Food Protection & Defense
Heartland Security Conference & Exhibition

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Food Protection & Defense

- Safety of the food supply is of critical importance
- The food industry as a target
- How can we learn from the past
- How can we better prepare for the future
Headlines On Recent Outbreaks

Supplier Expands Beef Recall Over Concerns of E. Coli Contamination
ASSOCIATED PRESS: NY Times, June 10, 2007

Pet Food Recall Expanded to New Wet Food Brand
FoxNews: SUNDAY, APRIL 01, 2007

Toxic carrot juice paralyzes 2 in Toronto
CBC News October 9, 2006

Another norovirus outbreak docks ship
World’s largest cruise ship held in port to undergo intensive cleaning
MSNBC: Associated Press Dec 11, 2006

China shuts 180 food factories for using illegal chemicals
Associated Press, June 27, 2007

Salmonella Cases in Peanut Butter Top 600
CNN.com

Investigators trace spinach E. coli to cattle ranch in California
Food Safety versus Food Defense

**Food Safety**
- Unintentional
- Routine
- Real
  - 76 million foodborne illnesses
  - 325,000 hospitalizations
  - 5,000 deaths

**Food Defense**
- Intentional
- Criminal
- Sporadic
- Plausible
- Unknown
What is Food Terrorism?

An act or threat of deliberate contamination of food for human consumption with chemical, biological, or radionuclear agents for the purpose of causing injury or death to civilian populations and/or disrupting social, economic or political stability.

(World Health Organization, 2002)
Who are we concerned about?

- Disgruntled employees
- Violent activist groups
- Criminals / subversives
- International / government supported or directed groups or individuals
Why are we concerned about food terrorism?

- No specific targeting information indicating attack on food supply is imminent
- Intelligence indicates that terrorists have discussed components of food sector
- Manuals for intentional contamination of food are widely available

The Poisoner’s Handbook, found in Kabul

Encyclopedia of Jihad

The Poisoner’s Cookbook

Silent Death

Slide credit: IFT
Why are we concerned about food terrorism?

- Potential for significant economic and psychological damage
  - Food sector = $1.24 trillion/year
Why are we concerned about food terrorism?

- Potential for significant economic and psychological damage
  - Food sector = $1.24 trillion/year

- Efficient food distribution = potential for mass casualties
Supply Chain Complexity

Slide credit: Shaun P. Kennedy, NCFPD
Why are we concerned about food terrorism?

- Potential for significant economic and psychological damage
  - Food sector = $1.24 trillion/year

- Efficient food distribution = potential for mass casualties

- Food chain complexity makes it hard to protect
  - 2,128,000 farms
  - 29,000 food manufacturing sites
  - 224,300 retail food stores
  - 565,000 food service outlets

Slide credit: IFT
Percent of US residents expecting a serious terrorist act in the next 4 years

Percent of anti-terrorism spending US residents believe should be allocated

Minnesota heritage linked to Food Industry

Pillsbury A. Mill, Arch Bridge and Mississippi River, Minneapolis, Minn.

Minnesota Historical Society
Heartland Food Safety & Technology Companies – Today

ConAgra Foods
Pearson’s
Buck di BEppo
Hormel
Old Dutch
Cargill
ECOLAB
Land O’ Lakes
General Mills
Applebee’s
3M Worldwide
Supervalu
Target
Famous Daves
DQ
Kraft
Food Research In the Heartland
About Ecolab

- Leading global provider of cleaning, sanitizing, food safety and infection prevention products and service
- 23,000 associates
- Global reach – 160 countries
- $5 billion sales in 2006
Solutions and Services that Deliver Cleaner, Safer, Healthier

Foodservice/Hospitality

Food & Beverage Processing

Healthcare/Infection Control
Global Customer Relationships
400,000+ Customers
What can we learn from past incidents?
Unintentional Foodborne Outbreaks provide insight to

- Vulnerable foods
- Vulnerable points in their production
- Potential magnitude of public health impact
Unintentional Foodborne Outbreaks

- **Norwalk like virus in bakery items with frosting, 1982**
  - 3,000 people ill

- **Pesticide (endrin) poisoning of contaminated flour, 1960s**
  - 800 ill in the Middle East

- **Salmonella Enteritidis in ice cream**
  - Single facility, 1994
  - Estimated 224,000 affected
  - 30% required hospitalization
Consequence Management System

Medical Attention
What can we learn from intentional attacks on our food supply?
Intentional attacks

1984: Oregon – Rajneesh cult
- *Salmonella* placed in multiple salads bars at restaurants, attempt to sway results of a local election
- 751 ill, 45 hospitalized

Oct. 1996: *Shigella dysenteriae* Type 2
- Lab employee used microbes grown in-house to contaminate pastries served to 45 co-workers
- 12 ill, 4 hospitalizations
Threat as a Weapon

1989: Chile – terrorist group

- Phone call to the U.S. Embassy in Santiago claiming to have contaminated Chilean grapes with cyanide
- FDA found 3 suspicious grapes in Philadelphia
- Ruined the crop and Chilean fruit sales for an entire season, at a cost of $200+ million
- Consumer confidence slow to return
- Lasting harm to image of imports
Intentional attacks – Counterfeiters and Diethylene Glycol - DEG

- 1990 – Bangladesh - 300+ children died from DEG contaminated cough syrup
- 1996 – Haiti - 85 children died from DEG contaminated cough syrup
- Oct. 2006 – Panama - over 100 deaths from DEG in sugarless liquid expectorant
Diethylene glycol sold as glycerin.....

A Poison’s Path
How a toxic industrial solvent from China made its way into medication in Panama, killing at least 100 people.

In a small factory in China, a syrup containing diethylene glycol, a toxic industrial solvent and prime ingredient in some antifreeze, was sold as glycerin, a more expensive syrup used in food and drugs.

The Taixing Glycerine Factory’s facility.
A Poison’s Path

How a toxic industrial solvent from China made its way into medication in Panama, killing at least 100 people.

It was sold to a Beijing broker, CNSC Fortune Way Company, which shipped it out of a port near Shanghai.
Counterfeit glycerin arrives in Barcelona…..

A Poison’s Path

How a toxic industrial solvent from China made its way into medication in Panama, killing at least 100 people.

The counterfeit glycerin arrived via container ship in Barcelona, where Rasfer International, another broker, took it over.
Brokers certificates claim 99.5% glycerin.....

A Poison’s Path
How a toxic industrial solvent from China made its way into medication in Panama, killing at least 100 people.

The Papertrail
The certificates falsely stated that the toxic supply was 99.5 percent pure glycerin. Each new broker put its own name on the certificate, obscuring the provenance of the syrup.
46 barrels arrive in Panama.....

A Poison’s Path

How a toxic industrial solvent from China made its way into medication in Panama, killing at least 100 people.

Medicom, a broker in Colón, received 46 barrels of the poisoned syrup.
Government packs it into 260,000 bottles…..

A Poison’s Path

How a toxic industrial solvent from China made its way into medication in Panama, killing at least 100 people.

The syrup was trucked to Panama City, where government officials used it in 260,000 bottles of medicine. At least 100 people were killed by the medicine.

Hundreds of unopened bottles of toxic medicine still remain in boxes at a Panama hospital.

The New York Times
Intentional attacks – Counterfeiters and Diethylene Glycol - DEG

- 1990 – Bangladesh - 300+ children died from DEG contaminated cough syrup
- 1996 – Haiti - 85 children died from DEG contaminated cough syrup
- Oct. 2006 – Panama - over 100 deaths from DEG in sugarless liquid expectorant
- June 2007 – phony Colgate toothpaste imported from China contains DEG

“death sentence to former pharmaceuticals control officer in China…”
Even ineffective attacks cause significant economic and psychological damage ...

- Anthrax in the mail – 2001
  - 22 cases, 5 deaths
  - 2 million people unnecessarily on Cipro
  - Cost $1 billion
  - Congress gave USPS $1 billion for initial interventions
  - USPS direct costs
    - >$3 billion
How can we better prepare for the future?
This research was supported by the U.S. Department of Homeland Security through the National Center for Food Protection and Defense, grant number N-00014-04-1-0659. However, any opinions, findings, and conclusions or recommendations in this document are those of the authors and do not necessarily reflect the views of the U.S. Department of Homeland Security.
Resistance to Biocides

- Prions
- Bacterial spores
- Protozoa cyst/oocyst
- Non-enveloped viruses
- Mycobacterium
- Fungi (vegetative)
- Vegetative bacteria
- Enveloped viruses

- B. anthracis
- Y. pestis
## Biocide Efficacy

<table>
<thead>
<tr>
<th>Organism type</th>
<th>Example indicator organisms</th>
<th>Product Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial spores</td>
<td><em>Bacillus subtilis</em></td>
<td>Sterilant</td>
</tr>
<tr>
<td></td>
<td><em>Clostridium sporogenes</em></td>
<td></td>
</tr>
<tr>
<td>Vegetative bacteria</td>
<td><em>Pseudomonas aeruginosa</em></td>
<td>High-level disinfectant</td>
</tr>
<tr>
<td></td>
<td><em>Staphylococcus aureus</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Salmonella choleraesuis</em></td>
<td>Disinfectant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sanitizer</td>
</tr>
</tbody>
</table>
## Study Variables

### Time
- 10 and 30 minutes

### Temperature
- 10, 20, or 30°C

### Food
- None (water)
- 10% Flour paste
- Whole milk
- 50% Egg yolk emulsion

### Organisms
- *B. anthracis*
- *Y. pseudotuberculosis*

### Biocides*
- Sodium hypochlorite
- Quaternary ammonium compound (QAC)
- Iodophor
- Hydrogen peroxide
- Peroxyacetic acid
- Acidified sodium chlorite
- Peroxy/fatty acid sanitizers

*In 500 ppm hard water, no pH adjustment*
Sodium hypochlorite – 10 minutes

Average of *B. anthracis* strains – 20°C

![Graph showing the average log CFU/carrier for different food carriers with total available chlorine as the x-axis. The graph includes data for egg yolk, whole milk, flour, and no food.](image-url)
Needed Biocide concentration for 6-log reduction, 30 minute

B. anthracis spores

<table>
<thead>
<tr>
<th>Biocide Type</th>
<th>No food</th>
<th>Flour paste</th>
<th>Whole milk</th>
<th>Egg-yolk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10°C</td>
<td>20°C</td>
<td>30°C</td>
<td>10°C</td>
</tr>
<tr>
<td>Sodium hypochlorite</td>
<td>2300</td>
<td>2300</td>
<td>900</td>
<td>5700</td>
</tr>
<tr>
<td>Acidified sodium chlorite</td>
<td>5900</td>
<td>1500</td>
<td>1100</td>
<td>5700</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>25%</td>
<td>14%</td>
<td>8.9%</td>
<td>25%</td>
</tr>
<tr>
<td>Iodophor</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Quaternary</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Mixed peroxyacids</td>
<td>2100</td>
<td>1500</td>
<td>500</td>
<td>4200</td>
</tr>
<tr>
<td>Peroxyacetic acid</td>
<td>14000</td>
<td>8000</td>
<td>2300</td>
<td>1500</td>
</tr>
</tbody>
</table>

“N” - undiluted biocide did not achieve a 6-log reduction

NOTE: Concentrations are all above allowable labeled use
Biocide efficacy

- QAC and iodophors not effective for *B. anthracis*
- Sodium hypochlorite, acidified sodium chlorite, hydrogen peroxide, peroxycetic acid, and mixed peroxy acid biocides may inactivate *B. anthracis* spores on hard surfaces at concentrations well above EPA label
Biocide efficacy

QACs and iodophors not effective for B. anthracis

Sodium hypochlorite, acidified sodium chlorite, hydrogen peroxide, peroxyacetic acid, and mixed peroxy acid biocides may inactivate B. anthracis spores on hard surfaces at concentrations well above EPA label.

IT IS A VIOLATION OF FEDERAL LAW

To use an EPA registered product in a manner inconsistent with its labeling.

Solution strength must be according to label

Applications must be on the label

For a manufacturer to make real or implied claims for efficacy against organisms which are not on the label.
Inactivation research summary

- Biocide efficacy
  - QAC and iodophors not effective for *B. anthracis*
  - Sodium hypochlorite, acidified sodium chlorite, hydrogen peroxide, peroxyacetic acid, and mixed peroxy acid biocides may inactivate *B. anthracis* spores on hard surfaces at concentrations well above EPA label

- Inactivation dramatically reduced in colder environments and in the presence of food residues

- Work needs to continue for other potential agents
More work needs to be done......

- Rapid detection methods
- Systems to improve traceability
- Communication
  - Technical information available for rapid response
  - Risk communication to minimize damage and panic
- Recovery tools and education
There is a real threat

Consequences would be devastating

We need to:
- Continue research
- Strengthen partnerships
- Reinforce response networks
Food Protection & Defense

Ecolab is proud to be a partner with our valued customers and the National Center for Food Protection and Defense

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