

## CHAPTER 2

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# The Relationship of Biosecurity to Sanitation

Knowledge of the threat of bioterrorism in food processing and preparation is essential for the maintenance of a safe food supply. Those involved with sanitation must be knowledgeable about food contaminants including microorganisms, allergens, physical hazards, and pests and about contamination through bioterrorism. The food industry is vulnerable to threats and possible damage to food.

The importance of protecting the food supply from natural and intentional microbial, chemical, and physical contamination is recognized throughout the food industry. Since attacks by terrorists in the United States in 2001, increased emphasis has been placed on national security, including food security, which has become a top priority for the food industry. The result has been a strong emphasis on security programs and procedures by food companies to continually improve and enhance the strength and effectiveness of food security programs. Academia, government, and industry representatives have dedicated efforts throughout the past to the development of food safety programs on the farm, in the processing plant, and in consumers' homes.

During the past, the food industry has become aware of the importance of addressing threats to food safety, from foodborne

disease outbreaks and inadvertent contaminations to isolated occurrences of product extortion and tampering. However, the food industry must now guard against the intentional, widespread contamination of the food supply. Food biosecurity is no longer addressed in hypothetical terms as the potential for the food supply being a target or tool of terrorism. Furthermore, optimism and complacency are no longer a viable option.

During 2003, the U.S. Homeland Security Secretary indicated the possibility that terrorists may select popular food products as a media for chemical or biological warfare. Thus, it is essential to protect consumers from bioterrorism in addition to accidental infestations or contamination from inadequate sanitation. Now, it is necessary for the food industry to protect against intentional interference and the possibility that food products could be used as weapons of destruction.

Previous challenges the food industry has faced include biosecurity. During the 1980s, a major security challenge was increased emphasis on maintaining a drug-free workplace. In the last decade of the 20th century, there was an increased emphasis on preventing workplace violence. During this time, the threat of biological and chemical weapons intensified. After the terrorism

events of 2001 in the United States, bioterrorism became a key security issue and necessitated that the food industry take this issue very seriously.

## **POTENTIAL RISKS OF FOODBORNE BIOTERRORISM**

After attacks by terrorists in the United States during 2001, a scenario pondered by individuals was reminiscent of the anthrax letters scare during 2001 and the Tylenol-laced cyanide of the early 1980s. DeSorbo (2004) reported that less than a month after being hired, four employees mysteriously disappeared from a dairy plant in California and became wanted in connection with an al Qaeda-backed attack and subsequent botulism outbreak that killed 800 and caused more than 16,000 to become ill. The scenario continued 3 weeks after the attack. Recalls of dairy products manufactured by the California firm reduced the impact of the botulism outbreak, with subsequent dairy shortages being reported throughout southern California. Other possible threat agents are hemorrhagic fever viruses, ricin toxin, and botulinum toxin.

According to Applebaum (2004), the food industry has focused on three areas that are referred to as the “3 Ps” of protection:

- *Personnel*: Food companies have increased employee screening and supervision.
- *Product*: Food companies have established additional controls for ingredients and products during receiving, production, and distribution, to ensure a high level of food safety.
- *Property*: Food companies have established additional controls to ensure that they have the highest barriers in place to guard against possible intruders.

Applebaum (2004) further stated that the criteria for accurate risk assessment is to evaluate a firm’s assets and determined the type of potential threat that exists and the establishment’s vulnerabilities. This author further stated that where a company’s assets and vulnerabilities overlap with potential threats, the risk of bioterrorism is increased. Although risk cannot be eliminated totally, it is essential to apply risk management to ensure deterrence and prevention and to apply the “Prevent to Protect” policy. Since food companies cannot completely prevent bioterrorism before it occurs, they must have the knowledge and tools to detect and mitigate any possible biosecurity breaches. Thus, the goal is to detect problems before it is necessary to mitigate their potential impact.

## **BIOTERRORISM PROTECTION MEASURES**

In the United States, the Food and Drug Administration (FDA) has issued Interim Final Rules for the registration of food facilities and prior notice of imported food shipments that became effective on December 12, 2003. Furthermore, the FDA is expected to issue additional rules for records and administrative detention.

The U.S. food industry has the responsibility of ensuring that approximately 400,000 domestic and foreign facilities that manufacture, process, package, or store food for human or animal consumption are properly registered with the FDA and that all companies that export food products or ingredients to the United States are meeting the prior notice requirements established by the Bioterrorism Act. The Bioterrorism Act directed the FDA to implement regulations for the registration of food facilities; prior notice of imported food shipments; the estab-

ishment, maintenance, and availability of records; and the administrative detention of food for human or animal consumption.

The National Food Processors Association has been effective in providing education for the food industry in the United States and several other countries on complying with these regulations. This organization has conducted several educational seminars on the Bioterrorism Act's requirements to increase understanding of the technical requirements and what specifically is necessary to be in compliance with these rules.

The food industry has been especially active in the review of existing food security programs and the implementation of preventive measures and effective controls—especially after the U.S. terrorist attacks of 2001. Progressive companies in the United States and other countries have increased their commitment and vigilance to ensure that preventive measures are in place to minimize, and if possible, eliminate the threat of international contamination of the food supply.

To ensure successful security efforts, food companies should establish a “security mentality” through increased knowledge of security, security needs, and the establishment of security priorities. They should review their current security practices and procedures and the crisis management and security program (if such programs exist) to determine what revisions or additions are needed. Applebaum (2004) has suggested that “food security” and “food safety” are not the same. Food safety addresses accidents such as cross-contamination and process failure during production; whereas, food security is a broader issue that can include intentional manipulating of the food supply to damage it or make it too hazardous for consumption. Thus, food security addresses hazards that are induced deliberately and intentionally and food safety addresses hazards that may

occur unplanned and accidentally. Both these activities have a common goal, which is to prevent problems that could undermine the safety of food products. Although the food industry must accept the responsibility of providing consumers a secure food supply, biosecurity should not impede food production, distribution, and consumption. Thus, changes to either food industry security activities or the regulations governing food security should be realistic and workable.

Another security enhancement technique is radio frequency identification (RFID). A large retailer has mandated that the larger vendors provide products tagged with RFID for products at the case and pallet levels. The utility of this technique is that RFID record keeping builds long-term data records that benchmark supply deficiencies and provide traceability. RFID provides records for supply-chain deviation and necessary corrective actions. Through radio frequencies, information is transmitted instantly from the tag to the reader. At its core, RFID is a technology that can identify, trace track, locate, and protect products throughout the supply chain (Lipsky, 2004).

### **Biosecurity Through Simulation**

Although the food industry must accept the responsibility for the maintenance of biosecurity, the ability to test the effectiveness of preventive and reactive procedures to an act of bioterrorism remains a challenge. Role playing and simulation can assist with the assessment of the value of biosecurity programs. Simulation has been developed by academia for such an assessment (Reckowsky, 2004). The intent of this technique has been to provide companies an opportunity to test their security plans on a realistic scenario in conjunction with the pressures of time, publicity, and finances. Most decisions involved with simulation were based on

information received from multiple inputs such as government releases, media relations, and communications between each other. Effective communication enhanced the trace-back of contaminated products and ingredients. Participants have been optimistic about role playing and simulation and consider this approach to be vital to the increase of industry awareness and readiness for a bioterrorism attack. It appears that simulation can be utilized to advance preparedness and strengthen decision-making abilities related to biosecurity threats.

### **Biosecurity Guidelines**

Guidelines provided by the U.S. Department of Agriculture, Food Safety Inspection Service web page ([www.usda.gov/Food\\_Security\\_&\\_Emergency\\_Preparedness/Keep\\_Americas\\_Food\\_Safe/index.asp](http://www.usda.gov/Food_Security_&_Emergency_Preparedness/Keep_Americas_Food_Safe/index.asp)), which are summarized here, should be considered:

1. Organize a food protection management team.
2. Develop a comprehensive transportation and storage security plan.
3. Assess and identify viable locations for contamination throughout the production and distribution process by the use of a flow diagram.
4. Identify and implement controls to prevent product adulteration or contamination during processing, storage, and transportation.
5. Provide a method to identify and track food products during storage and distribution including the use of tamper-resistant seals.
6. Verify that contract transporters and storage facilities have a security program in effect.

According to the U.S. Department of Agriculture, security measures for purchasing and distribution include:

1. Procedures for the immediate recall of unsafe products.
2. Procedures for handling biosecurity or other threats and an evacuation plan.
3. Appropriate handling, separation, and disposal of unsafe products.
4. Documentation method for the handling of both safe and unsafe products.
5. Documented instructions for the rejection of unsafe material.
6. Procedures for the handling of off-hour deliveries.
7. Current list of contacts for local, state, federal, Homeland Security, and public health officials.
8. Procedures for the notification of appropriate authorities if the need materializes.
9. Notification of all entry and exit points available during an emergency.
10. Strategy for communication of beneficial information to the news media.
11. Appropriate training of biosecurity team members.
12. Periodic conduct of practice drills and review of security measures.

The following screening and educating measures should be considered:

1. Appropriate background and criminal checks should be conducted.
2. References should be verified for all potential employers.
3. Personnel without background checks should be under constant supervision and their access to sensitive areas of the facility should be restricted.
4. Employees should be trained on food production practices and vigilance, specifically how to prevent, detect, and respond to threats of terrorist actions.
5. Ongoing promotion of security consciousness and the importance of

security procedures should be practiced.

6. Appropriate personnel should be trained in security procedures for incoming mail, supplies, raw materials, and other deliveries.
7. Employees should be encouraged to report any suspicious activities, such as signs of possible product tampering or breaks in the food security system.
8. It should be ensured that employees know emergency procedures and contact information.

The following security measures are appropriate:

1. A positive ID system should be required for all employees.
2. Visitors should be escorted at all times throughout the facility.
3. When a staff member is no longer employed, company-issued IDs and keys should be collected and lock combinations changed.
4. Restricted access to facilities, transportation vehicles, locker rooms, and all storage areas is essential.
5. Specific entry and exit points for people and vehicles should be designated.
6. All access and exit doors, vent openings, windows, outside refrigeration and storage units, trailer bodies, and bulk storage tanks should be secured.
7. Access to the water supply and airflow systems should be secured and restricted.
8. Adequate light should be provided in the perimeter areas.
9. Incoming mail should be handled in an area of the facility separate from food handling.
10. Employees should be monitored for unusual behavior (e.g., staying unusually late, arriving unusually early, taking pictures of the establishment, or moving company documents from the facility).
11. All food ingredients, products, and packaging materials should be purchased only from known, reputable suppliers with accompanying letters of guaranty.
12. Advance notification from suppliers for all incoming deliveries, including shipment details, driver's name, and seal numbers should be required.
13. Locked or sealed vehicles for delivery should be required.
14. Products known or suspected of being adulterated should be rejected.
15. Unscheduled deliveries should be retained outside of the premises pending verification of the shipper and cargo.
16. A supervisor or other agent should be required to break seals and sign off in the trucker's logbook, noting on the bill of lading any problems with product condition.
17. The broker, seal numbers, and truck or trailer number should be documented.
18. A plan should exist to ensure product integrity when a seal has to be broken before delivery due to multiple deliveries or for inspection by government officials.
19. Unloading of incoming products should be supervised.
20. Inbound deliveries should be verified for seal integrity, seal number, and shipping location.
21. Incoming products and their containers should be examined for evidence of tampering or contamination.
22. Foods should be checked for unusual color or appearance.
23. A procedural checklist for incoming and outgoing shipments should be developed.

24. All outgoing shipments should be sealed with tamper-evident numbered seals with notation on the shipping documents.
25. Employees should be aware of and report any suspicious activity to appropriate authorities.
26. Forward-shippers and backward-retailers, wholesalers, carriers, and others should be traced and there should be systems in place for quickly and effectively locating products that had been distributed.
27. Threats or reports of suspicious activity should be investigated promptly.
28. If a food security emergency occurs, the local law enforcement agency should be contacted.
8. Outside storage tanks for hazardous materials and potable water supply should be protected from, and monitored for, unauthorized access.
9. A current list of plant personnel with open or restricted access to the establishment should be maintained at the security office.
10. Establishment entry should be controlled through required positive identification (e.g., picture IDs, sign-in and sign-out at security or reception).
11. Incoming or outgoing vehicles (both private and commercial) should be inspected for unusual cargo or activity.
12. Parking areas for visitors or guests should be identified and located at a safe distance from the main facility.
13. Deliveries should be verified against a scheduled roster.
14. Unscheduled deliveries should be retained outside the plant premises, if possible, pending verification of shipper and cargo.
15. Outside access to wells, potable water tanks, and ice-making equipment and storage should be secured from unauthorized entry.
16. Potable and nonpotable water lines into processing areas should be inspected periodically for possible hampering.
17. The establishment should arrange for immediate notification of local health officials in the event the potability of the public water supply is compromised.
18. The establishment should determine and enforce a policy on which personal items may and may not be permitted inside the plant and within production areas.

The U.S. Department of Agriculture suggests the following precautions to address biosecurity on the outside of food plants:

1. Plant boundaries should be secured to prevent unauthorized entry.
2. "No trespassing" signs should be posted.
3. Integrity of the plant perimeter should be monitored for signs of suspicious activity or an unauthorized entry.
4. Outside lighting should be sufficient to permit detection of unusual activities.
5. Establishment entrances should be secured through guards, alarms, cameras, or other security hardware consistent with national and local fire and safety codes.
6. Emergency exits should have alarms and self-locking doors that can be opened only from the inside.
7. Doors, windows, roof openings, vent openings, trailer bodies, railcars, and bulk storage tanks should be secured at all times.

The recommended biosecurity precautions provided by the U.S. Department of



Agriculture for the inside of food establishments include:

1. Restricted areas inside the plant should be clearly marked and secured.
2. Access to central controls for airflow, water systems, electricity, and gas should be restricted and controlled.
3. Current layout schematics should be available at strategic and secured locations within the plant.
4. Airflow systems should include a provision for immediate isolation of contaminated areas or rooms.
5. Emergency alert equipment should be fully operational and the location of controls should be clearly marked.
6. Access to in-plant laboratories should be controlled.
7. Computer data processing should be protected using passwords, network firewalls, and effective and current virus detection systems.

## THE ROLE OF PEST MANAGEMENT IN BIOSECURITY

Since pest management is an integral part of food security, the training of pest management personnel is a viable method to improve food safety through monitoring the premises for indications of bioterrorism. This is a logical approach since pest management technicians have the responsibility of investigating conditions that do not contribute to wholesome foods. A link exists between pest exclusion and food safety and security (Anon., 2004) since pest management technicians monitor the interior and exterior of food facilities for abnormal conditions that may jeopardize food safety.

Biosecurity and pest management personnel should collaborate to create a set of common goals and training opportunities. The

security team can mentor pest management technicians on what to observe when they conduct their daily inspections, such as unusual footprints near the perimeter or abandoned packages in the plant, and indicate the necessary actions. Pest management personnel can teach security about monitoring potential water contamination sites such as drains and sewers, identifying signs of contamination of raw materials, and choosing security solutions that minimize pest problems, such as opting for sodium vapor lights instead of mercury vapor lights, which attract pests (Anon., 2004).

If a contract pest management company is utilized, it should be a reputable firm with technicians that are specifically trained in food pest management. These technicians should be cleared with a security background check and possess knowledge about bioterrorism prevention strategies. These experienced technicians know what to observe and how to advise the food company on the latest techniques for pest management and food security. Normally, in-house technicians do not have access to the expertise and ongoing training that pest management vendors possess and they cannot store chemicals off-site. This limitation creates sanitation and bioterrorism hazards within a facility. If pest management chemicals are stored on the premises, accidental contamination risk increases and it is more convenient for disgruntled workers or terrorists to intentionally poison products and destroy a firm's reputation.

## ADDITIONAL BIOTERRORISM INFORMATION

The FDA has a website ([www.cfsan.fda.gov](http://www.cfsan.fda.gov)) for the food industry that includes an extensive amount of information such as compliance documents and other related

documents about the Bioterrorism Act. The main areas of this act are as follows.

### **Food Detention**

This portion of the act authorizes the Secretary of Health and Human Services, through the FDA, to order the retention of food if an officer or qualified employee has credible evidence or even information that suggests that a foodstuff presents a threat of serious adverse health consequences or death to humans or animals. The Secretary of Health and Human Services, through the FDA, is required to issue final regulations to expedite enforcement actions on perishable foods.

### **Registration of Food and Animal Feed Facilities**

The Bioterrorism Act requires the owner, operator, or agent in charge of a domestic or foreign facility to register with the FDA no later than December 12, 2003. A facility is considered to be any factory, warehouse, or establishment, including importers that manufacture, process, pack, or store food for human or animal consumption in the United States. Exemptions include farms, restaurants, retail food establishments, nonprofit establishments that prepare or serve food, and fishing vessels not engaged in processing. Foreign facilities are also exempt if the food from the establishment is designated for further processing or packaging by another facility before it is exported to the United States, or if the establishment performs a minimal activity such as labeling. Such a registration roster will enable the FDA to rapidly identify and locate affected food processors and other establishments if deliberate or accidental contamination of food occurs.

### **Establishment and Maintenance of Records**

The Secretary of Health and Human Services is required to establish requirements for

the creation and maintenance of records needed to determine the immediate previous sources and the subsequent recipients of food. Such records permit the FDA to address credible threats of serious adverse health consequences or death to humans or animals. Entities that are subject to these provisions are those that manufacture, process, pack, transport, distribute, receive, store, or import food. Farms and restaurants are exempt from these requirements.

### **Prior Notice of Imported Food Shipments**

The Bioterrorism Act requires that prior notice of imported food shipments be given to the FDA. The notice must include a description of the article, manufacturer, shipper, grower (if known), country of origin, country from which the article is shipped, and the anticipated port of entry. This regulation mandates that importers of food must give the FDA prior notice of every shipment of food before it can enter into the United States. Issued jointly with the U.S. Bureau of Customs and Border Protection, the advance notification of shipments when they arrive at U.S. ports of entry is designated to assist these federal agencies to better target inspections of imported foods. Currently, the FDA requires that companies provide prior notice and receive FDA confirmation no more than 5 days before anticipated arrival at a U.S. port of entry and no fewer than 2 hours before arrival by land via road; 4 hours before arrival by air or by land via rail; or 8 hours before arrival by water.

## **SUMMARY**

During the past decade, biosecurity has become a major concern of the food industry. Knowledge of the threat of bioterrorism in food processing and preparation is essential for the maintenance of a safe food supply.



The food industry has focused on three areas that are referred to as the “3 Ps” of protection, which are personnel, product, and property. The U.S. Department of Agriculture has provided some beneficial guidelines for the processing, storage, and protection against bioterrorism and the FDA has implemented guidelines for enforcement of the Bioterrorism Act.

Since pest management is an integral part of food security, the training of pest management personnel is a viable method to improve food safety through monitoring the premises for indications of bioterrorism. Biosecurity and pest management personnel should collaborate to create a set of common goals and training opportunities. The FDA and the U.S. Department of Agriculture (USDA) have a website for the food industry that includes an extensive amount of information about biosecurity.

## STUDY QUESTIONS

1. Why is biosecurity a major concern to the food industry?
2. What are the “3 Ps” of protection against bioterrorism?
3. What is the significance of the Bioterrorism Act?
4. How does biosecurity and pest management interface?
5. How can biosecurity and pest management personnel complement each other?
6. What has the U.S. Department of Agriculture done to promote food biosecurity?
7. What has the FDA done to enhance food biosecurity?
8. How have attacks by terrorists in the United States in 2001 affected biosecurity among food processors?

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