

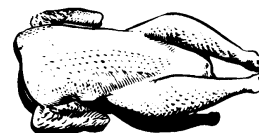


The University of Georgia

Cooperative Extension Service

College of Agricultural and Environmental Sciences / Athens, Georgia 30602-4356

NOVEMBER 2010



PROCESSING TIP . . .

CONTROL OF *SALMONELLA* IN BREEDER CHICKENS

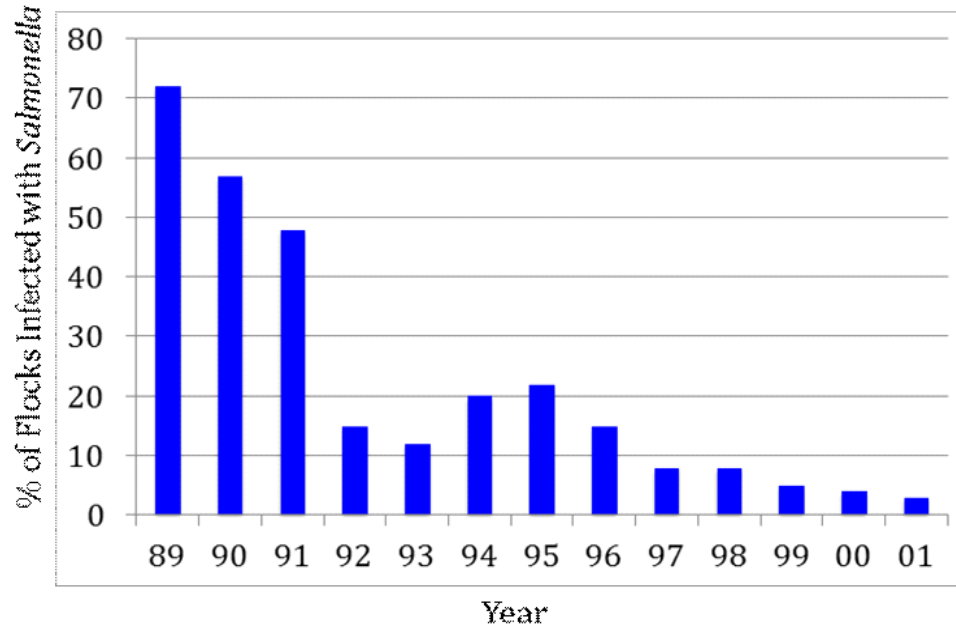
Part II

Salmonella colonization of poultry breeder and broiler flocks is a very complex issue. Chickens may become colonized through both vertical (from parent stock) and horizontal (environmental) means. The purpose of this Poultry Tip is to detail how *Salmonella* colonize breeder chickens and to explain effective measures for preventing or controlling vertical colonization.

Over the years, a number of methods have been used to eliminate *Salmonella* from breeder chicken populations. One method employed in Denmark, Sweden, and the Netherlands is to test chickens within their breeder flocks and, if found to be positive for *Salmonella*, slaughter them. Rapid increases in the incidence in human salmonellosis in the second half of the 1980s in Denmark was attributed to the spread of *Salmonella* in broiler chickens. Because of this link to poultry, a targeted national control program was initiated. Initially, the aim of the program was to reduce *Salmonella* in broiler flocks to less than 5% prevalence (Wegener et al., 2003). The program was developed based on the concept of eliminating *Salmonella* from the breeders, which would then theoretically ensure that broilers and processed products would be free from *Salmonella*. Wegener et al. (2003) reported that infected flocks of breeder chickens are slaughtered. The intensive testing program developed gradually over time. Birds from *Salmonella* positive flocks are slaughtered on separate slaughter lines or late in the day to avoid cross-contamination of *Salmonella* negative birds. One incentive the Danes give poultry growers is that farmers get a better price for birds from *Salmonella*-free flocks, and slaughterhouses can use the label “*Salmonella*-free” for birds that meet criteria determined by the authorities (Wegener et al., 2003). The effect of this program may be seen in Figure 1 presented below.

PUTTING KNOWLEDGE TO WORK

Figure 1. Effect of slaughtering *Salmonella* positive breeder flocks on *Salmonella* positive chickens arising from processing operations in Denmark.

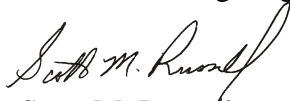


However, it is important to note that due to the sheer size of the poultry industry in the U.S., this approach would be impractical, if not impossible. For example, roughly twice as much poultry was produced in Athens, GA last year than was produced in all of Sweden. When we compare the rate of human salmonellosis between Sweden and the U.S. we find 42.8 per 100,000 people in Sweden versus the U.S. where it is 14.9 per 100,000 people. The question is, “In a country where extraordinarily expensive measures are used to eliminate *Salmonella* from the flocks prior to processing, what are they getting for their money?”

Scientists have been working for decades in an attempt to control *Salmonella* colonization of chickens using bacterial cultures that will colonize the baby chick and thus, prevent *Salmonella* from colonizing. Another approach has been to use antibiotics to prevent colonization of the chickens with *Salmonella*. In 1997, Reynolds et al. medicated breeding flocks of domestic fowl (*Gallus gallus*) using an antimicrobial treatment followed by competitive exclusion in 13 trials between February and September 1993. This approach was being used as an alternative to the Swedish model such that positive flocks would not have to be slaughtered, but would be treated instead. In each trial, the flock had been confirmed as naturally infected with *Salmonella enterica* serovar Enteritidis and the effect of treatment was determined on *Salmonella* isolation from internal tissues. Of the 11 trials where enrofloxacin was used to medicate the flocks, a long-term reduction of *Salmonella* was observed in two and a short-term reduction was measured in birds from another five trials. *Salmonella* Enteritidis was isolated from birds after treatment in four other trials with enrofloxacin and in two trials of medication with amoxicillin. The authors of this study concluded that enrofloxacin significantly reduced the prevalence of *S. Enteritidis* in tissues from birds, and reduced the level and prevalence of *Salmonella* in the bird’s environment. No *Salmonella* was identified in statutory meconium samples taken from the hatched chicks derived from the flocks after treatment. The program of antibiotic treatment and competitive exclusion offers an alternative to slaughter, but the approach must be part of a coordinated program, which will effect a decrease in the prevalence of *S. Enteritidis* over time by contemporary use of disease security measures (Reynolds et al., 1997). This approach in the U.S. may not be acceptable as many companies are trying to decrease the use of prophylactic antibiotics in order to preclude development of antibiotic resistant bacteria.

A number of poultry companies have investigated the use of vaccines for eliminating *Salmonella* in breeder flocks. Inoue et al. (2008) stated that young poultry are very susceptible to *Salmonella* Enteritidis (SE) infections because of the absence of complete intestinal flora colonization and an immature immune system in baby chicks. The authors conducted a study to evaluate the role of passive immunity on the resistance of young birds against early infections caused by SE. The progeny of broiler breeders were vaccinated compared to the progeny of unvaccinated birds. The efficacy of the vaccine was determined by challenging birds at Days 1 and 14 with SE. After challenge at 1 day of age, the progeny of vaccinated birds presented a significantly lower number (\log_{10}) of SE in liver (2.21), spleen (2.31), and cecal contents (2.85) compared with control groups (2.76, 3.02, and 6.03, respectively). This means that vaccination in these breeders reduced SE colonization by greater than 99%. Inoue et al. (2008) observed that examination of the internal organs, 3 days after infection, revealed that 28% of the birds (7/25) from vaccinated breeders were positive, whereas 100% (25/25) of the chicks derived from unvaccinated birds were positive. Moreover, birds that were challenged at 14 days of age showed a lower number of positive samples compared with those challenged at 1 day of age, and the progeny of vaccinated birds presented statistically lower numbers (2.11 vs. 2.94). In this study, age influenced the susceptibility of birds to SE infections: in control groups, the number of positive birds at 14 days of age (9/25) was lower when compared with the group infected at 1 day of age (25/25). The number of positive fecal samples of the progeny of vaccinated birds was significantly lower (36) than those of the control group (108) after challenge at 1 day of age. The authors showed that vaccinating breeders helped to increase the resistance of the progeny against early SE infections. However, the bacteria were not completely eliminated, suggesting that additional procedures are needed to effectively control SE infections (Inoue et al., 2008).

Most efforts to control *Salmonella* in breeder flocks in the U.S. have been concentrated on vaccination programs. In some cases, they are very effective; however, in others they do not have any effect. In working with one company that was vaccinating 100% of their breeders, plants receiving the broilers from these flocks reported a 100% *Salmonella* positive rate. These data indicate that the vaccination program in these operations was having no impact and highlights the importance of identifying the serotypes of *Salmonella* that are most frequently isolated and targeting those serotypes in the vaccine (Russell, unpublished data).



Scott M. Russell

Extension Poultry Scientist

Extension County Coordinator/Agent

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