

PROCESSING TIP . . .

EARLY PRE-HARVEST FOOD SAFETY ISSUES THAT CARRY OVER INTO THE PLANT

When a poultry company exceeds the *Salmonella* standard set by the U.S.D.A., the initial reaction is to place blame on the plant employees. Various companies have spent enormous amounts of time and money attempting to reduce *Salmonella* levels on finished carcasses by making changes in the plant. Unfortunately, this is not always successful. Numerous factors during breeding, hatching, growout, and transportation (chick and broiler) can directly impact the level of *Salmonella* on the finished product.

The following is an example of how these factors, which have nothing to do with processing, can significantly influence carcass *Salmonella* results. In one instance, a processing plant had a *Salmonella* prevalence of 17.5%. Another processing plant owned by the same company had a *Salmonella* prevalence of 6.7%. The company suspected that the plant that had 6.7% prevalence was doing an excellent job with processing, but had a problem with flocks that were “hot” with *Salmonella*. When the source of birds for the two plants was switched, instantly, the *Salmonella* prevalence for the first plant went from 17.5% to 25%. The *Salmonella* prevalence for the second plant fell from 6.7% to 1.6%. This effect held up over a few months. These data clearly demonstrate that just by manipulating the flocks that go into a plant, the prevalence of *Salmonella* within that plant may be significantly impacted. In the case of the first plant, the *Salmonella* level was acceptable and within U.S.D.A. specification at 17.5%. However, by processing more contaminated flocks (25%), the level exceeded the U.S.D.A. limits.

In this example, the company failed the U.S.D.A. *Salmonella* testing series and spent an enormous amount of money and effort to clean up the plant even though it was in excellent condition. In another instance, a company had a very similar situation that led to finger pointing between processing and production. The processing management knew that the plant was clean and that all efforts were being made to reduce *Salmonella* in the plant. The production people felt that “this is a processing problem” and did not want to get involved. In actuality, it is a “company” problem, and cooperation between processing and production is essential to identify and solve situations such as this.

PUTTING KNOWLEDGE TO WORK

Another major problem is that growout houses can become “hot” with high *Salmonella* populations without warning and may stay “hot” for a long period of time. This may vary due to weather conditions, insect or vermin infestation, problems with *Salmonella* cross-contamination at the hatchery, or season. Although the processing plant employees have the regulatory responsibility to ensure that the product meets or exceeds the *Salmonella* regulation, they have absolutely no control over these production factors. Management within a company must work together to identify and solve problems.

The breeder chickens have been a cause of concern for the poultry industry for many years with regard to *Salmonella*. *Salmonella* may be transferred on the surface of the egg shell due to fecal contamination during laying, or it may be encased within the egg. Cox and others found that *Salmonella* could be found in the reproductive tracts of roosters and in hen sperm storage tubules. These findings indicate that roosters may be infecting hen’s reproductive tracts during insemination. Thus, to prevent vertical transmission of *Salmonella*, many companies have instituted a vaccination program. These programs are showing positive benefits in decreasing *Salmonella* populations within the breeder chickens.

In some European countries, all breeder flocks are tested for *Salmonella*. If the flock is positive, it is slaughtered and the eggs are not used. This has dramatically reduced *Salmonella* populations in the broiler chickens. However, due to the sheer scale of the industry in the U.S., this approach is seriously impractical.

Another approach that many European countries use is competitive exclusion. The idea is that by feeding the chickens populations of “good bacteria”, these good bacteria will colonize the intestines of the chicken and fill up all of the parking spaces. Then, when *Salmonella* is ingested it: 1) does not have anywhere to park, and 2) bacteriocins produced by the good bacteria will kill the *Salmonella*. The cultures used in these countries are generally undefined. That is to say that the bacterial species in the culture are not defined and identified. The U.S. Food and Drug Administration will not allow these cultures to be used in the U.S. Thus, very few cultures are used and sold in the U.S. These cultures have not been widely accepted by the industry. In Europe however, the undefined cultures have been demonstrated to be successful at reducing *Salmonella*.

To reduce the prevalence of *Salmonella* on poultry carcasses during processing, intervention strategies should be implemented during the hatching phase of poultry production. *Salmonella* spp. may be found in the nest box of breeder chickens, cold egg-storage rooms at the farm, on the hatchery truck, or in the hatchery environment (Cox et al., 2000). These bacteria may then be spread to fertilized hatching eggs on the shell, or in some cases, may penetrate the shell and reside just beneath the surface of the eggshell.

Research has demonstrated that contamination of raw poultry products with *Salmonella* spp. may be attributable to cross-contamination in the hatchery from *Salmonella* infected eggs or surfaces to uninfected baby chicks during the hatching process. Cox et al. (1990 and 1991) reported that broiler and breeder hatcheries were highly contaminated with *Salmonella* spp. Within the broiler hatchery, 71% of eggshell fragments, 80% of chick conveyor belts swabs, and 74% of pad samples placed under newly hatched chicks contained *Salmonella* spp. (Cox et al., 1990).

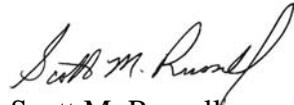
Cason et al. (1994) reported that, although fertile hatching eggs were contaminated with high levels of *Salmonella typhimurium*, they were still able to hatch. The authors stated that paratyphoid salmonellae do not cause adverse health affects in the developing and hatching chick. During the hatching process, *Salmonella* spp. is readily spread throughout the hatching cabinet due to rapid air movement by circulation fans. When eggs were inoculated with a marker strain of *Salmonella* during hatching, greater than 80% of the chicks in the trays above and below the inoculated eggs were contaminated (Cason et al., 1994). In an earlier study, Cason et al. (1993) demonstrated that salmonellae on the exterior of eggs or in eggshell membranes could be transmitted to baby chicks during pipping. Thus, proper disinfection of the hatchery environment and fertile hatching eggs is essential for reducing *Salmonella* on ready-to-cook carcasses. Suggestions for elimination of

Salmonella in the hatchery include: 1) install a disinfectant fogging system or electrostatic spraying system in the hatchery plenum, setters, and hatcher that are linked to a timer system, 2) spray disinfectant every 30 minutes during setting and hatching to prevent cross-contamination, 3) thoroughly clean and sanitize setters and hatcher regularly using documented sanitation standard operating procedures (SSOP's), and 4) regularly monitor eggshell fragments, chick paper pads, and chick dander from the bottom of the hatching cabinet for *Salmonella*.

Salmonella in the crops of chickens that have consumed litter may be spread from carcass to carcass during the crop removal process (Hargis et al., 1995, and Barnhart et al., 1999. Suggestions for elimination of *Salmonella* in the crop prior to processing are as follows:

1. Apply lactic acid to drinking water of the chickens before the feed withdrawal period.
2. Begin by applying small amounts and gradually increase levels until they reach 0.5 % (0.64 oz. of lactic acid/gallon of water).
3. Occasionally have the QA employees check the pH of the crops of birds at the plant to insure that they are being acidified.

Another popular method for reducing *Salmonella* in broiler chickens is to spray the chicks with a live vaccine in the hatchery. The two main companies that produce these vaccines are Fort Dodge and MeganVac. Using vaccines, companies have observed *Salmonella* reductions of 20 to 50%. Using these methods, companies have been able to significantly reduce pre-harvest *Salmonella* prevalence.



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“Your local County Extension Agent is a source of more information on this subject.”