



Roxarsone and Coccivac®-B: Impact on Immunity, Weight Gain and Feed Conversion Ratio

Several broiler integrators have reported successful use of in-feed roxarsone (3-Nitro) with Coccivac®-B vaccinated broilers, resulting in improved performance. The precise mode of action of roxarsone is unknown, but studies have demonstrated that roxarsone may improve weight gain and feed conversion ratios through more complete digestion of protein, slower intestinal transit time, better utilization of fats and lipids and suppression of some intestinal anaerobes.

A recent study conducted by Dr. Steve Davis at Colorado Quality Research examined the

impact of two roxarsone feeding programs on immunity induced by Coccivac-B and the performance outcome of both roxarsone programs compared to the use of Coccivac-B alone.

Roxarsone was fed at the full level of 45.4 g/ton 20% premix from day 1 to 28 or from day 17 to 42 to male broilers vaccinated with Coccivac-B at one day of age. The test groups were designed to examine roxarsone fed in representative starter feed (day 1 to 17) and grower feed (day 17 to 28) vs. grower feed (day 17 to 28) and finisher feed (day 29 to 42).

Immunity against coccidiosis was evaluated by challenge at 36 days of age and performance, judged by weight gain and feed conversion, was evaluated at 35, 42 and 47 days of age.

Key Points

■ Roxarsone fed from day 1 to 28 or 17 to 42 had no negative impact on coccidiosis immunity after vaccination with Coccivac®-B.

■ Weight and feed conversion ratios at 35, 42 and 47 days of age were significantly better in Coccivac-B vaccinates fed roxarsone from day 17 to 42 than in birds that received Coccivac-B alone.

■ Roxarsone fed from day 1 to 28 had a positive impact on weight at 35 days, but the benefit had declined when birds were evaluated at 42 and 47 days of age.

■ Roxarsone can be used in the feed to enhance performance in Coccivac-B-vaccinated broilers in birds grown to 47 days of age.

Study Design

The study was designed in two parts: an immunity/challenge study and a performance study.

Six hundred male Cobb x Cobb 500 broiler chicks were vaccinated with Coccivac-B at one day of age and housed in 30 randomized floor pens. At 5 days of age, pens were adjusted to 18 birds per pen to account for early mortality. An additional 40 unvaccinated control birds were housed in battery cages.

Pens were divided into groups of 10, representing 180 birds for each treatment (Table 1).

Table 1: Treatment group summary

Group	Treatment	Level	No. Birds Per Pen	No. Pens or Cages	Total
1	Unvaccinated, negative control	N/A	N/A	10	40
2	Coccivac-B only	N/A	18	10	180
3	Coccivac-B + roxarsone 1-28 days	45.4 g/t	18	10	180
4	Coccivac-B + roxarsone 17-42 days	45.4 g/t	18	10	180

At 35 days of age, 4 birds from each pen — 40 birds per treatment group — were removed, individually weighed and placed in Petersime cages with non-medicated feed for the challenge study. The remaining birds continued in pens on their assigned feeding program. Weights and feed conversion ratios were measured at days 35, 42 and 47.

Immunity Challenge Study

On day 36, 20 birds per treatment group were challenged with a 15X oral dose of Coccivac-B, while the remaining 20 birds received 1 ml of distilled water. At 7 days post-challenge, all birds were individually weighed, sacrificed and intestinal lesions scored by gross (Johnson and Reid) and microscopic scoring systems.

Microscopic lesion scores were slightly higher than gross lesion scores, and are summarized in Figure 1.

Weights as a percentage of unchallenged control weight are summarized in Table 2.

Immunity Challenge Study Conclusions:

Coccivac-B demonstrated excellent protection against challenge in all vaccinated groups, with or without roxarsone in the feed. Despite some very minor gross and microscopic lesion scores for *E. acervulina* in the group fed roxarsone from day 17 to 42, weights in challenged birds were equivalent to Coccivac-B birds fed non-medicated feed. 3-Nitro at full level in the feed did not interfere with the development of immunity.

Figure 1

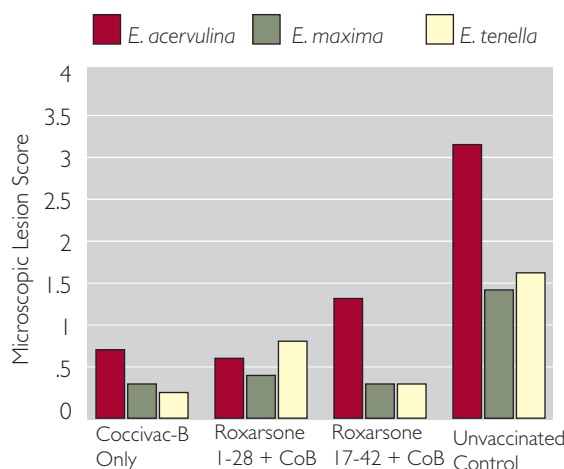


Figure 1: Microscopic lesion scores in birds challenged at 36 days of age

Microscopic Lesion Scoring System

Microscopic scores (average oocyst count of 4-5 microscopic fields)

<i>E. maxima</i>	<i>E. acervulina</i> and <i>E. tenella</i>
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1 = 1-10	1 = 1-20
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2 = 11-20	2 = 21-40
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3 = 21-40	3 = 41-80
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4 = TNTC	4 = TNTC
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Treatment Group	Non-Vaccinated Non-Medicated	Coccivac-B Only	Roxarsone Day 1-28 + Coccivac-B	Roxarsone Day 17-42 + Coccivac-B
Not challenged	0.644	0.634	0.583	0.620
Challenged	0.360	0.603	0.539	0.594
% of not challenged weight	55%	95%	92%	96%

Table 2: Weights of challenged vs. not challenged treatment groups from day 35 to day 43¹

¹ Mean weight gain per bird (kg).

Performance Evaluation:

Weight and feed conversion ratios were examined at days 35, 42 and 47. The parameters were compared for Coccivac-B only, Coccivac-B + roxarsone from day 1 to 28 and Coccivac-B + roxarsone from day 17 to 42. The findings are summarized in Table 3 and Figures 2 and 3.

Performance Evaluation Conclusions:

Roxarsone added to the grower-finisher ration at 17 to 42 days of age significantly enhanced both the weight gain and the feed conversion ratio of Coccivac-B vaccinates. Roxarsone added to the starter-grower ration at 1 to 28 days of age had a positive effect on

Treatment	Day 35		Day 42		Day 47	
	Weight (kg)	FCR	Weight (kg)	FCR	Weight (kg)	FCR
Coccivac-B Only	1.72 ^a	1.58 ^a	2.36 ^a	1.65 ^a	2.80 ^a	1.71 ^a
Roxarsone Day 1-28 + Coccivac-B	1.82 ^b	1.58 ^a	2.43 ^{ab}	1.66 ^a	2.86 ^{ab}	1.72 ^a
Roxarsone Day 17-42 + Coccivac-B	1.82 ^b	1.54 ^b	2.50 ^b	1.61 ^b	2.95 ^b	1.68 ^b

Table 3: Coccivac-B only vs. Coccivac-B + roxarsone performance parameters

Different superscripts indicate significantly different results.

Figure 2

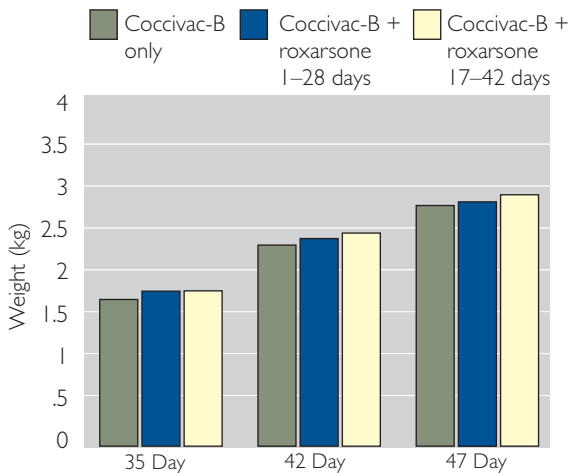


Figure 3

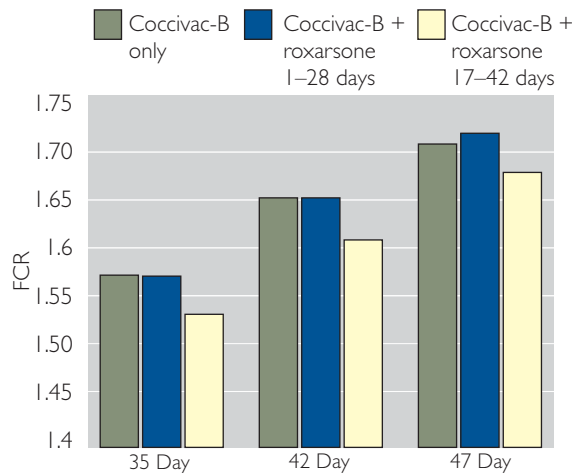


Figure 2: Coccivac-B only vs. Coccivac-B + roxarsone weight comparison

Figure 3: Coccivac-B only vs. Coccivac-B + roxarsone feed conversion ratio comparison

weight and feed conversion ratio at the 35-day evaluation, but the impact on feed conversion ratio was lost at 42 and 47 days.

Weight gain was still numerically better than Coccivac-B alone at older ages, but the difference between birds with roxarsone in the

starter-grower ration and those that received the vaccine alone declined with age.

Roxarsone added to the grower and finisher ration of Coccivac-B vaccinates may enhance broiler performance in birds grown to 47 days of age.