Food Safety vs. Food Defense: Differences and Similarities

Protecting the Middle East Food Supply from Intentional Contamination
MEPI
January 29-31, 2008
Cairo, Egypt

Dr. Carol Maczka, Ph.D.
Assistant Administrator
Office of Food Defense and Emergency Response
Food Safety and Inspection Service
United States Department of Agriculture (USDA)
Presentation Outline

- Who we are; our mission
- What is food defense?
- Why are we concerned about the food supply?
- Examples of unintentional contamination and intentional contamination
- Differences between food safety and food defense:
  - Outcomes
  - Contaminants/Agenets
  - Methods of Analysis
  - Prevention & Control Strategies
  - Decontamination and Disposal
  - Communications
Who we are; Our mission

• **U.S. Food Safety and Inspection Service (FSIS)**
  - Public health agency in U.S. Department of Agriculture
  - Mission: responsible for ensuring that U.S. supply of meat, poultry, egg products is safe—including safe from intentional contamination--wholesome, correctly labeled and packaged

• **U.S. Food and Drug Administration (FDA)**
  - Scientific regulatory agency in U.S. Department of Health and Human Services
  - Mission: responsible for ensuring that nation’s drugs, medical devices, cosmetics, and food are safe—including safe from intentional contamination

• **U.S. Environmental Protection Agency (EPA)**
  - Scientific regulatory agency
  - Mission: responsible for implementation of federal laws that protect the environment. Also responsible for water infrastructure protection, including protecting U.S. water supply from intention contamination
Food Defense vs. Food Safety

- **Food Safety** – the protection of food products from *unintentional contamination* by agents reasonably likely to occur in the food supply (e.g., *E. coli*, *Salmonella*, *Listeria*)
- **Food Defense** – the protection of food products from *intentional contamination* by biological, chemical, physical, or radiological agents that are *not* reasonably likely to occur in the food supply

- **Note:** *Food Security* is the reliable availability of a *sufficient quantity* and quality of nutritious food for a population
Why Are We Concerned about the Food Supply?

- Food supply is soft target
- Intelligence: terrorists have discussed food
  - Documents found in Afghanistan caves used by al Qaeda specify how to contaminate food
  - Manuals for intentional contamination of food are widely available on internet
- No specific targeting information indicating attack on food supply is imminent
- Deliberate contamination could cause:
  - significant public health consequences;
  - widespread public fear;
  - devastating economic impacts;
  - loss of public confidence in the safety of food and effectiveness of government
Examples of Unintentional Contamination vs. Intentional Contamination
Unintentional Contamination

- March/April 1985 – >16,000 confirmed illnesses and up to 17 deaths in six state area from pasteurized milk contaminated with *Salmonella typhimurium*
- Milk was produced at a single dairy plant in Midwest
- Contamination due to improper piping
Unintentional Contamination

• September 1994 – 150 people ill from ice cream contaminated with *Salmonella enteritidis*
• Ice cream was produced in a single facility
• Contamination due to transport of ice cream mix in tanker truck previously used to haul unpasteurized liquid eggs
Unintentional Contamination – Water Contamination in Hurricane Katrina’s Aftermath

- Water contaminated with chemicals: gasoline in gas tanks, oil in crank cases, lead in batteries, asbestos in brake pads, brake and transmission fluids, coolant
- Water contaminated with biological contaminates - flood water contains potentially harmful microbes: animal feces from pets, livestock, and wild animals; natural bacteria in the environment; human waste; and dead bodies of both humans and animals
Intentional Contamination

• 1984 – Cult members added *Salmonella* bacteria to restaurant salad bars in Oregon

• Intent: affect outcome of a local election

• Result:
  ➢ 751 illnesses reported
  ➢ 45 individuals required hospitalization
Intentional Contamination

- January 2003 – Michigan supermarket employee intentionally contaminated 200 pounds of ground beef with a nicotine-based pesticide
- 92 individuals reported becoming ill after consuming the ground beef
Intentional Contamination

- The **THREAT** of intentional contamination could pose serious problems for public health and the international economy.

- Example – 1989 threat of cyanide in Chilean grapes imported into the U.S.; incident cost $200 million in lost revenue.
Outcomes

• *Food Safety*: May involve many illnesses but few deaths

• *Food Defense*: Has potential to result in many deaths.
## Contaminants/Agents

<table>
<thead>
<tr>
<th>Contaminant Type</th>
<th>Unintentional</th>
<th>Intentional</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biological</strong></td>
<td><em>Escherichia coli</em>, <em>Salmonella</em>, <em>Listeria</em></td>
<td><strong>Heat Resistant: Bacillus anthracis (Anthrax), Clostridium botulinum</strong></td>
</tr>
<tr>
<td></td>
<td><em>montcytongenes</em></td>
<td>*<em>Heat Sensitive: Yersina pestis (Plague), Vibrio cholerae (Cholera)</em></td>
</tr>
<tr>
<td><strong>Chemical</strong></td>
<td>Pesticide residues</td>
<td><strong>Heat Resistant: Arsenic, Rat Poison</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Heat Sensitive: Ricin</strong></td>
</tr>
<tr>
<td><strong>Physical Hazards</strong></td>
<td>Metal, bone, rodent droppings</td>
<td></td>
</tr>
<tr>
<td><strong>Radiological</strong></td>
<td></td>
<td><strong>Plutonium-238, cesium-137</strong></td>
</tr>
</tbody>
</table>
Methods of Analysis

- **Food Safety**: Risk Assessments: An assessment is made of the magnitude and severity of the adverse health outcome due to the hazard and the likelihood it will occur.

- **Food Defense**: Vulnerability Assessments: An assessment is made of a food system to identify vulnerable products; potential sites where contamination can be introduced; and likely threat agents.
Vulnerability Assessments Methodology

1. Perform screening assessment to identify and prioritize products, agents, and/or process combinations that warrant more detailed analysis

2. Perform Farm-to-Table CARVER + Shock Vulnerability Assessments on priority foods
   - Methodology developed by U.S. FDA and FSIS for assessing vulnerabilities in food systems from intentional attacks
   - Examines health, economic, and psychological consequences of an intentional attack
   - Simplifies and standardizes assessment
CARVER + Shock Method – Overview

• Develop flow diagram for each product/process — “Farm to Table”
  ➢ Break food system into Subsystems, Complexes, Components, and Nodes

• Example: Ground Beef Production System
  ➢ **Subsystems** – Live Animal Production; Product Processing; Product Distribution, Transportation
  ➢ **Complexes** for Product Processing Subsystem – Slaughterhouse, Processing Facility
  ➢ **Components** for Processing Facility – Receiving Area, Storage Area, Cutting/Trimming Area, Grinding Area, Packaging Area
  ➢ **Node** for Grinding Area – combo bin
CARVER + Shock Method – Overview cont.

- Assess each step or “node” of flow diagram; assign a numerical score
- Total the scores for each node and compare
- Rank order nodes to determine which are most vulnerable
  - Nodes with high scores are most vulnerable (most likely targets for terrorist attack)
CARVER + Shock

• Acronym; considers seven factors (“attributes”) that affect the desirability of a target for attack:
  ➢ **Criticality** – Public health and economic impacts to achieve the attacker’s intent
  ➢ **Accessibility** – Physical access to the target
  ➢ **Recuperability** – Ability of the system to recover from the attack
  ➢ **Vulnerability** – Ease of accomplishing the attack
  ➢ **Effect** – Amount of direct loss from an attack
  ➢ **Recognizability** – Ease of identifying a target
  ➢ **Shock** – Psychological effects of an attack

• Each factor has a measurable scale from 1 to 10 based on certain criteria
  • Will be covered in detail tomorrow
Prevention and Control Strategies

- **Food Safety**: Risk management strategies such as Good Agricultural Practices (GAP); Good Management Practices (GMP); good hygiene practices (GHP)/ Sanitation Standard Operating Procedures (SSOP); and Hazard Analysis and Critical Control Point (HACCP)

- **Food Defense**: Measures or actions (i.e., countermeasures) taken to reduce the impact of intentional food contamination at vulnerable points in a facility (e.g., personnel and physical security), as well as government or industry-wide measures (e.g., surveillance, outreach training)
Industry/Facility Countermeasures

Include:

- Physical Security
- Personnel Security
- Operational Security
- Equipment re-design
- Change process technology to destroy threat agents
- Assess facility-specific or industry-wide vulnerabilities: CARVER + Shock Vulnerability Assessment
- Develop food defense plans based on results of assessments
Government Countermeasures

Include:

• Surveillance
  e.g., Government inspection of critical “nodes” in facilities, laboratory testing for threat agents in food

• Vulnerability assessments

• Research

• Outreach & training, including
  e.g., Guidance, awareness training, food defense exercises, international activities
Decontamination and Disposal

- **Food Safety**: Contaminated food can be cooked or sent to landfill. Sanitation procedures should be sufficient for cleaning facility before resuming food production.

- **Food Defense**: Contaminated food may be hazardous waste. Need to identify decontamination techniques and confirm facility is free of residual contaminant before resuming food production.
Communications

• **Food Safety**: Food safety education needed for general public and good risk communication strategies needed by industry and government.

• **Food Defense**: Much public concern, therefore extra consideration is needed when developing risk communication and public education messages
Summary
Differences between Food Safety and Food Defense

- Unintentional vs. intentional contamination
- Outcomes
- Contaminants
- Methods of analysis
- Prevention and control strategies
- Decontamination and Disposal
- Communications
Contact Information:

Carol Maczka, Ph.D.
Office of Food Defense & Emergency Response
Food Safety Inspection Service
01-202 690-6540
carol.maczka@fsis.usda.gov

www.fsis.usda.gov