



Coccivac®-D in Cage-Reared Leghorn Pullets: Day-of-Age Vaccination at the Hatchery Provides Long-Term Protection

A field study was conducted to determine whether day-of-age vaccination with Coccivac®-D could provide adequate immunity to cage-reared replacement leghorn pullets under commercial conditions. The facility chosen for the field trial had little or no exposure to coccidia, and pullets reared in the facility had a history of breaking with coccidiosis upon movement to the laying house.

Coccivac-D is a live, sporulated oocyst vaccine containing *Eimeria acervulina*, *E. maxima*, *E. necatrix*, *E. hagani*, *E. praecox*, *E. tenella*, *E. brunetti*, and *E. mivati*. The original dose of coccidial oocysts must complete at least four life cycles in the flock to induce complete immunity. Completion of a life cycle requires the birds to have access to the feces that contain oocysts from the prior life cycle. Floor-reared flocks have natural access to the fecal material in the litter, but cage-reared pullets do not have uniform, ready access to fecal material. As a result, special provisions must be made to ensure adequate vaccine cycling for proper development of immunity.

This trial examined two vaccination treatments placing the birds on paper and feed trays (to per-

mit access to fecal oocysts) for different lengths of time. Paper and feed trays were left in the cages of one group for 2 weeks (the standard practice at this facility), while the second group had paper and feed trays in the cages for 5 weeks. At 5 weeks of age, per normal management procedure, pullets were moved to additional cage rows and paper was removed.

Study Design

35,000 day-old leghorn Shaver pullets and 200 day-old cockerels were delivered to a commercial replacement pullet facility from two different hatcheries. The study divided the pullets and the cockerels equally between four rows of cages, representing an even division of birds from each hatchery.

Table 1 describes the test and control group arrangement:

Table 1: Treatment Groups

Row (Group)	Coccivac-D	No. Days on Paper
1 (A)	No	35
2 (A)	Yes	35
3 (B)	No	14
4 (B)	Yes	14

8,750 pullets and 50 cockerels were challenged at 5 and 18 weeks of age.

Leg bands identified the cockerels by treatment group.

The hatchery vaccinated the test birds with Coccivac-D via spray cabinet at 1 day of age prior to delivery. Unvaccinated control birds received no other treatment.

continued

Key Points

- Coccivac-D vaccination of cage-reared leghorns at 1 day of age provided protection against coccidiosis challenge at 18 weeks of age.
- Paper placed in cages through day 35 provided sufficient opportunity to complete the initial coccidial life cycles needed for development of complete immunity.
- No adverse coccidial reactions were observed, and none of the vaccinated flocks required treatment.
- There were also no adverse effects from vaccination on pullet performance or uniformity as compared to the standard program.

At 5 weeks of age, 25 of the cockerels from each row were challenged orally with all of the *Eimeria* species contained in Coccivac-D. The cockerels were sacrificed and examined for coccidial lesions at one week post-challenge. The Johnson and Reid¹ method was used to score the upper, middle, lower and cecal intestinal sections (0 = no lesion, 1 = very mild, 2 = mild, 3 = moderate and 4 = severe).

Lesion score results are summarized in Table 2 and Figure 1.

At 18 weeks of age, the remaining 25 cockerels from each row were challenged orally with all of the *Eimeria* species contained in Coccivac-D. Again, birds were sacrificed and *Eimeria* lesions were scored at 1 week post-challenge. The lesion scores are summarized in Tables 2 and 3 and Figures 1 and 2.

Results

Table 2: Challenge Results 5 Weeks Post-Vaccination

Row	Lesion Scores				
	Upper	Middle	Lower	Cecal	Total
1 = NonVacc, 5 wk paper	2.0 ^a (1.8)	1.0 ^a (1.4)	1.0 ^a (1.4)	0.0 ^{a, b} (0.5)	5.0 ^b (5.0)
2 = Vacc, 5 wk paper	0.0 ^b (0.3)	0.0 ^b (0.3)	0.0 ^b (0.2)	0.0 ^a (0.2)	1.0 ^c (1.0)
3 = NonVacc, 2 wk paper	2.0 ^a (2.3)	2.0 ^a (1.7)	2.0 ^a (1.6)	1.0 ^b (0.7)	7.0 ^a (6.3)
4 = Vacc, 2 wk paper	0.0 ^c (0.0)	0.0 ^b (0.2)	0.0 ^b (0.3)	0.0 ^{a, b} (0.6)	1.0 ^c (1.0)

Table 3: Challenge Results 18 Weeks Post-Vaccination

Row	Lesion Scores				
	Upper	Middle	Lower	Cecal	Total
1 = NonVacc, 5 wk paper	0.0 ^a (0.7)	1.0 ^a (1.5)	1.0 ^{b, c} (0.8)	0.0 ^c (0.5)	4.0 ^{a, b} (3.6)
2 = Vacc, 5 wk paper	0.0 ^a (0.6)	1.0 ^b (1.0)	0.0 ^c (0.7)	0.0 ^b (0.1)	2.0 ^b (2.4)
3 = NonVacc, 2 wk paper	0.0 ^a (0.5)	1.0 ^{a, b} (1.2)	2.0 ^a (1.5)	1.0 ^a (1.3)	5.0 ^a (4.4)
4 = Vacc, 2 wk paper	0.0 ^a (0.4)	1.0 ^{a, b} (1.2)	1.0 ^{a, b} (1.2)	1.0 ^a (1.1)	3.0 ^a (3.8)

Values in parentheses are mean scores.

Median values in the same column with different superscripts are significantly different.

Overall P-values by Kruskal-Wallis Test; Pairwise comparisons by Wilcoxon Exact Rank Sum Test.

Figure 1: 5-Week Challenge Summary

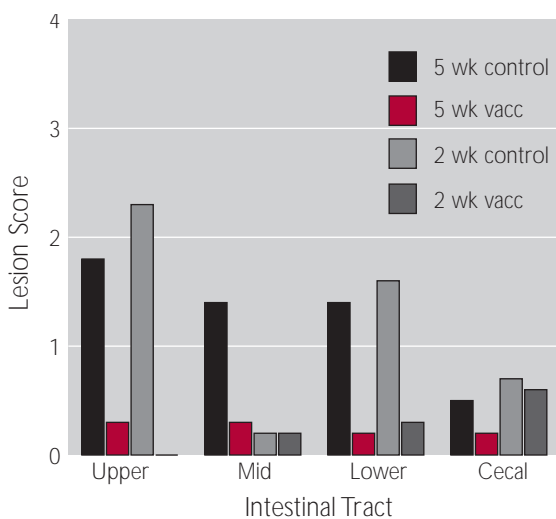
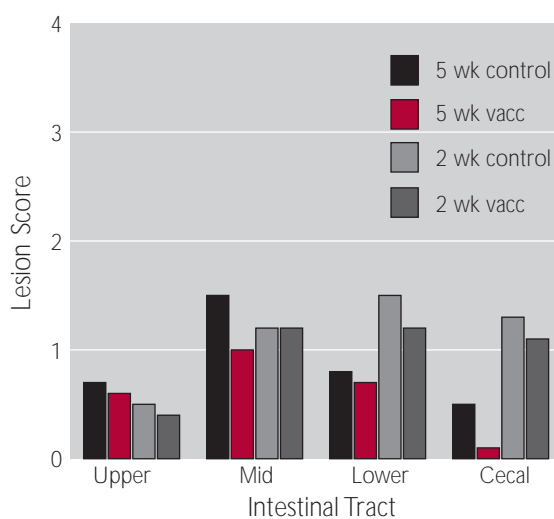


Figure 2: 18-Week Challenge Summary



Conclusion and Discussion Vaccination at day-of-age with Coccivac-D provided significant protection against coccidial challenge at 5 weeks of age, regardless of whether the birds were left on paper for 2 weeks or 5 weeks. At 18 weeks of age, however, vaccines exposed to coccidial cycling on paper for a full 5 weeks demonstrated stronger protection, especially against cecal coccidiosis.

Research has shown that immunity to some coccidial species (*E. acervulina* and *E. maxima*) requires the completion of only two life cycles, while immunity to other species (*E. tenella*, *E. necatrix*) requires the completion of three or more life cycles, each lasting approximately 1 week. Life-long immunity depends upon periodic re-exposure to coccidial oocysts.

This facility had a history of low exposure to coccidia. The degree of protection at 18 weeks of age may reflect limited re-exposure to oocysts once the paper was removed. Nevertheless, day-of-age vaccination followed by 5 weeks of active coccidial

cycling on paper in the cages appeared to provide significant protection, particularly against *E. tenella*.

Producers that choose to use vaccination for coccidiosis control in cage-reared pullets must be aware that the fecal material on paper contains concentrated oocysts compared to fecal material that is diluted by the litter in floor-reared birds. The producer should monitor the coccidial load of the flock as they progress through the critical immunity building phase of coccidiosis vaccination. Treatment of flocks with amprolium may be necessary to control the degree of cycling until immunity is complete.

The producer in this trial found that treatment was unnecessary. Pullet uniformity and subsequent performance were unaffected by the vaccination treatments.

Reference

1. Johnson J and Reid WM. 1970. Anticoccidial drugs: Lesion scoring techniques in battery and floor-pen experiments with chickens. *Exp Parasitol* 28:30-36.

Coccivac is a registered trademark of Schering-Plough Animal Health Corporation.