

# Forum on Microbial Threats

Session VII

## Threat Reduction Research and Policy Opportunities

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Foodborne Threats to Health: The Policies & Practice of  
Surveillance, Prevention; Outbreak Investigations; and  
International Coordination

National Academies, Washington, D.C.

26 OCTOBER 2005

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# Review:

## Multiple food system vulnerabilities

- Opportunities for perpetrator access
- Lack of terminal inactivation treatment
- Large volume and/or maximum mixing
- Product environment for agent growth/preservation
- Rapid distribution to consumers
- Rapid consumption by consumers
- Disproportionate consumption by “high risk populations”

# Review:

## Intentional vs. natural/accidental food contamination

- Concentration of agents
- Types of agents
- Choice of food systems/targets
- Scale/number of foods/targets
- Response to outbreaks

# Review:

## “Terrorists” come in various forms

- *"Mother Nature"*
- *"Human Nature"*
  
- Disgruntled employees
- Violent activist groups
- Criminals/subversives
- International/government supported or directed groups or individuals

# Focus on Threats Reduction Research in Food Protection and Defense but Recognize Collateral Benefits

Following materials drawn from:  
Research Needs Summit  
and

National Center for Food Protection and  
Defense Programs

# Food Defense Research Summit

- Goal: identify research needs
- Selected participation
  - Industry
  - Government
  - Academia
- Format
  - Speakers and discussants “set stage”
  - Iterative discussion group work with group reports to address specific questions

# Identify research needs

- How do we determine what has happened and what agent is involved in the event of a terrorist attack on the food supply?
- What is the appropriate course of action to protect public health and food workers?
- What is the optimum approach for managing recovery from the event?

# Major Research Areas I

- How do we determine what has happened and what agent is involved in the event of a terrorist attack on the food supply?
  - Sampling and detection of contaminants
  - Traceability of food products

# Major Research Areas II

- What is the appropriate course of action to protect public health and food workers?
  - Decontamination of contaminated products, people and places
  - Disposal of contaminated products

# Major Research Areas III

- What is the optimum approach for managing recovery from the event?
  - Risk communication
  - Economic impact

# Food safety and defense

- General Challenges
  - Global food supply
  - Supply chain vulnerabilities
- Food Production Challenges
  - Access
  - Batch size
  - Uniform mixing
- Special Challenge
  - Terrorist mindset

# Potential Impact

- *Economic disruption*: Target agriculture with animal or crop diseases (e.g., FMD virus in livestock)
- *Mass human casualties*: Target food processing or transportation with Class A agents (e.g., botulinum toxin in tanker truck)
- *Mass anxiety*: Target popular restaurants, food products with “credible” hoax
- *Panic*

# Requirements for detection methods

- Rapid
- Robust
- Field tested
- Portable
- Reliable
  - Specific and sensitive
- Quantitative
- Universal
  - Food product type and form

# Impact of False Positives

- Detection can be too good...
- Toxicants may naturally occur in foods
- Cost of false positives
- Consumer response

# Food Matrix Influence on Agent Detection

- Can agent be measured in or extracted
- Is agent (and detection) affected by
  - Viscosity
  - Homogeneity
  - Conductivity
  - pH

# Chemical Agent Detection

- What are likely agents?
  - Can we develop tests for them all?
- Toxicological tests are limited
- Factors driving analytical development
  - Chemical class
  - Molecular weight
  - Solubility

# Biological Agent Detection

- Novel detection methods
  - Oligonucleotide tiling arrays
  - Optical mapping
  - Pyrosequencing
- Sampling methods
  - Microbial vacuum
  - Nanofiber membranes with antibodies
  - Surface scanning biosensor

# Sampling, Sample Preparation, and Detection of Contaminants

- Optimize extraction
- Streamline sample prep
- Validate methods
- Understand impact of air and water
- Find low agent concentrations in large volumes

# Decontamination

- EPA disinfectant registration  $\neq$  actual event
- EPA restrictions on disinfectant use
- FSIS draft guidance on disposal and decontamination
- Adequate disposal facilities?

# Decontamination of Contaminated Products, People and Places

- What are baseline levels in facilities and foods?
- What is the “safe” level?
- What do consumers do with product?

# Managing the Communication Process

- Who provides information? The media!
- Risk perceptions include
  - Catastrophic potential
  - Unfamiliarity
  - Lack control
  - Lack trust
- Need to:
  - Use clear language
  - Stick to 3 key messages

# Risk Communication

- Roles and responsibilities for all stakeholders
- What are best messages for each stage of an event
- Protect proprietary information
- Evaluate available tabletop exercises

# Traceability of Food Products

- RFID limited use
- Product identity
- Product integrity (tampering)
- Prevent substitution  
(organized theft)
- Interoperability of systems
- Incentives for implementation?

# Economics

- What is willingness to accept unique costs?
- Role of non-traditional investors, like state and local governments
- What is consumer willingness to pay?
- Comparison of economics of alternative decontamination strategies

# What do we already know?

- Need a multidimensional database
  - Which agents
  - Which foods
  - Which conditions
  - Which detection methods
  - Which decontamination methods



# Homeland Security Established Integrated Network of Centers

- Center for Risk & Economic Analysis of Terrorism Events (USC) [CREATE]
- *National Center for Food Protection and Defense (UMN) [NCFPD]*
- *National Center for Foreign Animal & Zoonotic Disease Defense (Texas A&M) [NCFAZDD]*
- National Center for the Study of Terrorism and Responses to Terrorism (UMD) [START]
- *Coming:* Preparedness and Response to Catastrophic Events

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# National Center for Food Protection and Defense

*A Department of Homeland Security  
Center of Excellence*

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# NCFPD Vision

**Defending the safety  
of the  
food system  
through research and education**

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# Goal

Reduce the potential for catastrophic food system events by:

- Rendering targets unattractive
- Rapidly and accurately detecting attacks
- Responding effectively to minimize consequences
- Rapid delivery of effective recovery efforts
- Training new scientists and professionals

# Leveraging

- Communication, cooperation & collaboration from Academia/Industry/Agencies/Associations
- Covers the whole food system
- Focused on catastrophic threats but recognizing opportunities for multiple uses of findings
- Strong private sector & academic partners
- Extensive use of outstanding investigators
- Builds professional capacity

# Broad Academic Collaboration

UNIVERSITY OF MINNESOTA



IOWA STATE UNIVERSITY



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# Diverse Industry and Association Collaboration



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# Collaborating Across Agencies



**U.S. Food and Drug Administration**

CENTER FOR FOOD SAFETY AND APPLIED NUTRITION  
OFFICE OF REGULATORY AFFAIRS



Department of Health and Human Services

Centers for Disease Control and Prevention



United States Department of Agriculture



**Agricultural Research Service**

*the in-house research arm of the U.S. Department of Agriculture*



Cooperative State  
Research, Education, and Extension Service



United States Department of Agriculture  
Food Safety and Inspection Service

[aphis.usda.gov](http://aphis.usda.gov)

**ERS** ECONOMIC RESEARCH SERVICE  
United States Department of Agriculture

*The Economics of Food, Farming, Natural Resources, and Rural America*



Sandia  
National  
Laboratories



**ARGONNE**  
NATIONAL LABORATORY



State/Local Agencies

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# NCFPD Primary Themes

## *System Focus*

- Supply Chain Resiliency
- Public Health Response
- Economic Models For Evaluating Interventions

- Rapid detection
- Decontamination
- Inactivation
- Disposal

## *Agent Focus*

## *Training Focus*

- Disseminating NCFPD products
- Training scholars and professionals
- Risk communication

# Summary

- Strategies for hardening the supply chain
- Improved outbreak surveillance/investigation approaches for rapid event id. and traceback
- Realistic models to guide investments & intervention strategy selection for cost effective preparedness, response and recovery
- Detection technologies to rapidly identify contamination to accelerate containment, recall, response and recovery

# Summary

- Inactivation approaches to enable facility recovery now, with preferred options for the future
- Food handling & processing approaches to reduce the probability of harm
- Risk communication tools, standards and training to maximize appropriate actions while minimizing fear
- Educational programs to train the next generation of food system professionals

# Summary

- Integrative, trans-disciplinary effort spanning the food chain from field to fork
- Strategic partnerships with all key food system stakeholder groups:
  - Significantly leveraging opportunities
  - Connected to the users to ensure relevance
  - Technology transfer options and multi-use opportunities identified upfront
- Focused on realistic vulnerabilities and real world solutions; new technologies, tools and approaches

# National Center for Food Protection and Defense

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