APPLICATION OF *MYCOPLASMA SYNOVIAE* VACCINE (MS-H) IN LAYERS

Teruaki Ouchi[A], Yasuhisa Munakata[B], and Hiroshi Sakamoto[A]

[A]Nippon Biologicals, Inc., Kita Aoyama 1-5-12/5F, Minato-ku, Tokyo 107-0061 Japan
[B]Nippon Zenyaku Kogyo Co., Ltd., 1-1 Tairanoue, Sasagawa, Asaka-machi, Koriyama, Fukushima 963-0196 Japan

Significant advances in the control of mycoplasmosis have been realized since the introduction of attenuated live MG vaccines (e.g., ts-11). Until recently, the disease induced by *Mycoplasma synoviae* (MS) has remained problematic due to the lack of an effective vaccine. Additionally, MS may be contributory to other disease syndromes. Recent studies have shown that MS, aside from causing production losses in its own right, it can also be a significant factor in initiating *E. coli* peritonitis, a major cause of mortality in layers. At the 2004 American Association of Avian Pathologists meeting, Dr. Kenton Kreager reported that field evidence suggested synergy between the two pathogens to be a major problem for US layer flocks (1). Furthermore, an experimental study has supported the postulation that a virulent MS strain to be a primary factor in this syndrome (2).

NBI Technology Committee conducted two field studies in large multiple-age commercial layer farms to determine whether MS live, MS-H strain vaccination could cost-effectively increase production and decrease mortality (3).

Layer flocks vaccinated with MS-H showed significant improvements compared to non-vaccinated flocks previously placed on the same farm. In the field studies, reduced eggshell top cone abnormalities from 2 to 4% to 0% was seen in flocks vaccinated with MS-H. This is an important observation since MS is suspected to cause eggshell top cone abnormalities (4). In the first study, the cumulative egg weight per hen was 795 g greater at 57 wks. In the second study, the cumulative egg weight average was 787 g greater at 50 wks. Additionally, there was a reduction of mortality from *E. coli* peritonitis. From these results, NBI Technology Committee concluded MS-H vaccination to be effective and economic.

FIELD STUDY 1

MS-vaccinated group. 82,000 Hy-Line Gray layers (four subgroups placed March-October 2006)

Control group. 184,000 Hy-Line Gray layers (Nine subgroups placed 2000 to 2005)

***Vaccination programs**. Identical for both groups, except the MS-H live vaccine administration on day 31 via eye drop to layers in MS-H vaccinated group.

1 (d)	Marek's
7	IB (H120) + ND (VG/GA)
15 & 26	IBD
31	MG (ts 11) + IB (H120) + ND (VG/GA) **+[MS-H]***
50	Pox +ILT
63	ND (VG/GA) + IB (C-78)
70	AE
83	ND/IB2/Coryza (A&C) + SE

Historically, pullets on this farm were grown MS free for 120 days before being transferred to the laying house. By 150 days of age almost 100% of birds tested MS positive by serum agglutination testing. However, almost 100% of pullets vaccinated with MS-H tested

MS positive by six wks post vaccination. This is an expected result from the MS-H vaccination.

RESULTS

Comparison 1. Table 1 compares the **MS-H vaccinated group,** consisting of four subgroups placed into production March - Oct. 2006 to the Control group (all nine subgroups placed 2000 to 2005).

MS-H vaccinated group: Significant Improvements.

1) Age at 50% egg production was 4.7 days earlier.
2) Peak egg production rate was 1.5% higher.
3) HD egg production rate was 6.4, 2.8 and 2.2% greater for Stage 1, 2 and 3, respectively.
4) HH egg production rate was 6.5, 3.7 and 2.9% greater for Stage 1, 2 and 3, respectively.
5) Mortality (compared with the control group):
   Stage 1) 0.042%/wk lower (0.68%/15 wks),
   Stage 2) 0.029% lower (0.44%/15 wks),
   Stage 3) no significant difference.
6) Cumulative egg wt. at 57 wks was 795 g greater
7) Overall FCR was 0.13% better.
8) Feed intake: Stage 1) 2.3 g greater,
   Stage 2) 3.3 g less,
   Stage 3) 3.6 g less.

Comparison 2. Table 2 compares MS-H vaccinated group to the Control group consisting only the most recently placed subgroups (the four subgroups placed 2004 to 2005) to minimize impact of differences of time and conditions.

MS-H vaccinated group: Significant Positive Results.

1) The time to 50% egg production was 9 days earlier.
2) Peak egg production rate was 1.6% higher.
3) HD egg production rate was 9.9, 2.1 and 1.4% greater for Stage 1, 2 and 3, respectively.
4) HH egg production rate was 9.8, 2.7 and 1.8% greater for Stage 1, 2 and 3, respectively.
5) Mortality (compared with the control group):
   Stage 1) 0.036%/wk lower (0.57%/15 wks),
   Stage 2) 0.013% lower (0.2%/15 wks),
   Stage 3) 0.033% lower (0.5%/7 wks).

Data analysis suggests the lower mortality is attributable to fewer cases of E. coli peritonitis.

6) Cumulative egg wt at 57 wks was 787 g greater
7) FCR was 0.1% lower during Stage 1. The overall difference was 0.07% (not significant).
8) Feed intake: Stage 1) 5.6 g greater, Stage 2) no difference, and Stage 3) 3.5 g less.

Comparison 3. Table 3 provides data related to forced molting. The mean time for forced molting in the MS-H vaccinated group was 5.2 wks later than that in the Control group (all subgroups combined 2000 to 2005) and 3.8 wks later than that in the most recently placed Control group (four subgroups 2004 to 2005). Even though forced molting in the MS-H vaccinated group was four wks later, the egg production was similar at the time of molting for both groups. The MS-H vaccinated group sustained a longer period of good egg production.

SUMMARY

The MS-H vaccinated layers tended to increase egg weight rapidly during the early egg production stage, while reducing it during the late egg production stage due to improved laying persistency. The benefits of the vaccine are as follows:

1) Prevents delay of egg production
2) Decreases mortality
3) Improves egg production rate
4) Improves laying persistency
5) Reduces under-grade eggs in the late production
6) Increases cumulative egg production
7) Improves FCR

ECONOMIC BENEFITS

HH cumulative egg production is considered the best indicator of the economic benefit gained from use of the vaccine. The HH cumulative egg production out to 57 wks was approximately 800 g (13 eggs) greater in the vaccine group, which is estimated to represent a net profit of about 100 yen ($0.94)*. This is a conservative estimate. This extra income comfortably covers the cost of the MS-H vaccinations. Feed conversion ratio was better in the MS-H vaccinated group by approximately 7%, compared to all nine flocks of Control group. This savings amounts to a 120-yen ($1.13)* reduction in the cost of feed per hen (assuming that the hens are fed up to 78 wks).

FIELD STUDY 2

MS-H vaccinated group. 315,000 Lohmann (Julia-LSL)
(nine subgroups) placed April 2006 to Feb. 2007.

Control group. 245,000 Lohmann (Julia-LSL) layers

(seven subgroups) placed prior to the above period.

Vaccination programs. are identical to Field Study 1.

The study was conducted at a farm that historically maintains an egg production rate greater than 90% for approximately 20 wks, followed by a period of relatively good and stable egg production. Pullets are raised MS-free but within 30 days after transfer to layer house, all hens became sero-positive for MS. The farmer suspected that MS was negatively influencing the duration of the 90% egg-production rate and increasing the mortality.

RESULTS

MS-H vaccinated layers showed significant improvements compared to MS non-vaccinated layers. When performance comparisons were made, the flocks vaccinated with MS-H laid ≥ 90% rate for approximately 10 wks longer. By 50 wks, this resulted in a 5% increase in egg production (additional seven eggs per hen) compared with the non-vaccinated flocks. (Data available on request.) The other benefits gained from administration of MS-H vaccine were similar to results of the Field Study 1.

CONCLUSION

In these two large-scale field studies, flocks vaccinated with the MS-H consistently performed better than previously placed, non-vaccinated flocks. The actual benefits of using MS-H vaccine in other commercial settings in the future might vary from farm to farm, depending upon such factors as management practices, concurrent disease, and severity of wild MS field challenge. However, these current studies provide strong evidence that MS-H vaccine will easily prove to be economically justified in today's competitive layer industry.

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* Exchange rate: 2005: 1 USD=106 Yen

** Registered in Australia, Mexico, Japan, S. Africa, Columbia, Brazil, and currently pending registration USA.

Table 1. MS-H vaccinated group compared to control group (all nine subgroups 2000-2005).

Difference (I–N)			**+2.2**	**+2.9**	–	**+2.6%**	**+0.795 kg**	**–0.2 g**	**–3.6 g**	**–0.11**

Table 2. MS-H vaccinated group compared control group (four subgroups most recently placed).

(Nov. 29, 2007, T. Ouchi)	Age at 50% Egg Prod.	Peak Egg Prod. (%)	HD Egg Prod. (%)	HH Egg Prod. (%)	Mortality%/wk	Rate of Normal Eggs (%)	Cumulative Egg Weight (kg/hen)	Mean Egg Weight (g)	Feed Intake (g/hen/day)	FCR
Stage 1 (21-35 wks)										
MS-H vaccinated	148.8	94.7	85.5	84.8	0.098	97.3	5.225	57.7	102.1	1.91
Control group (N)	157.8	93.1	75.6	74.9	0.134	97.8	4.650	57.3	96.4	2.01
Difference (I–N)	**–9.0**	**+1.6**	**+9.9**	**+9.8**	–	**–0.5%**	**+.575 kg**	**+0.5 g**	**+5.6 g**	**–0.10**
Stage 2 (36-50 wks)										
MS-H vaccinated			87.5	85.4	0.163	97.7	10.913	63.4	104.4	1.88
Control group (N)			85.4	82.7	0.175	97.6	10.150	63.7	104.5	1.93
Difference (I–N)			**+2.1**	**+2.7**	–	**+0.1%**	**+.763 kg**	**–0.3 g**	**–0.2 g**	**–0.04**
Stage 3 (51-57 wks)										
MS-H vaccinated			80.8	76.7	0.256	98.5	13.362	64.3	105.9	2.04
Control group (N)			79.4	74.8	0.289	95.2	12.575	64.8	109.4	2.12
Difference (I–N)			**+1.4**	**+1.8**	–	**+3.3%**	**+0.787 kg**	**–0.5 g**	**–3.5 g**	**–0.08**

Table 3: Forced Molting

(Dec 2, 2007, T. Ouchi)	Subgroup No.	Age at Forced Molting (wks)	Egg Production Rate at Forced molting (%)	Mean Egg Prod. Rate Before Forced molting (%) **	Substandard Eggs (%)*
Control group No vaccine	00531	65	78.7	86.1	0.9
	20907	56	79.6	83.4	1.5
	30405	57	76.6	81.8	1.9
	30619	62	77.4	82.5	3.7
	30827	60	74.2	83.3	2.6
	40610	58	75.5	82.5	2.7
	41030	66	78.7	84.7	6.0
	50323	62	75.3	82.5	10.0
	50604	64	78.3	85.0	12.9
Mean (2000-2005)		**61.1**	**77.1**	**83.5**	**4.7**
Mean (2004-2005)		**62.5**	**77.0**	**83.7**	**7.9**
MS-H vaccinated Group	60321	64	72.3	83.0	2.4
	60531	67	79.4	86.7	2.3
	60812	68	79	86.3	2.7
	61021	(not molted)	Not included in molting data comparisons		
Mean (March-Oct 2006)		**66.3**	**76.9**	**85.3**	**2.5**

* % are taken before grade and packaging.

** Average egg production rate from 50% of flock producing eggs until just before molting.