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Effect of Ionophores on Some Parameters of Broilers Experimentally Infected with *Eimeria* Species

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ABSTRACT

The chemotherapeutic efficacy of lasalocid sodium, monensin and salinomycin against coccidiosis in day-old broilers (n=150) was determined. The birds were experimentally inoculated with mixed field isolates of *Eimeria* spp. (50,000 sporulated oocysts/bird). Lasalocid sodium (180 ppm) medicated birds had better feed conversion and consumption ratio, more weight gain and lower faecal oocyst counts compared to salinomycin (66 ppm) and monensin (130 ppm) medicated birds.

Key Words: Coccidiosis; Ionophores; Weight gain; Feed consumption and conversion ratio; Oocyst counts

INTRODUCTION

Coccidiosis is one of the major disease problems, loomed as an amplifying threat despite of the recent advances made in its prevention and control. As a very contagious disease, coccidiosis is virtually impossible to eliminate once it strikes any poultry facility. Unexpected outbreaks often occur in the form of enteritis and heavy mortality in birds that appeared healthy the previous day. Annual worldwide losses directly associated to this disease, although based on guesswork, number to hundred of millions of dollars (McDougald, 1980). (Shukla, *et al*., 1990). Animal health scientists have evolved a remarkable class of drugs known collectively as ionophores. Three of the leading members of the ionophore family, i.e. salinomycin, lasalocid and monensin, are ranked among the most widely used anticoccidial drugs in the world (Augustine *et al*., 1987). The ionophores act at ionic levels through formation of complexes with sodium and potassium, increasing the cell permeability and inhibiting the mitochondrial functions of the parasite. If given in coccidiosis, these drugs not only reduce the lesion advancement and mortality but also escalate gain in body weight (McDougald, 1980). This papers reports the comparative efficacy of different ionophores against coccidiosis in broilers.

MATERIALS AND METHODS

Different *Eimeria* species were collected from the naturally coccidia infected guts of the poultry received for diagnostic purposes in the office of Project Director, Poultry Production, Faisalabad and poultry farms in and around Faisalabad city. Twenty two infected guts and their contents taken from dead or sick birds were examined for the location of the gross lesions and the presence of oocysts using the routine examination methods for the confirmation of the disease.

Extraction and sporulation of oocysts. The infected gut contents and scrapings were mixed and soaked overnight in 2.5% potassium dichromate solution. The suspension was filtered through a fine sieve and filtrate was centrifuged (1500 rpm) for 2-3 minutes. The supernatant was discarded and the sediment was re-suspended in saturated solution of sodium chloride and centrifuged. The top layer was pipetted out, mixed with water, kept overnight and supernatant was discarded. The sediment containing oocysts was re-suspended in 2.5% potassium dichromate solution (Soulsby, 1982). The solution containing oocysts from different field isolates of *Eimeria* was poured into petridishes and kept at 30 ^{o}C for 24-72 hours with forced aeration and humidity. The sporulated oocysts were stored at 4 ^{o}C in potassium dichromate solution (Soulsby, 1982; Graat *et al*., 1994). The sporulated oocysts count was adjusted to 50,000 oocysts per 2 ml of inoculum (Hodgson, 1970; Long *et al*., 1976) for experimental inoculation to birds.

Experimental design. Day-old broiler chicks (n=150) purchased from a commercial hatchery were kept on floor-pens under coccidial free managemental conditions for initial 30 days. The chicks were vaccinated against Newcastle disease and Hydropericardium syndrome. The chicks were randomly divided into five groups (A, B, C, D and E) and each further into three sub-groups (n=10). All chicks were fed with broiler starter feed without any coccidiostat for initial 30 days and then broiler finisher feed until the termination of the experiment. Birds in group A, B, C and D were inoculated with sporulated oocysts (50,000) orally into the crop and birds in group E were administered tap water of equal amount. Groups A, B and C were fed with broiler finisher ration treated with lasalocid sodium (Avatac®, Roche) @ 180 ppm, monensin (Elancoban®) @ 130 ppm and salinomycin (Coxitac®, Pfizer) @ 66 ppm, respectively on day 3rd post infection. The birds of group D were kept untreated and infected while group E as untreated and uninfected controls. Three parameters: body weight gain, feed consumption and feed conversion ratio (FCR) and faecal oocysts counts were considered to assess the

comparative efficacy of different treatments. The advancement of signs and other evidences of clinical coccidiosis in birds of all groups were recorded starting from day 1 to 50 post-inoculation.

RESULTS AND DISCUSSION

All the experimentally infected groups of birds developed characteristic acute stages of coccidiosis initially within a period of 3-4 days, which was also supported by the post-mortem observations in the later stages. The clinical feature of the disease included, initial development of first watery faeces followed by hemorrhagic dysentery, lethargy, dropping of wings, anaemic comb and wattles, decrease feed and water intake and soiled feathers.

The average body weight gain per week by birds from day 30 to 50 post-inoculation has been presented in Table I. The average body weight gain per chick in groups A, B, C, D and E at the end of experiment was 1446.09, 1278.86, 1292.55, 1095.25 and 1535.82 g, respectively. There was a highly significant ($P<0.05$) difference among the different experimental groups. The birds in untreated uninfected group gained maximum body weight followed by those treated with lasalocid, salinomycin and monensin, and untreated infected groups. The reduction in body weight gain in all inoculated groups could be attributed to reduction in feed and water intake and other stresses induced by the coccidial infection (Kim *et al*., 1987). The average gain in body weight of lasalocid treated birds was comparatively better than monensin and salinomycin treated groups. This might be due to little stress of the disease and was in better in position to approach the normal gain in body weight (Bains, 1980; McDougald *et al*., 1981; Seikh *et al*., 1988). The salinomycin treated birds apparently performed better than monensin medicated birds in terms of body weight gain with no significant difference ($P<0.05$) as supported by Jo and Jang (1987), Kilskinen and Anderson (1987) and Mounz *et al*. (1993).

Each bird in groups A, B, C, D and E consumed a total average feed of 2449.57, 2228.45, 2220.85, 1912.20 and 2546.86 g, respectively (Table II). A significant contrast was observed among three ionophores-treated infected and untreated-infected and uninfected-untreated groups. Feed consumption was significantly greater at week two and three compared to week one of the experiment. The maximum feed was consumed by the birds of control group compared to all other birds in different groups. The average feed consumed was comparatively lower in birds of infected-untreated than birds in all treated groups and the control group. The chicks of this group were noticed in severe stress of disease as evidenced by the symptoms of coccidiosis. This explained the rationality of the maximum cutbacks in feed intake. A similar observation was recorded by Reid and Pitosis (1965). Among the treated groups, lasalocid treated birds consumed more feed than monensin and salinomycin treated birds. It is evident that lasalocid combated the infection more efficiently than the other two ionophores. These findings are correlated with the previous observations reported by Mitrovic and Schildknecht (1974). The average feed conversion ratio (FCR) after the 3rd week in group A, B, C, D and E was 2.67, 2.96, 2.96, 3.32 and 2.50 g, respectively (Table III). Lasalocid treated birds contributed

Table I. Effect of ionophores medication on weekly average body weight gain in broilers infected with *Eimeria* species

Week	Group A (g)	Group B (g)	Group C (g)	Group D (g)	Group E (g)
0	535.39±8.39	525.91±8.75	539.72±8.6	522.97±7.62	519.40±7.50
1	$794.06±4.84^{g}$	$740.23±9.8^{h}$	$746.46±9.50^{h}$	$701.90±3.93^{i}$	$812.76±7.14^{g}$
2	$1092.90±5.23^{d}$	$965.68±5.07^{e}$	$972.78±4.02^{e}$	$882.80±4.16^{f}$	$1111.94±5.52^{d}$
3	$1446.09±3.37^{b}$	$1278.86±3.64^{c}$	$1292.55±30.43^{c}$	$1095.25±4.16^{d}$	$1535.82±5.78^{a}$
Total	1446.09	1278.86	1292.55	1095.25	1535.82

Table II. Effect of ionophores medication on weekly average feed consumption in broilers infected with *Eimeria* species

Week	Group A (g)	Group B (g)	Group C (g)	Group D (g)	Group E (g)
1	$65228±4.40^{h}$	$605.33±4.17^{i}$	$601.95±4.73^{I}$	$573.74±3.31^{j}$	$679.18±3.79^{g}$
2	$811.45±3.34^{d}$	$690.27±3.32^{g}$	$696.60±2.88^{f}$	$541.50±3.34^{k}$	$793.27±3.02^{e}$
3	$985.48±3.03^{b}$	$932.85±3.19^{c}$	$922.30±2.95^{c}$	$796.96±2.79^{e}$	$1074.41±3.04^{a}$
Total	2449.21	2228.45	2220.85	1912.20	2546.86

Table III. Effect of ionophores medication on weekly feed conversion ratio in broilers infected with *Eimeria* species

Week	Group A (g)	Group B (g)	Group C (g)	Group D (g)	Group E (g)
1	$2.50±0.06^{h}$	$2.82±0.04^{ef}$	$2.92±0.05^{cde}$	$3.21±0.04^{b}$	$2.32±0.03^{i}$
2	$2.72±0.02^{fg}$	$3.06±0.04^{bc}$	$3.08±0.02^{bc}$	$3.00±0.05^{cd}$	$2.64±0.03^{gh}$
3	$2.79±0.04^{fg}$	$3.00±0.04^{cd}$	$2.89±0.04^{de}$	$3.75±0.06^{a}$	$2.54±0.02^{h}$
Average	2.67	2.96	2.96	3.32	2.50

better FCR (2.67) than other birds. Comparable to feed intake, this group gained maximum body weight and consequently resulted in drop of FCR value than the other two groups. However, there was no difference in FCR values between the treatment groups (B & C), which indicated that their potency of controlling the disease was equal but less than that of group A. The findings reported in the studies of Reid *et al*. (1974) and Chang *et al*. (1982), were also assimilated with the present observations.

The post inoculation oocysts/grams of faeces were counted at regular two-day intervals and is expressed in Table IV. The oocysts started appearing in the faeces from day 34 onward post-infection with mixed *Eimeria* species and lasted to maximum during the days 38-39 followed by a steady decline. No significant difference was noted in the oocyts count among the medicated groups with a highly significant ($P<0.0001$) difference between ionophores treated and untreated-infected groups. Kaul and Verma (1985), and Salisch and Friederichs (1991) have also reported the similar pattern of oocyst count. It is assumed that the increase in faecal oocyst count had direct correlation with the severity of the disease. In contrary to the above, Reid (1975) had argued that owing to lot of variability in oocyst count at different time intervals of the disease, it was unsatisfactory to use this parameter in evaluating the intensity of disease and anticoccidial activities of coccidostats.

Table IV. Effect of ionophores medication on daily oocysts count/gram of faeces in broilers infected with *Eimeria* species

Days	Group A	Group B	Group C	Group D	Group E
30	-	-	-	-	-
31	-	-	-	-	-
32	-	-	-	-	-
33	-	-	-	-	-
34	400	300	200	400	-
35	1000	3500	2000	3000	-
36	1700	16600	15400	26700	-
37	21700	26900	23800	78500	-
38	17800	21700	28300	165500	-
39	18500	27420	22400	190300	-
40	14400	17540	18700	190300	-
41	7300	12300	11300	178000	-
42	500	6070	4300	147000	-
43	1500	800	500	186000	-
44	-	-	-	101000	-
45	-	-	-	77000	-
46	-	-	-	30100	-
47	-	-	-	51200	-
48	-	-	-	32300	-
49	-	-	-	18500	-
50	-	-	-	7000	-

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