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Safety in Knowledge

WHITE PAPER

Food Defense Case Studies: Examples for Food Producers

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Introduction

Headlines read hundreds dead, even more injured, and some left permanently disabled. This headline contains just some of the harrowing consequences on public health from incidents of intentional adulteration. Add to the public health impact the prospect of lost revenue, increased turnover, lawsuits, negative brand publicity, temporary closures leading to lost wages, or even complete collapse of a company and we can quickly visualize the gravity of not addressing **food defense** in the modern world.

Food production continues to undergo rapid change as population growth, politics, natural disasters and climate impacts, as well as technological innovation come together to demand more of the food sector. Our food supply system is globalized as a growing, elaborate, and expanding web of interconnections and interdependencies. Hand in hand with this pressure on our food system is shifting consumer demand and preferences. All these factors together increase potential food defense threats.

In 2016, the Food and Drug Administration (FDA) issued a sweeping food policy reform, the Food Safety Modernization Act (FSMA). Under FSMA, the **Mitigation Strategies to Protect Food Against Intentional Adulteration rule (IA Rule)** requires domestic and foreign (with some exceptions) to address the potential for intentional adulteration to the food supply. Under the IA rule, companies must develop a **food defense** plan to protect the food supply from intentional adulteration incidents meant to cause wide-scale public health harm. This white paper serves as a reference guide and education point for facilities tasked with doing so.

What can we learn from food fraud and food defense examples?

A food defense threat consists of three parts:

- **Motivation:** adversary's intent to do harm
- **Capability:** adversary's knowledge, adulterant, and tactics
- **Vulnerability:** conditions of accessibility and likelihood that the adulteration would cause an impact

Understanding motivation, capability, and vulnerability aids in mitigating threats to the food system.

Food Defense Threat Triangle

Motivation

The three most prominent food defense threat motivations are economically motivated adulteration, sabotage and terrorism.

Economically Motivated Adulteration is often referred to as food fraud. Perpetrators of EMA are motivated by a desire to make money fraudulently, evade regulation, or gain an unfair economic advantage. However, although the intent of the EMA is not to cause public health harm, many EMA incidents have resulted in devastating public health impacts.

Sabotage is most often committed by disgruntled employees, consumers, or competitors. A saboteur's intent is directly related to harming a company's reputation or brand. They may or may not intend to cause public health harm, but wide-scale public health harm may be a consequence.

Terrorism is intended to cause fear, public health harm, or social and economic disruption.

Capability

Capability refers to the adulterator's knowledge, adulterants, and tactics. For incidents intended to cause wide-scale public health harm, capability includes access to adulterants that are typically inexpensive and easy to produce; highly lethal or infectious; and resistant to environmental factors.

Examples of capability include:

- An EMA perpetrator substituting expensive ingredients with cheaper ones to increase profit, adding unapproved ingredients to increase taste or volume, or mislabeling ingredients to avoid tariffs.
- A disgruntled employee who has access and knowledge of a company's food production process and food defense program.
- A terrorist with access to toxic chemicals or a microbial pathogen and access to a food manufacturing facility.

Vulnerability

Vulnerability is about accessibility to the product during processing – how accessible is the process to a successful contamination capable of wide-scale public health harm. This relates directly to the vulnerability assessment and the three-element analysis outlined by the Food and Drug Administration: is it possible for an inside attacker to easily access the food, successfully add an adulterant, and cause wide-scale public health harm?

Each food defense case study that is included in this document discusses motivation, capability, and vulnerability. By studying historical examples of food defense incidents, and their three components, we can better understand how they happen and what we can do now to prevent them.

Examples of Intentional Adulteration – Food Fraud

Food fraud is not in the scope of the FSMA IA Rule but must be addressed as part of the FSMA Preventive Control Rule. Although most EMA incidents do not cause public health consequences, several high-profile cases caused wide-scale public health harm. Because fraudulent ingredients are added specifically to create economic gain, food fraud must be managed through hazard analysis, preventive controls, and supply chain controls through food safety plans rather than through vulnerability assessments and mitigation strategies in food defense plans

Food Fraud Example 1: Spanish Olive Oil Fraud

Background

In 1981, the ingestion of an oil fraudulently sold as olive oil led to a foodborne illness outbreak of a never-seen-before magnitude. Around 20,000 people contracted what would later be known as toxic oil syndrome (TOS) after consuming rapeseed oil, an alternative to olive oil outlawed by the Spanish government to protect its native oil industry, contaminated with a yet-to-be-identified toxic compound.

Motivation

The Spanish olive oil fraud incident is an example of EMA. To turn a profit, local importers sold cheaper, compromised oil labeled as olive oil directly to the general public.

Capability

Perpetrators had easy access to rapeseed oil and knowledge of olive oil processing.

Vulnerability

The perpetrators took advantage of the Spanish government's lack of oversight in the areas on the capital's periphery. With little regulation or consequence, these intelligent adversaries were able to operate in several small communities.

Consequences

Approximately 20,000 people became sick with toxic oil syndrome (TOS), an illness characterized by incapacitating myalgias, peripheral eosinophilia, and pulmonary infiltration. Of those affected, about 300 died shortly after contracting the disease, an additional 1,500 died within the next 14 years, and many more developed chronic conditions. The Spanish "olive" oil incident is widely considered the prototype for contemporary scientific food fraud.

Food Fraud Example 2: China Melamine

Background

In 2008, Chinese dairy firms intentionally adulterated infant formula with melamine, a toxic industrial chemical. Melamine tricked the common dairy quality control test Kjeldahl for nitrogen as an indicator of protein.

Motivation

The high nitrogen level in melamine mimicked the protein in milk. At the time, raw milk supplies in China were priced based on protein content. The introduction of melamine allowed for the sale of compromised and diluted milk products for profit.

Capability

The perpetrators of the melamine adulteration had knowledge about the Kjeldahl test for protein content. Melamine was present in a variety of ingredients entering global commerce at the time. Multiple adversaries created a systematic network to spread the chemical for economic gain.

Vulnerability

China's milk production supply chain lacked adequate regulation and quality testing, creating multiple vulnerabilities where the toxic chemical remained undetected.

Consequences

China's melamine adulteration resulted in over 300,000 sick children with permanent kidney damage and 6 deaths due to kidney failure. Although illness was not intended, certain batches of milk products contained between 0.1 and 2,500 parts per million of melamine.

The Chinese milk scandal is an example of EMA having unforeseen public health consequences. It is a reminder that EMA is not only a consumer fraud issue – it can have catastrophic health impacts as well.

Examples of Intentional Adulteration – Food Defense

Food defense, or the protection against intentional adulteration intended to cause wide-scale public health harm, is the goal of the FSMA IA Rule. The core principles of food defense planning are conducting vulnerability assessments and identifying mitigation strategies to decrease the vulnerability. It is important to understand that a food company cannot control the motivation or capability of an intentional adulteration attacker. However, food companies can take action through food defense planning to decrease the vulnerabilities in their facilities. By controlling this one aspect of the food defense threat triangle – motivation, capability, and vulnerability – the food defense threat can be neutralized.

Food Defense Example 1: Dalles, Oregon Salmonella

Background

Members of the Rajneesh commune in Dalles, Oregon sought political gain by adulterating salad bars at ten local restaurants with Salmonella Typhimurium. Rajneeshpuram was a religious community headquartered in Wasco County, Oregon between 1981 and 1988. This incident of intentional adulteration occurred in 1984 and is the first and largest bioterrorist attack in United States history.

Motivation

As the Rajneesh commune grew, they sought and were subsequently denied building permits. In response, commune leadership hatched a plan to win political influence via two county circuit court seats in an upcoming election. To achieve their goal, they sought to incapacitate voters of the city who might oppose their candidates.

Capability

Twelve people were reportedly involved in plotting the attack, with four directly linked to the development of Salmonella for the operation within Rajneesh's medical laboratory.

Vulnerability

Cold salad bars in local restaurants were open, easily accessible, and rarely monitored.

Consequences

This incident of intentional adulteration sickened 751 and hospitalized 45. It also highlights how a food defense intentional adulteration may at first appear to be a more common unintentional foodborne illness. Understanding how to identify the differences between food safety and food defense incidents is essential to informing the appropriate response.

Food Defense Example 2: Japan Malathion

Background

In October 2014, hundreds fell sick across Japan after consuming frozen food tainted with pesticides. A disgruntled employee of Aqlifoods Co., a plant located in Japan's Gunma prefecture, sprayed malathion on frozen foods, causing some 2,800 illnesses and a recall of over 6 million products. Malathion is registered with the U.S. Environmental Protection Agency for use on crops and is also an ingredient in head lice treatments. According to the U.S. Centers for Disease Control, malathion can cause death at high enough concentrations.

Motivation

The perpetrator, Toshiki Abe, had previously noted frustration with the company to his co-workers. Abe felt his performance evaluation lacked legitimacy and the result, a reduction of his bonus, unfair. Abe, a contract worker, was hoping to secure a long-term position within Aqlifoods Co. Investigators cite these findings as evidence of Abe's motivation to carry out an act of sabotage.

Capability

Abe leveraged his access to the Aqlifoods Co. processing lines to smuggle a spray bottle of malathion into the facility and spread the pesticide over various frozen food products, including pizzas, croquettes, and pancakes moving on a conveyor belt.

Vulnerability

Several areas in the facility were vulnerable to food adulteration. Trays on conveyor belts were open and accessible, and not all points in the facility were covered by surveillance cameras.

Consequences

While Abe initially intended to cause a recall and cause his employer substantial revenue loss, his act of sabotage resulted in severe consequences for both company and consumer. With 2,800 illnesses reported and approximately 6.4 million products recalled, Aqlifoods Co. was forced to issue numerous public apologies via the media. The company's brand trust, market share, and the trust of Japan's food system at large faltered. Leadership and employees alike were removed from their positions and the company eventually went out of business. Toshiki Abe was sentenced to 3 years in prison for this act of sabotage.

Food Defense Example 3: New Zealand Pesticide 1080

Background

In 2014, Jeremy Kerr, a resident of Auckland, New Zealand, threatened to adulterate infant formula with the pesticide 1080 if the chemical continued to be used for controlling invasive species. Kerr sent authorities blackmail letters, accompanied by samples that demonstrated his threat – infant formula adulterated with 1080.

Motivation

Kerr owned a pesticide company of his own. He believed that if the rival pesticide, 1080, ceased to be used, his profits would increase.

Capability

As a member of the industry, and especially as a business owner, Kerr had unfettered access to 1080. While developing his pesticide, he often liaised with laboratories to have the pesticide verified. In particular, Kerr targeted the Chinese market, a major importer of New Zealand products.

Vulnerability

Kerr was familiar with the infant formula food system and the pesticide sector. He understood how wide-scale public health threats using infant formula adulterated with pesticide would affect the market.

Consequences

New Zealand officials, law enforcement, and industry ensured no infant formula was adulterated. They accomplished this through close coordination and collaboration. Kerr was tried and sentenced to 8 and half years in jail on two counts of blackmail. This incident cost the New Zealand government over $37 million (NZD).

Conclusion

Food defense incidents, including acts of food fraud and intentional adulteration, present grave consequences for your business, your consumers, and the global food supply. Food defense threats arise for a number of reasons, from economic gain to a disgruntled employee seeking to carry out an act of revenge to terrorists wanting to incite fear. Each presents a teachable moment for businesses, industry networks, and governing bodies. By **studying food defense examples**, food manufacturers become more prepared to prevent these incidents or handle them swiftly should they occur.

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What can you do today to prevent intentional adulteration?

Zosi and the Food Protection and Defense Institute teamed to offer a full-service food defense training solution. This expertly curated library of online courseware ensures your food defense plan and those involved in its execution understand key food defense concepts and their role in protecting the food supply.

Courses Offered

Food Defense in 15 (English & Spanish)

Food Defense Supervisor Awareness (English & Spanish)

Food Defense Manager

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