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Effect of Intramuscular Ciprofloxacin on Feed Intake, Body Weight and Humoral Immune Response of Broiler Chicks

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Abstract: Ciprofloxacin was administered intramuscularly at 1.25, 2.5, 5 and 10 mg kg^{-1} b.w. doses to different groups of Ranikhet La Sota and SRBC inoculated broiler chicks. The immune status and growth parameters were studied. Ciprofloxacin in all dose levels tested showed significant reduction in antibody titre against La Sota and SRBC: but did not produce any significant effect on cumulative feed intake, feed efficiency and body weight gain.

Key words: Ciprofloxacin, feed intake, body weight, humoral immune response

INTRODUCTION

The use of fluoroquinolone group of antimicrobial compounds in veterinary practice is mainly for their antimicrobial action. But they also influence the complex entities of biological system such as feed intake, growth and immune status. Earlier studies have proved that quinolones in general have both favorable effects such as improving body weight gain in chicken. Fang Bingllu *et al*.,[1] and unfavorable effects such as immunosuppression[2]. Since the use of this group of compounds is becoming popular among the poultry practitioners, knowing additional information on this group of compounds would be of practical utility for the poultry industry. In this context, Ciprofloxacin, one of the important members of this group was chosen for the study with a view to know it's effect on cumulative feed intake, cumulative feed efficiency, body weight gain and humoral immune response in broilers.

MATERIALS AND METHODS

Day old sexed male broiler chicks of 'cobb' strain were randomly divided into groups of six chicks each. The chicks were leg banded and reared in three-tier individual cages (12"x12"x18") and reared for 8 weeks. Feed and water were provided individually ad libitum under standard managemental conditions. The broilers were fed with standard broiler starter mash and finisher mash from 0-4 weeks and 5-8 weeks, respectively.

Ciprofloxacin was administered intramuscularly at 1.25, 2.5, 5 and 10 mg kg^{-1} body weight doses to different groups of broiler chicks on day 7,8,9, 28, 29 and 30 after the priming and booster inoculation with Ranikhet-La Sota and Sheep Red Blood Cells (SRBC) on day 7 and day 28.

Production parameters such as weekly body weight, cumulative feed intake and feed efficiency and immunological parameters such as Haemagglutination Inhibition antibody titre against La Sota and Haemagglutinin antibody titre against SRBC were observed.

For estimation of Haemagglutination inhibition titre against Ranikhet La Sota antigen, microdilution technique, as described by Giamborne[3] using "V" bottom microplates was followed. For estimation of Haemagglutination antibody titre against Sheep Red Blood Cells, the method described by Van Der Zipp *et al*.[4] was followed.

Antigens used

La sota: Ranikhet Disease virus-La Sota Strain was used to produce antibodies against Ranikhet disease virus.

Sheep red blood cells: The Sheep Red Blood Cells (SRBC) were obtained from six Mecheri sheep and washed three times in physiological saline solution and then packed. The 0.25 mL of packed SRBC mixed with 0.75 mL of physiological saline was used as antigen. This antigen was injected intramuscularly 0.5 mL each in both the thighs of the bird.

RESULTS AND DISCUSSION

Ciprofloxacin when administered intramuscularly at doses 1.25, 2.5, 5 and 10 mg kg^{-1} b.w. doses did not

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Table 1: Effect of ciprofloxacin (intramuscular administration) on cumulative feed intake and feed efficiency in broilers

Dose of ciprofloxacin (mg)	Cumulative feed intake (g)				Cumulative feed efficiency			
	0-14 days	0-28 days	0-42 days	0-56 days	0-14 days	0-28 days	0-42 days	0-56 days
Control	273±2^{a}	940±10^{b}	2059±28^{ab}	3518±153^{ab}	1.17±0.05^{a}	1.38±0.05^{a}	1.73±0.03^{a}	2.12±0.09$^{a\ ns}$
1.25	274±2$^{a\ ns}$	888±12$^{a\ **}$	2018±13$^{a\ ns}$	3501±50$^{ab\ ns}$	1.31±0.08$^{a\ ns}$	1.50±0.15$^{a\ ns}$	1.72±0.06$^{a\ ns}$	2.16±0.12$^{a\ ns}$
2.50	272±2$^{a\ ns}$	922±9$^{ab\ ns}$	2105±19$^{b\ ns}$	3625±60$^{b}_{ns}$	1.26±0.04$^{a\ ns}$	1.56±0.03$^{a\ ns}$	1.65±0.03$^{a\ ns}$	1.97±0.04$^{a\ ns}$
5.00	274±1$^{a\ ns}$	905±10^{ab} *	2003±28$^{a\ ns}$	3554±63$^{ab\ ns}$	1.28±0.04$^{a\ ns}$	1.55±0.05$^{a}_{ns}$	1.63±0.07^{a} ns	2.04±0.08$^{a\ ns}$
10.00	274±1$^{a\ ns}$	920±13$^{ab\ ns}$	1992±17$^{a\ **s}$	3432±43$^{a}_{ns}$	1.31±0.04$^{a\ ns}$	1.55±0.08$^{a\ ns}$	1.61±0.05^{a*}	1.97±0.12$^{a\ ns}$

Mean values within each column bearing atleast one common superscript do not differ significantly, *p<0.05; **p<0.01 as compared to the control by DMRT

Table 2: Effect of ciprofloxacin (intramuscular administration) on body weight (g) of broilers

Groups	Age (Days)			
	14	28	42	56
Control	235±3^{a}	688±14^{a}	1240±16^{a}	1618±25^{a}
Ciprofloxacin 1.25 mg kg^{-1} b.w	213±5$^{a}_{ns}$	615±9$^{ab}_{ns}$	1184±26$^{a}_{ns}$	1648±24$^{a}_{ns}$
Ciprofloxacin 2.5 mg kg^{-1} b.w	218±4$^{a}_{ns}$	593±4^{ab*}	1275±24$^{a}_{ns}$	1840±15$^{a}_{ns}$
Ciprofloxacin 5.00 mg kg^{-1} b.w	216±2$^{a}_{ns}$	587±14^{a*}	1230±46$^{a}_{ns}$	1758±13$^{a}_{ns}$
Ciprofloxacin 10.00 mg kg^{-1} b.w	211±2$^{a}_{ns}$	602±8$^{ab}_{ns}$	1245±14$^{a}_{ns}$	1773±22$^{a}_{ns}$

Mean values within each column bearing atleast one common superscript do not differ significantly, *p<0.05; **p<0.01 as compared to the control by DMRT

Table 3: Effect of ciprofloxacin (intramuscular administration) on HI titre ($\log_2$) against LaSota antigen in broilers

Dose of Ciprofloxacin	Age in days							
	7	14	21	28	35	42	49	56
Control	1.39±0.12	2.57±0.09	2.57±0.06	2.32±0.00	2.65±0.08	2.57±0.06	2.41±0.05	2.13±0.14
1.25 mg kg^{-1} b.w	1.03±0.24	2.21±0.07	2.28±0.15	1.70±0.25	2.45±0.06	2.24±0.14	1.84±0.13	0.67±0.21
2.5 mg kg^{-1} b.w	0.76±0.26	2.09±0.12	2.14±0.12	1.86±0.09	2.35±0.09	2.21±0.07	1.98±0.10	0.86±0.29
5.0 mg kg^{-1} b.w	1.12±0.25	2.04±0.11	2.14±0.12	1.76±0.17	2.41±0.05	2.09±0.12	1.93±0.07	1.29±0.13
10.0 mg kg^{-1} b.w	1.12±0.25	2.11±0.07	2.49±0.05	2.41±0.05	2.61±0.07	2.41±0.05	2.11±0.07	1.12±0.25

Table 4: Effect of ciprofloxacin (intramuscular administration) on haemagglutinin antibody titre ($\log_2$) against SRBC in broilers

Dose of Ciprofloxacin	Age in days							
	7	14	21	28	35	42	49	56
Control	0.00±0.13	2.52±0.10	1.62±0.05	0.00±0.00	2.57±0.06	1.42±0.05	0.56±0.07	0.00±0.00
1.25 mg kg^{-1} b.w	0.00±0.00	1.79±0.09	0.67±0.21	0.00±0.00	1.00±0.37	0.86±0.39	0.50±0.22	0.17±0.17
2.5 mg kg^{-1} b.w	0.00±0.00	2.08±0.14	1.12±0.25	0.17±0.17	1.43±0.33	0.17±0.17	0.00±0.00	0.00±0.00
5.0 mg kg^{-1} b.w	0.00±0.00	1.90±0.15	1.17±0.31	0.00±0.00	1.70±0.36	0.76±0.37	0.33±0.21	0.00±0.00
10.0 mg kg^{-1} b.w	0.00±0.00	0.86±0.29	0.00±0.00	0.00±0.00	1.77±0.13	0.60±0.28	0.00±0.00	0.00±0.00

produce any significant change over the respective controls in any of the parameters such as feed intake, body weight and cumulative feed efficiency (Table 1 and 2). These results slightly differ from the findings of the earlier studies of Kempf *et al.*[5] and Jordan *et al.*[6], who have observed that enrofloxacin, a fluroquinolone was able to increase body weight in E.coli and Mycoplasma infected chicken. But our present study revealed that the quinolone, ciprofloxacin did not have any influence on body weight in healthy broilers. Therefore, it can be presumed that the fluroquinolone has influence in increasing body weight only in infection: not in healthy condition.

Ciprofloxacin reduced the antibody titre against La Sota and SRBC antigens in all the doses tested (Table 3 and 4). These findings which are indicative of the immunosuppressive action of Ciprofloxacin are in accordance with the observations of Jimenez-valera[2]. The reduction produced in the antibody titre was more pronounced against Sheep Red Blood cells than against Ranikhet La Sota antigen. This finding might be attributed to the fact that Sheep Red Blood cell is relatively an unnatural antigen to broilers than Ranikhet La Sota antigen.

The present study also showed that ciprofloxacin, though it produced immuno-suppression, it did not have any appreciable effect in cumulative feed intake, cumulative feed efficiency and body weight gain in broilers. These findings are in agreement with the findings of Roura *et al.*[7] who indicated that antibiotics are known to produce no significant improvement on growth performance under cleaner environment despite continuous administration of antibiotics in low doses.

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