



INTRODUCTION

Salmonellosis is one of the leading foodborne illnesses in the United States. Chickens may harbor *Salmonella* without having severe symptoms. *Salmonella enterica* serotypes Typhimurium (ST), Enteritidis (SE) and Kentucky (SK) are in the top 5 common poultry isolates¹. In 2016, ST and SE were isolated from 9.8% and 16.8% of human cases, respectively². However, the number one isolated serotype in poultry is SK, which has a low incidence (0.14%) in human cases².

Current reduction strategies include biosecurity measures, water treatments, feed additives, vaccines and competitive exclusion. Direct colonization resistance occurs due to lack of space and nutrients. Yang and colleagues excluded SE and ST in broiler chicks when a serovar was administered 24 h prior to the other³.

Indirect colonization resistance occurs in response to microbiota stimulated host immunity⁴. Characterization of the immune response can be measured by gene expression of cytokines.

HYPOTHESIS: *Salmonella* Kentucky will reduce *Salmonella* Enteritidis and *Salmonella* Typhimurium by competitive exclusion in broiler chicks and affect the host immune response.

OBJECTIVES: Chicks were concurrently challenged with both *Salmonella* Kentucky and Typhimurium or Enteritidis. Cecal colonization and incidence was measured by differential plating. Changes in cytokine gene expression was measured in cecal tonsils and liver by quantitative real-time reverse-transcription PCR.

MATERIALS AND METHODS

EXPERIMENTAL DESIGN

Trials 1 and 2

Treatment	NC	SK	SK→ST	ST	ST→SK	SK+ST
D0	Place chicks					
D1 (Challenge)	PBS	10 ⁴ CFU SK	10 ⁴ CFU SK	10 ⁴ CFU ST	10 ⁴ CFU ST	10 ⁴ CFU SK+ST
D2 (Re-Challenge)	PBS	PBS	10 ⁵ CFU ST	PBS	10 ⁵ CFU SK	PBS
D3 (Kill)	Collect ceca, liver, and spleen tissues					

Trials 3 and 4

Treatment	NC	SK	SK→SE	SE	SE→SK	SK+SE
D0	Place chicks					
D1 (Challenge)	PBS	10 ⁴ CFU SK	10 ⁴ CFU SK	10 ⁴ CFU SE	10 ⁴ CFU SE	10 ⁴ CFU SK+SE
D2 (Re-Challenge)	PBS	PBS	10 ⁵ CFU SE	PBS	10 ⁵ CFU SK	PBS
D3 (Kill)	Collect ceca, liver, and spleen tissues					

Differential plating was used to select *Salmonella* isolates for resistance to specific antibiotics. The sample size was n=20 chicks per treatment. Each trial was replicated twice. Gut colonization and incidence were measured from cecal contents. Relative mRNA levels of cytokines interleukin-1 β (IL-1 β), IL-6, IL-10, IL-10 and gamma interferon (IFN- γ) were measured via qRT-PCR (n=5/treatment).

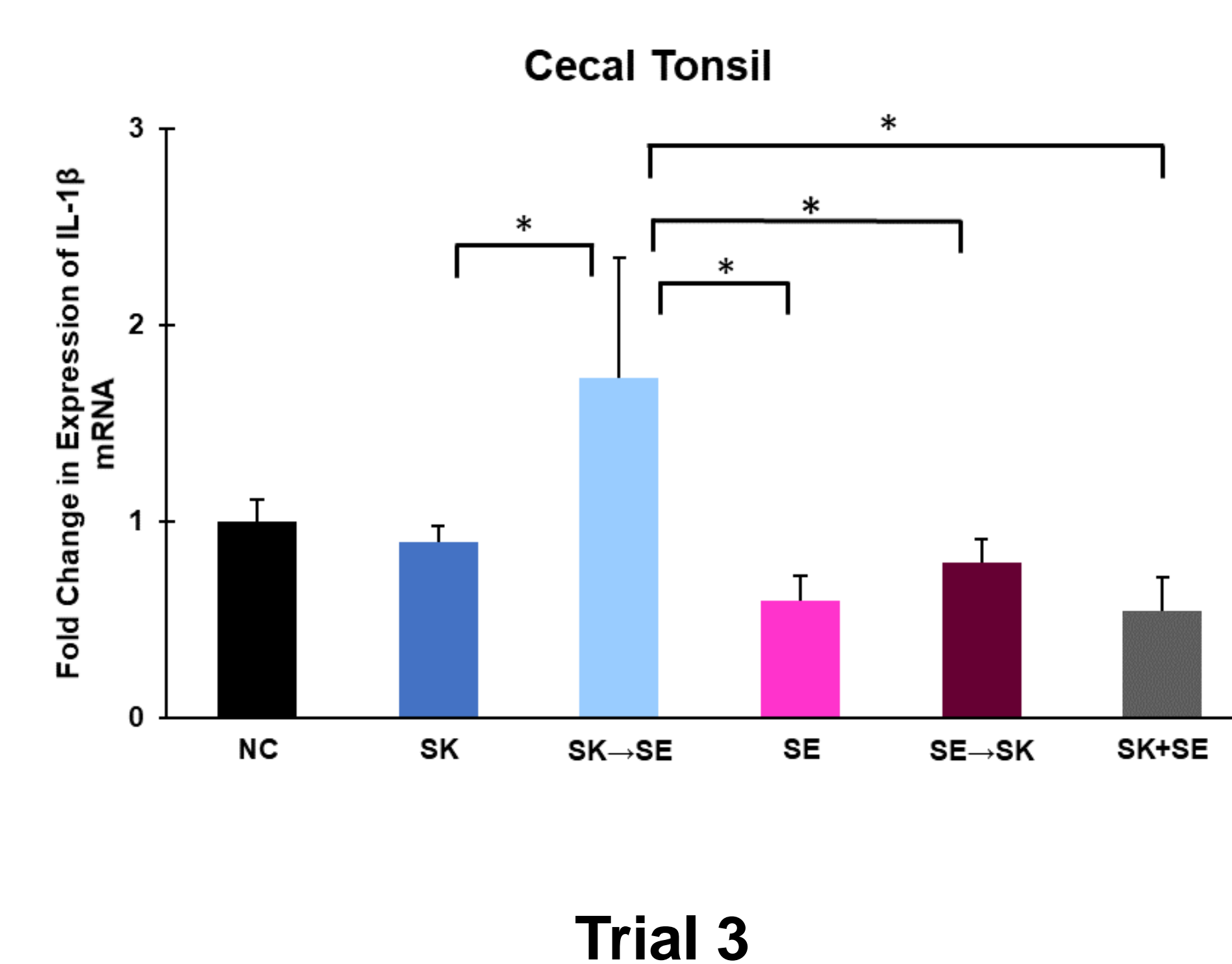
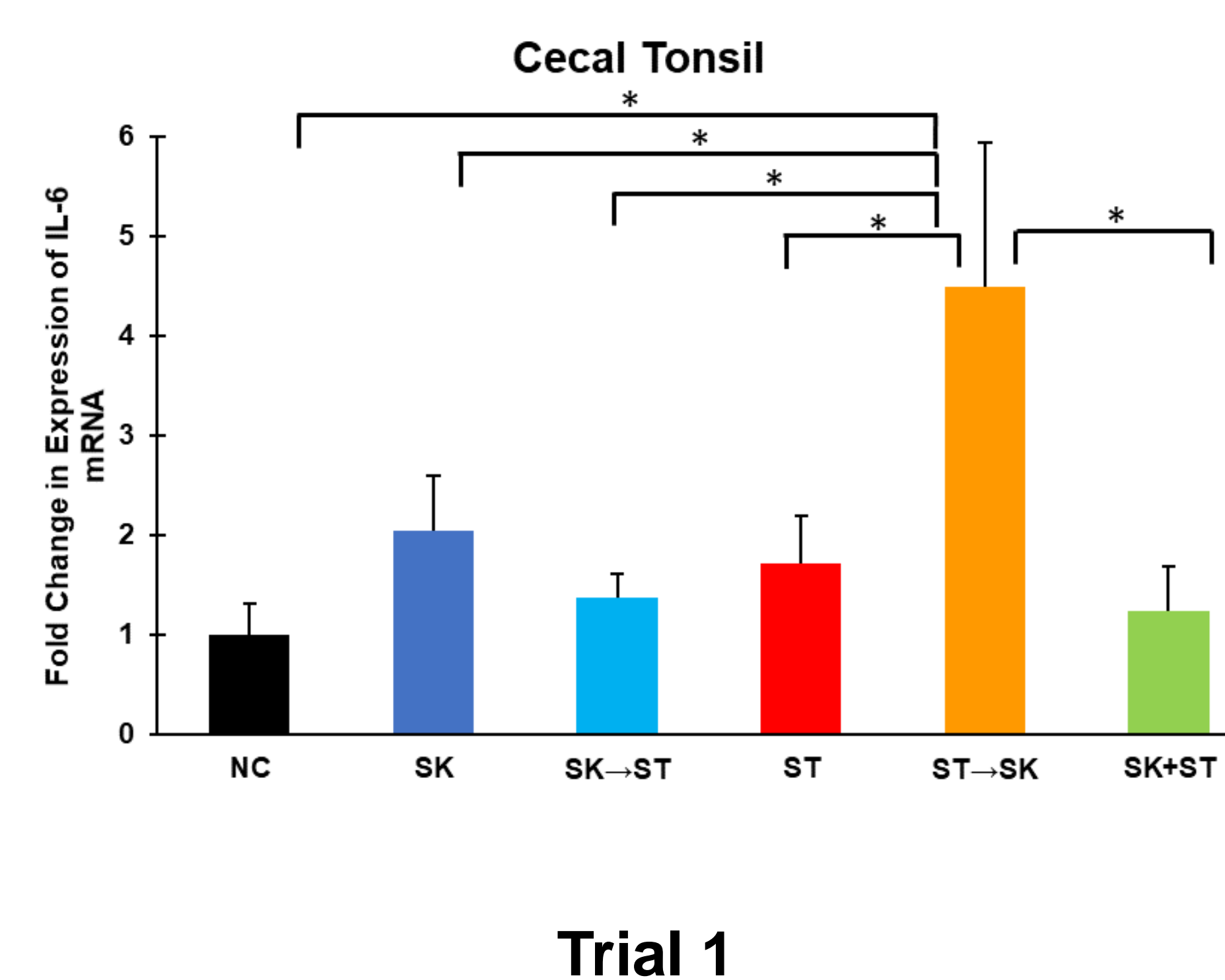
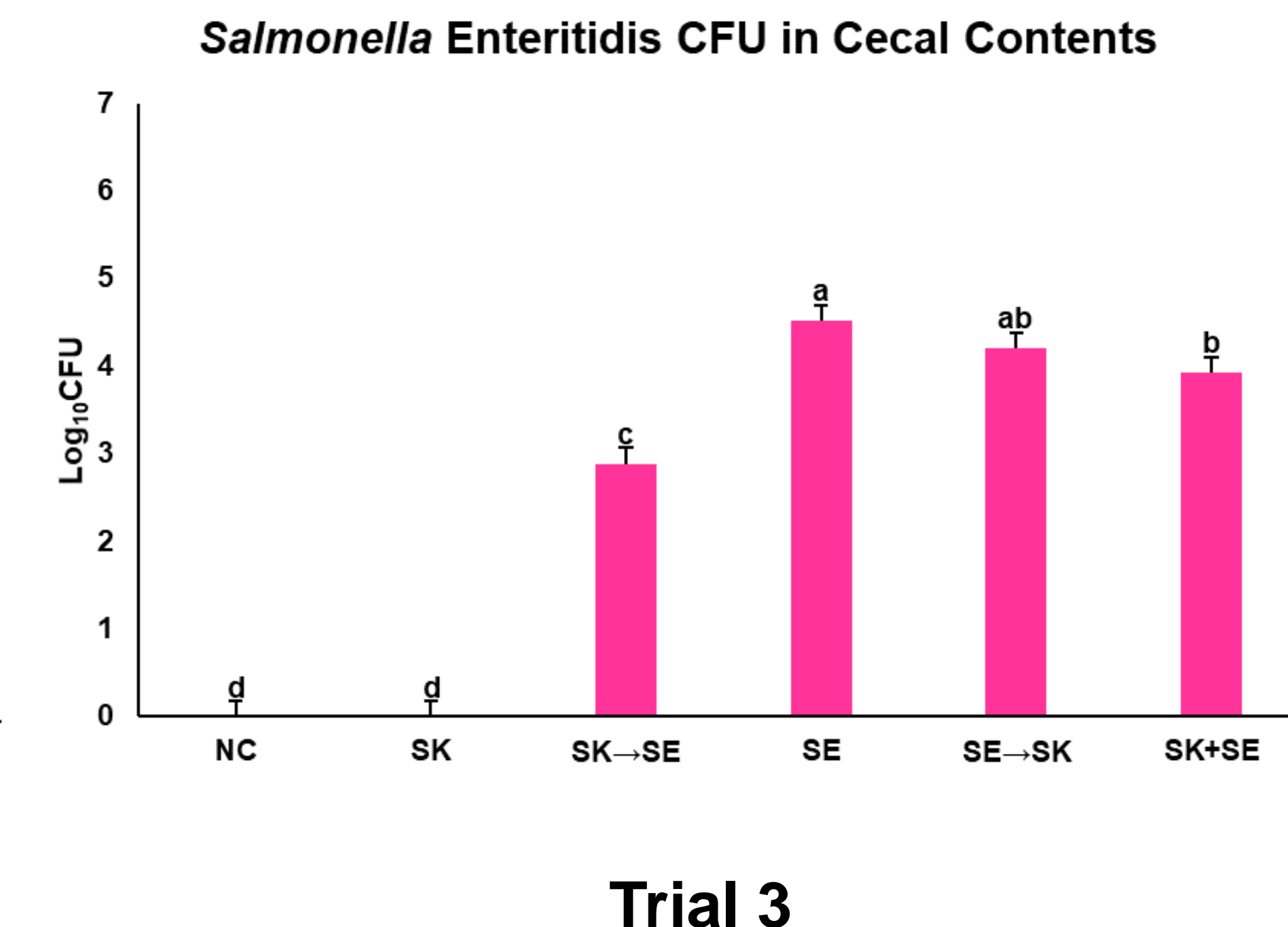
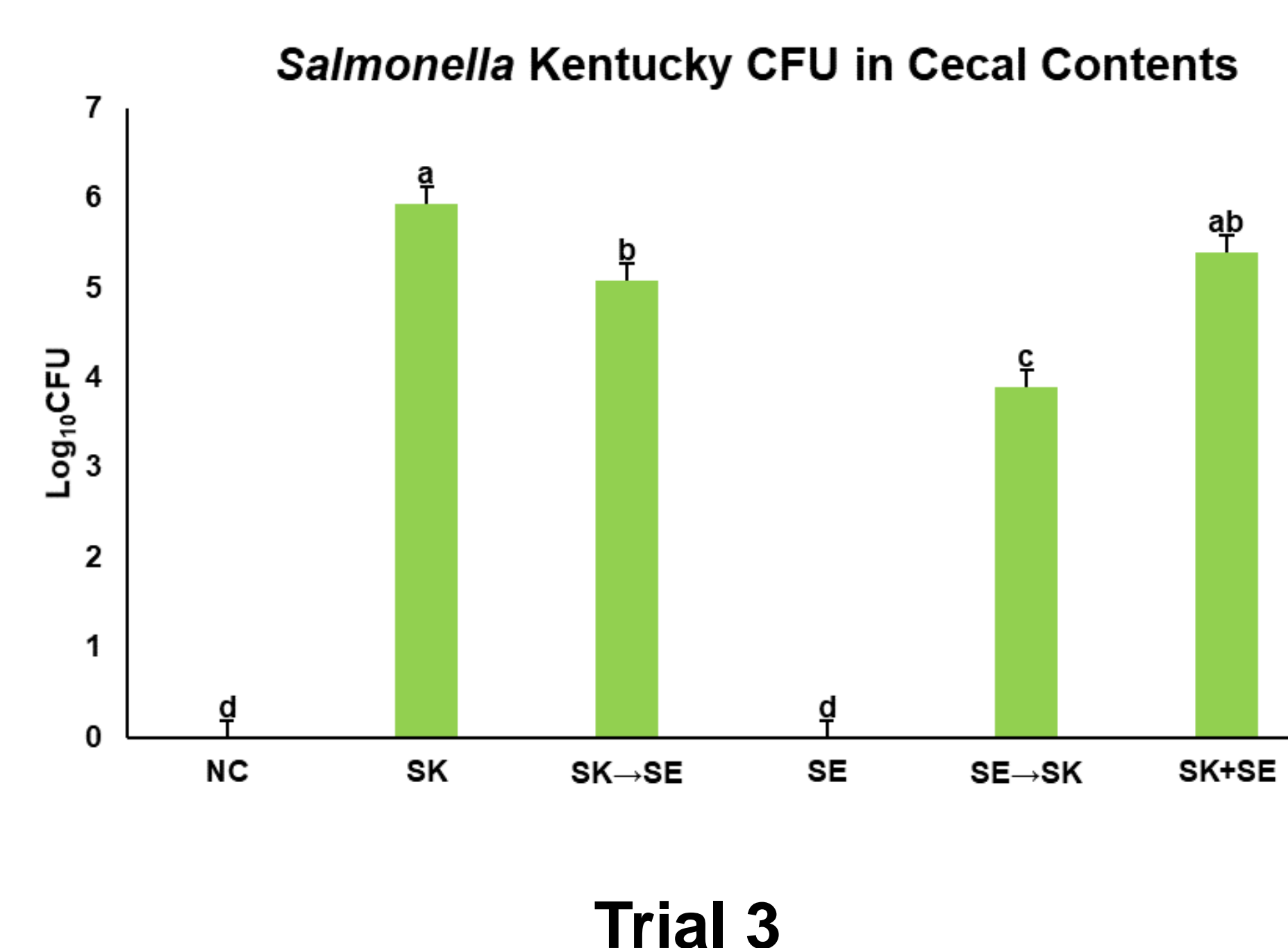
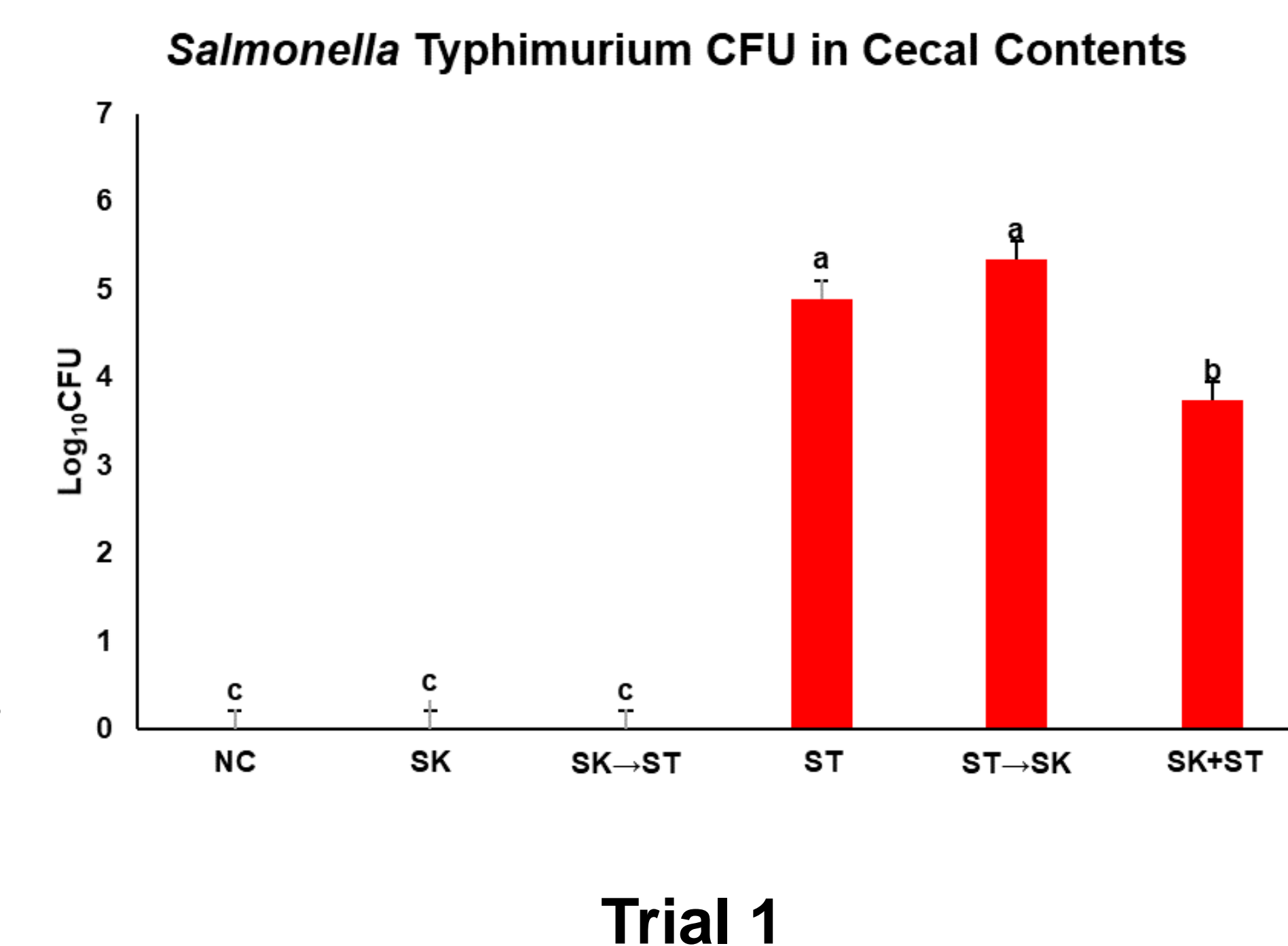
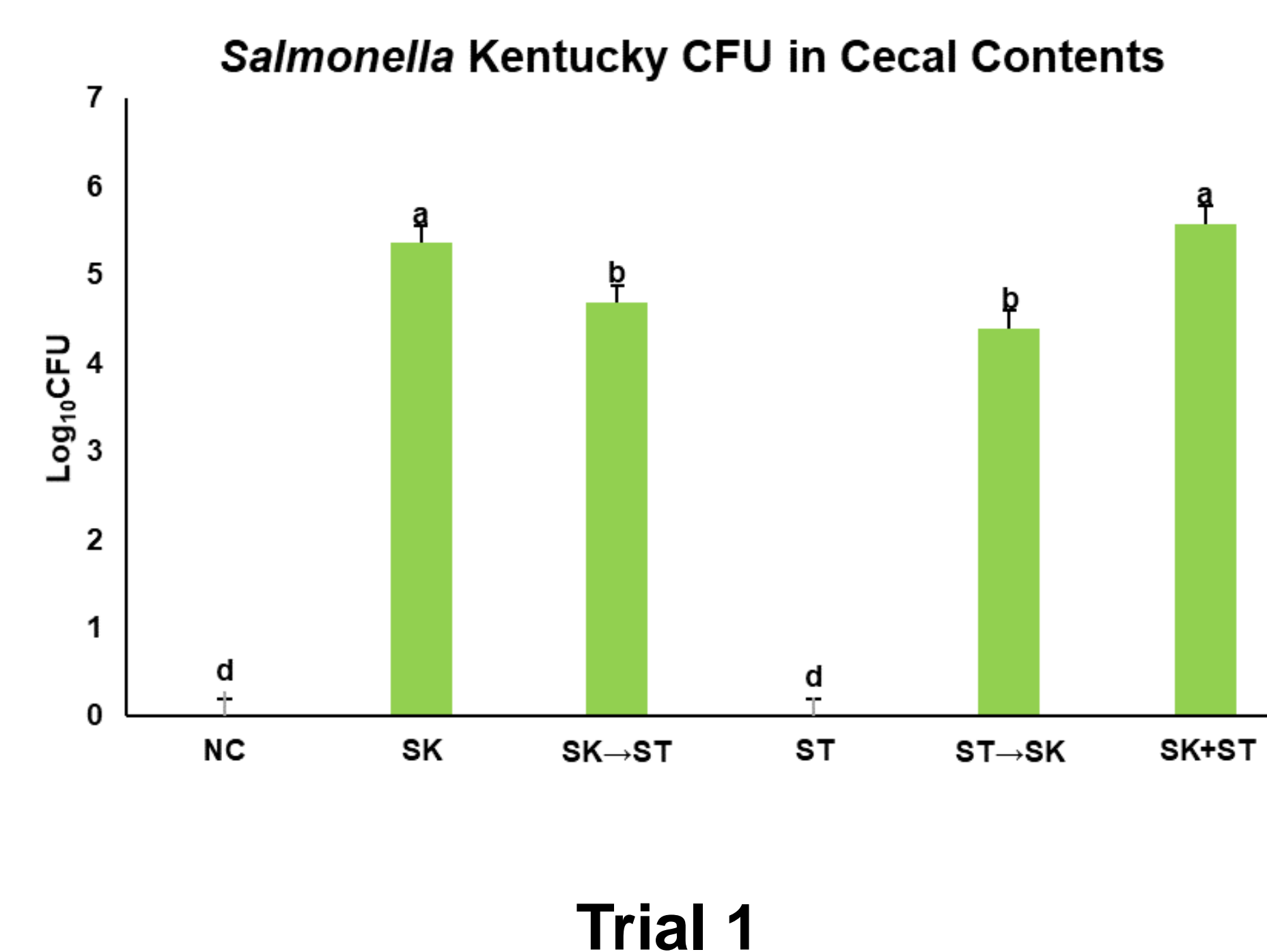
STATISTICAL ANALYSIS

Statistical analyses were conducted via a Student's t-test for enumeration and gene expression using JMP Pro 15. All the data were presented as mean standard error of the mean. A p-value of < 0.05 was considered significant when compared to the respective positive control. Each trial was replicated twice at different times. Gene expression data were measured from trials 1 and 3.

KEY WORDS

broiler, colonization resistance, cytokine, immune response, *Salmonella*

RESULTS



CONCLUSIONS

- When administered first *Salmonella* was able to significantly reduce colonization of the following serotype.
- *Salmonella* Kentucky significantly reduced SE and ST.
- Significant differences were found in the mRNA levels of cytokines.

REFERENCES

1. FSIS. 2014
2. CDC. 2016.
3. Yang, et al., 2018
4. Lawley and Walker, 2012
5. Pineda, et al., 2021