



# **Food Safety vs. Food Defense: Differences and Similarities**

**Protecting the Middle East Food Supply  
from Intentional Contamination**

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## 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/Agents**
  - **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**



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## 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 contaminants - 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

Contaminant Type	Unintentional	Intentional
Biological	<i>Escherichia coli</i> , <i>Salmonella</i> , <i>Listeria</i> <i>montcyltongenes</i>	<u>Heat Resistant:</u> <i>Bacillus anthracis</i> (Anthrax), <i>Clostridium botulinum</i>  <u>Heat Sensitive:</u> <i>Yersina pestis</i> (Plague), <i>Vibrio cholerae</i> (Cholera)
Chemical	Pesticide residues	<u>Heat Resistant:</u> Arsenic, Rat Poison  <u>Heat Sensitive:</u> Ricin
Physical Hazards	Metal, bone, rodent droppings	
Radiological		Plutonium-238, cesium-137





## 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



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