Research Note: Turkey Poult Tolerance to Diets Containing Deoxynivalenol (Vomitoxin) and Salinomycin

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ABSTRACT Feed taken from a commercial turkey farm where poults had refused to eat the feed and high mortality had occurred was analyzed and found to contain .81 mg/kg vomitoxin and 2.2 mg/kg salinomycin. The present four experiments investigated the effects of diets containing salinomycin at 0, 2.2, 5.5, 11, and 22 mg/kg and vomitoxin at 0, 2.2, and 4.4 mg/kg. A factorial design with vomitoxin at 0 and 4.4 mg/kg and salinomycin at 0 and 22 mg/kg was used in Experiment 4.

Poults fed the suspect commercial diet had significantly lower feed consumption and higher motality than poults fed a control diet (P<.05). Poults (0 to 3 wk of age) fed diets containing vomitoxin (4.4 mg/kg), salinomycin (22 mg/kg), or both showed no significant decrease in feed consumption, body weight gain, or viability.

(*Key words:* salinomycin, vomitoxin, poult, turkey body weight, viability)

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INTRODUCTION

Toxic effects of vomitoxin on poultry include mouth ulcers, gizzard erosion, decreased feed consumption, decreased weight gain, and increased mortality (Moran *et al.*, 1983). McMillan and Moran (1985) found that neither vomitoxin (75 mg/kg) nor zearalenone (50 mg/kg) decreased growth or feed consumption of poults 7 to 14 days of age.

Salinomycin has been proved to be toxic when fed to adult turkeys (Stuart, 1983). Halvorson *et al.* (1982) found that salinomycin fed at or below dosages recommended for broilers (60 mg/kg) caused mortality and clinical lesions in adult turkeys, but not in growing turkeys. Potter *et al.* (1986) found salinomycin to be toxic at 22 mg/kg for turkeys ranging in age from 7 to 34 wk.

Feed from a commercial turkey farm suspected to have caused high poult mortality was analyzed and found to contain .81 mg vomitoxin and 2.2 mg salinomycin per kilogram diet. As feed refusal was also observed before mortality occurred, a study was conducted to determine the individual and combined effects of vomitoxin and salinomycin on feed intake, body weight gain, and mortality.

MATERIALS AND METHODS

Large White turkeys were provided feed and water *ad libitum* in each experiment from 0 to 3 wk of age, except in Experiment 1, in which birds were fed only to 2 wk of age. Diets were formulated from a basal corn-soy diet that contained 28% crude protein and 2,813 kcal metabolizable energy/kg feed. Body weights and feed consumptions of poults were determined weekly in all experiments. Poults in Experiment 1 were floor-reared whereas poults in Experiments 2 to 4 were reared in batteries. All dead birds were necropsied and examined for mycotoxin lesions.

Experiment 1. To reproduce the conditions that had been observed in a commercial flock, poults (0 to 2 wk of age) were fed either a control diet or a commercial diet obtained from a poultry house wherein turkey poults, approximately 3 wk of age, had refused to eat the feed, and 14% mortality had occurred. Each diet was fed to two pens of unsexed poults containing 46 poults per pen.

Experiment 2. The toxicity of salinomycin was determined by feeding poults diets containing salinomycin at 0, 2.2, 5.5, 11, and 22 mg/kg. Each diet was fed to three pens containing 25 males/pen from 0 to 3 wk of age.

Experiment 3. Ground yellow corn that was analyzed to contain 9.9 mg/kg vomitoxin was used to formulate diets containing 0, 2.2, and 4.4 mg/kg vomitoxin. The contaminated corn

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TABLE 1. *Performance of poults fed a commercial diet vs. a control diet from 0 to 2 wk of age (Experiment 1)*[1]

Diet	Body weight Initial	Gain	Feed consumed	Feed efficiency	Mortality
	(g)			(g/g)	(%)
Control	51	96	216	.444	4
Commercial[2]	49	85	179*	.475	13
LSD[3]		29	17	.100	2

[1] Each diet fed to two pens each with 46 poults.

[2] Contained .81 mg vomitoxin and 2.2 mg salinomycin per kilogram.

[3] LSD = Least significant difference.

*Significantly less than value for control diet.

was analyzed by Kjeldahl for crude protein, and found to be lower (16%) in crude protein than published National Research Council (1984) values for ground yellow corn. As a result, in one-half of the vomitoxin-corn diets, the crude protein was adjusted by the addition of soybean meal and fat in place of corn in the basal diet to maintain protein and metabolizable energy values similar to that of the control diet. Each of six diets was fed to four pens with nine birds per pen.

Experiment 4. Salinomycin at 0 and 22 mg/kg and vomitoxin at 0 and 4.4 mg/kg were added to the basal diet of birds in a 2 × 2 factorial experiment. Each diet was fed to four pens with nine poults per pen.

All experiments were analyzed using analysis of variance. Significant differences ($P \leq .05$) were determined by Duncan's multiple range test. Differences in mortality between treatments were compared using chi-square analysis.

RESULTS AND DISCUSSION

In Experiment 1, poults fed the commercial diet had a lower mean body weight gain (11%) and consumed significantly less feed (17%) than those fed the control diet (Table 1). Of the 92 poults fed the commercial diet, 12 poults died in comparison to only four deaths among those fed the control diet.The high mortality and poor growth among the poults fed the commercial diet were similar to what was previously observed.

Body weight gain was not significantly depressed by salinomycin in Experiment 2 (Table 2) nor by vomitoxin-contaminated feed in Experiment 3 (Table 3). These results indicate that neither the salinomycin nor vomitoxin alone was the cause of the poor growth and high mortality experienced by the poults fed the commercial diet. Potter *et al.* (1986) observed that deleterious effects from feeding salinomycin (22 mg/kg)

TABLE 2. *Performance of poults fed diets containing varying amounts of salinomycin from 0 to 3 wk of age (Experiment 2)*[1]

Salinomycin	Body weight Initial	Gain	Feed consumed	Feed efficiency
(mg/kg)	(g)			(g/g)
0	56	367	637	.576
2.2	54	343	606	.566
5.5	53	363	616	.589
11	54	331	589	.558
22	56	371	616	.602
LSD[2]		34	67	.050

[1] Each diet fed to three pens each with 25 males.

[2] LSD = Least significant difference.

TABLE 3. *Performance of poults fed diets containing varying amounts of vomitoxin from 0 to 3 wk of age (Experiment 3)*[1]

Vomitoxin	Body weight Initial	Body weight Gain	Feed consumed	Feed efficiency
(mg/kg)	(g)			(g/g)
0	53	482	641	.752
2.2	54	442	621	.711
4.4	52	484	644	.752
LSD[2]		60	62	.040

[1] Each diet fed to four pens with nine unsexed birds per pen.

[2] LSD = Least significant difference.

were greater for older birds. Whether the effect is age related or related to the detoxifying effects of the normally higher protein diet is not known (Welch *et al.*, 1986). Experiment 3 confirms the observation of Hamilton *et al.* (1985) and that of McMillan and Moran (1985), who observed no deleterious effects when poults were fed vomitoxin. Additionally, no significant effect on feed consumption was found when vomitoxin (4.4 mg/kg) and salinomycin (22 mg/kg) were fed together in Experiment 4 (Table 4).

Feed consumption was not affected by vomitoxin or salinomycin in Experiments 2, 3, or 4 (Tables 2 through 4). Moran *et al.* (1982) found that feed consumption was not depressed until 116 mg/kg vomitoxin was added to the feed. McMillan and Moran (1985) found no reduction in feed consumption attributable to vomitoxin (75 mg/kg).

Mortality in Experiments 2, 3, and 4 was low and symptoms were not consistent with those for vomitoxin or salinomycin toxicity (Moran *et al.*, 1983). Necropsy of the birds did not indicate a consistent cause of death. This work confirms earlier findings of Halvorson *et al.* (1982) and Stuart (1983).

The deleterious effects of the suspect feed on feed consumption and mortality both at the commercial farm and in Experiment 1 were apparently caused by something other than salinomycin and vomitoxin. As no other known toxicants were found when the feed was tested by both a chemical residue laboratory and a veterinary toxicology laboratory, it is possible that the feed contained some unpalatable or toxic agent not included in the survey of common toxicants. Feed containing salinomycin and vomitoxin at 22 mg/kg and 4.4 mg/kg, respectively, or in combination was tolerated by Large White poults 0 to 3 wk of age without significantly affecting body weight gain, feed consumption, or viability.

TABLE 4. *Performance of poults fed diets containing either vomitoxin, salinomycin or both from 0 to 3 wk of age (Experiment 4)*[1]

Vomitoxin	Salinomycin	Body weight Initial	Body weight Gain	Feed consumed	Feed efficiency
(mg/kg)		(g)			(g/g)
0	0	55	480	673	.719
0	22	54	523	700	.748
4.4	0	53	474	659	.721
4.4	22	54	508	660	.772
LSD[2]			50	73	.121

[1] Each diet fed to four pens with nine unsexed poults per pen.

[2] LSD = Least significant difference between any two values within a column.

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