United States Department of Agriculture
Agricultural Research Service

EASTERN REGIONAL RESEARCH CENTER FACT SHEET

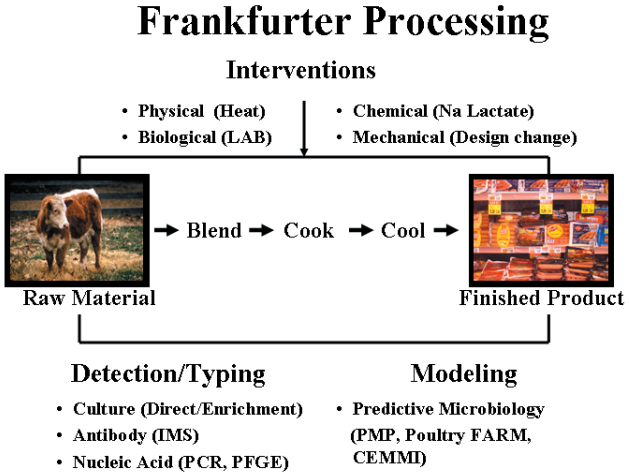
Intervention Strategies for Control of Foodborne Pathogens

Program Background

Our understanding of foodborne pathogens and of the types of microorganisms that have been linked with documented outbreaks of illness has dramatically increased in the past two decades. Thus, it is necessary to enhance the approach to pathogen control and food preservation by developing and implementing biological, chemical, and physical methods.

The efficacy of a preservation technology is influenced by a number of microorganism- related factors that are independent of the technology itself. These include the genus, species and strain of target pathogen, its growth stage and itsstress selection mechanisms. Each of these factors influence the resistance of a microorganism to a preservation process, independent of the apparent inactivation ability of that particular process.

Quantitative knowledge of the factors in food systems that interact and influence the growth/inactivation kinetics of food borne pathogens are required to accurately estimate how a particular pathogen is likely to behave in a specific food. There is a need for a better understanding of how the interaction among preservation variables can be used for predicting the safety of minimally processed, ready-to-eat foods. Complex multifactorial experiments and analysis to quantify the effects and interactions of intrinsic and extrinsic factors and development of "enhanced" predictive models are also warranted to ensure the microbiological safety of thermally processed foods.



Research Objective

Over the next five years, the research program on intervention strategies for control of foodborne pathogens will focus on the following specific objectives:

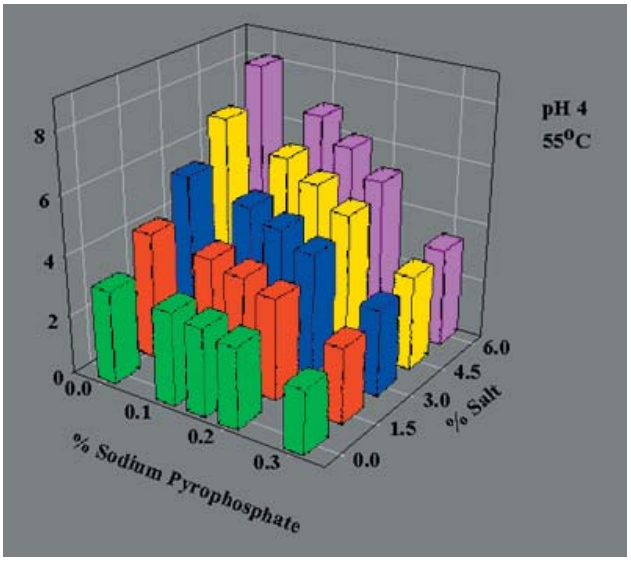
Developing strategies to ensure the safety of thermally-processed foods by quantifying the heat treatment required to achieve a specific lethality of foodborne pathogens

Assessing the effect of additives on the fate of *Clostridium perfringens* during cooling after thermal processing.

Controlling pathogens in ready to eat products by post processing/packaging application of treatments.

Elucidating the cellular and molecular mechanisms of increased resistance of pathogens, and developing novel food preservation systems for the safe production of foods processed using milder preservation technologies.

Identifying factors affecting attachment of foodborne pathogens to meat and their removal using combinations of selected chemical and biological means.



Effects and interactions of NaCl and sodium pyrophosphate on the predicted D-values, at 55C, of four-strain mixture of *Listeria monocytogenes* in beef gravy at pH 4.

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Impact

The predictive models rapidly give accurate estimates of pathogen survival during cooking and bacterial growth during cooling of the cooked foods, allow food processors to formulate foods to include acknowledged intrinsic barriers, assess the microbial risk of a particular food and design reduced thermal processes that ensure safety against pathogens in ready-to-eat foods while minimizing quality losses. The models aid in designing HACCP program and setting of critical control levels, and evaluate the relative severity of problems caused by process deviations. Further, these are used to estimate the expected effectiveness of corrective actions as a consequence of deviations from a critical limit. The models serve as the scientific basis for the cooking/cooling standards and are used by the retail food industry and USDA-Food safety and Inspection Service (FSIS) to establish guidelines/performance standards for safe time/temperature for cooking and cooling of meat. The Food and Drug Administration, FSIS and Health Canada use the findings in risk assessment models for cooked meats. The FSIS routinely use the technology to aid with the disposition of products subject to cooling deviations and set priorities in relation to inspection efforts. The models are also being used by the food science departments of more than 15 universities as a teaching aid to illustrate hurdle concept. The predictive equations have been incorporated into the USDA pathogen modeling computer program.

The basic research which is an integral part of the project provides new insights into the biochemical and molecular mechanisms underlying the increased heat resistance of pathogens. Food industry use the concept to identify potential new approaches for the safe production of cooked foods to avoid bacterial food poisoning.

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