The Effect of Colistin Sulfate in Feed on the Controlling of *Salmonella enteritidis* Contamination in a Broiler Farm

Short Communication

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Summary

The effect of colistin sulfate on reducing *Salmonella enteritidis* (*S.enteritidis*) infection in broilers and contamination from broiler carcasses was evaluated. 40000 birds in two separate houses were considered. Colistin sulfate was added in to the feed of the test group as 100g containing 1,200,000IU/ton of feed for the whole period (56 days). To isolate *S.enteritidis*, samples were taken from different parts of the intestine and cultured in Selenite broth and then on SS agar plates. The suspected colonies were isolated and identified by biochemical and serological tests. It is conducted that the addition of the above mentioned amount of this antibiotic in to the broiler feed could decrease the rate of the infection of flocks and contamination of carcasses with *S.enteritidis.* The results also indicate that due to addition of colistin sulfate, the live weight gain increases by 14% and the feed conversion rate improves by 8% in this study.

***Key words*:** *Salmonella enteritidis*, colistin sulfate, broiler, Iran

Introduction

Salmonella enteritidis (*S.enteritidis*) is the causative agent for salmonellosis in poultry and food poisoning in human. Since 1986, the phage type 4 (pt4) strain was known to be the main pathogen *Salmonella* strain in poultry (Menna *et al* 1992) and from 1988 played a main problem in the world (Bygrove & Gollaghr 1989). Since 1987, this *Salmonella* has been isolated from broilers, layers and breeder

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replacement stocks. In a study in Iran from 1987 to 1991, 715 broiler flocks had been tested for salmonellosis on the basis of the isolation of *S.enteritidis* from chickens at the age of 1-7 days. This organism was isolated from 480 broiler flocks (65.5%). 11 out of 13 (84.6%) breeder replacement flocks (at age of 1-7 days) were also infected with *S.enteritidis* (Bozorgmehri Fard 1993).

This trial was carried out in order to determine the effect of colistin sulfate on reducing *S.enteritidis* contamination of broilers and broiler carcasses. In addition, the effect of colistin sulfate on feed conversion and live weight gain was evaluated.

Materials and Methods

The trial was conducted during 56 days in a one-day-old broiler farm in Eshtehard area, Karaj. The broiler farm had capacity of 40000 birds in two separate houses (each house 1t.100 mt and wi.12 mt.). Both feed and water were supplied *ad libitum* by automatic dosimeters. During the trial period the average temperature in house 1 varied between 34°C in the day time and 11°C in the coldest time at night, in house 2 the temperature varied between 38°C and 14°C. It was the hottest time of the season, and low humidity and strong winds in that area impeded optimal ventilation condition. The broilers were divided into two groups. 20000 broilers in house 1 acted as the control group and the other broilers in house 2, the house with the higher temperature (because of improper isolation) considered as the test group. The vaccination program (as follows) did not vary between the two groups:

IB (H120), COARSE spray, one day old/ ND (B1), D.W., 10 days old/ ND (LaSota), D.W., 20 days old/ IBD, D.W., 14 and 28 days old. 100g colistin sulfate contain 1200000IU/g (per ton of feed) was added in the feed of test group until the end of period. 50 one-day-old chicks from each house were randomly selected for culturing *S.enteritidis* contamination. During the trial, at age of 20 and 36 days fifty birds from each house were cultured, as same as samples from ready to cook carcasses from each house.

Bacterial isolation and identification. After sacrificing the birds, samples were taken from different parts of the intestine (duodenum, ileum, jejunum, caecum and cloaca). The samples were cultured overnight in Selenit broth (Difco) at 37°C. A loopful drop was transferred to a Salmonella Shigella (SS) agar plate (Difco) and incubated for 24h at 37°C. The suspected *S.enteritidis* colonies were isolated and identified by biochemical and serological tests (Harvey & Price 1974, Mallinson & Snoeyebos 1989, Wray & Davies 1994). In addition, the sensitivity of ten isolated *S.enteritidis* strains against various antibacterial substances was measured by a disk sensitivity method (Sojka *et al* 1972).

The live weight gain was calculated separately for each house at 3rd, 4th and 6th weeks and finally at the time of shipping. Both groups were medicated continuously via feed by an ionophor coccidiostate and, erythromycin after the first ND vaccination. The mortality rate of both groups was calculated after 8 weeks. The feed conversion rates were calculated on the basis of the total weight of chicken and the total feed intake, at time of transporting.

Results and Discussion

S.enteritidis was isolated from 14 out of 50 one-day-old chicks in the control group and in 16 out of 50 one-day-old chicks of the test group. The number of colony forming units (CFU) was 3×10^6. The results of the *S.enteritidis* cultures are summarized in table 1.

The results of the sensitivity tests from 10 isolated *S.enteritidis* cases are shown in table 2. In these cases colistin sulfate and chloramphenicol showed high activity against all the isolates as compared to the other 4 drugs, Neomycin sulfate, Furazolidone, Trimethoprim, Oxytetracyclin HCL).

The average live weight (gram) at different ages 3, 4, 6, and 8 weeks in control and medicated groups are as follow respectively: 550/570, 830/885, 1390/1600, and 2020/2370. The whole feed intake for the control and the test groups were 4848 and

5214g, respectively. The feed conversion rate for the control group was 2.4 versus 2.2 for the test group. No significant difference was seen in the mortality between groups, 4.6% for the control and 4.4% for the other group.

Table 1. Recovery of *Salmonella enteritidis* from control and medicated houses

House	Days of sampling	No. of sample	No. of positive	%	Mean of CFU, 0.2MI
Control	1	50	14	28	3×10^6
	20	50	9	18	2×10^9
	36	50	7	14	2.5×10^6
	Carcasses	50	8	16	4×10^4
Medicated	1	50	16	32	3×10^6
	20	50	3	6	2.4×10^3
	36	50	1	2	1.2×10^2
	Carcasses	50	0	0	0

Table 2. *Drug sensitivity of Salmonella enteritidis isolates*

Antibiotic	Sample									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Furazolidone	0/+	+	+	++	+	+/++	+	+	+	+/++
Trimethoprim	0/+	+	+	+	++	0/+	+	+	+	+
Colistin	+++	+++	++/+++	+++	++	++++	+++	++/+++	+++	+++
Chloramphenicol	+	+++	++	+++	++	+++	+++	+++	++/+++	+++
Oxytetracyclin	+	0/+	+	++	+	0/+	+	+	+	+++
Neomycin	+	++	+	+	0/+	+	+	0/+	+	++

Some antibiotics result in residues in *Salmonella* contamination is one of the biggest problems for the poultry industry and a great hazard for human health. The meat of domestic animals affects the health of the consumer. Development of resistance in bacterial strains as a result of wide spread use of antibiotics is another well-known problem (McLory *et al* 1989). Therefore, many efforts have been undertaken to control the problem. Among alternatives, the eradication of *Salmonella* from poultry farm is the most possible way. In countries, in which

Salmonella is still a problem and eradication is not possible, adding an effective antibiotic in the feed for reducing the bacterial burden is a way to proceed.

Colistin sulfate belongs to the group of the polypeptide antibiotics with a strong bactericidal activity against Gram-negative bacteria (Cloud *et al* 1985). It is not absorbed from the intestine thus having good results in the treatment of gastrointestinal infection with Gram–negative bacteria without producing residues in the various tissues of the target animals (Brander *et al* 1991, Sat *et al* 1972). In this study, colistin showed good capacity in reducing *Salmonella* infections from the body and the carcasses. This finding is experimentally confirmed by Menna *et al* (1992) and Sojka *et al* (1986). The later showed that all 8930 *Salmonella* strains isolated from domestic animals and poultry were sensitive to colistin whereas they were some resistance to other drugs. By adding colistin sulfate in the rate of 100ppm in feed the live weight gain increased by 14% the feed conversion rate was improved by 8% in this study.

It is concluded that the addition of the above mentioned amount of colistin sulfate to broiler feed decrease the contamination of flocks and carcasses with *S.enteritidis*, promotes the growth rate and improves the feed conversion rate.

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