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Chemicals and
Physical
Hazards



Foodborne Disease Caused by Chemicals

Naturally Occurring:

- Allergens
- Ciguatoxin
- Mycotoxin
- Scombrototoxin
- Shellfish toxins
- Plant toxins

Man-made Chemicals:

- Cleaning solutions
- Food additives
- Pesticides
- Heavy metals
- Machine lubricants
- Kitchenware and equipment
- Hand solution and hairspray

Man-Made Chemicals

Man-made chemicals can be:

- Intentionally added
 - Food additives
 - Preservatives.
- Non-intentionally added
 - Cleaners
 - Sanitizers
 - Heavy metals.



Non-intentionally added chemical

Chemical Hazards



Prevention

- Use chemicals approved for the intended use in food service operations
- Maintenance of the installations
- Protect food and food contact surfaces
- Purchase chemicals from approved sources
- Store chemicals away from food, preparation areas, food storage areas, food contact surfaces by spacing and partitioning
- Never store chemicals above food or food contact surfaces

Prevention

- Only handle food with equipment and utensils approved for food service use
- Keep Safety Data Sheet (SDS) current and accessible
- Follow manufacturer instructions, and local and regulatory requirement when throwing chemicals or containers out

Food Allergens*



Label products correctly.

90% of all allergies are caused by:

- Milk products
- Egg products
- Wheat proteins
- Peanuts
- Soy products
- Tree nuts
- Fish
- Shellfish.

* More details in Food Allergen presentation

Biological toxin: Ciguatera



Red snapper

- Ciguateras are commonly found in marine finfish such as:
 - Snapper
 - Grouper
 - Barracuda
 - Jack
 - Mackerel
 - Reef fish.
- Occur in certain fish that eat smaller fish that have consumed the toxin

Biological toxins: Scombrototoxin

- Scombrototoxin is caused by eating food that contain high levels of histamine.
- Histamine is produced by certain bacteria when they decompose food containing the protein histidine.

Prevention: Do not to submit fish to temperature abuse

- Scombrototoxin creates a peppery taste when infected fish are eaten.

Shellfish Toxins

Shellfish toxins are commonly found in:

- Mussels
- Clams
- Oysters
- Scallops.



Shellfish

Mycotoxins

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Mycotoxins are commonly found in:

- Milk
- Moldy grains
- Corn and corn products
- Peanuts
- Pecans
- Walnuts.



Nuts

Prevention

- Store in dry places
- Buy only to approve supplier
- Rotate - FIFO

Mushrooms

- Toxic wild mushrooms
 - There are numerous varieties of wild mushrooms hence eat only from approved commercial sources.

Prevention: Do not consume food or medicinal contaminated with these alkaloids

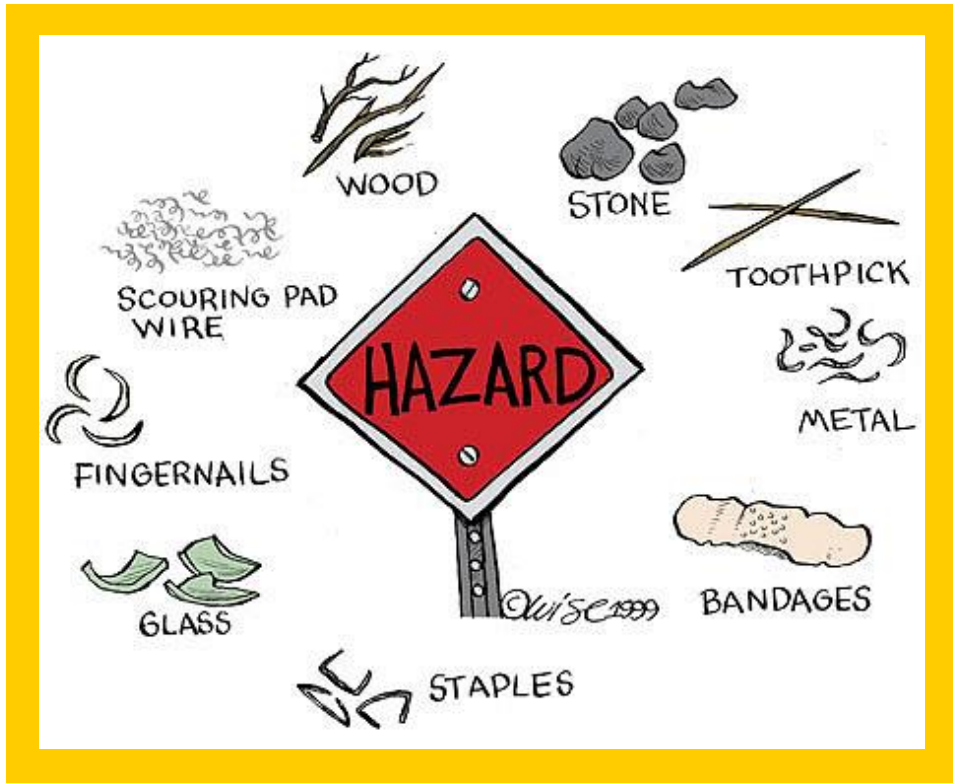
Plant toxins

- Pyrrolizidine alkaloids (PA's) - Present in certain plants. Can contaminate flour milk, honey and other.
- Phytohaemmagglutinin – Raw red kidney beans. Undercooked can be more poisonous

Physical Hazards

Physical hazards are objects in food that can cause injury or illness such as:

- Toothpicks
- Stones
- Human hair
- Jewelry.



Physical hazards can create injury.

INTENTIONAL CONTAMINATION

BIOLOGICAL, CHEMICAL, PHYSICAL AND
RADIOLOGICAL HAZARDS

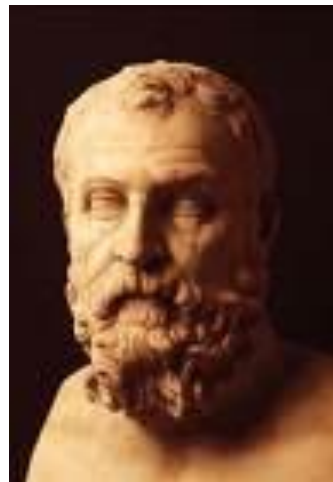
Groups who may attempt to contaminate food:

- Terrorists or activists
 - Disgruntled current or former staff
 - Vendors
 - Competitors
-
- May tamper food
 - Attack anywhere in the food chain
 - Specific food item, process, business

Intentional Adulteration



Intentional adulteration



- 6 AC
- Asirianos
 - Water ponds contaminated with parasites
- Solón - Athens
 - Poison water with crossbow grass or fetid hellebore (eleboro)

Intentional Contamination



- 1860-1865
- Soldiers thru dead animals in water

Intentional Contamination



- 1970- Student association *Weathermen*, part of a *Revolutionary Youth Movement* try to obtain biological agents to contaminate potable water in protest against Vietnam war

Intentional incidents

- 1984: Oregon State Salad bar were contaminated with *Salmonella*.
- Intention: Politics
- **751 sick, 45 hospitalized.**



Incidents intentional

- 1996: Donuts contaminated with *Shigella dysenteriae* Type 2.
- Cause: **Unhappy Ex-employee** .
- **12 sick employees, 4 hospitalized**

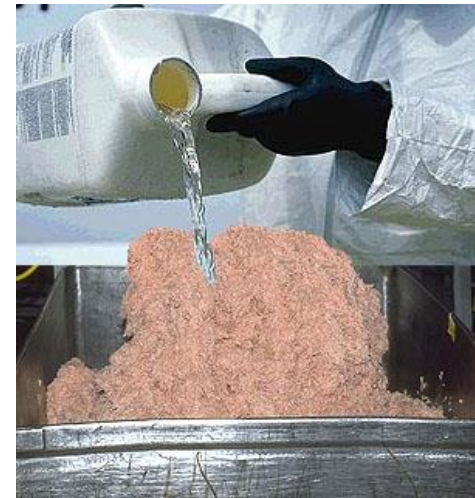
Intentional Incident

- Italy - 2003
- Bottled water injected with bleach or acetone
- 30 illnesses reported
- Copycats in 20 different cities
- Eco-terrorism?



Intentional incidents

- 2003: Michigan Supermarket
200 pounds of ground meat
contaminated with nicotine.
- Cause: Unhappy employee
- 92 sick



Similarities between food safety and food defense

- Prevention from farm to table
- Risk based decisions
- Concerns on both domestic and imported food
- Same agencies involved

Differences

- Unusual contamination
- Familiar agent in unusual food
- Thing outside the package
- Exterior of the establishment vs. interior

Your responsibility

- Employee awareness.
- Reduce vulnerabilities.
- Minimize opportunities of contaminants.
- Enhance communication and surveillance among employees.
 - See something, say something

What have agencies done?

Tools available to prepare a plan and reduce vulnerability

- Agencies and Universities
 - Guidance Documents
 - Self Assessment Checklists
 - Vulnerability Assessments
 - Sample Plans
 - Training Materials
 - Mitigation Strategies
 - Recovery and Response Exercises

Broad Mitigation Strategies

Outside Security

- Property Perimeter
- Building Perimeter
- Vehicles

General Inside Security

- Facility/Plant
- Utilities
- Laboratory
- Process Computer Systems

Broad Mitigation Strategies

Logistics and Storage Security

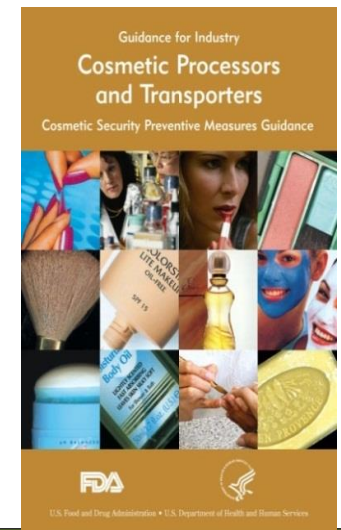
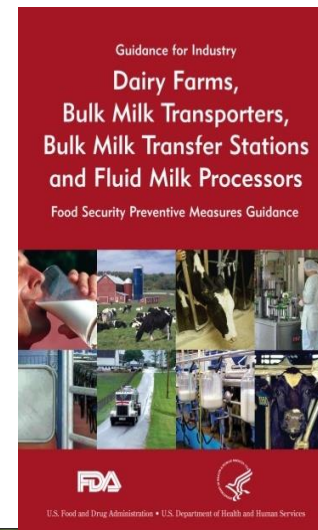
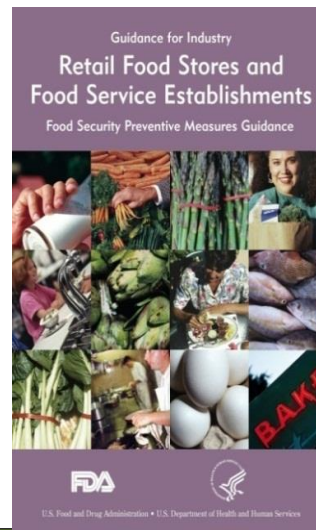
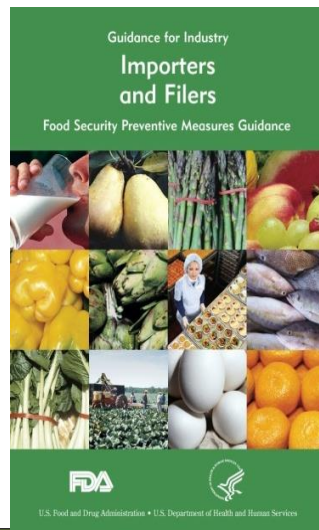
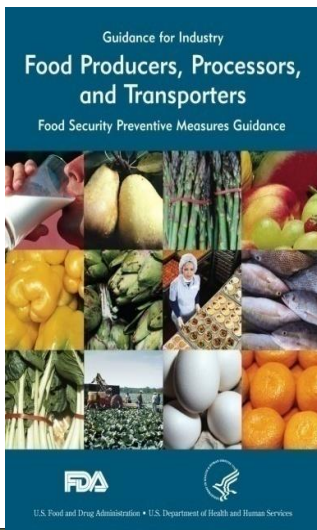
- Suppliers and Vendors
- Incoming/Outgoing Shipments
- Returned Products/Goods
- Storage/Warehouse
- Hazardous Materials/Chemicals

Management

- Personnel Security
- Food Defense Plan

FDA Food Defense Guidance

1. Food producers, processors and transporters
2. Importers and filers
3. Retail food stores and food service establishments
4. Dairy farms, transporters, processors
5. Cosmetic processors and transporters



ALERT

- Targeted to regulators and supervisors
- Identifies 5 key food defense points:
 - **A**ssure
 - **L**ook
 - **E**mployees
 - **R**eport
 - **T**hreat

In today's world it is important to be ALERT to protect your business.

A How do you **ASSURE** that the supplies and ingredients you use are from safe and secure sources?

L How do you **LOOK** after the security of the products and ingredients in your facility?

E What do you know about your **EMPLOYEES** and people coming in and out of your facility?

R Could you provide **REPORTS** about the security of your products while under your control?

T What do you do and who do you notify if you have a **THREAT** or issue at your facility, including suspicious behavior?

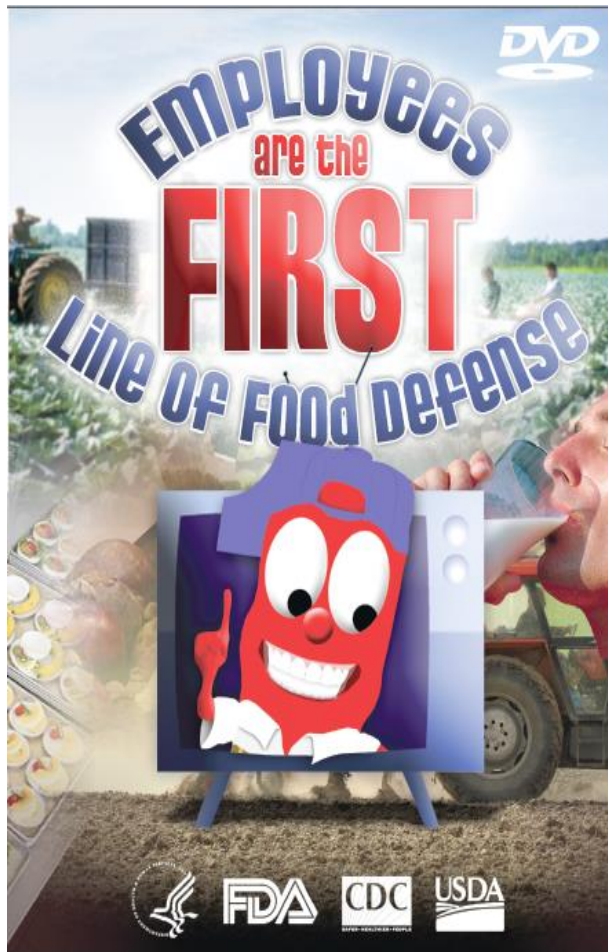
ALERT FOOD DEFENSE
AWARENESS

Deliberate Contamination of Food

- A**ssure Make sure products received are from safe sources.
Request delivery vehicles are locked
- L**ook Monitor the security of products in the facility
Limit access to preparation and storage area
Train staff and store chemical in secure location
- E**mployees Know who is in your facility. Identify all visitors
- R**eports Keep information related to food defense
accessible. Receiving log, Staff files,
- T**hreat Develop a plan for responding to suspicious activity
or a threat to the operation
Hold any product suspect of contamination
Maintain emergency contact list

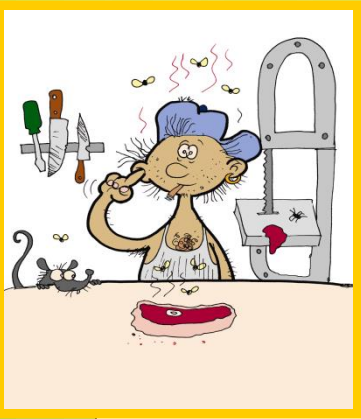


Employees FIRST



- Employee training program designed to educate front line workers
- **FIRST** line of defense in preventing intentional contamination of the food supply

Concepts to Keep



- Foodborne illnesses are classified as infections, intoxications, or toxin-mediated infections.
- The three types of food hazards are biological, chemical, and physical.
- The six conditions required for bacterial growth are:
 - Food
 - Acidity
 - Temperature
 - Time
 - Oxygen
 - Moisture.

More Concepts to Keep



- The best way to control foodborne illness in retail food establishments are to:
 - Keep foods below 41°F (5°C) or above 135°F (57°C)
 - Prevent contamination and cross contamination of foods
 - Practice good personal hygiene
 - Purchase ingredients from approved sources
 - Store foods properly.

“ Concepts to remember”

- Some bacteria can survive in the Temperature Danger Zone.
- Biological hazards can be prevented when proper procedures are followed:
 - Proper Time and Temperature Controls
 - Proper Personal Hygiene and Handwashing
 - Proper Cleaning and Sanitizing
 - Avoiding Cross Contamination
 - Purchasing from Reputable Suppliers.