EVALUATION OF SALINOMYCIN FOR IONOPHORE ACTIVITY IN BROILER CHICKENS

M.O. Smith[1] and R.G. Teeter[2]

Story in Brief

Two experiments were conducted to determine if the toxic effect of feeding high salinomycin levels could be overcome through potassium supplementation. Rations contained soybean meal, fish meal or casein as the protein source to achieve basal potassium concentrations of .96, .75 and .2% respectively. Salinomycin levels evaluated in the first experiment included 60 and 75 g per ton with levels of 100 and 200 g per ton evaluated in the second. Salinomycin depressed weight gain only at the 200 g per ton level. Potassium supplementation failed to enhance weight gain.

[Key Words: Ionophore, Potassium, Salinomycin.]

Introduction

Including salinomycin, a known ionophore, in broiler rations at 70 g/ton is frequently efficacous. However, when Salinomycin dietary levels exceed 100 g/ton, growth depressions may be noted. Ionophores are known to interact with nutrients in the diet; noticeably the electrolytes, sodium, potassium and chloride. The ion carriers facilitate the passage of mineral ions through biological membranes and in some instances exhibit selectivity. Austic and Smith (1980) have shown that Salinomycin facilitates entry of sodium into animal cells with gradual intracellular potassium depletion. This suggests that Salinomycin related growth depressions may be related to broiler potassium status. Cervantes et al., (1982) reported a significant interaction between the ionophore monesin and diets containing soy or fish meal as the major protein source. Potassium supplementation increased growth rate of chicks fed the low K fish meal diet but had no effect on the high K soybean meal based ration.

The purpose of this study was to evaluate the impact of salinomycin upon broiler growth rate in rations containing varying amounts of potassium.

Materials and Methods

Two experiments were conducted to evaluate Salinomycin for ionophore activity. In the first experiment, one week old Arbor Acre x Vantress broiler chicks were weighed and allotted to 24 experimental groups at random such that each group was replicated 4 times with 10 chicks per replicate. Birds were housed in electrically heated starter batteries under continuous lighting for the duration of the 3 week growth study. Rations (Table 1) and water were available for ad libitum consumption. Treatments within each ration type included:

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[1]Graduate Assistant [2]Associate Professor

Basal
Basal + 60 g Salinomycin/ton
Basal + 60 g Salinomycin/ton + 0.2% K
Basal + 60 g Salinomycin/ton + 0.4% K
Basal + 75 g Salinomycin/ton
Basal + 75 g Salinomycin/ton + 0.2% K
Basal + 75 g Salinomycin/ton + 0.4% K
Basal + 0.2% K

All diets contained 0.3% sodium.

Table 1. Composition of basal diets for experiment 1.

Ingredients	Protein Source		
	Soybean Meal	Fish Meal	Casein
	-----%		
Ground Corn	49.1	61.54	55.3
Soybean Meal	39.8	8.50	---
Fish Meal	---	20.0	---
Casein	---	---	18.5
Fat	5.0	5.0	5.0
Dicalcium Phosphate	3.20	---	3.64
Calcium Phosphate	1.23	1.03	.67
Salt	.48	.47	.61
Vitamin Mix	.40	.40	.30
Trace Mineral	.10	.10	.10
D-L Methionine	.24	.10	---
Polyethylene	.45	2.86	15.43
L-Arginine	---	---	.45
	100	100	100

In experiment two, Salinomycin levels were increased to 100 g and 200 g per ton with the potassium supplement level at .25% (Table 2). The basal ration contained .96% K. Body weight gain and feed consumption were measured.

Results and Discussion

Results for the first experiment are displayed in tables 3-5. Adding 60 or 75 g salinomycin to rations containing .96, .75 or .2% K did not effect ($P>.1$) live gain. Potassium addition to the basal rations, averaged across ration type, enhanced ($P<.05$) body weight gain by a mean of 8.6%. However, addition of K to rations containing salinomycin, averaged across ration typed, depressed weight gain ($P<.05$) by a mean of 11.3%.

Table 2. Composition of basal diet for experiment 2.

Ingredient	%
Ground Corn	54.85
Soybean Meal	38.0
Alfalfa	3.0
Dicalcium Phosphate	2.35
Calcium Phosphate	.9
Vitamin Mix	.4
Salt	.3
Trace Mineral	.1
D-L Methionine	.1
	100

Table 3. Body weight gain, feed consumption and feed efficiency of birds on a soybean meal ration.

			60 g Salinomycin per ton			75 g Salinomycin per ton		
Potassium (%)	0	.2	0	.2	.4	0	.2	.4
Gain (g)	443^{ab}	487^{a}	410^{bc}	341^{d}	403^{bc}	426^{abc}	374^{cd}	399^{bc}
Feed (g)	779^{ab}	789^{a}	679^{a}	696^{b}	763^{ab}	762^{ab}	708^{ab}	736^{ab}
Gain/Feed	.57^{ab}	.61^{a}	.60^{a}	.49^{b}	.53^{ab}	.56^{ab}	.53^{ab}	.54^{ab}

^{abcd}Means in rows with unlike superscripts differ (P<.05).

Table 4. Body weight gain, feed consumption and feed efficiency of birds on a fish meal diet.

			60 g Salinomycin per ton			75 g Salinomycin per ton		
Potassium (%)	0	.2	0	.2	.4	0	.2	.4
Grain (g)	436^{a}	446^{a}	453^{a}	368^{d}	378^{cd}	437^{a}	390^{abcd}	414^{abc}
Feed (g)	731	763	819	701	730	784	709	754
Gain/Feed	.59	.58	.55	.52	.52	.56	.55	.55

^{abcd}Means in rows with unlike superscripts differ (P<.05).

Table 5. Body weight gain, feed consumption and feed efficiency of birds on a casein diet.

			60 g Salinomycin per ton			75 g Salinomycin per ton		
Potassium (%)	0	.2	0	.2	.4	0	.2	.4
Gain (g)	281^{abc}	324^{a}	300^{ab}	285^{abc}	261^{bc}	286^{abc}	276^{abc}	234^{c}
Feed (g)	574	620^{a}	631^{a}	630^{a}	630^{ab}	622^{a}	615^{a}	617^{b}
Gain/Feed	.49^{a}	.52^{a}	.47^{a}	.45^{a}	.41^{ab}	.46^{a}	.45^{a}	.38^{b}

^{abcd}Means in rows with unlike superscripts differ (P<.05).

Birds fed the diet (.2% K) containing casein as the major protein source (Table 5) gained significantly less weight than those on either soybean meal or fish meal suggesting that palatability may have been a problem. The casein ration met or exceeded all known nutrient requirements. If salinomycin impacts the K requirement of the growing broiler, the effect should be maximized here as the diet provided just .2% K. Salinomycin failed to impact growth rate, however, supplementing the ration with K resulted in a linear (P<.01) decline in growth.

The second experiment was conducted to evaluate salinomycin-potassium effects in the corn-soybean meal based ration at higher salinomycin levels. Salinomycin depressed weight gain by 2.3 and 24.6% for the 100 and 200 g per ton inclusion levels respectively. Adding .25% K to the ration increase weight gain 4.5% in birds fed the control ration but was without numerical effect with salinomycin treatments. Additional work is needed to adequately understand this area.

Table 6. Body weight gain, feed consumption and feed efficiency of birds in experiment 2.

	Salinomycin (g/ton)			Salinomycin (g/ton) + .25% K		
	0	100	200	0	100	200
Gain (g)	175	171	132	183	173	133
Feed (g)	371	377^{a}	362^{ab}	397^{a}	374^{a}	372^{b}
Gain/Feed	.47^{a}	.45^{a}	.37^{ab}	.46^{a}	.45^{a}	.35^{b}

^{ab}Means in row with unlike superscripts differ (P<.05).

Literature Cited

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Cervantes et al. 1982. Poultry Sci. 61:1107-1112.