Spice Adulteration – White Paper

What is Adulteration?

Adulteration can be defined as the inclusion in foods of constituents whose presence is prohibited by regulation, custom and practice or "making impure by adding inferior, alien or less desirable materials or elements."

The most common practice is the intentional addition of an adulterant to a food to increase the food's value through deception i.e. using an adulterant to make a food seem more valuable than it appears. Often, the adulterant is safe for human consumption although it may not be expressly permitted for addition to food. Adulteration may occasionally be a public health issue as when a toxic substance is added to food as an adulterant.

The addition of adulterants to food to increase attractiveness and value is often referred to as "economic adulteration" and it is this type of adulteration that is the primary subject of this report.

Legal and Regulatory Aspects of Adulteration

Most national regulatory programs are constructed to clearly prohibit the presence of adulterants regardless of how they came to be present in food, whether intentional or inadvertent. For example, in the United States, under the general adulteration provisions of Section 402 of the Federal Food, Drug and Cosmetic Act (FFDCA), the primary food safety law administered by the Food and Drug Administration (FDA), a food, including a spice, is considered adulterated if it:

- Contains any <u>added</u> "poisonous or deleterious substance"
- Contains filth
- Contains unapproved food or color additives

Or

- If any valuable constituent has been omitted or removed
- If any substance has been substituted for it
- If inferiority is concealed
- If any substance has been added to increase bulk or weight, or to make it appear more valuable

Also important to the consideration of adulteration in the spice industry is the FDA definition of "spice." FDA defines spice as: ". . . any aromatic vegetable substance in the whole, broken, or ground form, except for those substances which have been traditionally regarded as foods, such as onion, garlic and celery; whose significant function in food is seasoning rather than nutritional; that is true to name; and from which no portion of any volatile oil or other flavoring principle as been removed." 21 CFR 101.22(a)(2).

Two key parts of this definition relevant to the issue of adulteration of spices are the requirements:

- That a spice be "true to name" (i.e. that it be what it is represented to be).

- That the spice have "no portion of any volatile oil or other flavoring principle" removed. This definition is consistent with the requirements of FFDCA Section 402 that a food is adulterated if any valuable constituent has been removed.

The FDA definition of spice at 21 CFR 101.22(a)(2) also contains a list of materials considered spices that is largely consistent with the ASTA spice list, and the FDA list of GRAS spices at 21 CFR 182.10. The definition also points out that paprika, turmeric, saffron, and other spices may be multi-functional and may be used for their coloring properties in addition to their contribution to a food's flavor.

Another important legal issue associated with adulteration is that a situation that could be considered adulteration may be rectified by appropriate labeling. For example, paprika used as a spice that contains defatted paprika as a filler may be legal for sale provided that the label clearly states that the contents of the package (either retail or in bulk) includes paprika <u>and</u> defatted paprika, and that the contents are not labeled in such a way as to lead the consumer to believe that it contains only paprika.

Implications of Adulteration

The economic adulteration of spices can have serious implications. In some instances, spices have been adulterated with highly toxic materials such as lead-bearing pigments and other unapproved color additives. In these instances, adulteration may have serious public health consequences.

In most instances of adulteration, spices are adulterated with material that is not highly toxic or carcinogenic, and therefore does not present a significant, immediate public health risk. However, in these instances, while there is no immediate public health risk, the spices are still illegally adulterated and subject to regulatory action that may cost spice and food manufacturers millions of dollars in recall expenses should a regulatory agency determine that action is warranted. Additional changes in industry practices as a result, such as increased testing and auditing, can also add significant costs.

In some instances, adulteration can simply result in inferior products with no safety risks. However, even these circumstances have significant implications for the spice industry because any reported adulteration damages the spice industry's reputation and credibility.

History/Background

The adulteration of food products was first seen hundreds of years ago, with Greek botanist Theophrastus (370 – 285 BC) reporting on the use of artificial flavors in the food supply and on the use of adulterants for economic reasons in some items of commerce. Pliny the Elder (23 – 79 AD) detailed adulteration in a variety of food products, including the use of juniper berries in pepper. Ancient physician Galen (131 – 201 AD) also raised concern about food adulteration, including pepper.

Efforts to address the adulteration of food date back to Roman civil law. Early efforts were seen in England beginning in 1266 and spices were eventually seen as a specific food commodity. Adulteration of food products grew in significance as society began the

transition from largely agrarian to industrial, and in 1860 the English Parliament enacted statutes broadly prohibiting any form of food adulteration. These laws were the models for legislation enacted in the United States years later.

A number of particularly egregious adulteration incidents led to the first extensive legislative action in the U.S. on food safety. The first U.S. Federal statute to establish food safety mechanisms, the Federal Pure Food and Drugs Act of 1906, came about largely because of rampant adulteration of dairy products and other foods. The 1906 Act didn't solve problems with adulteration and the 1938 Federal Food, Drug, and Cosmetic Act went much further, and is the statute (with more modern amendments) that provides the modern FDA with its legal authority over adulteration and misbranding.

Adulteration has continued in recent times, with several notable instances involving the spice industry. In 1994, ground paprika in Hungary was found to be adulterated with lead oxide, causing the deaths of several people, while dozens of others became sick. More recently, ground capsicums were found to contain dyes not approved for use in food. Recalls were issued in the United Kingdom for foods contaminated with the dyes, estimated to cost the companies involved hundreds of millions of dollars.

Everyone involved in the spice industry has a stake in ensuring that adulterated spice is not being traded. One need only look to the case of John Park to understand the seriousness of that responsibility. Mr. Park was president of Acme Food and in 1975 was found criminally liable as a "responsible corporate officer" for violations of the Federal Food, Drug, and Cosmetic Act even though he personally had not participated in any wrongdoing. The U.S. Supreme Court upheld his conviction, supporting the trial judge's instructions to the jury that Park could be found guilty if the jury determined he had a responsible relation to the situation even though he may not have participated personally.

Why Adulteration Occurs

A key step in the prevention of adulteration is to understand why it occurs. Why would an individual or company adulterate a spice and risk making people ill in addition to risking exposure to criminal charges and the economic ramifications that discovery and prosecution may bring? There are a variety of reasons.

The most obvious and simplest reason is to increase profit. A manufacturer may use a cheap filler that is easily disguised in the spice to increase the volume sold thereby cutting the cost of pure spice, and thereby increasing the ultimate profit margin.

The second reason is to be able to compete. If a manufacturer cannot meet the quality criteria of the customer he may adulterate the product either in an attempt to meet a specification or to compete by offering an admittedly inferior product at a lower price. For example, capsicums may be adulterated to meet a color specification set by the customer or to allow the manufacturer to offer a lower priced product that allows him to compete. In other cases the adulterated product may be more visually appealing than the pure spice. For example, cistus has a dark green color that, when added to oregano, makes the adulterated spice more visually appealing than pure oregano.

Customers who are not aware of the adulteration then wind up believing they are getting a bargain. In some instances, adulteration can encourage copy cat actions as others in the market adopt similar practices to allow them to compete with the adulterating manufacturer.

Finally, adulteration may be market driven, the result of cost-cutting pressures. As customers squeeze their suppliers to reduce costs, there comes a point when the supplier can no longer sustain his margin. At that point, instead of turning down the business, the supplier may adulterate the product to lower the cost and maintain a workable margin. It is believed that much of the adulteration seen today is the result of cost-cutting pressure as producers approach the point where it is difficult to make a profit. Adulteration results in a number of problems for reliable and honest suppliers as they find it difficult to compete on price.

Prevention

Preventing adulteration from occurring in the first place is essential to maintaining the confidence of customers and consumers. A number of steps can be taken to prevent adulterated spice from entering the food supply chain.

Two key elements in preventing and discouraging adulteration are awareness of the problems that can exist and the existence of solid inspection and surveillance programs to maintain the integrity of the supply chain. Companies need to be very familiar with their suppliers. Ensure that your suppliers have control of their raw materials and adhere to good manufacturing practices as the principle means of prevention. Require certification as warranted and buy to a specification not a price. Be aware that if the price is too good to be true, it probably is.

Companies should ensure that suppliers undertake an appropriate risk assessment and ensure that all relevant systematic controls are in place to prevent adulterated materials from entering the food chain .Risk assessments and controls should be based upon known and foreseeable food safety issues. The ASTA sampling procedure along with the recommended method (see below) should allow for use of the spice with confidence. Materials should only be released under a positive release system.

The following elements should be considered as part of any risk assessment.

- Country of origin of the product
- Nature of the material (e.g. whole, ground or crushed)
- Type of spice
- Supplier selection and approval:
    - Raw material control
    - History of supply
    - Capability of meeting U.S. requirements
    - Adherence to Good Manufacturing Practices (GMPs)
    - Adherence to HACCP principles
    - Traceability

- Third party certification
- Testing capabilities and accreditation

An ISO 17025 accredited laboratory should carry out the analyses where possible

Examples of Spice Adulteration
A number of examples of spice adulteration are available. These examples all generally confer an economic advantage to the adulterator.

Spices containing non-spice material
The inclusion of defatted paprika in unaltered paprika when the paprika is used as a spice renders it adulterated and misbranded unless the presence of defatted paprika is declared. Likewise, the inclusion of spent black pepper meal in ground black pepper renders it adulterated and misbranded unless the presence of the spent meal is declared. Various types of "extenders" have also been found in spices (e.g. non-spice vegetable matter) that while not harmful gives the spice the appearance of increased volume or weight. Spices containing such materials are adulterated, and likely also misbranded.

Spices containing undeclared or unapproved color additives
The inclusion of undeclared or unapproved color additives renders a spice adulterated, and if the color is undeclared, the spice is also misbranded. Recent examples include turmeric and other color additives in paprika, Sudan Red I in chili powder, and various color additives in saffron. Such instances may present a public health risk.

Spices with valuable constituents removed
In recent years there have been several examples of spices that have been marketed with valuable constituents removed (i.e. the "flavoring principle" mentioned in the FDA definition of spice). A prominent example is "defatted" paprika. This material cannot be labeled simply as "paprika" and must be labeled in a manner that will allow the consumer to determine that it is paprika with its flavoring (i.e. "valuable") constituents removed.

Detection
Following is a list of spices and potential adulterants as well as the suggested method to be used for detection:

Product	**Adulterant**	**Recommended Method**
Ground spice	Spent spices (defatted)	ASTA Methods 26.1, 27.0
Capsicums	Sudan Red & related dyes	ASTA Method 28.0
Capsicums	Tomato skin	Lycopene
Capsicums	Dextrose or other mono or di-saccharides	HPLC Carbohydrate Profile
Ground spice	Starch	ASTA Starch Method, Microscopic
Ground spice	Grains	Microscopic
Ground spice	Hulls	Microscopic
Ground spice	Added oleoresins	

Oregano	Foreign leaves, ie. sumac, cistus	ASTA Method 26.0
Oregano	Non-compliant herbs, ie. Savory, thyme, marjoram	Microscopic
Saffron	Floral waste	Microscopic
Saffron	Added artificial color	TLC
Ground black, white pepper	Buckwheat, millet seed	Microscopic
Cinnamon	Coffee husks	Microscopic
Nutmeg	Coffee husks	Microscopic

If spice is found to be adulterated, take aggressive action. All of the suspect product should be destroyed to prevent it from being blended down or used in smaller portions in the hopes of avoiding detection. Failure to destroy the product and remove it from the supply chain will only result in further contamination. Purchasers of raw ground spices should consider sampling and testing when it appears warranted.

ASTA Activities

ASTA has taken a three-pronged approach to the problem of adulteration, focusing on education and technical tools, communication and self regulation.

1. Education and Technical Tools – ASTA conducted a day-long workshop on adulteration in January 2005. This educational program covered a range of topics, including why adulteration occurs, how it is done and the technical tools ASTA has to look for adulteration. A condensed version of the workshop was repeated at the 2006 ASTA Annual Meeting. A variety of technical tools have been developed and made available to members, including the ASTA Analytical Methods that contain a number of methods to detect adulterants, including Sudan and other dyes. ASTA has also produced the CD ROM, "Microscopic Identification of Spices" to assist with identification of pure spice and common adulterants. Other activities underway include updating of the *HACCP Guide for Spices and Seasonings* and development of additional educational programming to keep members current on the problems presented by adulteration.

2. Communication – ASTA plays a key role in keeping its members informed about issues such as the Sudan dye problem. In this instance, numerous updates were provided to members about events in Europe, activities involving the European Spice Association and its members' interaction with the European Commission. ASTA also provided communication from the Spices Board of India regarding its mandatory testing and certification program. ASTA developed white paper and distributed advice to members on dealing with the problem. ASTA also contacted the FDA to discuss the situation and notified members of FDA's position not to issue formal guidance to the industry.

3. Self Regulation – As the trade association representing the spice industry, ASTA's position is that the industry needs to take responsibility for the integrity of the products we buy and sell instead of waiting for regulatory bodies to do that

for us. The Self Regulation Program was introduced in October 2004 as a way for members to report suspected adulterators. ASTA members who believe they have received adulterated spice are encouraged to file a complaint through that program.