Achieving Continuous Improvement in Reductions in Foodborne Listeriosis: A Risk-Based Approach

Overview of Expert Panel Report

Michael Doyle
Objective: Develop a strategy to achieve continuous improvement in reducing the number of cases of foodborne listeriosis in the USA

- Not attempting to eradicate foodborne listeriosis
Approach
Organize an Expert Panel through the International Life Sciences Institute-Risk Science Institute

- Publish a report of experts' opinions based on scientific information presently available
Approach: Develop a road map

- Identify landmarks
- Identify routes to our goal
Landmarks for Reducing Incidence of Foodborne Listeriosis

1. Identify Baseline
   - 2002 FoodNet surveillance data
   - 0.27 cases of listeriosis per 100,000 US population
   - Represents culture-confirmed cases only; actual incidence of listeriosis is greater
   - Serves as a standardized data collection and reporting system to enable monitoring trends in incidence of listeriosis
Landmarks for Reducing Incidence of Foodborne Listeriosis

2. Define "At-Risk" Populations
   a. Exquisitely sensitive (highly immunocompromised)
      - Very high risk of listeriosis
      - Transplant patients and individuals on cancer therapy
   b. An increased risk (immunocompromised)
      - Higher risk of listeriosis than normal healthy population but less sensitive than exquisitely sensitive
      - Includes elderly and pregnant women
Landmarks for Reducing Incidence of Foodborne Listeriosis

2. Define "At-Risk" Populations (Cont.)
   c. Very low risk
      - Normal healthy population
   d. Unique "high risk" subpopulations
      - Pregnant Latina women (likely associated with consumption of queso blanco/fresco soft cheese)
Landmarks for Reducing Incidence of Foodborne Listeriosis

2. Define "At-Risk" Populations (Cont.)
   - Need different control strategies for different "at risk" populations
   - Need to know number of listeriosis cases in each category to assess impact of control strategies on overall incidence of listeriosis
Landmarks for Reducing Incidence of Foodborne Listeriosis

3. Define "High Risk" Foods
   - Certain foods pose a substantially greater risk of acquiring listeriosis
     - Based on outbreak and sporadic case (case-control) studies, and on risk assessment
Landmarks for Reducing Incidence of Foodborne Listeriosis

3. Define "High Risk" Foods (Cont.)
   - Characteristics of high risk foods
     a. Have potential for contamination with *L. monocytogenes*
     b. Support growth of *L. monocytogenes* (to high numbers)
     c. Are ready to eat
     d. Require refrigeration
     e. Are stored for an extended period of time
Landmarks for Reducing Incidence of Foodborne Listeriosis

3. Define "High Risk" Foods (Cont.)
   - Two critical components requiring expert opinion
     a. How long is an extended period of time?
     b. What is the cell number to which \( L. \) monocytogenes must grow for a food to be considered "high risk"?
     - Risk of listeriosis increases as the number of listeriae in a food increases
Landmarks for Reducing Incidence of Foodborne Listeriosis

4. Additional Considerations
   - Dose-response data useful for estimating the impact of reducing the numbers of \( L.\) \textit{monocytogenes} in foods
   - Example
     If the risk of illness associated with consuming \( 10^6 \) listeriae per serving is 1 in 1,000,000, then reducing the number of listeriae to \( 10^4 \) or \( 10^2 \) per serving will reduce the risk by several orders of magnitude
4. Additional Considerations (Cont.)

- Information regarding **virulence attributes of** *L. monocytogenes* strains useful for identifying higher risk foods

- Some strains are more virulent than others, but do not have sufficient knowledge to differentiate these strains based on genetic or phenotypic markers
Virulence attributes of *L. monocytogenes* strains

(Cont.)

Present information, based on outbreak and dose-response data, indicate that exceptionally virulent (low infectious dose) strains (like *E. coli* O157:H7) of *L. monocytogenes* have caused few to no identified illnesses in Category 2 (Intermediate sensitivity) or Category 3 (Normal health) "At-Risk" populations
Landmarks for Reducing Incidence of Foodborne Listeriosis

Virulence attributes of *L. monocytogenes* strains (Cont.)

- Hence, for purposes of having a major impact on reducing the incidence of foodborne listeriosis, consider outbreak-associated *L. monocytogenes* serotype 4b strain involving Hispanic-style soft cheese and pregnant woman to be "typical" virulent strain.
Control Strategies to Provide Continuous Improvement in Reduction of Foodborne Listeriosis in the USA (Routes to Our Goal)

- Major impact will involve:
  - Reducing the number of servings of "high-risk" foods
  - Prevent contamination
  - Prevent growth in "high risk" foods
  - Educating "at-risk" populations
Control Strategies

Focus on Controlling/Eliminating *L. monocytogenes* in "High-Risk" Foods to reduce the number of serving of high-risk foods

Most effective strategies include:

- **Reformulating** foods to include antimicrobials to prevent/retard growth of listeriae to high numbers

- **Post-packaging treatments** that destroy listeriae on product

  Example, hot water treatment of packaged deli meats

  Weakness-recontamination of high-risk foods in home
Controlling Strategies

Controlling *L. monocytogenes* in "High-Risk" Foods (Cont.)

Most effective strategies:

- Establishing acceptable storage times of foods that support growth of listeriae to high numbers
Control Strategies

Educate "At-Risk" Populations
Principles and Philosophy

- Human behavior is a factor in the continued incidence of listeriosis
- All food handlers and end-users need education and training to ensure product safety
- To be most effective, educational messages should be tailored to the individuals who will be expected to implement the guidance
Control Strategies

- Educate "At-Risk" Populations
  - Need to be targeted messages to different populations at risk
    - Category 1 - Exquisitely sensitive
      - No safe level of *L. monocytogenes*; individuals should be maintained on restricted low microbial diets
Control Strategies

- Need to be targeted messages to different populations at risk
  - Category 2 - At increased risk
    - Guidance on healthy eating, including avoid high-risk foods or cook them before consumption
  - Category 3 - Very low risk
    - Typical safe food handling practices
Risk-based Approach

- Focus resources on reducing levels of L. monocytogenes in high risk foods
- Target education messages to at-risk consumers
Caveats

- Report is still a work in progress
- As with most works involving scientific judgments on reduction of risks associated with public health, there are a diversity of opinions
- Do not have complete consensus on all details, but end product will represent the expert opinion of the vast majority of our committee
Expert Panel Members

- David Acheson, FDA/CFSAN
- Phillip Bird, Hunter Public Health Unit, NSW Australia
- Bob Buchanan, FDA/CFSAN
- Victor Cook, USDA/FSIS
- Catherine Donnelly, University of Vermont
- Mike Doyle, CFS, University of Georgia (Chair)
- Jeff Farber, Health Canada
- Sara Fein, FDA/CFSAN
- Alicia Fry, CDC
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- Christopher Griffith, University of Wales
- Paul Hall, Kraft Foods
- Anthony Hepton, Dole Foods (retired)
- Dr. Walt Hill, USDA/FSIS
- Val Hillers, Washington State University
- Janell Kause, USDA/FSIS
- Pat Kendall, Colorado State University
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