

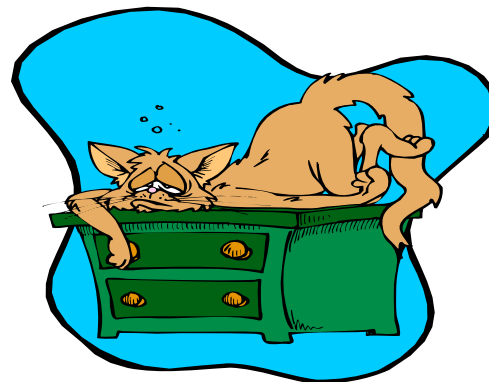


Pathogen Prevention & Intervention Strategies

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Foodborne Illness – “Past”

- Localized illnesses, common event, identifiable cause
- Rarely associated with manufactured foods
 - Little need for manufacturer interventions



Foodborne Illness – “Past”

- Controls often known
 - Proper cooking
 - Proper temperature control (hot and cold holding)
 - Avoid cross-contamination





Foodborne Illness – “Present”

- Widespread (multistate) illnesses, no common event
- Identified by PFGE analysis and epi investigation
- Have been associated with “processed” foods
 - Some are minimally processed



Foodborne Illness – “Present”

- Controls may be less clear
 - *Salmonella* from NRTE pot pies
 - Botulism from refrigerated carrot juice
 - *E. coli* O157 from produce



Foodborne illness

- “Same old same old”
 - *E. coli* O157 in undercooked ground beef
- Old pathogens, new places
 - *Salmonella* in cereal, peanut butter, raw almonds
 - *E. coli* O157:H7 in apple cider
- New foodborne pathogens
 - *E. coli* O157:H7 (1982)
 - *Cyclospora cayetanensis* (1996)
 - Viruses

No single all-encompassing solution

- Each foodborne disease agent has unique characteristics that influence its ability to cause illness.
- So many different factors influence pathogen contamination of foods.



Prevention and Intervention Strategies

- Keep pathogens out
- Kill pathogens
- Keep pathogens from growing





Keep pathogens from growing

- Does not apply to
 - Viruses
 - Parasites
 - Low-dose bacterial pathogens, e.g., O157
- Preventing growth of bacterial pathogens does reduce risk
 - *Salmonella* in eggs, cut tomatoes

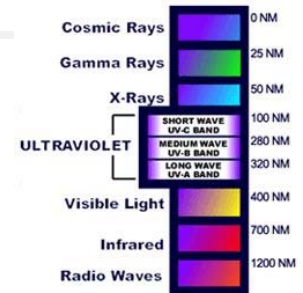


Keep pathogens from growing

- Refrigeration
 - Does not control all pathogens
 - Need to consider potential for temperature abuse
- Freezing
 - Bacteriostatic – “slacked out” foods
 - Potential to reduce risk from LM in smoked seafood
- Antimicrobial agents
 - Lactate and diacetate in luncheon meats
 - Conditions can reduce antimicrobial effectiveness

Kill pathogens

- Heat
- UV
- Irradiation
- High pressure processing
- bacteriophage





We can't always kill pathogens

- No one process works for all foods.
- No one process works for all pathogens.
- Not all foods can be heated or treated in ways to inactivate pathogens.
- Some technologies are not acceptable to consumers.

Lethal treatments - best
intervention when available



Keep pathogens out

- Most difficult
- Microorganisms have a mission to survive
 - Find new niches
 - Develop new survival mechanisms



Keep pathogens out – M&P

- Interventions at meat and poultry slaughter
 - Carcasses washes (hot water, organic acids)
 - Steam vacuum
 - Steam pasteurization
 - Chemical decontamination (e.g., acidified sodium chlorite)



Keep pathogens out – M&P

- Pre-harvest interventions for animal production
 - Investigation of animal husbandry practices (diet, feed withdrawal, feed additives)
 - Feed pasteurization
 - Competitive exclusion (defined and undefined) and probiotics
 - vaccination



Keep pathogens out – produce

- Pre-harvest interventions for animal production
- Manure control
- Minimize potential for contamination from wild animals
- Water control
- Worker controls

Keep pathogens out – processed foods

- Supplier food safety programs
- GMPs
- SSOPs
- HACCP - Validated CCPs
- Environmental monitoring programs

Consumers can be their own worst enemy

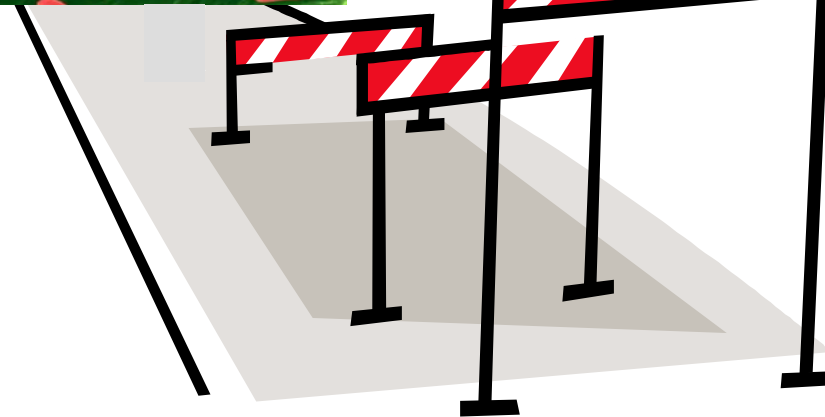
- Fresh, natural
- Lower salt
- Fewer preservatives
- Less processing
- Less cooked



General Approach

- Identify risk factors - epi
- Identify points at which control measures will have the greatest influence on food safety – risk assessment
- Determine what is practical
- Validate the interventions are effective
- Apply safety factors, redundancy

Multi-faceted approach



Example: *Salmonella* - cantaloupe

- GAPS
- Wash step
- Antimicrobial wash?
- Phage treatment?
- Heat treatment of surface?

Example: *Salmonella* – nut butters

- Separate raw processing side of operation from further processing
- Validate roasting step
- Minimize potential for entrance of *Salmonella* by control of traffic: people, equipment
- Add only ingredients that have received lethal treatment (or stringent pathogen controls)
- Establish conditions to prevent/minimize growth of *Salmonella* in case of entry
- Establish an aggressive environmental monitoring program



Reduction of foodborne illness must come from a partnership

- The solutions cannot focus on the processing industry alone.
- Producers, transporters, handlers, manufacturers, retailers, foodservice, federal, state and local regulators, public health community AND the consumer each have a role.



Reduction of foodborne illness must come from a partnership

- We need better food attribution data – what foods are involved.
- We need better determination of cause.
- We need to identify where effective interventions can be implemented.



Reduction of foodborne illness must come from a partnership

- We need research to understand the ecology and behavior of pathogens.
- We need research to know what interventions are effective.
- We need to translate the research into practical application.



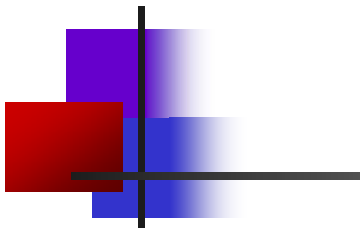
Reduction of foodborne illness must come from a partnership

- We need to apply prevention and intervention strategies at multiple points in the food chain.
- Prevention and intervention are everyone's responsibility, since we cannot ensure all foods will be risk-free.



Reduction of foodborne illness must come from a partnership

- We need to anticipate “what is next” using “clues” that are now available.
- We need to re-visit our food safety preventions/interventions
 - Assess their validity
 - Assess their robustness



Thank you!

