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Application of Meta-Analysis to Predict Salmonella Contamination in a Broiler Chickens Abattoir

Josphat Gichure[1,2], Ranil Coorey[3], Patrick Njage[4], Gary Dykes[3], Joseph Wambui[5], Elna Buys[1]

[1]University of Pretoria, Pretoria, South Africa. [2]South Eastern Kenya University, Kitui, Kenya. [3]Curtin University, Perth, Australia. [4]Technical University of Denmark, Copenhagen, Denmark. [5]University of Zurich, Zurich, Switzerland

Abstract

Introduction: Combining data from multiple studies provide a robust quantitative estimate to predict changes in microbial contamination during processing. This study aims to aggregate results from several studies of Salmonella spp. decontamination interventions using a systematic review.

Methodology: Published articles on the Salmonella spp. were reviewed to assess the changes in the concentration and prevalence after applying chemical and physical decontamination interventions at different processing steps along the broiler slaughter process. Meta-analysis was used to unify the changes in concentration measured using standardized mean difference, odd ratios for concentration and relative risks for prevalence.

Results and Discussion: A pooled reduction (0.82 log10 CFU/carcass) of Salmonella spp. concentration was observed, with the carcass-wash (1.20 log10 CFU/carcass) and post-chill (1.18 log10 CFU/carcass) having the most significant reduction in contamination. Chemical decontaminants were effective on the Salmonella concentration (0.98 log10 CFU/carcass reduction). Electrolyzed water, sodium hypochlorite-acetic acid, and trisodium phosphate had greater than 2 logs reduction. The decontaminant application through immersion, as opposed to spraying/fumigation, was superior by up to 0.57 log10 CFU/carcass reduction. Hard scalding and steam pasteurization after carcass wash were effective physical decontamination techniques. Use of chlorine after a high pH scald, sodium hydroxide, acidified chlorinated trisodium phosphate and additional dips in portable water after carcass wash reduced the relative risk of Salmonella spp. prevalence by more than 100%.

Conclusion: Existing methods are highly effective in reducing Salmonella spp. concentration, but there is a risk of cross-contamination within batches, mainly where chemical decontaminants are applied through immersion. The results provide a basis for control decision-making and quantitative microbial risk assessment.