

REFERENCE 1

STATUS REPORT ON THE EFFECT OF SE BACTERIN VACCINATION IN PEQAP FLOCKS (1997-1999)

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The Pennsylvania Egg Quality Assurance Program (PEQAP) is the national model used for developing a national standard program on reduction interventions of SE contamination of table eggs as stated by the President's Council on Food Safety Action Plan titled "Egg Safety: From Production to Consumption. An Action Plan to Eliminate Salmonella Enteritidis Illnesses Due to Eggs", and presented on December 10, 1999. This plan intends to reduce by 50% (year 2005) and ultimately eliminate (by 2010) egg-associated SE illnesses. Additionally, the Food and Drug Administration (FDA) conducts traceback investigations involving table eggs as a suspected source of human food poisoning that include bacteriological testing of eggs and the layer house environment.

Together with its predecessor in 1994, the Salmonella Enteritidis Pilot Project (SEPP), PEQAP has been the leading provider of information concerning the epidemiology of SE in the commercial layer industry as well as the effect that specific interventions have on reducing SE in table eggs. The SEPP Progress Report (1995) summarized the findings on 134 participating flocks in 1992-1993. There were 47.7% of flocks with SE positive manure or egg belt samples; 16.1% of these manure or belt samples were SE positive; flocks in SE positive environment with SE positive eggs were 37.2%. The estimated prevalence of SE in eggs from flocks in SE positive environment was 2.75 eggs per 10,000 eggs. These data show the seriousness of the situation then.

Today, PEQAP is an industry program intended to minimize SE contamination of chicken (shell) eggs. Enrollment is voluntary, however, once enrolled, compliance is mandatory. Requirements include, among many other steps, to monitor the environment of pullet and layer houses with continuous testing of eggs from any environmentally positive houses. Any positive eggs are diverted to pasteurization, therefore, SE control measures in laying chickens must occur prior to laying age. Monitoring of the environment consists of culturing two samples taken from the manure beneath each row of cages of pullets at 10 to 15 weeks of age and layers at 29 to 31 weeks of age and again at 44 to 46 weeks of age. In molted flocks manure is tested at five to seven weeks following return to feed. Houses with positive manure samples must test 480 nest run eggs every two weeks for four lots of samples. Eggs are cultured in pools of 20. If the four lots of eggs are negative, a sample of 480 eggs must be sampled each month for the life of the flock and this egg testing will eliminate the need for further environmental testing (PEQAP, 1997). A summary of the SE status of PEQAP flocks during the last three years, including environmental and egg testing of the layer house, is presented in Table 1 (Source: PEQAP Coordinator, Pennsylvania Department of Agriculture [PDA]). There is a marked increase in the number of participating flocks from 1997 to 1998. The impact of PEQAP in reducing the prevalence of SE in table eggs is evident.

TABLE 1
SE Status of PEQAP Flocks

	<u>1997</u>	<u>1998</u>	<u>1999*</u>
☐ Total flocks participating	261	316	315
☐ SE positive manure samples (%)	2.06	2.23	1.53
☐ Flocks with SE positive manure samples (%)	10.7	13.9	8.9
☐ Flocks with SE positive eggs (%)	7.3	10.1	4.4
☐ SE prevalence in eggs from flocks in SE (+) environment (<u>per 10,000</u>)	2.19	1.51	1.37
	29/132,240	53/350,613	25/182,379

* Jan. – Sept., 1999

The manual titled “Preharvest HACCP in the Table Egg Industry” (1997) recommends vaccination with a USDA-approved SE bacterin as being part of Critical Control Point #3, which specifically deals with placement of SE clean pullet chicks. SE bacterin vaccination is used in Pennsylvania to control SE. Biomune Co. has maintained the identity of every SE bacterin vaccinated flock and data on the bacteriological monitoring of each vaccinated flock has been recorded since 1997. Data presented herein includes all the PEQAP-participating flocks that were vaccinated in full with an SE bacterin from January, 1997 to September, 1999, and are compared with data from the rest of PEQAP participating, non-vaccinated flocks. All data have been generated, collected and summarized by PDA. Participation under PEQAP facilitates the standardization of specific management practices and SE testing procedures to make any comparison between the two groups much more significant. All data are from flocks vaccinated with one dose.

The results of environmental testing in PEQAP laying flocks presented by samples are summarized in Table 2. The non-vaccinated group of flocks show 2.1%, 2.47% and 1.89% of all manure samples positive to SE during 1997, 1998 and 1999, respectively. The number of SE positive manure samples in the vaccinated group of flocks is 0%, 0.19% and 0.25%, respectively, for the same time period. The summary of environmental testing in PEQAP layers presented by flock is shown in Table 3. The number of non-vaccinated flocks with SE positive manure was 10.9%, 14.6% and 10.6% during 1997, 1998 and 1999, respectively. The number of vaccinated flocks with SE positive manure during the same time period is 0%, 4.8% and 2.9%, respectively.

TABLE 2
Results of Environmental Testing in PEQAP Laying Flocks (By Samples)

	<u>1997</u>	<u>1998</u>	<u>1999*</u>
Non-vaccinated Flocks			
No. Flocks	258	295	246
SE (+) samples / total	82/3913 2.1%	172/6975 2.47%	54/2858 1.89%
SE Bacterin Vaccinated			
No. Flocks	3	21	69
SE (+) samples / total	0/74 0%	1/517 0.19%	2/801 0.25%

* Jan. – Sept., 1999

TABLE 3

Results of Environmental Testing in PEQAP Layers (By Flocks)

	<u>1997</u> n = 261	<u>1998</u> n = 316	<u>1999*</u> n = 315
Total No. of Flocks			
Non-vaccinated Flocks			
Flocks with SE (+) Manure	28/258 10.9%	43/295 14.6%	26/246 10.6%
SE Bacterin Vaccinated			
Flocks with SE (+) Manure	0/3 0%	1/21 4.8%	2/69 2.9%

* Jan. – Sept., 1999

The results of egg testing in PEQAP laying flocks with SE positive environment are presented in Table 4. In 1997, 7.4% of non-vaccinated flocks with SE positive environment had SE positive eggs. The same figure of flocks with SE positive eggs for 1998 and 1999 is 10.8% and 5.7%, respectively. During 1997 through 1999 there have been no SE positive eggs detected in flocks vaccinated with an SE bacterin.

TABLE 4

Results of Egg Testing in PEQAP Laying Flocks with SE (+) Environment

	<u>1997</u>	<u>1998</u>	<u>1999*</u>
Non-vaccinated Flocks			
No. Flocks	258	295	246
Flocks SE (+) eggs / total	19/258 7.4%	32/295 10.8%	14/246 5.7%
SE Bacterin Vaccinated			
No. Flocks	3	21	69
Flocks SE (+) eggs / total	N.A. 0	0/1 0	0/2 0

* Jan. – Sept., 1999

There is an increase in the number of manure samples positive to SE, as well as the number of flocks with SE positive environment and SE positive eggs detected during 1998. This was likely due to a relatively large number of small producers who joined PEQAP during 1998 and had already a high prevalence of SE at their farms. This should not be interpreted as a failure of the program but rather a success, since the respective numbers of SE prevalence have decreased for 1999, reflecting the effect of the program.

The cumulative results of prevalence of SE in PEQAP laying flocks following use of SE bacterin (1997-1999) are very impressive as shown in Table 5. A total of 799 non-vaccinated flocks have participated, representing 45.6 million birds. Average for the last three years is 12.1% of flocks with SE positive environment; average of SE positive environmental

samples in all flocks is 2.2%; the average of flocks with SE positive eggs is 8.1% and the average number of SE positive environmental samples in SE positive flocks is 21.4%. A total of 93 vaccinated flocks have participated representing 8.2 million birds. By contrast, the same figures for the vaccinated group are 3.2%, 0.22%, 0% and 8.3%, respectively.

TABLE 5

Cumulative Results of SE Prevalence in PEQAP Flocks Following Use of SE Bacterin (1997-1999*)

	<u>Non-vaccinated</u>	<u>Vaccinated</u>	<u>Reduction</u>
No. of Flocks	799	93	-
Birds represented (Millions)	45.6	8.2	-
Flocks SE (+) Environment	12.1%	3.2%	3.8 X
SE (+) Environmental Samples in all Flocks	2.2%	0.22%	10 X
Flocks with SE (+) Eggs	8.1%	0	
Env. (+) samples in (+) flocks	21.4%	8.3%	2.6 X

* Jan. - Sept., 1999

The protective effect of SE bacterin vaccination on reducing SE positive environmental samples = 9.9 X and is equivalent to a reduction of 89.9%, as calculated in Table 6. The role that SE bacterin plays in the success of PEQAP is clearly evident.

In conclusion, analysis of PEQAP data from January, 1997 to September, 1999, shows a 89.9% reduction in environmental samples (manure swabs) in SE bacterin vaccinated flocks when compared to non-vaccinated flocks. Analysis of the same data bank show that during the same time period there have been no SE positive eggs detected in SE bacterin vaccinated flocks. The impressive reduction achieved by PEQAP has improved by increased use of SE bacterin. Use of SE bacterin vaccination against Salmonella enteritidis should be recognized by the President's Council on Food Safety (Objective No. 7) as an extremely cost-effective and already available tool to achieve its goal to minimize the risk of SE positive table eggs. This risk reduction can be accomplished with a fraction of the cost (100 X less) of other interventions proposed by the President's Plan, such as in-shell pasteurization of eggs.

TABLE 6

Protective Effect of SE Bacterin Vaccination on Reducing SE (+) Environmental Samples

Combined Reduction Effect =

Reduction of Flocks with SE (+) Environment (3.8) X

Reduction of (+) Env. Samples in (+) Flocks (2.6) = 9.9 X

Combined Reduction Effect = 89.9 %