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Review Article

FOOD ADULTERATION: GENTLE INRODUCTION

Matthew N.O. Sadiku[1], Tolulope J. Ashaolu[2] and Sarhan M. Musa[1]
[1]Roy G. Perry College of Engineering, Prairie View A&M University
[2]College of Food Science, Southwest University,
Tiansheng Road Beibei District, Chongqing, 400715, P.R. China
E-mail: sadiku@ieee.org; ashaolut@gmail.com; smmusa@pvamu.edu

Abstract: Food is important for sustenance of life. Food adulteration refers to the failure of a food product to follow the hygiene rules in order to make profits. It occurs when adulterants is added to food. Food adulteration constitutes an economic problem and causes serious health issues for consumers. It is of major concern to industries, food processors, regulatory agencies, and consumers. It is becoming one of the significant public health issues in all parts of the world. This paper provides a brief introduction to food adulteration.
Keywords: Food adulteration, food contamination, food supplement adulteration.

INTRODUCTION

Food refers to a substance which is intended for human consumption. Food is our basic need and plays a major sustaining role. Food may be deliberately or accidentally contaminated. Major food hazards involve contamination and adulteration. Adulteration is a common problem in food, spices, and cosmetics. It is often performed by adding adulterant to the authentic product. Food products are vulnerable to adulteration at any stage. Adulteration is widespread in the United States and in the rest of the world. It thrives in a period of shortages.

CONCEPT OF FOOD ADULTERATION

Food adulteration (or "food fraud") refers to the process by which a given food is reduced through addition of adulterants or removal of vital substance to cause harm. A food product is considered adulterated if it omits a valuable constituent or substitutes another substance. Food adulteration has been happening since times immemorial and is regarded as a curse for mankind. It takes many forms such as mixing, substituting, concealing the quality, etc.

There are three types of adulteration [1]: (1) Intentional Adulteration: The adulterants are added as a deliberate act with intention to increase profit; Deliberate or intentional adulteration (IA) occurs when food systems are deliberately damaged to cause widespread harm to the public health.; (2) Incidental Adulteration: Adulterants are found in food due to negligence, carelessness, ignorance or lack of proper facilities.; This happens when the

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poisonous or deleterious substance is unavoidable; (3) Metallic Adulteration: When the metallic substances are added intentionally or accidentally. Mercury-contaminated fish can cause brain damage, paralysis, and death.

Food and Drug Administration (FDA) considers food as adulterated if [2]: (a) A substance is added which is injurious to health, (b) Cheaper or inferior quality item added to food, (c) Any valuable constituent is extracted from main food article, (d) Quality of food is below the standards, (e) Any substance has been added to increase bulk or weight, (f) To make it appear more valuable.

Common adulterated foods include food supplements, milk products, cereals, coffee/tea, food grains, vegetables, honey, spices, olive oil, butter, ice cream, baking powder, alcohol, juices, and other beverages. Adulterated foods can cause harmful effects such as toxicity in the body, diarrhea, dysentery, vomiting, diseases, kidney failure, paralysis or eventually death. Food adulteration cheats the consumer and poses serious risk to health.

Food contamination and adulteration erode trust in the integrity and safety of the food supply chains and manufacturing practices. With increasing globalization of food and rapid distribution systems, IA can have international impacts with far-reaching consequences.

PREVENTING FOOD ADULTERATION

Preventing IA was one of the seven foundational pieces of the Food Safety Modernization Act enacted in 2011. When a food is adulterated, FDA and state regulators have a broad array of enforcement tools including seizing and condemning the product, detaining imported product, enjoining persons from manufacturing or distributing the product, or requesting a recall of the product [3].

Authentic testing of food and adulterant detection of various food products is necessary to assure consumer protection against fraudulent activities. Legislation, fines, and jail terms may serve as deterrent against food adulteration. Greater consumer vigilance and action can help improve the situation [4].

DETECTION OF FOOD ADULTERATION

The detection of food adulteration is an essential requirement for ensuring both the quality and safety of foods. FDA cannot possibly examine every shipment of food entering the United States. Its inspectors randomly prioritizes and targets certain exporting nations it expects to pose greater risk to human health.

Various methods have been developed to detect food adulteration. The technologies used for detection of possible food adulteration and contamination include physical, chemical/biochemical, and molecular technique [2,5]:

- *Physical techniques*: Different physical methods include microscopic and macroscopic visual structural analysis. These analyze the physical characteristics of food. For example, different analytical techniques, mainly chromatography and spectroscopy, are employed to quantify or identify specific adulterants in oils and spice. Spectroscopic techniques include near-infrared, mid-infrared, Raman, and NMR spectroscopy. Among the spectroscopic techniques, near infrared spectroscopy (NIR) helps in rapid detection of adulterants in raw materials. Figure 1 shows the schematic diagram of a typical spectroscopic technique [6].
- (2) *Chemical/biochemical techniques*: There are different methods that classify into four groups: Chromatographic-based techniques, Spectroscopic-based techniques, Immunologic-based techniques, and Electrophoretic-based techniques.
- (3) *Molecular techniques:* Although physical, chemical and biochemical techniques are easy and more convenient for routine detection of food adulterants, they may not provide exact quantitative and qualitative results. The DNA-based molecular techniques could be more ideal as detection tools for food adulteration.

Fingerprinting is another method for food adulteration detection.

CONCLUSION

Adulteration refers to noncompliance with health standards as determined by the Food and Drug Administration (FDA). Food adulteration is a menace; it can pose a health risk to consumers. It has been gaining increasing attention from industry and consumer in recent years. Food adulteration is an age-long problem and its incidents will not likely disappear in the near future. It is high time that the food regulator and consumers be more aware and vigilant. More information on food adulteration can be found in book [7] and journals on food such as *British Food Journal.*

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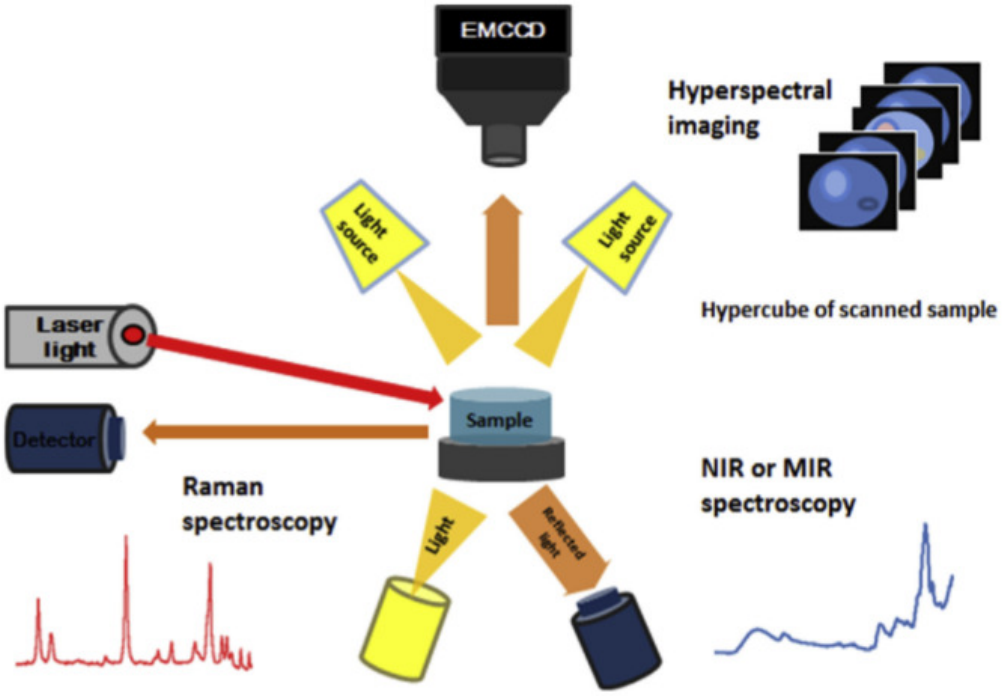

Figure 1: A typical spectroscopic technique [6]