Simulation of Wildlife Fecal Contamination of Romaine Lettuce by Indicator *E. coli*

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Abstract:

Introduction: Foodborne disease outbreaks have been linked to enterohemorrhagic *E. coli* (EHEC) contamination of fresh produce from domestic and wildlife sources. Non-pathogenic generic *E. coli* strains may be used to monitor for potential fecal material in the fresh produce production environment. Indicator strains of generic *E. coli* have also been used to study bacterial transference and survival to plants under commercial experimental field conditions.

Purpose: The purpose of this study was to conduct applied real-world field research to determine the amount and persistence of generic *E. coli* that transfers onto mature Romaine lettuce following simulated contamination by wild animal defecation.

Methods: Experimental field trials were conducted in the Salinas Valley, California following the U.S. Food and Drug Administration Quantitative Predictive Risk Assessment Model (QPRAM) protocol with modifications. Specifically, feces (chicken, rabbit, pig) were inoculated with rifampicin-resistant generic *E. coli* to estimate the transfer, survival, and concentration on mature Romaine lettuce plants following foliar irrigation Negative binomial and linear regressions were used to assess contributing factors for prediction of bacterial contamination and to measure bacterial survival, respectively.

Results: Inoculated *E. coli* was recovered from a total of 182/196 (93%) lettuce heads following irrigation. A decreasing concentration (7.8 log reduction) of 47 samples from the fecal pat to the 5-foot no-harvest zone was observed. Age of scat, distance from scat, and distance from sprinkler heads were statistically significant with the magnitude of bacterial transference to lettuce in linear model ($p < 0.05$). All 288 spiked heads had detectable inoculated *E. coli* up to 10 days post-inoculation. Decimal Reduction Time (DRT) of bacteria in chicken and rabbit feces were 2.1 and 2.5 days, respectively, while the pig feces was unpredictable.

Significance: These data will enhance the effectiveness of good agricultural practices designed to protect leafy greens from microbial contamination due to animal intrusions.