



Lesson 13

Food Science and technologies





Hurdle Technologies

Food Safety and Quality Challenges

- © Pet food, Peanut butter, Chili Sauce, Fresh Spinach... 2006 and 2007 were not great years for food safety. 2008 has begun with tomatoes > serrano peppers. We will continue to see more of the same, due to:
- New types of food items that have not been marketed before
 - Improved detection systems and lower detectable limits
 - Enhanced regulatory focus
 - Increased urbanization in America > blending of rural and urban landscapes > potential for contamination from field, runoff, etc.
 - An increase in global trade, and extensive food distribution systems that have resulted
 - An aging population that is more susceptible to foodborne illness
 - Emergence of new pathogens, pathogens not previously associated with food, in addition to antibiotic-resistant strains

Safety – Growing Requirements by Retailers

© February 4, 2008: *Wal-Mart Stores, Inc. has become the first nationwide U.S. grocery chain to require suppliers of its private label and other food products such as*



GLOBALG.A.P.
The Global Partnership for Good Agricultural Practice

Technology Innovations and Solutions

- **Good news:** Variety of technologies exists to enhance food safety and extend product shelf life
- **Sobering news:** For every food product, assume preventative technologies may be
 - Absent
 - Inadequate
 - Incapable of withstanding significant abuses in time, temperature



HACCP and Hurdles

- ◎ Primary Objective of a HACCP program is to establish processes to inhibit or destroy microorganisms capable of causing foodborne illness.
- ◎ Every organism has defined growth parameters, and the ability of an organism to pose a hazard can be inhibited, and potentially eliminated, by a number of factors, such as:

Nutrients

Water Activity

pH

Hurdle Technologies Definition

- ◎ A Hurdle Technology may be considered as:
 - A potential Critical Control Point (CCP) in your process, and/or
 - A weapon in your arsenal of technologies that provides enhanced food safety and/or enhanced food sensory characteristics for a greater period of time, and/or
 - A technology that provides your company with a distinct competitive advantage
- ◎ Hurdle Technologies are proactive and preventative tools to extend the bacteriological and/or the sensory shelf life of a food product.
- ◎ Application of hurdle technologies will minimize risk, but will not eliminate it. However, synergistic results are typically achieved when hurdles are used in combination



Hurdle Technologies: *From Farm to Fork*

- A. Good Agricultural Practices
- B. Formulation
- C. Packaging
- D. Processing
- E. Distribution/Merchandising/Home Preparation

Synergistic results are typically achieved when hurdles are used in combination



A. Good Agricultural Practices

- ◎ GAP Field Audits!
- ◎ Segregated area for sanitizing produce with low risk and high risk processing operations
- ◎ External surface blanching/pasteurization (steam or hot water) of raw materials (e.g. whole melons), if possible
- ◎ Abrasive scrubbing and/or aggressive agitation
- ◎ Extreme sanitation of cutting equipment, which can be notorious as source of cross contamination
- ◎ Chlorine, Peroxyacetic acid, ozone, UV light and/or other chemical aids in washing solution before and/or after cutting



A. Good Agricultural Practices

Fresh-Cut Dilemma

- ◎ Microbial variability on produce is significant and can vary
 - within inches in the field
 - by product
 - by degree of product maturity
 - by season, and
 - by point of origin
- ◎ Pathogens can be internalized via roots, flowers, stem scars, pores, channels, bruises, air cells, temperature differentials
- ◎ Biofilms protect pathogens against bactericidal agents

B. Formulation Hurdles

◎ Acidulants- Natural or Synthetic

◎ Antimicrobial agents

- Sodium benzoate, potassium sorbate, sodium nitrite, etc.
- Sodium lactate, nisin, liquid smoke, sodium propionate
- Salt, Natural spices, e.g. rosemary

◎ Pre-treatment of components used in process

- Irradiated spices
- Blanching of vegetables
- Chemical/preservative dips

◎ Water Activity Control

◎ Antioxidants

◎ Competitive Microorganisms