OBSERVATIONS ON *SALMONELLA ENTERITIDIS* DECONTAMINATION OF POULTRY FACILITIES

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Egg quality insurance or *Salmonella enteritidis* (SE) Risk reduction programs comprise several control steps. All programs recommended by professional and industry organization, starting with the first program developed by the NECAD Salmonella Committee (1), have included complete cleaning and disinfection (C & D) of SE contaminated poultry barns. Post C & D testing of environmental samples from poultry barns has given variable results. Occasionally post C&D samples test more strongly SE positive than prior to C & D collected samples. We have seen poultry houses in the early 90's, which tested SE positive after more than 2 or 3 C & D cycles.

In recent years the cost effectiveness of C&D procedures has been questioned for reasons, which include: (a) risk of bacterial blooms after wet cleaning or improper disinfection procedures, (b) the cost of C & D per poultry barn is high ($ 6 – 12 thousand/ barn), (c) loss of production during extended down periods, (d) damage to equipment, (e) technical difficulty of satisfactory cleaning of the increasing number of hyper-sized poultry barns, (f) an unpredictable pattern of SE contamination re-occurred in the environment of replacement flocks and (f) environmental and worker safety concerns associated with the use of some disinfectants. It has been suggested that dry cleaning of poultry barns in association with effective rodent control, housing of SE test clean replacement birds and SE vaccination pullets would be more cost effective than the use of all these steps plus C & D.

Davison started a retrospective study comparing wet vs. dry-cleaned poultry barns in Pennsylvania (2).

We report here preliminary observations from a prospective field study initiated in 2001 as well as an intensely monitored SE decontamination of two small experimental poultry isolation rooms following a SE infection study.

Field Study

The study was conducted in in-line layer complexes with a history of SE background contamination. All but 4 of 72 poultry barn environments tested SE +ve at least once. In two houses each the environments of 7 flocks tested positive over a 13-year period despite a complete C & D at the end of every contaminated flock (Fig. 1).

An equal number of houses that tested SE positive will either be dry cleaned or be submitted to the regular C& D sanitation. All replacement flocks will come from SE test clean parents and pullet houses and will be vaccinated at least once against SE prior to placement in the layer house. Thirty birds of all vaccinated flocks will be tested 4 -6 weeks after vaccination for the presence of vaccination titers. The presence of antibody titers in 24 birds (80%) is considered adequate. Environmental samples and 2 x 1000 eggs will be tested at a flock age of 45 and 65

weeks. Of 18 flocks only 5 met the vaccination standard of 80% seroconversion. One environmental sample tested positive from a C & D'd house and none of 27000 eggs yielded SE (Table 1).

Fig. 1: **End of Production SE Positive Environments**

13 Year Observation

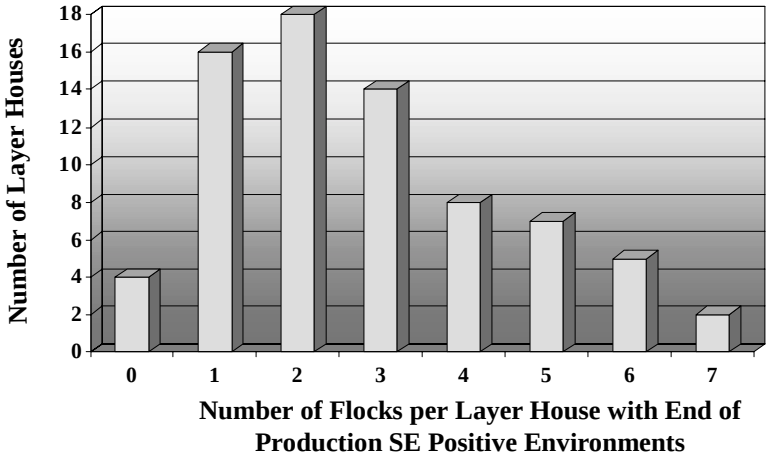


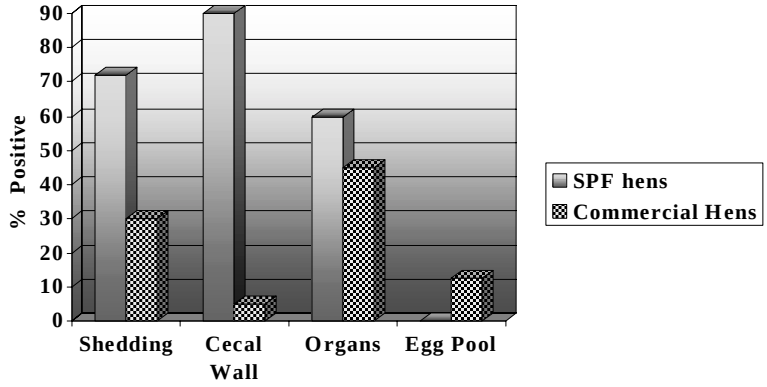
Table 1: **Wet vs. Dry Cleaning - Field Study**

	Dry Cleaned Barns	Wet Cleaned Barns
Barn History 89-02 Mean No. SE+ ve Flocks	**3.3**	**3.4**
No. of Barns in Study/ Completed	**11/7**	**7/6**
No. of Env.Samples Positive / Tested	**0 / 164**	**1 / 125**
No. of Eggs Positive / Tested	**0 / 17,000**	**0 / 10,000**

Laboratory Study

Decontamination was monitored in two experimental isolation facility rooms, which had housed either 20 brown commercial laying hens or 20 white leghorn SPF hens. The birds had been infected into the crop or by contact with a nalidixic acid resistant SE culture for another study. The birds were euthanized 14 days after infection and were shedding at that time $4.4x10^3$ or $16.5x10^3$ CFU of SE per gram fecal droppings. Interestingly, the level of SE shedding did not correlate with the level of internal organ or egg colonization (Fig. 2).

Fig. 2: Fecal Shedding and Colonization of Cecal Wall, Organs and Eggs with *S. enteritidis* (14 Days Post Challenge)

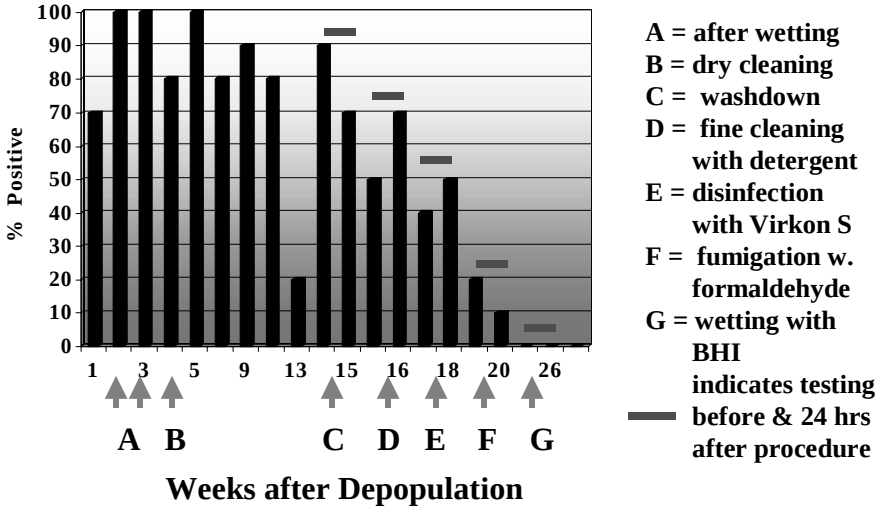


Decontamination of the 2 isolation rooms was monitored over a 6 month period (Fig. 3). Both isolation rooms were identically equipped and the temperature in these rooms fluctuated between 18°C and 29°C. Five samples consisting of 2 pooled 10 x 10 cm 12-ply gauze sponges soaked with distilled water were taken from each room at each sample period (2 from manure dropboards, 1 each from feeders, drinkers and floor). One isolation room was misted with water at 2 and 3 weeks after depopulation. Both rooms were dry cleaned and manure was removed 4 weeks after depopulation. For 10 weeks no other activity took place except for environmental sampling. Between 15 and 20 weeks post depopulation both facilities were equally treated: complete wash down, 2 weeks later fine wash and scrubbing using Pine-Sol detergent, 2 weeks later disinfection with Virkon S and 2 weeks thereafter fumigation with formaldehyde. Each time samples were taken before and 24 hours after each procedure.

All samples were tested by routine procedures using selective enrichment (Tetrathionate brilliant green broth Hajna) and secondary enrichment procedure (3).

Six weeks after fumigation both rooms were sampled again, the surfaces were moistened with brain heart infusion broth and both rooms were sampled again 24 hours after this procedure. These samples were submitted to a non-selective enrichment in brain heart infusion broth followed by selective enrichment.

Fig 3: ***S. enteritidis Isolations from Environmental Samples after Depopulation (n=10)***



Conclusions

Except for a spurious, unexplainable result at 13 weeks, the SE isolation rate did not decline for 15 weeks. Dry cleaning at 4 weeks after depopulation did not reduce the SE isolation rate. The coarse wash down slightly reduced while fine cleaning and both disinfection procedures increased the SE isolation rate. The most consistent reduction of SE isolation followed every cleaning procedure (except dry-cleaning) that was followed by a drying period of at least 2 weeks.

From this small study one could conclude that the most effective method of decontamination consists of the old proven methods: removal of organic matter, drying, disinfection followed by a drying period (Fig.3).

The preliminary observations from our field study have not provided conclusive results. Farm decontamination is much more complex. Factors other than cleaning procedures could have had a more important impact on the low SE isolation rate from the farm environments. Effective control of rodents, the reservoir host of SE, and SE vaccinations are likely factors.

(1): Bryant, E. (1990): Proceedings of the 62nd NECAD, Guelph, ON, Canada.
(2): Davison, S. (2002): Proceedings of the 106th Annual Meeting of USAHA, St. Louis, MO, Pg. 472.
(3) USDA-APHIS (2002): National Poultry Improvement Plan and Auxiliary Provisions. Pg. 87-94.