Title: Quantifying *Salmonella* Typhimurium in Ground Chicken Through Surface Plasmon Resonance Biosensor Analysis

Abstract:

Introduction:

Regulatory bodies in numerous countries have instituted measures for monitoring and mitigating *Salmonella* contamination in poultry products. Rapid quantitative analysis empowers producers to pinpoint potential issues in their production processes, facilitating prompt corrective measures to reduce *Salmonella* levels and enhance overall product safety.

Purpose:

This study aimed to establish a Surface Plasmon Resonance (SPR) biosensor for quantifying *Salmonella* Typhimurium in ground chicken and to evaluate the performance of SPR in comparison with real-time PCR (RT-PCR).

Methods:

The SPR biosensor was functionalized with a well-characterized monoclonal antibody specific to flagellin. An optimized SPR workflow for quantitative determination was developed. Ten sets of 6 ground chicken samples (32.5 g each) were inoculated with a cocktail of 4 strains of *S*. Typhimurium at target levels ranging from 0 to 4 log CFU/g. The samples underwent analysis using both SPR and RT-PCR after enrichment in buffered peptone water (BPW) and BAX MP Supplement (MPS) for 6, 8, 10, and 12 hours at 42 °C.

Results:

The SPR responses (μRIU) exhibited a log-linear correlation with the concentration of *S*. Typhimurium within the range of 4.6×10^5 and 2.1×10^7 CFU/mL. The utilization of MPS for *Salmonella* enrichment in chicken samples demonstrated equal effectiveness for both SPR and RT-PCR. Linear regression analysis was conducted for each enrichment time. The optimal linear fitting between 0 and 4 log CFU/g was observed at 10 hours of enrichment ($R^2 \geq 0.92$) for SPR, in contrast to 6 hours of enrichment ($R^2 \geq 0.90$) for RT-PCR. The Limit of Quantification (LOQ) for SPR was determined to be 0.77 log CFU/g, and there was no significant difference ($p < 0.05$) when compared with RT-PCR.

Significance:

The findings suggest that the precision of SPR in quantifying *S*. Typhimurium in ground chicken is comparable to that of RT-PCR. The cost-effectiveness of SPR renders it an attractive alternative for enumerating *Salmonella* in poultry products.