

Chapter 3

Food Fraud Prevention Overview

(Part 1 of 3): Basics



Summary

This chapter presents the overall food fraud prevention concept and introduces the fundamental theory of prevention, the relation of food fraud to all other food risks (e.g., food quality, food safety, and food defense), why the core focus is prevention, and finally the Food Fraud Prevention Strategy (FFPS). There is a specific focus on how these activities interact and also how new information enters the cycle. The next chapter will expand to include the application of the Food Fraud Prevention Cycle (FFPC).

The Key Learning Objectives of this chapter are

- (1) **The Interdisciplinary Prevention Approach:** This section will start with prevention versus reaction and then present the wide range of disciplines that cover the entire food fraud problem.
- (2) **The Interdisciplinary Nature of Prevention:** This section will review the interdisciplinary nature of prevention by considering how the fraud opportunity is created and the many academic disciplines that help risk assessors understand the identification of optimal countermeasures and control systems.
- (3) **Understand the Prevention Strategies:** This section presents several concepts that are important for shaping the prevention strategies. There are fundamental or principal theories that support the need to focus on vulnerability and the fraud opportunity.

On the Food Fraud Prevention Cycle (FFPC), this chapter addresses the overall fundamental prevention concepts of “connecting everything to everything” (Fig. 3.1).

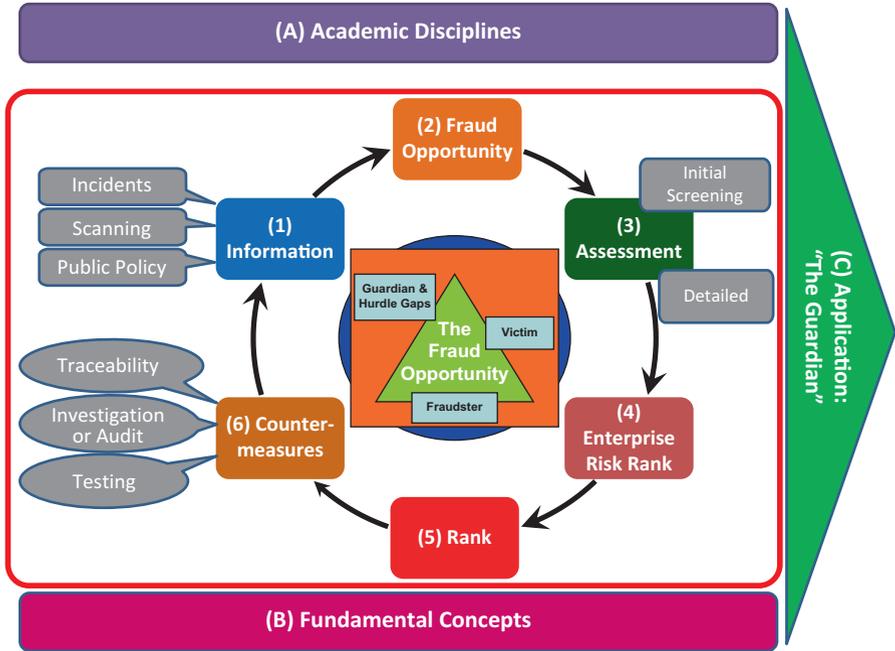


Fig. 3.1 Food Fraud Prevention Cycle—where this chapter applies to the overall concept: The entire Cycle 1, 2, 3, 4, 5, and 6 and the fraud opportunity. (Copyright Permission Granted) (Spink 2014; Spink et al. 2019)

Introduction

Food fraud is a fundamentally unique food risk since the root cause is an intelligent human adversary who is actively seeking to avoid detection. The human fraudster has the potential for a large economic gain, so they have the incentive and can justify financial spending to attempt to circumvent the countermeasures and control systems. The core goal of the prevention strategy is to reduce that fraud opportunity to the point that the fraudsters are dissuaded.

Key Learning Objective 1: The Interdisciplinary Prevention Approach

This section reviews the complex food fraud problem by considering the interdisciplinary approach combined with a practical and pragmatic consideration that prevention is the most effective approach.

The key Learning Objectives of this section are:

- (1) Interdisciplinary approach
- (2) “Why can’t we just arrest all the fraudsters?”
- (3) The methodical and efficient focus of the prevention approach

Overview of the Prevention Approach

While many disciplines are required to efficiently and effectively reduce the “fraud opportunity.” Each approach to the process, and their value and efficiency, must be judged in relation to their contribution to the overall prevention. A single-discipline approach is limited in effectiveness. For example, a pure *criminology* approach to food fraud prevention would prioritize crime-fighting activities such as investigation and enforcement—seizures of products and arrests. A pure *legal* or prosecution approach would prioritize punishment—judged explicitly by successful court cases and long-term incarceration. A pure *food science* or food authenticity approach would prioritize validated detection test methods—catching food fraud. A pure *supply chain management* focus would prioritize monitoring for anomalies in the movement of product and quickly replenish suspicious product—identifying when contraband is found. A pure *consumer behavior science* focus would prioritize educating buyers and consumers about the dangers of counterfeits and persuading them not to take purchasing risks or not to purchase the illegal product. A pure *forensic accounting* focus would prioritize finding financial anomalies that indicate fraud has occurred. A pure *packaging science* focus would prioritize on-package authentication or security features—such as traceability codes printed on the package or labels. Each single-discipline focus has limitations since they can be circumvented. An *interdisciplinary approach* can consider many often complex but straightforward countermeasures and control systems such as adding complex taggants to a simple packaging feature (Fig. 3.2). This interdisciplinary approach focuses on reducing the fraud opportunity which can vastly increase the challenge for the fraudster to commit the act successfully. This focused effort would reduce the “fraud opportunity.” The “fraud opportunity” is reduced by (1) increasing the risk of getting caught or (2) increasing the cost of conducting the crime with the most crucial step to (3) make sure the fraudsters know of the increased risks of detection. The efficiency of resource allocation and reducing the fraud opportunity is rooted in the best of many academic disciplines.

While there are core concepts that apply—e.g., criminology, supply chain management, packaging science, food authenticity testing, consumer behavior, and others—there is a need to provide an example of the application. The Food Fraud Prevention Cycle (FFPC) combines many basic concepts from a wide range of disciplines. This *interdisciplinary* approach is needed to combat the complex threat. Traditional research starts with one discipline and then focuses on the complex problem. Occasionally there are interdisciplinary teams that gather two or several

Fig. 3.2 Interdisciplinary considerations to address food fraud prevention: a range of academic disciplines that help to understand the fraud opportunity and implement a holistic and all-encompassing prevention strategy



single-discipline researchers. This research method would be to focus on the problem from the perspective of those disciplines. Counter to that “solution to the problem” focus, the MSU-FFI research started with “the problem outward.” A *multidisciplinary team* (experts from different disciplines) is different from an *interdisciplinary team* (colleagues whom each had expertise and experience in a broad range of fields including as corporate business managers) (Gray 2011).

The multidisciplinary team has a natural inclination to start with a specific type of technology and seeks possibly applications—“a solution looking for a problem.” The result of this research was to develop the Food Fraud Prevention Cycle which will be reviewed here. Later, another chapter will review the functionality and application of the cycle. The intent of this chapter is to provide background on the overall concepts and not to delve into the specific components of the cycle.

Sidebar: Can’t We Just Arrest All the Fraudsters? No. (MSU-FFI 2018)

Title: Can’t We Just Detect and Arrest Fraudsters? Sorry, But No.

By John Spink • October 3, 2013 • Blog (MSU-FFI 2018)

If we cannot arrest our way to food safety, can we rely only on authenticity testing and detection? Forget enforcement? Ignore investigation? Of course not... however, you cannot increase the safety of the food supply if you’re only running around chasing “bad guys” or just “trying to catch bad product.” Prevention is by far the most efficient policy. To focus on prevention before developing detection methods will provide insight into the precise technical detection needs. A focus on prevention can help Food Science and Food Authenticity research to be more efficient.

I recently guest-lectured for MSU Food Science and Human Nutrition professor Dr. Gale Strasburg's course FSC 455 FOOD AND NUTRITION. This is a class for mostly undergraduate seniors. Even though my guest lecture material covered content that isn't usually included on their tests, I usually find a pretty engaged audience. If the only thing accomplished is introducing food fraud prevention to the next wave of future industry leaders then it was time well spent. I'm even starting to get calls from the alumni as a result of my past guest lectures. The ideas are sticking and becoming part of the formal or informal curriculum.

When I presented to those MSU students – the food scientists and chemists – I went through my usual “detect, deter, and prevent” concepts. Our discussion led me to really focus on the connection between “detect” and “prevent,” skipping over “deter.”

To review, “detect” is like a security alarm sounding in your house, alerting you that there is a burglar inside. “Deter” is like the police arresting the burglar as he is breaking in (in Situational Crime Prevention and the Crime Triangle this is the “guardian” factor), or like bars on the inside of your windows (barriers or hurdles). Moreover, “prevent” is like having lights on, doors and windows locked, an alarm on, and a dog barking – the burglar now has no interest in breaking into your house. Clearly, you'd rather have the “bad guy” pass right by rather than break your window or be in your house!

For protecting food, we need to focus on the “detect” function – and we need to keep developing more precise and targeted tests and equipment. As we've covered before, there are a seemingly near-infinite number of types of fraud, and they keep evolving, so we need to keep evolving. The specification of the “detect” innovations must be determined by the ability to support the ultimate goal, which is the “prevent” function. After an incident is under control, the focus must first be on “prevent” before we take any other steps.

The “deter” component is also critical, however, I'd rather leave that dangerous function of engaging burglars to the brave and committed law enforcement professionals. Facing potentially dangerous or violent situations is way out of the scope of the curriculum for food science, packaging, supply chain management, or public health. Hopefully, with the increase in the “prevent” and “detect” efficiency, we decrease the need – and cost – of the “deter” function.

Whether you are a big or small company, a manufacturer or retailer, industry or government, just understanding the “detect” and “prevent” functions can help increase the efficiency of time and money.

Sidebar: Boring Ole' Prevention (MSU-FFI 2018)

Food Fraud Prevention – Not Exciting or Urgent, But Critical

By John Spink • May 8, 2013 • Blog

No one gets a trophy for implementing a preventative program. Acts of heroism are defined in crisis moments, not in a strategic, methodical development of a prevention plan. While that is understood, the adage “an ounce of prevention is worth a pound of cure” still holds true here. Combating food fraud is an effort that requires prevention. That prevention is most efficient within a coordinated, global public-private partnership.

The concept of governments and industry working together was a recurring topic during the Food Safety Summit held last week in Baltimore (2013 which as after the 2011 passing of the FSMA law and the 2016 implementation of the FSMA-PC final rule). As in previous events, this attracted a wide range of important regulators and the usual influential food safety members of the industry. Those leaders kept mentioning the goal of public-private partnership and the efficiency of a coordinated collaboration. “Collaboration” was a common theme from a wide range of regulators including in the town hall meeting by Michael Taylor (Deputy Commissioner for Foods, FDA) and Elisabeth Hagen (Undersecretary for Food Safety, USDA) and to the employees at the FDA Center for Food Safety and Applied Nutrition (CFSAN) booth.

The FDA speakers in the food fraud Session defined the overall agency objectives and the alignment with the Food Safety Modernization Act (FSMA). They stated, “The FDA’s goal is not to just identify violations but to help provide safe food.” They also discussed some of the shifting regulatory landscape in the US and abroad such as:

- National to Global
- Component View to System Perspective
- Adversarial to Collaborative
- Reactive to Proactive
- Compliance to Oversight

These all underscore the prevention focus and the partnerships with industry.

Industry echoed these themes, including in the Keynote Address by Will Daniels (SVP of Earthbound Farms... a rousing presentation as expected) and by Yves Rey (General Manager of Corporate Quality for Danone and the Chair of the Global Food Safety Initiative – GFSI). Regarding food fraud prevention, Yves stated that it’s the perfect time to take a prevention approach because the science is still under development. The fundamental concepts and work processes can be influenced and shaped here at the start of the development of the core concepts. As groups start implementing programs or setting

standards, it will be more difficult to change the industry-wide direction. A lack of leadership could end up with a disconnected, confusing, inefficient, and non-harmonized set of actions.

With the growing list of high profile food fraud incidents – melamine to horse meat to rat meat – others in governments and industry WILL have to get going. The governments and industry will be quickly implementing programs and countermeasures and control systems. As I mentioned in a previous blog post, the GFSI is addressing food fraud and is receiving insight from a Food Fraud Think Tank it created (I am one of the five core members). Yves also stated “GFSI decided to tackle the issue head-on,” and “food fraud has been defined by the [GFSI board] as a food safety issue.” (GFSI is an important stakeholder since most of the world’s food safety management systems that are implemented by industry are GFSI compliant.)

While responding to a food fraud incident requires a team of crisis managers, stakeholders are starting to focus on prevention. How to expand the focus from detection to deterrence to prevention, and the roles of each player in the public-private partnership, are still to be defined... well, to correct that, we *are* all defining it now. This is an unprecedented opportunity for you to participate in shaping public policy and industry best practices. Join with your industry groups, make sure to submit your comments to the FDA request for comments on Economically Motivated Adulteration, and become educated. MSU-FFI.

Key Learning Objective 2: Interdisciplinary Nature of Prevention

This section reviews the interdisciplinary nature of prevention by considering how the fraud opportunity is created and the many academic disciplines that help provide an understanding of the optimal countermeasures and control systems.

The key Learning Objectives of this section are:

- (1) Applying social science and criminology
- (2) Considering business and supply chain management and traceability
- (3) Exploring ways to engage packaging science in increasing the “hassle factor” for the fraudster and thus reducing the “fraud opportunity”

There is a saying:

Repeat after me – “Social Science is a real science.”

In a room of food scientists, there is often a chuckle and then the start of a lot of discussion about the scientific method, validating hypotheses with tests and measures, and general emphasis on the clear nature of testing for the presence or absence of a chemical. A follow-up statement of “if the biological organism in question were

a microbe we would go to the field of microbiology; now the biological organism in question is a human so we must go to Social Science and specifically Criminology.” The main focus is on crime prevention and Situational Crime Prevention. This is a well-research field. A recent Google Scholar search from 2000 to the present for the keyword “Situational Crime Prevention” resulted in over 10,000 results. This specific topic has been researched since the mid-1970s. When dealing with human adversaries, it is critical to engage social sciences.

Social Science and Criminology

“Social Science is a real science.” “Behavioral Science and Consumer Behavior are sciences.” These are hard for food scientists or analytical chemists to believe or understand. When confronted with a food fraud incident such as melamine in milk powder or horsemeat in beef, the food scientist response is to apply food science tools such as authenticity testing. While this is critical when intervening during a human health hazard outbreak where the culprit is an adulterant-substance, this is a reactionary approach that tangentially contributes to prevention. Of course, detection and authenticity testing will help prevent—catching fraudulent product is essential—but without a prevention strategy, the countermeasures and control systems will only *catch* bad product not *prevent* food fraud from occurring in the first place.

Sociopaths When dealing with fraudsters and criminals, “it is most efficient to remove morals and ethics from the equation.” It is inefficient to try to “shame” the fraudsters into not acting. First, to deal with “morals” is to focus from the human fraudster outward to prevent the criminal activity. When focusing on the fraudster, an important concept to review is the nature of sociopaths. Second, ethics are often defined by local custom or tradition. In addition, “ethics” can be situational where “stretching the rules” may be more acceptable or practiced in one situation versus another. It is most efficient to remove appealing to the ethics of the fraudster and to shift to reducing the opportunity to commit the fraud act successfully.

To consider situational ethics, for example, if a parent needs \$100,000 for a cancer treatment for their child, they may consider stretching a trusted relationship or even break the law. If a company is on the verge of bankruptcy that would lead to 100 employees to lose their jobs with no social safety net, the decision-makers may “relax” their “risk tolerance.” They may save money by not paying for preventive controls such as supplier verification or expensive food safety testing. While this may be illegal or unethical, there may be a situation where someone rationalizes and justifies their activity due to prioritizing a “higher morality.”

You Are A Habitual Law Breaker To approach the question from a different direction, how much over the speed limit do you drive on the highway? A response is sometimes “but I’ve never been pulled over,” “I’ve never been in an accident,” or “if the road is icy, then I slow down.” So, where does the actual speed limit fit into

the consideration? If you drive over the speed limit, you are breaking the law. Period. You justify your activity possibly because you've never been penalized. What are the decision-making criteria? Is it the risk of getting caught (by the police) or the cost of conducting the crime (of wrecking your car from reckless driving in dangerous conditions)? If you drive over the posted legal speed limit—especially if you do it on a regular basis or basically “constantly”—do you consider yourself unethical or immoral?

The most relevant social science discipline that applies to food fraud prevention is criminology which is the studies of crime and criminals. The core of food fraud prevention is to understand and address the “fraud opportunity.” Since the mid-1970s, there has been an expanded research effort to shift focus from punishment to prevention. Concepts that will be covered more in another chapter are the study of the “space” of crime to adjust the physical environment to reduce the opportunity for crime.

Sidebar: Considering Sociopaths Are Everywhere (Everywhere!)

It is important to study the behavioral sciences to understand the motivation. The general criminal traits will be reviewed later, and this section will explore the more general concept of sociopaths. From an article on the challenges of intellectual property enforcement in agricultural products (Spink 2011):

When dealing with responsible parties, the [legal and regulatory] process works. The system breaks down when dealing with fraudsters and counterfeiters who are, in the worst but unfortunately the very common case, criminals not concerned with breaking the law, sociopaths not concerned with cheating or demoralizing others, or uninformed and ignorant of risks inherent in the actions. Specifically, counterfeiters are often “irresponsible defendants” who hide or flee from prosecution and have laundered their assets out of reach of the courts. ‘Those [counterfeiters and diverters] who evade the laws do so with the expectation that they can reap substantial profits and the risk of incarceration—or even detection—is minimal. (Spink 2011)

A typical fraudster exhibits sociopathic tendencies by not being concerned about the feelings of others and does not worry about cheating society (APA 2000; Stout 2005). “*Sociopaths* exhibit asocial or antisocial behavior while a psychopath is characterized by the antisocial behaviors that manifest in aggressive behaviors” (APA 2000). The potential for harm—even physical harm—is not a concern or consideration. The American Psychological Association estimates that 1 out of 25 humans would be classified as having an “anti-social personality disorder” or labeled as a “sociopath.” Consider that statistic for a moment. While different social or professional organizations may attract different types of people, consider that of the 25 people around you that statistically, 1 has a full-blown “anti-social personality disorder” and could be psychologically labeled as a “sociopath.” (Actually upon further review this may not be surprising, and maybe some of the vulnerability reducing strategies may work in your personal life!)

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A sociopath is defined as someone who exhibits a “high level” of three of seven key traits:

1. Failure to conform to social norms
2. Deceitful, manipulateness
3. Impulsivity, failure to plan ahead
4. Irritability, aggressiveness
5. Reckless disregard for the safety of others
6. Consistent irresponsibility
7. Lack of remorse after having hurt, mistreated, or stolen from another person

There is a saying:

“Your best defense [against sociopaths] is to understand the nature of human predators” (Stout 2005).

The sociopaths are “satisfied” with their lives and are generally not concerned or cognizant of the feelings of others, so they do not seek and are not usually influenced by psychological treatment or messages. Sociopaths will not be shamed into compliance.

The focus on the fraud opportunity is to reduce the vulnerabilities, so this would change the target and thus be effective in changing the behavior of sociopaths. “To create a better world, we need to understand the nature of people who routinely act against the common good, and who do so with emotional impunity.” The sociopaths typically look for easy opportunities or targets, so creating barriers or “increasing the hassle factor” is a fundamental response—such as reducing the fraud opportunity. While all sociopaths are not the same, the physical space around the victim can be addressed systematically and universally. This target hardening and vulnerability reducing systems have been studied in the criminology theory of Situational Crime Prevention.

The next discipline to consider is the business function of supply chain management.

Key Management Disciplines

Supply Chain Management (SCM)

Another interdisciplinary consideration is supply chain transparency and traceability. The academic research field of supply chain management is covered more in another chapter—with over 100 global universities with Supply Chain Departments and many offering—traditionally focuses on controlling and optimizing legitimate product moving within an authorized network. Supply chain management includes

massive systems and networks that track and manage billions of global transactions almost simultaneously. The amount of “Big Data” is absolutely overwhelming unless it is managed by using statistical methods and data analytics.

That said, the food safety traceability systems are built upon trust and mutual need for quick and efficient product tracking and product recalls. The human fraudster *cannot* be trusted and may even use the traceability systems to comingle fraudulent product in the supply chain. For example, fraudulent, hacked, or cloned codes could be used to mask (e.g., to cover-up or hide the detection of) the fraudulent product. If hackers uploaded fraudulent codes, then legal databases would identify the hacked codes as genuine. Once the legal and illegal codes are comingled, it may be difficult or impossible to un-comingle the data set—since there would be no way to identify which code was genuine and which as fraudulent, every code could become considered “adulterated” and “unfit for commerce” per the Adulterated Foods Section of the Food, Drug, and Cosmetics Act (FDCA).

Understanding how the supply chain management and transparency activities could be vulnerable is important during the shift to focus on how to identify countermeasures and control systems that reduce the “fraud opportunity.” The supply chain management systems are already in place and functioning, so they have a critical and primary role in the Food Fraud Prevention Cycle.

Managerial Accounting and Enterprise Risk Management (ERM/COSO)

The concepts of managerial accounting and enterprise risk management are so important that they will be covered in specific chapters on Business Decision-Making, Risk Analysis Fundamentals, and Risk Analysis Application. Managerial accounting is the academic discipline of how entities such as companies or countries are managed and operate. Financial accounting is the discipline of how they report to investors such as stockholders, the Board of Directors, or financial investment institutions. The Enterprise Risk Management concept was a system developed to meet laws and regulations to serve both managerial and financial accounting.

Packaging Science

To leverage another discipline, it is also important to consider packaging components. Whether an authentication features such as a hologram or a traceability code on a label, these are important parts of the overall system (Spink 2012a, b). The academic research field of packaging science—includes approximately 10-degree-granting universities worldwide, specialties in other disciplines such as polymer science and food science, and a \$500 billion global industry—traditionally focuses on protecting the product from damage and supporting the on-package consumer communication. Part of that damage protection includes tamper-resistance/tamper-evidence (do not refer to “tamper-proof”—you don’t want to insinuate something

cannot be defeated), anti-theft, and anti-counterfeiting. Again, the fraudsters may use the packaging-related countermeasures and control systems as a way to infiltrate the legitimate supply chain. For example, used packages—including the security features or authentication codes—can be reused and refilled with the fraudulent product. This is the type of fraud defined as unauthorized refill or tampering.

Regarding the consideration of a countermeasure, if one aspirin is good then is five better? Is one hologram (or any packaging security product) good then is five better? It depends on the contribution of this countermeasure or control system for reducing the “fraud opportunity.” Many product security or anti-counterfeit strategies begin and end with packaging components. This is logical and initially efficient since the external package is what is seen in the marketplace. Regardless of the impact on reducing the “fraud opportunity,” a resource-allocation decision can externally show and demonstrate an immediately visible and “aesthetic” result. Adding the anti-counterfeit features is overt and visible. These are very valuable countermeasures and control systems as long as they are considered in relation to the overall fraud opportunity and prevention.

A brand owner or manufacturer may focus on protecting their finished goods or consumer packaging, but there are also opportunities for incoming goods or raw materials. By reviewing the overall fraud opportunity, for all types of fraud, there may be a risk of tampering or unauthorized refill of bulk packaging. By taking a holistic approach, all these vulnerabilities are considered in relation to all possible countermeasures and control systems. By considering the overall fraud opportunity, innovative and synergistic benefits can be achieved such as a packaging component could be combined with a supply chain tracking feature then make sure to include a criminology focus to understand how fraudsters perceive the changing fraud opportunity. This interdisciplinary approach can provide an innovative countermeasure and control system that is very simple and yet very effective at reducing the “fraud opportunity.”

Sidebar: Packaging Countermeasures—Multipurpose Components

Expanding on the idea of multipurpose activities, when the holistic fraud opportunity is considered, often incremental adjustments can have a significant impact. For example, the holistic fraud opportunity may define additional countermeasures and control systems that support resource-allocation decision-making. For example, a shrink band between a cap and bottle provides a tamper-evident and tamper-resistant value. The materials and operations costs of applying the feature have been already justified and implemented. If diversion or counterfeiting is a concern, then a microtaggant or security printing can be added to the shrink band. The additional countermeasure does not require a new packaging component since it is added to the current shrink band and there are no additional operations needed to apply the component. The band could be preprinted, so no additional manufacturing operations step. This is an example of the value of considering all types of fraud within the scope of the Food Fraud Prevention Strategy.

From ISO 12931, specific types of anti-counterfeiting countermeasures apply to authentication and traceability which are overt, covert, and forensic:

- **Overt:** “authentication element which is detectable and verifiable by one or more of the human senses without resource to a tool (other than everyday tools which correct imperfect human senses, such as spectacles or hearing aids)” (ISO 2011).
- **Covert:** “authentication element which is hidden from the human senses, utilizes the use of a tool by an informed person, reveals it to their senses or else allows automated interpretation of the element” (ISO 2011).
- **Forensic:** “scientific methodology for authenticating material goods by confirming an authentication element or an intrinsic attribute through the use of specialised equipment by a skilled expert with special knowledge” (ISO 2011).

Sidebar: Package Uplabeling—Using a Unique Lid Stock or Unique Cap

Unauthorized or illegal labeling of a packaged product is a unique fraud opportunity, and an example provides insight into the risk and possible countermeasures. An example of considering the overall fraud opportunity is to combat labeling fraud. A single package style (e.g., 8 ounce, polyethylene bottle, polypropylene cap, with paper label and inner seal over the opening) may be used for several types of products such as a medicine with 10%, 50%, and 80% strengths. A fraud opportunity exists where the fraudster could purchase the less expensive 10% strength product then creates a counterfeit label stating the 80% strength. If that counterfeit label is applied to the lower strength and lower priced genuine product, that is called labeling. The fraudster could buy the lower priced product, label it, and then sell it for the higher price of the 80% strength product.

For that uplabeled product, there will be a lower fraudulent business opportunity—ability to sell fewer products at the highest price—if they cannot infiltrate into the legitimate supply chain. That does not mean an individual fraudster is not motivated and that they will not seek other opportunities. If the low strength product has a retail price of \$1 per bottle and the 80% strength is \$5 per bottle then—combined with the potentially low threat of detection and prosecution—this could be a profitable enterprise. The number of fraudulent transactions could be increased if the product is sold online on a peer-to-peer website or auction website. There are examples of individual fraudsters conducting hundreds or thousands of transactions. The \$5 per unit fraud turns into \$500 or \$5000.

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A way to reduce the fraud opportunity is to add another countermeasure that differentiates the product strengths. For example, different colors of inner lid stock or the color of the cap could be changed for the different strength products. Also, to further reduce the fraud opportunity for the fraudster would be to use a “proprietary cap” that is harder to replicate (a “proprietary” packaging component would be produced for just the one company whereas a stock cap would be sold publically). If the cap is transparent, then the inner lid stock could be visible to an investigator or consumer and even if a buyer just asks for a photo of the package before making a sale. Presumably, the outer cap would be easier to dupe than the inner seal.

An interdisciplinary approach would consider how the consumer is deceived which is the criminology concept of victimization. When looking for a product online, the websites often use stock photos of the branded product. Also, a fraudster could take one picture of the genuine product and post that single image hundreds of times when representing the counterfeit product. At this point, it may seem there is no hope to reduce the fraud opportunity, but stress inspires innovation. “Necessity is the mother of invention.” This extra challenge can lead to a rational, practical, and pragmatic approach that builds upon all these “givens” and deals with reducing the overall “fraud opportunity.”

A key need that can be addressed by packaging components is to help an investigator identify counterfeit products. If the investigator can physically assess the product—such as at retail—then the lid and cap can be assessed. This does not seem possible online. However, the investigator could ask the online seller to provide a picture of the product next to a current newspaper. The investigator can now visually inspect that product and also compare that to what would be received in a “buy.” There is an incremental cost of the investigator interacting with the online seller, and the reduced fraud opportunity is potentially significant. This is an example of considering many disciplines to reduce the fraud opportunity.

Packaging Component Shortcomings: A Complex Scenario

From the article “Fade to Black” by Liang (2006) (emphasis added) (Liang 2006):

“In almost every case, the technology, be it a hologram, tamper proof labels, embossing, thermo-reactive ink, RFID tags, DNA markers, and the like, enable companies to track cardboard, not product. In the United States and in the European Union, the two largest pharmaceutical markets in the world, repackaging is legal; thus, without violation of any law, packaging, with all types of expensive, state of the art secure devices, can end up in the trash or worse, in the hands of a counterfeiter, while genuine product is legally distributed in packaging with no security features.”

“Counterfeiters generally deal, not only with the counterfeit product, but with diverted, expired, and stolen product as well. Envision the scenario where:

- A counterfeiter steals the product,
- Removes genuine product from the "secure packages," and then
- Puts the counterfeit product in these packages, and then reinserts the counterfeit product back into the system.

The counterfeit product would pass through all the readers successfully. What then happens to the genuine product? The irony is that the genuine product would most likely be repackaged in counterfeit packaging with unreadable tags and entered into the distribution system. *If the RFID system works correctly, the genuine product would be kicked out of the system, but later determined to be genuine, undermining any confidence in the system”* (Liang 2006).

Sidebar: Parallel Trade and Importation

Continuing from the “Fade to Black” article, Liang expands to address parallel trade and importation (Liang 2006):

“Parallel Trade Enablers and Risks:

“Although counterfeit/gray market problems are not well known in the United States, they are throughout the rest of the world. International drug counterfeiting difficulties are due in part to problems with parallel trade, i.e., international drug importation in Europe and other countries around the world. Through parallel trade, drugs may pass through many different countries and scrupulous and unscrupulous sellers’ hands before ending up in a pharmacy. The incentive to engage in this practice is attributable in part to differences in medicine pricing amongst European countries and is permitted in the EU under Article 28 of the European Commission Treaty for the Free Movement of Goods and Services within the Internal Market of the EU countries. This principle of free movement mandates that no country within the EU may place legal, legislative, or other barriers preventing trade between members, *nor may an owner of a trademark use its rights to prevent repackaging* of the medicinal product if the repackaging will not adversely affect the original condition of the product” (Liang 2006).

“There have been significant issues of counterfeits in Europe both domestically and across international lines relating to parallel trade. Unfortunately, examples abound. *The UK recently uncovered one of the largest counterfeiting operations ever discovered, which was churning out 500,000 tablets of counterfeit drugs daily, and which disseminated those products through parallel trade means across Europe.* It is interesting to note that in the UK, like the US and Latin America, penalties are light. Allen Valentine, the mastermind of the UK counterfeit ring, who had been convicted on 14 previous occasions on charges of medication fraud, only received 5.5 years imprisonment and the sentence was due to his copyright infringement, not his threat to public health. He is eligible for release in two years.”

Usually, parallel trade, diversion, and the gray market product is a legitimate product that is safely traded across borders. As was demonstrated in this section, diversion demonstrates a system weakness or vulnerability that could be—and is—exploited by counterfeiters and fraudsters.

Food Science and Food Authenticity Testing

Food authenticity testing will probably always be the most complex and scientifically challenging aspect of food fraud prevention. A food product is not a synthetic chemical that is sold in a homogeneous state such as 99.99% pure. Food is subject to so many variables during the processes of growing, harvesting, processing, packaging, storing, distribution, and then during the final consumption and even disposal (farm to fork or farm to flush). There are so many variables in the food ingredient, and the final chemical composition is even impacted by fluctuations in humidity, temperature, amount of sunshine, or rain. An example of this variation is that orange juice has very different general product profiles depending on if the product is grown in Florida, California, or Brazil. All are genuine orange juice. They are not all genuine Florida orange juice. Another factor is whether the product is not-from-concentrate or concentrated. Then there is the more common fraud opportunity of adding synthetic flavors or diluting with added sugar.

A critical *detect* role is that, of course during an active incident, there is an urgent and immediate need to identify the root cause of the problem especially if there is acute public health harm. The medical sciences work with public health sciences to identify the root cause and then food science, and food authenticity testing is engaged to find a way to detect the problem. For example, during the melamine incident, after melamine was identified as the problem, there was an urgent need to identify a detection test and appropriate test method and then enough testing capacity to meet the need. For the melamine incident, there was even a basic medical and public health question of an acceptable threshold for melamine—in reality, there is not a “zero tolerance” but an Appropriate Level of Protection (ALOP) that is based on a threshold of detection (TOD), a threshold of regulation (TOR), and threshold of concern (TOC—or threshold of toxicological concern TTC or TTOC) (ILSI 2000; CFSAN 2005; EFSA 2015; HC 2016). Per Codex “This concept may otherwise be referred to as the ‘acceptable level of risk’” (CODEX 2003). Also, “An importing country has the right to set a level of sanitary protection it deems appropriate in relation to the protection of human life and health. The ALOP may be expressed in qualitative or quantitative terms” (CODEX 2003).

A critical *deter* role is to put a testing plan in place that identifies further problems from that specific incident.

The most important *prevent* role is to build upon the understanding of the root cause that is used in evaluating the vulnerability assessment that defines the key problems and unacceptable risks in a Food Fraud Prevention Strategy. That strategy would identify the countermeasures and control systems that would most efficiently and effectively address first the problems that were above the risk tolerance. Considering criminology and crime prevention, such as using Hot Product/Hot Spot Analysis, a very precise and specific test and testing plan can be identified, developed if needed, implemented, and then monitored (Lam and Spink 2018; Spink 2019).

Other Important Fields: Law, Accounting, Information Technology, and Others

There are many concepts that are critical and addressed below later in the Food Fraud Prevention Strategy.

- **Laws and Regulations:** The laws, themselves, are critical to establishing what is illegal and the details of compliance.
- **Laws and Courts:** The law system and the judiciary are critical to providing a criminal, civil, and regulatory penalty that is both a general deterrence but also in place to confront the most brazen and bold criminals.
- **Accounting—financial accounting (expanding on managerial accounting):** The communication to the investors and regulators is critical to both support confident investment but also establish common auditable practices.
- **Accounting—forensic accounting and forensic audit:** Beyond the concepts of managing a company or presenting information for external investors, there are separate functions of forensic accounting that includes systems to continually monitor for problems as well as a forensic audit that addresses the investigation of specific questions.
- **Information Technology (IT):** This is a very broad field that includes the internal communications and reporting as well as all external transactions.
- **Consumer behavior:** The focus on the full range of consumer to first understand why they act, to understand why they often inadvertently make dangerous decisions, and to finally be able to change their behaviors.
- **Psychology/Business Anthropology (of buyers, brand protection managers, investigators, and others):** Beyond consumer behavior, the psychology of stakeholders is important to understand the underlying principles or habits that shape behaviors.
- **Risk Analysis and Risk Management:** This is the application of managerial and financial accounting needs and includes decision sciences before providing a methodical and systematic approach to evaluating and managing the problems of an enterprise.
- **Decision Sciences:** This is an applied focus on how decisions are made beyond statistics or analytical analysis to the support, feedback, and reinforcement of behaviors.
- **Political Science:** The world operates within government and agency control mechanisms both for the basic rules for a civil society but also for a geopolitical balance of resources and power.
- **Public Policy:** The study of how government policies are developed and changed over time.
- **Public Administration:** The management of the government and agencies is based on legal statutory guidelines and boundaries while based on common basic practices.

- **Public Health:** While healthcare focuses on the individual, this focuses on the population-wide issues and programs.
- **Medical/Veterinary/Nursing:** When considering the health of individuals, the medical professionals are the front line in detection and response to public health harms.
- *And others...*

While the list of disciplines could go on, the important point is that there are many disciplines that play a critical role in food fraud prevention. To implement the most efficient and effective, holistic, and all-encompassing strategy, it is important to start with a broad base foundation.

Key Learning Objective 3: Understand the Prevention Concept

This section reviews several concepts that are important to shape the prevention strategies. These are underlying theories that support the value of focusing on vulnerability and the fraud opportunity.

The key Learning Objectives of this section are:

- (1) The Food Protection Plan is a cycle of prevention, intervention, and response.
- (2) Strategies and tactics are two key types of responses.
- (3) The overall system is considered to implement countermeasures and control systems.

Food Protection Plan: Prevention, Intervention, and Response

When confronted with a new challenge, it is human nature to try to classify the unknown in previously known terms and then to apply familiar and currently applied risk treatments.

For food scientists or analytical chemists, the application is that if there is a problem, it should be solved with testing and detection. When melamine was found to be the source of the food safety outbreak, traditional food safety systems led to the intervention.

A saying is that:

If you are a hammer (food scientist) everything looks like a nail (food science problem).

Following the FDA Food Protection Plan concept, the first crisis step was “intervention”—to identify the hazard and find a detection method (Fig. 3.3) (FDA 2007, 2008). Focusing on an immediate, direct, and tactical response to “intervention” is absolutely critical and proper during a crisis. The next step was “response”—to find ways to remove the hazard from the supply chain quickly. The food safety system would be the key stakeholder to respond to a food safety hazard including analysis

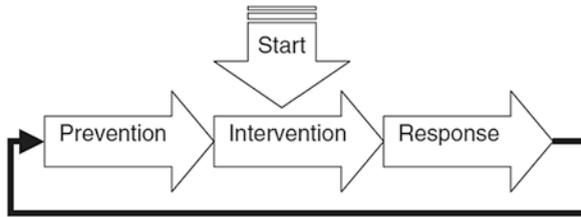


Fig. 3.3 Food Protection Plan series of activities: prevention-intervention-response (PIR) with the starting point after an incident at intervention. (Copyright Permission Granted) (Spink and Moyer 2011)

of the seriousness of the hazard, finding the product, and removing it from the supply chain. A key to reducing the acute health hazard was a quick response and to be reactive. Once the crisis is passed, then there is a cycle back to prevention.

Consider Strategies First and then Review Tactics

If there is a known incident, then there is an urgent need to act immediately—to do something. If not then don't start by just acting. Have a plan, a diagnosis of the problem, an understanding of the root cause, and a consideration of the resource-allocation decision-making options and limitations, and then consider the countermeasures. This set of steps is based on having a strategy before selecting tactics.

If food safety prevention concepts were implemented before the development of a Food Fraud Prevention Strategy (e.g., after finding melamine in the product to then only implement melamine testing of incoming raw materials), the countermeasures activities would still be “tactical” not “strategic” and possibly not reduce the vulnerability (the system weakness may not be for incoming raw materials). The management of the activities is “operational.” The focus would naturally *not* be on the fraud opportunity or the overall VACCP plan (see below for more on strategic, tactical, and operational).

- **Strategic action:** addressing an overall problem and then to prevention. Webster's Dictionary includes one definition as: “of great importance within an integrated whole or to a planned effect” (Merriam-Webster 2004).
- **Tactical action:** after “detection” then a specific countermeasure for a specific problem which would be “deterrence.” Webster's Dictionary includes one definition as: “made or carried out with only a limited or immediate end in view” (Merriam-Webster 2004).
- **Operational action:** the effort to apply the strategic or tactical plan.

To review the strategic and tactical concepts in more detail, there are specific definitions of the terms and standards for their adoption. These concepts are not defined directly in the quality management standards (e.g., ISO 9000 Quality Management) but have been codified elsewhere (such as ISO/IEC TR 33014:2013 deals with process improvement on three levels) (ISO 2013).

- **Strategic:** what goals to achieve, the motivation and direction.
- **Tactical:** how to achieve the goals of process improvement.
- **Operational:** how to perform the process improvement.

Also, from ISO 24516: 2017 (ISO 2016):

- **Strategic plan:** “plan containing the long-term goals and strategies of an organization; Note 1 to entry: Strategic plans have a strong external focus, cover major portions of the organization and identify major targets, actions and resource allocations relating to the long-term survival, value and adoption to ongoing changes of an organization.”
- **Tactical plan:** “prioritization in the medium term on the basis of influencing factors/indicators on performance, costs, risk and failure probability and scale of failure, including general determination; EXAMPLE 1: Indicators of damage probability can be age, usage, and damage; EXAMPLE 2: Indicators for the magnitude of failures can be hydraulic importance and vulnerable infrastructures; EXAMPLE 3: General determinations can be technology of rehabilitation and material.”
- **Operational plan:** “implementation of rehabilitation measures (short-term planning).”

Tactics are, by nature, reactive and can be very efficient if they are selected to support a strategy. For example, a food safety “Early Warning System” is usually a “tactic” to support the food safety “strategy” of rapid detection and response to known hazards (for more detail, see later review of Early Warning Systems). Other Food Safety Management System actions focus on prevention of the hazard in the first place. Thus, a traditional food safety “Early Warning System” by itself is not food fraud prevention but rather “rapid, rapid detection.”

To develop tactics (e.g., “just start doing something” or “we need some data” or “it must be good to improve the test method for this adulterant-substance”) before understanding the overall strategy is usually inefficient at best and dangerous at worst. If the typical fraud occurs at 1%, then a detection test at 10 parts per million is not needed. If there are a seemingly near an infinite number of fraudsters, then arresting 100 or 1000 bad guys probably do not reduce the fraud opportunity. Without considering the overall needs and the entire system, there may be gaps in the tactics that produce a new critical flaw that may lead to an even bigger fraud opportunity.

It is critical to consider how all the concepts connect together in the Food Fraud Prevention Cycle (FFPC)—and applying the concepts to a specific situation or system—to understand everything that needs to be covered and how much data or intelligence is needed to make resource-allocation decisions, and to consider how the system will be sustainable. Everything should be connected and calibrated to everything else. To consider the holistic and all-encompassing strategy *before* implementing programs provides an opportunity to identify unmet needs or gaps. If everything is *not* connected to everything, then the process and assessment are static and not dynamic—it does not actually re-calibrate and becomes out of date almost immediately.

Sidebar: Shift to a Prevention Focus

Food fraud prevention is similar to other food safety management concepts such as Hazard Analysis and Critical Control Point plan (HACCP) and the broader business quality management concepts such as Total Quality Management (TQM) or Six Sigma (“6S”). While both HACCP and quality management faced resistance when first implemented, they are widely accepted and understood. Quality is not only part of the corporate culture but even is often now a core company value.

Considering the quality management commitment, the core philosophies of the control systems are fundamentally similar to other food safety programs. The same concepts are the idea of identifying hazards, determining critical control points that should be monitored, and then a process to make sure the countermeasures and control systems are implemented. When developing and then implementing a new system, for getting buy-in and speed understanding, it is effective to start with a known concept to explain the value to the resource-allocation decision-makers. Food fraud starts with the highly regarded and familiar HACCP concepts and then refines the process to apply to the vulnerability uniquely. For food fraud prevention, the concept has been a “Vulnerability Assessment and Critical Control Point plan” or “VACCP” (GFSI FFFT 2013; GFSI 2016; FSSC 2018). Addressing food fraud in VACCP is identified as different as addressing food safety (HACCP) but yet utilizing very similar methods and systems. Food defense—an intentional act with the intent to inflict a health hazard, economic or psychological terror—often is considered a “threat” so the concept is “Threat Assessments and Critical Control Point plan” or “TACCP.” This philosophy creates an overarching set of concepts, but that identifies very different control and management activities.

When considering food fraud prevention—not just identifying human health hazards and implementing critical control points to monitor for an adulterant-substance like melamine or horsemeat—the countermeasures and control systems are fundamentally different than for addressing food quality, food safety, or food defense.

An Early Warning System as Prevention for Melamine Fraud? ...or Rapid, Rapid Detection of an Illness?

After the original melamine food fraud incident in milk powder and then in pet food, there was a sense that the food safety system “worked” and was proactive. These were intervention and response. After thinking about this, the trigger for the “Early Warning System” to look for melamine was the illness and death. So, there was a *rapid alert* that there was a problem which was an *early warning* of a food safety incident not a warning of a new vulnerability that rose to the level of now being a *hazard that requires a preventive control*.

To be fair to the food safety legacy systems, it is essential to define the scope and fit for purpose of the “Early Warning System.” Many systems were implemented to detect a chemical contaminant or pathogen that naturally occurs in the product. These systems were not originally designed or intended to monitor other activities such as food fraud or food defense attacks. The great opportunity is that an Early Warning System tracking and response system is already in place and functioning. There is an efficiency in integrating food fraud prevention activities into the current functional system.

An Early Warning System is critical to the rapid detection of all health hazard or fraudulent activity. To be efficient, a Food Fraud Prevention Strategy should inform the Early Warning System to know what to look for. Moreover, to actually lead to prevention of the fraud act, the fraudsters must know the prevention system is in place. Fraudsters just need to know that the supply chain monitoring is in place for “melamine”—and whatever else might be a concern—to dissuade the fraudulent act.

In Fig. 3.4, there are separate determinations or threshold of “unacceptable risks” for food quality, food safety, food fraud, and food defense. If a single threshold and general response were defined—such as a reported illness in a government product recall alert—the model would be an “ill-fitting tool.” For example, the US FDA CARVER+Shock food defense assessment system has a factor that prioritizes the “shock” of an incident. While addressing package tampering is critical, based on this assessment system, the 1986 Tylenol tampering incident that changed the entire US packaging laws would not have been prioritized. The “shock” would have been a low rank of 1 or 2 out of 10 points on the CARVER+Shock scale, and thus other higher ranking threats would have been clearly prioritized. Even after the incident occurred, the statistics and data on the Tylenol incident would still be prioritized in the CARVER+Shock scale as very low.

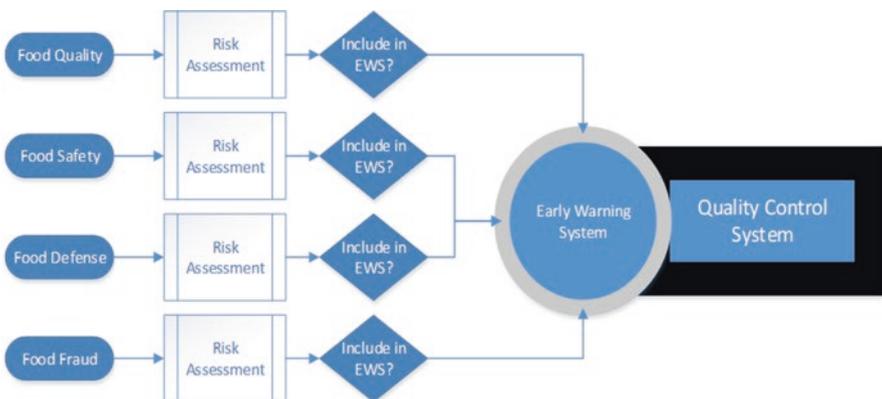


Fig. 3.4 Contaminant Early Warning System structure of multiple types of risks and implementation in a quality control system

With this organizational structure, the food safety Early Warning System methods and procedures can be utilized to address multiple types of risks. The food safety Early Warning System then broadens to really becoming a food quality Early Warning System.

Optimize the Countermeasure and Control System

Once the Food Fraud Prevention Strategy is in place and countermeasures and control systems are selected, it is crucial first to create a vision of the goal. At the very start of the process, it is important to consider “what are we really trying to do?” There are many ways to dissuade the fraudsters from acting. Before jumping to complex or expensive risk treatments, consider all your options. Review the countermeasure and control strategies in relation to your Food Fraud Vulnerability Assessment and on your corporate risk map. There are some situations where you may become aware of more incidents, but they don’t fundamentally shift your fraud opportunity. For example, the increased fraud opportunity does not shift the result above the “risk appetite.”

Also, before selecting new countermeasures and control systems—and after reviewing “what are we really trying to do?”—it is wise to review other testing, audits, or monitoring conducted by your company. There may already be subscriptions or processes in place that you can leverage and use.

Once you have identified a vulnerability that is above the “risk appetite” (unacceptable), you can use the Food Fraud Prevention Strategy Cycle (FFPC) to consider countermeasures and control systems. The range of countermeasures and control systems should be evaluated on a corporate risk map.

The Food Fraud Prevention Strategy (FFPS) is a self-correcting process that dynamically calibrates the fraud opportunity in relation to the goal to at least stay just within the risk appetite. As the fraud opportunity rises or lowers, it is compared to the evolving risk appetite. If the fraud opportunity drops, then there is a methodical recommendation that countermeasures and control systems could be reduced. Without a lot of evidence and enterprise support, a manager moving into a new position would never reduce the countermeasures that are already in place—if after that countermeasure was eliminated an incident did occur, that new manager could be held accountable for weakening the position of the corporation.

The most important part of the process here is that there are analytical, resource-allocation decision-maker-based assessments. Decreasing the countermeasures and control systems can be judged without bias or opinion. The process provides a rational justification for the decisions.

Engaging the corporate risk map places the risk appetite threshold decision where it should be which is at the CEO/CFO. The CEO/CFO is held accountable by the Board of Directors to keep the business operating below that risk appetite. The Board of Directors is the proxy for the owners and shareholders. All of these leaders

must report the risk management process in financial securities regulatory documents such as a “10-k form” that is part of the annual report. Not addressing these risks—or not reporting them—can lead to personal criminal liability.

Sidebar: A Supplier Credit Rating as a Proxy for Financial Duress

This may seem completely obvious, but credit ratings that are already monitored by every company’s credit department are an excellent way to gain insight on *every* supplier continually and very accurately. Potential fraudster companies—or owners and managers—do not all of a sudden shift from being financially secure to under duress. Unless there is an extenuating circumstance or a specific incident, for most situations, the company slips gradually.

During a project, there was a question about evaluating the fraud opportunity by conducting a judgment of the supplier “being under financial duress” or the owner “living beyond their means.” These are important root causes for someone to be tempted to commit fraud. From a practical perspective, how would you, your headquarter-based purchasing managers, your auditors, or supplier relationship managers evaluate this factor? Would you investigate your suppliers? What would trigger an investigation? How much would it cost to conduct an effective lifestyle evaluation across town or halfway around the world? What is “living above your means?” In one country is having two cows considered wealthy? What about owning a race car? If a fraudster is smart, they would not drive a Ferrari to their manufacturing plant but would pretend to be personally fiscally responsible and drive an old car.

Thus, the goal is to have some type of automated, data, and fact-based system to watch for triggers that might suggest an increasing vulnerability. Ideally, to tip you off of potential problems, this would be a currently produced streaming data that you can have automatically monitored. As we said, companies do not usually have an immediate shift in identifying new financial duress. Thus it would be an excellent countermeasure and control system to monitor something.

A company’s credit department already has the systems in place to monitor the credit rating of customers (accounts receivables) and maybe also already suppliers (accounts payable). So, an alert could be created to signal some type of countermeasure when a supplier slips. For example, if they slip from the Dun & Bradstreet creditworthiness rating of AAA rating to AA (of the range from a high of AAAAA to a low of HH (Dunn and Bradstreet 2018), there could be an automated request to confirm some aspect of their supply chain. As long as there is a follow-up to confirm their response, “they know you’re looking.” If the supplier slips, again and again, there could be another more detailed request such as requiring that the supplier send copies of food safety tests or audits. If the supplier passes below a threshold, they could trigger routine on-site food safety audit. This is an audit you would be doing anyway, but this could just speed up that cycle.

If this credit monitoring system were to be put in place—even if the control system was just an automatically produced email request for some response—then the fraud opportunity is reduced since, if that supplier feels pressure and is tempted to commit fraud, they will perceive you are a lower fraud opportunity than other companies who are not asking. They will remember that you’ve been very diligent, engaged, and monitoring many aspects of the business. The fraud opportunity will be reduced since they will perceive they may get caught if they attack your company.

A burglar who is carousing your neighborhood to scout crime opportunities (a “motivated attacker” seeking a “crime opportunity”) is not usually trying to specifically break into your house. If your house has all the lights on and your neighbor’s house is dark... the fraud opportunity is at your neighbor’s house.

Personal Insight: Example of Starting a New Strategic Initiative—Sustainability, Quality... Food Fraud?

When a corporation takes on a new initiative, there is often little awareness by the general employees of why this effort was chosen and why this one and not another focus area. There is often an acceptance that “this makes sense” (or the contrary that it is “flavor of the month”) but little insight on the enterprise-wide motivations. There cannot be ten “top-3” initiatives. In reality, a Board of Directors and C-Suite review enterprise-wide risks for the short- and long-term. They then consider how their enterprise may reduce the negative impact. Along the way, creating a benefit is also the goal. The start of the Wal-mart sustainability effort provides an interesting case study (Note: I was fortunate to be the Michigan State University School of Packaging representative to the Wal-mart Packaging Sustainable Value Network (PKG-SVN) for the second to the fifteenth meeting).

Wal-mart was an early adopter of corporate sustainability initiatives. In 2005, their CEO Lee Scott presented his “21st Century Leadership” speech (Scott 2005). This was the proclamation that Wal-mart would fully embrace and engage in environmental sustainability. He mentioned the main reasons were:

- (1) Merchandising: have the products on the shelves that customers want
- (2) Control costs: predicting that raw materials such as electricity or truck fuel prices would increase, so the efficient use of energy would be important
- (3) Attract and retain employees: corporations faced hiring challenges, and there had been efforts to put in place, and support, innovative programs

None of these were a change or contrary to the Wal-mart Value Statement or culture of taking care of the customer under a motto of “everyday value.”

Fast forward to 2018 and “sustainability” is a common and accepted—even critical or mandatory—corporate initiative to the point of being core to a culture. The original response of suppliers to Wal-mart initiatives was to embrace sustainability

just to sustain or grow sales. Along the way, companies refined their programs to support good business growth for new “green” products that customers were seeking, controlling costs, or positioning their corporations to look good for the investment community.

Environmental sustainability initiatives were not always a “no-brainer.” At the very start, a Board of Directors—such as possibly Wal-mart—would have reviewed long-term threats to their enterprise. Futurists help envision what could be, what might be, and how to position for reducing risk and increasing the chance of success. For the 100s of possible initiatives, Wal-mart picked sustainability. The Wal-mart senior decision-makers decided where and how to direct and financially support their employees to strongly position the company in the short- and long-term. This type of awareness of typical Board-level review and decision-making is not well understood even by those who work at a company. Many employees just believe that “no-brainer” initiatives such as sustainability—or others such as quality, safety, food safety, and others—just “make sense,” so they just naturally become part of the culture.

Before sustainability, in the late 1980s and early 1990s, there was an earlier trend to implement quality management programs. While an employee for almost 12 years at Chevron Corporation, I experienced a wave of initiatives that had ended up being core to the Chevron culture and success such as quality (e.g., before Six Sigma there was Deming and then Crosby), safety, diversity, and sustainability. Over time these “new” initiatives became ingrained in the everyday practices or “culture.” When we had positive experiences—or the business kept growing—the efforts became even more valued.

While there are frontline compliance requirements such as by GFSI, the concept of food fraud prevention is at the very start of the corporate-level implementation process as well. There are many competing enterprise-wide priorities, and there is a need to conduct this very high-level assessment to help the enterprise consider how to best address this vulnerability. Over time there will be a calibration of “how much is enough” based on risk and reward. The Food Fraud Prevention Strategy helps connect the vulnerability to the corporate risk map to provide that high-level perspective. Using ERM/COSO, a food fraud incident can be effectively and efficiently compared to all other risks, vulnerabilities, or threats. In this integrated system, all risks can be compared to all other risks. There can be a real assessment of this new problem above the “risk tolerance” and of what countermeasure specification reduces the problem to within that threshold.

Sidebar: Food Fraud Strategy—Managing Diabetes Not Fixing a Broken Leg

An important concept is that addressing food fraud is not like fixing a broken leg where one intervention can “solve” the problem. Food fraud must be “managed.” It is essential to set the expectation or philosophy of managing food fraud which is more like managing diabetes than fixing a broken leg. For treating diabetes, the patient may look fine right now but without care could become very sick very quickly.

There has been feedback from anti-counterfeit or brand protection managers who have been gun-shy to approach their resource-allocation decision-makers to ask for more money since they are asked “We’ve been giving you millions of dollars each year... so why haven’t you solved this?” The problem here is that the countermeasures and control systems were positioned as “solutions” not “ongoing management”—a “solution” is expected to “solve” the problem. When you “solve” a problem, there is an expectation it no longer exists.

The vulnerability will continue to evolve, so the first step in the treatment is to create a methodical monitoring and continuous improvement process, program, or system. The second step is to assess risk treatments and implement effective countermeasures and control systems. Finally, there should be agreements on the success metrics. The goal is not to “catch” “more” bad product or to arrest “more” criminals; the goal is to “prevent” the incident from occurring in the first place. However, this is prevention, so success is not only measured by the “nonconformities,” which in these cases are food fraud incidents. As with a diabetes patient, we should be monitoring that the patient is still alive, but there are other indicators of success or well-being. For food, we would call this a product recall. The diabetes patient has other factors that indicate the process is under control such as blood glucose monitoring, exercise, a healthy diet, and other indicators.

In a food safety management system such as HACCP, this would be referred to as “Critical Control Points.” A proactive and sound patient treatment plan—as with a quality management system—identifies the root causes of the nonconformance, reduces out of control activities, and then monitors key aspects of that critical control point that are being addressed. For food safety, this would be a HACCP that monitors the temperature of a refrigerator (e.g., the temperature, that it has stayed even and that the monitoring system is stable). For food fraud prevention, this would be a Vulnerability Assessment and Critical Control Point plan (VACCP) that monitors the variation in non-targeted tests such as to see if there are any “unexpected” but not yet “suspicious” results.

The Food Fraud Prevention Cycle is an overall monitoring system to connect specific monitoring activities. The crucial point is that all systems are connected and calibrated to interact with all the other systems. The objective is to “connect everything to everything.” Without this integrated system, there really are no internal controls and no integrated framework to monitor, assess, and implement the strategy. Without the cycle then resource-allocation decisions are guesses. From the COSO report “Risk Assessment in Practice” (COSO 2012):

- “Without a standard of comparison, it’s simply not possible to compare and aggregate risks across the organization.
- “Risk aggregation models are extremely variable from one enterprise to another, even within the financial services industry.”

Sidebar: The Trophy Remains Elusive—How to Define Success? (MSU-FFI 2018)

By John Spink • August 22, 2013 • Blog

Melamine, horsemeat, rat meat, Sudan red carcinogen colorant... we understand food fraud is an issue, but how big of an impact does it make? How do we define the risk or vulnerability? Moreover, probably more importantly... how do we define progress or “success”? The presenters in the Economic Adulteration (Food Fraud/ Economically Motivated Adulteration) sessions at the IFT 2013 conference framed these questions... and set the direction to find the answers.

This year’s IFT conference was held at McCormick Place in Chicago from July 11 to 17. It was reported that over 23,000 people attended. I presented three food fraud, packaging, and food defense sections in the HACCP certification pre-conference workshop. I was also a part of the MSU Online Master of Science in food safety exhibitor team and attended several educational sessions related to my research. Two sessions focused on Economically Motivated Adulteration (EMA), which included many mentions of food fraud (FF).

IFT is focused on food science and technology for ingredients, so it was logical for the conference to include a session on the adulterant-substances and the adulteration aspects of the food vulnerability. IFT and these presenters have been increasingly covering the economically motivated adulteration issues.

The first EMA session was on “Strategies and Technology to Prevent/ Detect Economic Adulteration of Food.” The presentations focused on test methods to detect EMA. The increased ability to detect product that has been adulterated will provide another, better weapon in the countermeasure arsenal. The presentations reviewed techniques to increase detection, not prevention. There were many excellent descriptions of fraud identification and authenticity testing.

The second EMA session was on “Risk Assessment for Economically Motivated Adulteration of Raw Materials and Ingredients: New Tools and Research Needs.” This session started with a statement by Joseph Scimeca — a food safety VP at Cargill, speaking for the Grocery Manufacturer’s Association workgroup on Economic Adulteration – stating, “Intentional adulteration is a game changer” since the potential impact is huge and the prevention countermeasures and control systems are from outside traditional food science. He continued to focus on the industry concerns of economic adulteration and, specifically, on the behavioral sciences and criminology aspects of prevention. He stated that there is a tremendous need for more research and that there is great industry concern on the topic. Next, Markus Lipp – a VP at U.S. Pharmacopeia and the Food Chemicals Codex – discussed some of the work of its food adulteration-related Expert Panels. Karen Everstine of the National Center for Food Protection and Defense (after the US Department of Defense funding ended it is now called the Food Protection and Defense

Institute – FPD, who was an early funder of our MSU food fraud research) presentation included some of its complex and expansive data-gathering activities in the food fraud area. The NCFPD has a deep engagement with its U.S. agency funders in protecting our borders and food supply.

The session was moderated by Jonathon DeVries from General Mills/Medallion Labs. He closed with an important concept about prevention – “we don’t have a way to claim success.” Later he stated, “If we prevent EMA no one knows for sure... we need to find a way to prove our success.”

The key takeaways for me were that food fraud is a critical food industry issue. Many great minds are collaborating at very high levels on the subject. As we found with our previous MSU-FFI efforts to quantify the economic impact or risk of counterfeiting, these fraud events defy our current methods and processes. We will need to continue to work together to develop the vulnerability and risk assessment systems. Finally, as Dr. DeVries stated, we need to find a way to “prove success” in prevention. We need to be able to define why food fraud prevention is important and to define how, and when, we reduce the vulnerability.

Update 2018: This concept of how to measure success was a key problem for quality management and crime prevention. While measuring an actual incident is important the more proactive measures are to reduce the actions that could lead to incidents. For quality management, this is identifying and addressing the root causes of an anomaly. Adapted to food in the HACCP plan this is identifying and managing critical control points. In crime prevention, this is identifying the crime “hot spots” and implementing countermeasures to reduce the opportunity. Adapted to food fraud, this is identifying and reducing the vulnerabilities. A critical control point or vulnerability can be identified, modified, and measured. Thus, the objectives shift to prevention and “success” can be defined by controlling those root causes of the problems. To assess food safety, we do count the number of incidents, but the greater focus is on monitoring and managing critical control points such as the consistent and calibrated temperature of a refrigerator. This shift from measuring only outcomes to focusing on addressing the root cause of anomalies is the founding principle of quality management. Measuring the end product is, of course, key, but the real focus and success measures focus on managing the critical control points.

Conclusion

Over the years, it has become clear that addressing food fraud incidents and implementing prevention strategies require a fundamentally different approach than for addressing food quality, food safety, or food defense problems. It has become clear that we will “not arrest our way to safety” and not “test our way to compliance.” The frustration and exasperation have led to deconstructing the root cause and shifting to disciplines such as social science and criminology with decision-making in

managerial accounting and enterprise risk management. There has been a simplicity in stepping back to consider the entire process and for all types of product fraud. *The first conclusion is* that there is an interdisciplinary approach to food fraud prevention. The basic idea of prevention requires a holistic, all-encompassing view of the problem and also awareness through to even the final resource-allocation decision-making process. This examination leads to a consideration beyond just tactics such as arresting bad guys or seizing product to taking a strategic approach to identify the fraud opportunity and then manage the vulnerabilities and root causes. *The second conclusion is* to start with an overall strategic approach and then select tactics. Finally, that strategic approach requires a system to consider all aspects of the vulnerabilities and the control systems. When there is a consideration of “everything,” then a systematic approach can be developed that “connects everything to everything.” This includes seeking new information, considering how that new information impacts our understanding of the fraud opportunity, then an assessment of whether this new or changing risk is above the risk tolerance, and then a method to select and monitor countermeasures. *The final conclusion is* to “connect everything to everything” in a Food Fraud Prevention Strategy.

There is a saying:

“If the biological organism in question was a microbe you would logically engage the field of microbiology; for Food fraud, the biological organism I question is a human to you would logically engage the field of Social Science and specifically Criminology.”
“Repeat after me – ‘Social Science is a real science.’”

Appendix: WIFM Chapter on Prevention Basics

This “What’s In It For Me” (WIFM) section explains why this chapter is important to you.

Business functional group	Application of this chapter
WIFM all	Follow the process and start first <i>only</i> at a very high level with a quick, enterprise-wide assessment... <i>for now</i>
Quality team	This is not like any other food risk you are assigned to manage— step back, consider the root cause, and follow the process to start with a focus at the very high level, enterprise-wide assessment... and <i>then</i> drill down into the details
Auditors	The nature of the risk is that the controls are based on, and best assessed by, enterprise-wide assessments—a manufacturing site requirement may be <i>only to not</i> deviate from the corporate-wide plan
Management	Let your team follow the process and reinforce a quick, high-level, top-down assessment <i>before</i> getting into too much detail and <i>long</i> before conducting manufacturing plant-level vulnerability assessments
Corp. Ddecision-makers	Believe it or not, the process will provide you with a clear assessment that will be immediately applied in enterprise risk assessment type systems

Appendix: Study Questions

This section includes study questions based on the key Learning Objectives in this chapter:

1. Discussion Question
 - (a) Why was a FF interdisciplinary approach so hard to create and implement?
 - (b) How is the FF problem interdisciplinary?
 - (c) What are the strengths and weaknesses of a mono-discipline, interdisciplinary, or multidisciplinary approaches?
2. Key Learning Objective 1
 - (a) What is “interdisciplinary” versus “multidisciplinary”?
 - (b) What are the disciplines in the interdisciplinary approach?
 - (c) Are investigation and prosecution a preventive approach?
3. Key Learning Objective 2
 - (a) What is a “Sociopath”?
 - (b) What is the relationship between a “Sociopath” and a “Criminal”?
 - (c) Is a traceability code an overt or covert anti-fraud feature?
4. Key Learning Objective 3
 - (a) What is a supplier “Credit Rating”?
 - (b) How does the Food Protection Plan start?
 - (c) What is the difference between an action that is strategic, tactical, or operational?

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