

Development and Production of Safe Process Cheese Formulations

Food Research Institute, University of Wisconsin–Madison, Madison, WI 53706
J. F. Friedrich Center, April 26, 2005



FRI FOCUS ON
FOOD SAFETY
SERIES

Summary prepared by Ellin Doyle, FRI

With the April 26, 2005, meeting on "Development and Production of Safe Process Cheese Formulations," FRI launched its new Focus on Food Safety meeting series with in-depth presentations on specific topics of interest to food producers and processors. Speakers from FRI, other university departments, industry, and government discussed pathogens of concern and practical and regulatory considerations for producing safe process cheese products. Over 60 persons, representing 27 companies, attended the meeting.

Pathogens of concern. Spore-forming bacteria (*Clostridium botulinum*, *C. perfringens*, *Bacillus cereus*) and fungi are resistant to heat inactivation and toxins produced by these bacteria and spoilage caused by fungi are a concern for process cheese manufacturers. Preservation procedures, such as acidification, lowering water activity, refrigeration, and use of antimicrobials and sanitizers may all be used to ensure safety of process cheese.

In addition to pathogens that may survive heat treatment during process cheese manufacture, post-process contamination with some vegetative pathogens, such as *Staphylococcus aureus* and *Listeria monocytogenes*, must also be prevented or their growth inhibited. *S. aureus* can grow at a lower water activity than many other bacteria and the toxin it produces is not destroyed by pasteurization. *L. monocytogenes* is ubiquitous in the environment and is infamous for growing at refrigeration temperatures.

Intervention strategies. Microbiological safety of process cheese and related foods has traditionally relied on heat to destroy vegetative pathogens, formulation to prevent growth of surviving heat resistant spore formers, and refrigeration to prevent growth of recontaminating bacteria. A predictive model developed by FRI defines safe formulations for standard process cheese products in terms of moisture, total salts, and pH. Recent trends in product development include non-standard process cheese products that contain higher levels of fat, particulate ingredients (such as vegetables), or dairy or non-dairy solids instead of cheese. Some new products are designed for storage at ambient temperatures rather than under refrigeration. These new products may be more susceptible to pathogen growth and toxin production. Each formulation and processing change must be evaluated carefully to determine its effect on product safety.

Production controls. A number of models have been devised to aid decision making in assessing formulations for process cheese products. The Tanaka model developed by FRI estimates the statistical probability that a given formulation will permit toxin production. Data are collected and then extrapolated to predict safe formulations. Other approaches to predict safety include artificial neural networks, decision trees, and support vector machines. These alternative methods were described and their applications discussed.

Monitoring of cook times and temperatures and analytical methods to determine purity and concentration of ingredients are essential parts of a HACCP program for process cheese products. Proper sanitary design of equipment and processes are also key components for producing safe products.

Regulations. Sanitary equipment design in the dairy industry, extended runs, record keeping, and corrective actions were discussed by a representative of the WI Dept. of Agriculture, Trade and Consumer Protection. An FDA representative described electronic filing of reports by acidified and low acid food processors.

Our next Focus on Food Safety meeting, in September 2005, will present current information on "Strategies to Enhance Food Safety Using Antimicrobials and Sanitizers."