MODELING APPROACHES TO UNDERSTAND AND REDUCE *SALMONELLA* INFECTIONS IN EGG-LAYING HENS AND HUMANS

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Abstract: Understanding various pathways leading towards introduction of pathogens in food safety continuum of farm-to-fork is a continuous challenge. Shell-eggs and their products have been implicated in 80 percent of the *Salmonella enteritidis* (*Se*) outbreaks. One of the reasons for such high outbreaks is the amount of time such birds spends (60-100 wk) under farm conditions and are vulnerable to pathogens onslaught, which become embedded in their physiological systems and subsequently transfer to eggs and by-products. Using 20-80 rule of identifying 20% of causality (hazards) that could account for 80% of effects (damage) may provide an understanding to manage such complex problem. Modeling approaches, such a quantitative risk assessment using scenario trees of critical control points and conditional probabilities may be one such options. For example, an important finding of 2002 FAO/WHO risk assessment of *Salmonella* in layers (ISBN 92 9 156230 7) was that reducing flock prevalence by 50% will cut public health risk by one half. In EU number of human *Salmonella* cases is often linked to reduction of *Salmonella* flock prevalence in layers – one of the success stories of EU food safety risk management. Other options to manage this problem is through artificial intelligence modeling or traditional statistical and mathematical models. The challenge, however, is to validate those models under applied farm conditions and not a mere academic exercise. For this particular paper, different risk pathways and modeling approaches will be compared and analyzed to find an optimal solution to manage S*e* infection in egg-laying hens and humans.

Key words: *Salmonella*, egg-laying hens, risk assessment, modeling approaches

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