The influence of enrofloxacin on hematological features, total cholesterol, blood glucose and body weight of broilers

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Abstract

The effect of enrofloxacin on hematology and some parameters of blood biochemistry of broilers were investigated. A total of 50 day old commercial broiler chicks were raised and distributed into two equal groups, group A treated with enrofloxacin and group B designed as a control. Enrofloxacin was used for group A for five consecutive days via drinking water (double dose 1ml/litter) at the 21 days of life, ten birds from each group were slaughtered at 27 days post treatment, hematological examinations were performed, serum total cholesterol and blood glucose were analyzed by using special enzymatic kits for that purpose, body weight was considered at 32 days of life for five samples. Changes in Hb, PCV, RBC, WBC, MCV, MCH, MCHC, Total cholesterol, blood glucose, and body weight were observed, the investigation demonstrated all these hematological parameters were without divers effect due to enrofloxacin treatment comparing to control, and showed that the enrofloxacin have no effect on total cholesterol, blood sugar or body weight comparing to control.

Introduction

Avian blood differ in cells characteristics from their mammalian counterpart (1), several factors including water and feed restriction (2,3), diet content (4), environmental conditions (5), continuous supplementation of Vit.E (6), and poultry diseases (7) affect the hematology of birds. Antibiotics are used in the commercial flocks to treat diseases, growth promoters and increased feed efficiency (8). However certain antibiotic recently have been shown to exert diverse effect on different elements of the blood, some agents are known to cause leucopenia such as beta lactam and trimethoprim-sulfamethaxazole, or pancytopenia and toxic effect on the intestinal mucosa in case of chloramphinicol treatment (9, 10,11), or toxic effects of furazolidone on blood profiles (12), enrofloxacin with prolonged duration of treatment may cause elevation in the liver enzymes such as serum glutamic acid pyrovic transaminase (SGPT) and serum glutamic acid oxaloacetate transaminase (SGOT), may be due to the adverse effect on tissue of the liver (13), although antibiotics are often prescribed for treatment and growth promoters reports on it’s side effects are present. Enrofloxacin is a quinolone carboxylic acid derivative with antimicrobial action against gram positive and gram negative organisms, highest concentration occurred in liver and kidney, following a one-day withdrawal in poultry the highest drug concentration were found in the skin (14), its action increases double-strand (DNA) breakage, inhibits relaxation of supercoiled (packed) DNA needed for DNA replication, inhibit the A subunit of DNA gyrase for this reason its activity was bactericidal (15,16), there was no evidence for carcinogenicity (17), enrofloxacin has been claimed to be an effective antibacterial agent and basically used in Veterinary Medicine for the treatment of diseases, caused by E coli, Salmonella and strains of Mycoplisma gallisepticum, Hemophilus spp. as well as chronic respiratory disease. (18). The purpose of this research was to investigate the hematological parameters, total cholesterol, blood glucose and body weight performance offer treatment with enrofloxacin which is frequently
prescribed for birds on the course of infection.

Materials and Methods

A total of 50 one day old broiler chicks obtained from commercial hatchery were used in this study. The birds were distributed randomly into two equal test groups, group A treated with enrofloxacin and group B designed as control. Group A was treated with double dose 1ml/litter (Enrofloxacin 10%) via drinking water at 21 days for 5 consecutive days. Blood samples were taken from each group at 27 days of age after the duration of treatment. Ten birds have been taken randomly from each group and bled by incision of the jugular vein. An constricted blood flow was allowed to accumulate to plastic tubes with and without EDTA for hematological studies and for collection the serum. The hematological examination carried out on the 5 unclotted blood samples were included estimation of packed cell volume (PCV) to evaluate the status of avian erythron, the hemoglobin concentration (Hb), red blood cell count (RBC), white blood cell count (WBC), and the mean values of these five samples were considered and from these were calculated the mean cell volume (MCV), the mean cell hemoglobin (MCH), the mean cell hemoglobin concentration (MCHC), these values are important in determining the morphological characteristics of anemia (19). The collected serum samples were examined for total cholesterol and blood glucose by using spectrophotometer (PD-303, APEL, Japan) and special enzymatic kits (cholesterol SL (CHOD-PAP), wave length 510 nm, and Glucose SL (GOD-POD), wave length 500 nm, Giesse Diagnostic Snc, Italy). Five birds were weighed on day 32 of age. Antibiotics and enrofloxacin treatment was similar to regimen used in commercial chicken production, routine vaccination of Newcastle disease (ND) and Infectious bursal disease (IBD), the diet was standard, the chickens were reared at standard condition. Statistical analysis, all data were subjected to ANOVA –test.

Results and Discussion

The hematological values, serum total cholesterol, blood glucose and body weight gain were determined on the birds treated at the 21 days of age with enrofloxacin which are shown in Table 1 and 2. These results display the hematological values were numerically decrease of Hb, PCV, RBCs, WBCs, MCV, MCH, MCHC of treated group in comparison with that of control group but the differences were not significant, these hematological values were closely related with that of normal ranges mentioned by (20,5), we suggest that enrofloxacin does not cause anemia, since anemia is commonly defined as hematocrit value of less than 27% in birds (21), of any type macrocytic or microcytic anemia since that MCV with normal range. RBCs count of treated group is ranging with normal values, this making us to say that the enrofloxacin has no effect on bone marrow or spleen. WBCs count showed numerical differences but not significant of comparable two groups, in the treated group there is a little decline in the WBCs count this may be due to the way which enrofloxacin affect the bacteria through impair the gyrase, an enzyme which plays a major role in the replication of DNA (22), its not quite sure if with long term or high doses treatment with enrofloxacin will cause decrease in immune response by reducing total WBCs count in blood, although the humeral immune response following vaccination using as an example, Newcastle disease antibodies were not reduced by treatment with enrofloxacin (Baytril) (23). Serum total cholesterol and blood glucose showed low levels of treated group in comparison with the control, but did not differ significantly. These results are true for laboratory animals that give therapeutic level which did not reveal any significant effect on blood cholesterol, triglyceride and sugar (24), but (13) found that long term treatment with enrofloxacin caused a significant decline in the cholesterol level of the broilers serum at 4, 6, 8 weeks of age. Weight gain of the treated group was at the same time not
better than control group, there is no influence on feed conversion by enrofloxacin comparing two groups, this result does not match with results obtained by Bauditz (25) who found that the enrofloxacin enhances the body weight by 7.8% compared with control. These data demonstrate here revealed these values under investigation of hematology are analogue with the normal range of both groups, may be these results indicate that the enrofloxacin has no adverse effects on hematological values, there is no influence on erythron status or evidence of anemia, since that the PCV, Hb, RBCs with normal range at one single age in chickens of 21 days old treated with double dose of enrofloxacin, we suggest this is may be due to the complete development of haemopoietic system of chickens and so we thought the use of enrofloxacin at the beginning of life may had an influence on the hematology, since the haemopoietic system is not developed yet, and this need to investigate to confirmed and whether this effect is temporary or prominent, also it is not well known if high doses or long term treatment will affect the hematology of older birds. The use of enrofloxacin does not cause changes in the total cholesterol or blood sugar, this may be due to that enrofloxacin has no or little effect on the liver, although the highest concentration of enrofloxacin in this organ (26), or may be due to that the enrofloxacin did not affect the absorption of nutrients and fats in the diet, may be due to that enrofloxacin has no or little toxic effect on intestine. The enrofloxacin has no effects on the body weight therefore we considered that enrofloxacin is not enhancing growth or feed conversion and can not use as growth promoter. These data were showed here it is restricted by the bird age, dose and duration of treatment, nutrition, health status and environment.

Table (1) Represent the hematological values

<table>
<thead>
<tr>
<th>Group</th>
<th>Hbg/dl</th>
<th>PCV%</th>
<th>RBC 10^6/mm3</th>
<th>WBC 10^3/mm3</th>
<th>MCV fl</th>
<th>MCH pg</th>
<th>MCHC g/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10.2(0.94)a</td>
<td>30.38(1.13)</td>
<td>2.49(0.12)</td>
<td>21.86(0.3)</td>
<td>120.8(3.37)</td>
<td>40.8(0.9)</td>
<td>33.74(0.89)</td>
</tr>
<tr>
<td>B</td>
<td>10.6(0.5)a</td>
<td>31.18(0.87)</td>
<td>2.55(0.15)</td>
<td>22.40(0.46)</td>
<td>121.06(3.55)</td>
<td>41.1(0.64)</td>
<td>33.96(0.8)</td>
</tr>
</tbody>
</table>

Data are means of 5 samples for each parameter analyzed, a: standard deviation A: treated group, B: control

Table (2) Represent the biochemical values and body weight

<table>
<thead>
<tr>
<th>Group</th>
<th>Glucose Mg/dl</th>
<th>Total cholesterol Mg/dl</th>
<th>Weight gm</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>76.1(8.049)a</td>
<td>159.1(18.458)</td>
<td>882*(62.417)</td>
</tr>
<tr>
<td>B</td>
<td>86.07(10.312)a</td>
<td>165.6(17.267)</td>
<td>874(54.198)</td>
</tr>
</tbody>
</table>

Data are means of 10 samples for each parameter analyzed, *: five samples, a: standard deviation A: treated group, B: control

References


تأثير مركب الأتروفلوكساسين في الصورة الدموية، الكوليسترول الكلى، كلوتز الدم ووزن الجسم في أفرع اللحم

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الخلاصة

درس في هذا البحث تأثير مركب الأتروفلوكساسين على الصورة الدموية وبعض المعايير الكيميائية للدم في فروع اللحم. تضمنت التجربة التي صممت لهذا البحث تربية (50) فرخة لحم حيث قسمت إلى مجموعتين، المجموعة الأولى تم تت علاجتها بمركب الأتروفلوكساسين والمجموعة الثانية عدت مجموعة سيطرة. استخدم الأتروفلوكساسين في المجموعة B بعمر 21 يوم ولد خمسة أيام متتالية عن طريق ماء الشرب بجرعة مضاعفة مقدارها 1 مل/فأرة. اخذت عشرة طيور من كل مجموعة وعمر 27 يوم بعد تقديم العلاج حيث جمع الدم من كل طير واجريت فحوصات الدم على RBCs ومعدل كريات الدم الحمراء Hb وعدد الخلايا المرصوصة PCV ومستوى الكوليسترول ومستوى الكلوتز الدم والوزن. أظهرت الأتروفلوكساسين تأثيرات في الصورة الدموية في جميع الفروع. بالإضافة إلى ذلك، أظهرت النتائج عدم وجود أي تغييرات في مستوى الكوليسترول الكلى وـ اتروفلوكساسين لجميع الفروع. النتائج تشير إلى أن استخدام مركب الأتروفلوكساسين إلى تحسين أو زيادة في النمو.