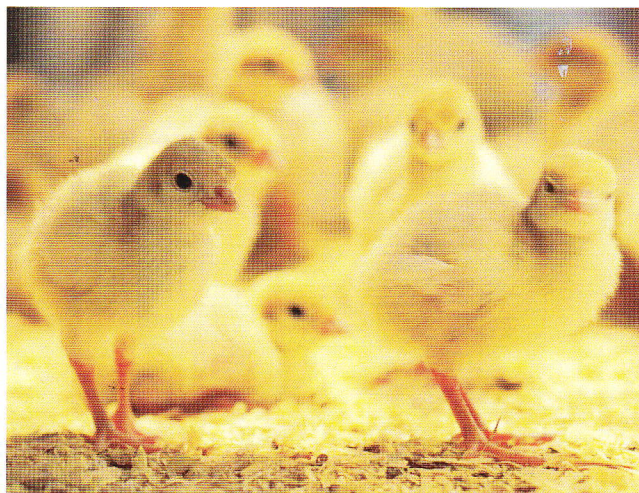


Oocyst Studies with Hemicell®

In 2002 ChemGen Corporation conducted two studies at Southern Poultry Research and published the findings in an article titled "Beneficial Effect of β -Mannanase Feed Enzyme on Performance of Chicks Challenged with *Eimeria sp.* and *Clostridium perfringens*, published in *Avian Diseases* 47:759-763, 2003. The results are shown in Table 1 and Table 2. The studies showed that Hemicell



"provided significant improvement in the performance of chicks challenged with several intestinal pathogens, the degree of improvement usually being approximately half that afforded by the medications employed in this study."

Table 1. Effect of infection, β -mannanase and medication on broiler chick performance, 8-21 days of age (Experiment 1)^A

Treatment No.	Infection ^B	Enzyme ^C	Medication ^D	Gain (g)	FCR (g/g)	Mortality (%)	Lesion score (day 14)	
							Upper ^E	Lower ^F
1			■	540 ^a	1.446 ^c	0.00 ^b	0.000 ^c	0.000 ^c
2		■	■	548 ^a	1.424 ^c	1.78 ^b	0.000 ^c	0.000 ^c
3	■			429 ^d	1.704 ^a	9.78 ^a	1.375 ^a	1.563 ^a
4	■	■		490 ^c	1.536 ^b	3.75 ^{ab}	1.156 ^b	1.438 ^a
5	■		■	522 ^b	1.447 ^c	0.89 ^b	1.031 ^b	0.875 ^b

^AMeans within columns without common lowercase superscripts are significantly different ($P < 0.05$).

^BOrally inoculated with a mixed solution of approximately 70,000 oocysts of *E. acervulina* and 1250 oocysts of *E. maxima* per bird on day 7. On days 11, 12, and 13, birds were given broth cultures of *C. perfringens* containing approximately 1.5×10^8 CFU per bird.

^CHemicell, 100 million units/ton.

^DSalinomycin (60 g/ton) and BMD (50 g/ton).

^EArea most affected by *E. acervulina*.

^FArea most affected by *E. maxima*.

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Table 2. Effect of infection^A, β -mannanase enzyme^B, and medication on broiler chick performance, 8-21 days of age (Experiment 2)^C.

Treatment series type	Treatment no.	Treatment	Gain (g)	FCR (g/g)	Mortality (%)	Lesion score (day 14)	
						Upper ^D	Lower ^E
Non-infected	1	Non-medicated	427 ^{ab}	1.70 ^c	1.3	0.0 ^c	0.0 ^c
	2	Medicated ^f	437 ^a	1.66 ^c	2.5	0.0 ^c	0.0 ^c
Infected/ non-medicated	3	- β -mannanase	296 ^c	1.91 ^a	1.3	2.4 ^a	2.3 ^a
	4	+ β -mannanase	338 ^d	1.85 ^{ab}	3.8	1.9 ^b	1.3 ^{cd}
Infected/medicated (BMD) ^F	5	- β -mannanase	352 ^d	1.77 ^{bc}	5.0	2.3 ^{ab}	1.9 ^{ab}
	6	+ β -mannanase	348 ^d	1.77 ^{bc}	5.0	2.1 ^{ab}	1.3 ^{cd}
Infected/medicated (salinomycin) ^G	7	- β -mannanase	368 ^{cd}	1.72 ^c	3.8	1.0 ^c	1.1 ^d
	8	+ β -mannanase	397 ^{bc}	1.69 ^c	3.8	1.0 ^c	1.1 ^d
Infected/medicated (BMD + salinomycin) ^H	9	- β -mannanase	397 ^{bc}	1.67 ^c	5.0	1.6 ^d	1.6 ^{bc}
	10	+ β -mannanase	390 ^c	1.67 ^c	5.0	0.8 ^{cd}	1.2 ^{cd}

^AOrally inoculated with a mixed solution of approximately 70,000 oocysts of *E. acervulina* and 5000 oocysts of *E. maxima* per bird on day 7. On days 11, 12, and 13, birds were given broth cultures of *C. perfringens* containing approximately 1.5×10^8 CFU per bird.

^BHemicell* (100 million units/ton).

^CMeans within columns without common lowercase superscripts are significantly different ($P < 0.05$).

^DArea most affected by *E. acervulina*.

^EArea most affected by *E. maxima*.

^FBMD (50 g/ton).

^GSalinomycin (60 g/ton).

^HSalinomycin (60 g/ton) and BMD (50 g/ton).

Based on these results the question was asked "Could there be an interaction between coccidiosis vaccines, *Clostridium perfringens*, other viral and bacterial pathogens, etc. with Hemicell?"

To attempt to answer these questions two studies were planned.



Trial 1

This study evaluated Hemicell in chickens vaccinated with Coccivac®-B that were raised on litter taken from broiler houses with recent outbreaks of necrotic enteritis or gangrenous dermatitis. The study used 4 pens with approximately 80 birds per pen. Birds were grown to market weights and fed commercial broiler rations at normal stocking densities.

Fecal oocyst counts were conducted at approximately 18 days as shown in Table 3.

Table 3. Oocyst counts at 18 days of age.

Pen	Hemicell®-HT	Oocysts/gram of feces
1	Yes	6,250
2	Yes	0
3	No	29,851
4	No	16,326

Trial 2

This study evaluated the effect of Hemicell in conjunction with RSS challenge. This study was conducted by Dr. Jack Rosenberger, AviServe LLC utilizing his experience and RSS challenge model. Birds were all vaccinated with live coccidiosis vaccine at day 1 and grown on clean litter using a commercial broiler ration at normal stocking densities. Oocysts were counted at about 21 days of age to determine if the same trend occurred. Results are in Table 4.

Table 4.

Pen	Hemicell®-HT	RSS Challenge	Oocysts/gram of feces
1	No	No	17,413
2	No	Yes	120,000
3	Hemicell®-HT, .45 lb/ton	Yes	120,000
4	Hemicell®-HT, .80 lb/ton	Yes	7,500
5	Hemicell®-HT, .80 lb/ton, enzyme A, 100	Yes	66,000
6	Hemicell®-HT, .80 lb/ton, enzyme B	Yes	42,857

Summary

Based on data from Trial 1 and Trial 2 there is less oocyst shedding with the addition of Hemicell in the feed.

Trial 3

Another trial at Southern Poultry Research evaluated different parameters. The chickens were housed on used litter and fed Salinomycin as the coccidiostat. There was no disease challenge.

Table 5.

Treatment	Hemicell®-HT	Oocyst count (avg. of 8 pens)	42 DOA FAFC ¹
Control	No	5,670	1.72
1	36 mu/ton	2,635	1.67
2	36 mu/ton	2,901	1.69

¹Day of age weight adjusted feed conversion.

Summary

The results in trial 3 show the same trend as Trial 1 and Trial 2 (Table 5), leading to the conclusion Hemicell has a positive impact in intestinal health by allowing broilers to better “clear” coccidiosis from the intestinal tract in either birds given live cocci vaccine or a coccidiostat. In addition performance was measured and correlates positively to the oocyst counts.

Trial 4

This study examined the relationship between uniformity and oocyst count. Another Hemicell attribute is increasing uniformity in all types of birds. A demonstration trial to measure uniformity led to the question “could there be a difference in oocyst counts in these birds also?”

The pullets were approximately 8 weeks old when the samples were collected. Results were 4000 oocysts per gram in the Hemicell birds, 240,000 per gram in the control birds. Pullet source, farm, and age were all the same. Uniformity was also dramatically improved, possibly due to less oocyst shedding.

Conclusion

Based on the above 4 studies, none of which were designed to specifically look at oocyst counts, it appears there is a dramatic difference in oocyst shedding in various situations, challenges, and coccidiosis protection programs. Further studies are planned to better understand this.

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Hemicell®

Hemicell® is a proprietary and unique enzyme-based feed additive used in poultry and swine diets. The β -mannanase active ingredient in Hemicell® breaks down the anti-nutritive β -galactomannan in soybean and other legume meals, providing many benefits to the producers. Hemicell® adds value by improving live performance in terms of feed efficiency, ability to withstand challenges to the innate immune system, and making live weights more uniform. At the same time, Hemicell® offers environmental benefits by reducing the stickiness of fecal matter and improving litter quality. Hemicell® is available in liquid and dry forms, for post-pellet or un-pelleted mash feed programs.

Hemicell®-W

Hemicell-W® is a feed enzyme system containing β -mannanase and xylanase, designed to improve feed efficiency, average daily gain, weight uniformity, and litter quality when used in animal diets containing both soy and wheat. Hemicell-W products are available in liquid and dry forms.

Hemicell®-HT

Hemicell-HT is a thermally stable product developed to provide all of the same benefits as Hemicell®, but allow application into the mixer. In tests, Hemicell-HT retained more than 80% β -mannanase activity when used in commercial feeds conditioned at 190°F (88°C) for up to 60 seconds. Hemicell-HT may be added directly into the feed mixer and then pelleted. There is no need to have or install post-pelleting spray application equipment. See the Hemicell-HT product description for information on the many benefits of this unique feed enzyme. Hemicell-HT is available in liquid and dry forms.



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