Evaluating the Impact of School Foodservice Cooling Techniques on Escherichia coli Populations in Recipe Prepared Chili Con Carne with Beans

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Abstract

Introduction & Purpose: In preventing foodborne illness outbreaks, proper food preparation practices are especially critical in institutional settings where food products are prepared in large quantities. The third leading factor in outbreaks of school associated foodborne illness is improper or “slow” cooling. Therefore, conducting research regarding cooling methods that are both effective and feasible for preventing pathogen growth is critical to public health. The purpose of this study was to evaluate combinations of cooling techniques and their impact on Escherichia coli populations in a recipe prepared chili con carne with beans.

Methods: Chili was prepared according to a school nutrition program recipe and heated to 165°F, poured into steam table pans to 2 and 3 inch depths, then cooled to 135-145°F before inoculation with E. coli (target concentration of 10^4 CFU/g). Pans were stored in a commercial walk-in freezer (-20° C) or placed in ice water baths in a commercial walk-in refrigerator (4°C). All pans were stored uncovered or covered with one or two layers of aluminum foil. Samples were plated onto MacConkey agar at 0, 4, 8, 12, and 24 hours, and incubated for 18-24 hours to enumerate E. coli populations.

Results & Conclusions: No statistically significant difference (P>0.05) in E. coli population was observed for cover (two layers, one layer, uncovered), treatment (refrigerator vs. freezer), or depth variables. However, time (P<0.0015) and a two way interaction, depth by time (P=0.197), were significant for this product. Although time was statistically significant, the largest recorded change in E. coli population (-0.1755 log10 CFU/g) between time points 4 and 12 may not be considered microbiologically significant. Depth by time was also statistically significant, with the largest population change (-0.277 log10 CFU/g) recorded for three inch food depths between time point 0 and time point 4. For two inch depths, the largest change in E. coli population (-0.154 log10 CFU/g) occurred between time point 0 and 12. This data indicates that most cooling treatments evaluated were effective at controlling E. coli populations in commercially prepared chili product.

Conclusion and Significance

Time was statistically significant for this food product (P<0.0015). The slight decrease in E. coli population over time indicates an effective control for the cooling methods evaluated. The time by depth interaction was significant for this food product as well (P=0.197). The decrease in E. coli population over time for the three and two inch food depths also demonstrates an effective control for the cooling methods evaluated. Although these effects were statistically significant, it should be noted that the variation observed in population was well under 0.5 Log CFU/g. It is possible that this small degree of difference is the result of natural variation in populations throughout the food. These results, along with the lack of statistical differences among cover and treatment variables, indicate that a majority of foodservice cooling methods were evaluated for effective at controlling E. coli populations in chili con carne with beans.

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