show depression of this ability of these cells in fishes. (5)

Seelig (6) suggested that antibiotics not only inhibit competing bacterial flora but also inhibit antibody synthesis and prophylactic activity in human, causing irritation of the tissues which makes tissue penetration by candida is easier.

The bursa of Fabricius in chickens, has large number of antibody-producing cells. This lymphoid tissue performs a variety of vital immuno- logic functions in the ontogeny of the immune system & in the host defense .For example, removal of the bursa of Fabricius in young chickens is known to influence serum immunoglobulin concentration to modify specific immune response to antigens, and to induce suppression for one or more immunoglobulin classes.(7)

The present study was designed to evaluate the effect of common anti- biotics used in farm production on the immune system of chickens during the 21 days of age.

MATERIALS AND METHODS

A total of 60,one-day old chicks (FAOBRO) were divided into four equal groups (A,B,C and D) , raised for 30 days & provided a commercial broiler ration for ad libitum consumption . Group A,B and C were given Ampicillin (Dox-al Italia Spa , Italy) , Enro-floxacin (MADMAK,JORDAN) and Amoxycillin (MADMAK,JORDAN) respectively, where as group D served as control . Antibiotic treatment was similar for a regimen, generally, used incommercial chicken production, which included utilization of antibiotics at one day of age to minimize early chick mortality, and at 21 days of age to prevent secondly infection after vaccination with Newcastle Disease (ND) vaccine (2&8). These drugs were given at a dose of 1mg/L of drinking water for 5 consecutive days according to the manufacture directions.

All these birds were vaccinated against ND with B1 and LaSota vaccine (Cevac, Hungry) via drinking water at 7 and 21days of age respectively.

At 3,14 and 21 days of age, 2 birds from each group were killed, weighed individually. The bursa of Fabricius was carefully removed and weighed.

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Table 1: I
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Group	Antibiotics
A	Ampicillin
B	Enrofloxacin
C	Amoxycillin
D	Control

*Figure

The rate of bursal growth was monitored in relation to body weight growth for the duration of the experiment. the bursa of Fabricius weight to body weight ratio was determined for individual birds in the 4 treatment groups at each age interval, the mean ratios were calculated. At 14 and 29 days of life, blood samples were collected in a clean glass tubes for determination of total protein, albumin & globulin. The blood samples were collected from two birds of each group, these birds have been killed at 14th days of age and blood had been taken from each individual killed bird separately. Additional 2 other birds were killed at 29 days of life for this purpose.(3,4,8) the data were subjected to statistical analysis.

RESULTS AND DISCUSSION

Table 1: Effect of antibiotics treatment on bursa of Fabricius weight (BFW) & bursa of Fabricius ratio (BFR) at each age interval.

Group	Antibiotics	BFW(grs) at each age Interval (days)			BFR at each age interval (days)		
		3	14	21	3	14	21
A	Ampicillin	0.120 ± 0.01 * a	0.176 ± 0.02 a	0.253± 0.007 a	0.256 ± 0.008 a	0.160 ± 0.004 a	0.175 ± 0.005 a
B	Enrofloxacin	0.122 ± 0.03 a	0.177 ± 0.001 a	0.229± 0.08 a	0.251 ± 0.006 ± a	0.159 ± 0.003 ± a	0.176 ± 0.007 ± a
C	Amoxycillin	0.121 ± 0.003 a	0.175 ± 0.01 a	0.225± 0.01 a	0.259 ± 0.007 a	0.156 ± 0.002 a	0.173 ± 0.004 a
D	Control	0.120 ± 0.001 a	0.324 ± 0.03 a	0.717± 0.002 a	0.259 ± 0.009 a	0.290 ± 0.001 b	0.301 ± 0.009 b

*Figure at the same vertical columns with different letters are significantly

differ ($p< 0.05$).
Data are expressed as mean ± SD.

t the first 3 days of age the bursa of Fabricius weight & bursa of Fabricius ratio of control group was not significantly differed from that of antibiotics treated groups as indicated in table 1. This result was in agreement with that of (3) who reported that bursa of Fabricius was not undergoing significant changes at this age because it was expected to have primarily IgM – and IgG bearing cells in the early post hatch period in the chickens.

At 14 days of age, the trend reversed somewhat in that the antibiotic- treated chickens had significantly ($p<0.05$) lower bursa of Fabricius weight and bursa of fabricius ratio of the untreated chickens. This situation remained true at 21 days of age when general suppression of the bursa of fabricius weight in the antibiotic- treated chickens was evident (fig. 1&2). This result was in agreement with that of (2) who stated that for the 21 days of life, a reduced rate of bursal growth was observed in the antibiotic-treated turkeys, which included preincubation dipping of fertile eggs in gentamicin solution, injection of turkeys with gentamicin at hatching, and inclusion of chlortetra- cycline in the diet.

The present study evaluated the effect of antibiotic treatment on the immune system of chickens through the measurement of bursa of fabricius development in the first 21 days of life of chickens; because, during this period rapid growth of lymphoid tissue is believed to occur, any negative effect on immunologic processes at this stage would probably produce lasting effects on the immune system in general & the bursa of fabricius in particular (8).

The normal weight of the bursa of fabricius in meat type chickens at 21 days of age is about 0.3% of the body weight, weight below 0.1% is highly suggested of severely immunosuppression (9). The present study show mild to moderate suppressive development of bursa of fabricius in the antibiotic-treated groups as indicated in table 1.

It is worth mentioning that mortality rate was 26.66% in the control group during the duration of the experiment, whereas in the antibiotic-treated groups was ranging from 13.33 to 20% .

Table 2 : Effect of antibiotic treatment on blood total protein, albumin & globulin in gm/100ml at each age interval (days).

Group	Antibiotic	Total protein		Albumin		Globulin	
		14	29	14	29	14	29
A	Ampicillin	2.71 ± 0.19 a	3.72 ± o.18 a	2.50 ± 0.10 a	3.51 ± 0.17 a	0.12 ± 0.1 a	0.22 ± 0.02 a
B	Enroflox-acin	2.63 ± 0.21 a	3.89 ± 0.21 a	2.24 ± 0.10 a	3.64 ± 0.11 a	0.21 ± 0.2 a	0.25 ± 0.02
C	Amoxyllin	2.44 ± 0.33 a	3.89 ± 0.32 a	2.22 ± 0.22 a	3.64 ± 0.21 a	0.22 ± 0.4 a	0.25 ± 0.01 a
D	Control	3.54 ± 0.13 b	4.49 ± 0.21 b	3.25 ± 0.12 b	4.19 ± 0.101 b	0.29 ± 0.3 a	0.30 ± 0.2 a

*Figure at the same vertical columns with different letters are significantly differ ($P<0.05$).
Data are expressed as mean ± SD.

A perusal of table 2 indicated that there was a significant decrease ($P<0.05$) in total protein & albumin in the antibiotic treated groups in comparison with control group. Globulin was also high in control group ;but, it was not significantly differed. There were no significant differences between treated groups. Previous reports have shown immune suppressive potential of chlor-tetracycline & gentamicin in chickens & turkeys(2). The present study also revealed similar effects.

The immune response was clearly detected on day 29 through the increment of globulin in the control group. This could be due to maturity of immune system & formation of memory cells (8).

The growth rate of bursa of fabricius, which is relevant to its functional capability, was adversely affected (2). How antibiotics affected suppression of the immune system was not investigated in this study; interference in protein synthesis, lowered

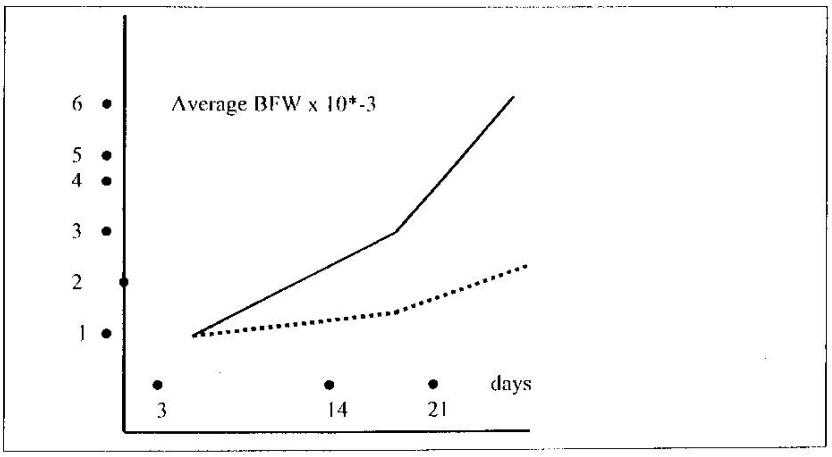

Fig. 1: Bursa of Fabricius weight in control (solid line) and Ampicillin treated (dotted line) of chicken.

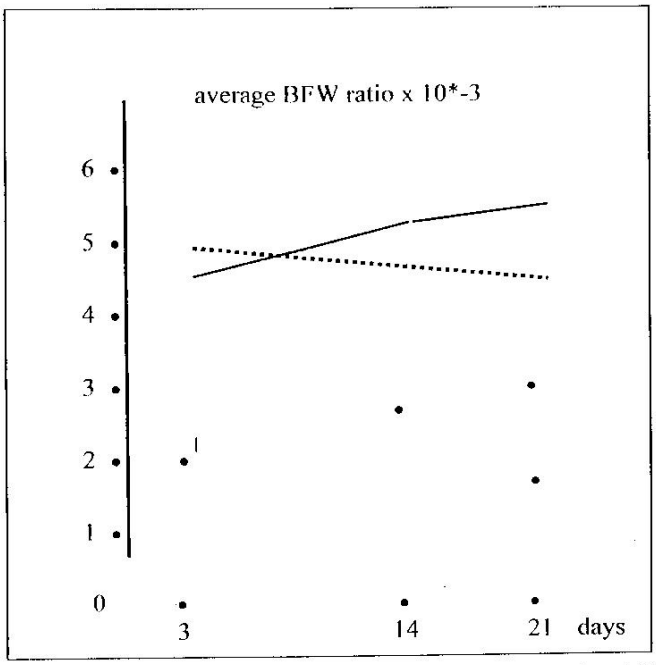

Fig.2: Bursa of Fabricius weight to body weight ratio in control (sold line) and Ampicillin treated (dotted line) of chicken.

phagocytosis & reduced exposure to antigens have been indicated as possible mechanisms. (3)

Decreased bursa of fabricius weight could be due to decrease production of bursim hormone, which in turn, could lead to differentiation of B-cells to plasma cells which responsible for antibodies production (4).

Neonatal poultry exhibit a transient susceptibility to infectious diseases during the first week of life largely due to impairment of the avian host defense. This period of transient immunological incompetence is character- ized by the general failure of T-cells to proliferate and secrete cytokines, reduced ability to produce immunoglobulin and functional inefficiency of heterophils and macrophages for the first 7days of life due to any stress factor such as inappropriate use of antibiotics (10).For further conformation of negative effects of antibiotics other, immunological tests could be used for supporting our results.

Under the assumption of combating subclinical & clinical diseases & stimulating growth, antibiotics are used. If this practice is reducing infection risk,and at the same time,is compermising immunity,the risk vs benefit situation should be evaluated carefully.

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التأثير السلبي للمضادات الحياتية على المناعة في الدجاج

علي عبد سهم المياح -جلاء عامر- دينا حامد -نغم يحيى-
جنان عبد الخضر-هنادي ميخائيل -آمال فاضل و ثامر عبدالكاظم
فرع الأمراض والدواجن،كلية الطب البيطري،جامعة البصرة،البصرة ، العراق

الخلاصة

تم في هذه الدراسة تقييم آثار إستخدام المضادات الحيوية الشائعة الاستخدام في حقول الدواجن على المناعة في هذه الطيور خلال ٢١ يوماً من عمر الدجاج. وقد إستخدام في هذه التجربة ٦٠ طيراً بعمر يوم واحد من نوع (فاوبرو) حيث قسمت الى اربعة مجاميع متساوية أعطيت المجاميع الثلاثة الأولى الاميسلين، انرو فلوكساسين و الاموكسيلين على التوالي و استخدمت المجموعة الرابعة كمجموعة سيطرة .وتمت تربية هذه الأفراخ لمدة ثلاثين يوماً. إن إستخدام المضادات الحيوية في المجاميع الثلاثة مشابه لما معمول به في تربية الدواجن حيث يتم إعطاء الأفراخ المضادات الحيوية اعتباراً من اليوم الأول من العمر لتقليل نسبة الهلاكات خلال الأسبوع الأول ثم تعطى الأفراخ المضادات الحيوية بعد تلقيحها بالنيوكاسل . تم تسجيل أوزان الأفراخ واوزان غدة فابريشي ونسبة وزن الغدة إلى وزن الجسم (المنسب) في الأعمار ٣و١٤ ٢١ يوم لمعرفة تطور نمو هذه الغدة خلال مدة ٢١ يوماً . أعطيت جميع الأفراخ لقاح النيوكاسل في الأعمار ٧و٢١ يوماً. اخذت نماذج من الدم في الأيام ١٤و٢٩ من عمر الأفراخ لمعرفة مستويات البروتين الكلي والزلال (الألبومين) والكلوبيولين في الدم. اتضح من

التجربة أن المجاميع المعاملة بالمضادات الحيوية كان وزن الغدة فيها اقل بصورة معنوية من مجموعة السيطرة كذلك بالنسبة إلى المنسب. أما البروتين الكلي والزلال والكلوبيولين كذلك كان اقل في المجامع المعاملة بالمضادات الحيوية من مجموعة السيطرة .بالإضافة إلى ذلك وجود اختلافات في هذه المعايير المذكورة بين المجاميع المعاملة بالمضادات الحياتية إلا أن هذه الاختلافات ليست معنوية.

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