

## **Food Safety: A Primer**

Matthew N. O. Sadiku<sup>1</sup>, Sarhan M. Musa<sup>1</sup>, and Osama M. Musa<sup>2</sup>

<sup>1</sup>Roy G. Perry College of Engineering Prairie View A&M University Prairie View, TX 77446

<sup>2</sup>Ashland Inc. Bridgewater, NJ 08807

**ABSTRACT :** *Public health is directly or indirectly affected by the food supply. Food safety is a public health issue which has become a global problem. Since food is necessary for human survival, a food safety crisis can cause widespread social panic and heavy casualties. Food safety has been a major concern for governments, the food service industry, and academia. This paper provides an introduction to food safety.*

**KEY WORDS:** *food safety, chemical food safety, food regulation, food safety challenges*

### **I. INTRODUCTION**

As food is basic to human existence, food safety is crucial to sound health. Safe food refers food prepared in clean and sanitized surroundings with clean utensils and dishes. Millions of people worldwide are hospitalized every year, and many die, due to consumption of contaminated food. Due to the frequent occurrences of food poisoning and food safety crises, consumers now demand that the food they buy is safe. Due to customers' increasing demand for better quality food, the issues of food safety are becoming important worldwide. Lack of trust in the safety of food is a major concern because we are what we eat. The food industry has five core sectors [1]: (1) food production (farm), (2) food processing (food, meat, poultry, factories), (3) food distribution (warehouses, trucking), (4) food retail (supermarkets, grocery stores), and (5) food service (restaurants, cafeterias). The food system is illustrated in Figure 1 [2].

### **II. WHAT IS FOOD SAFETY?**

Food safety is the discipline that describes handling, preparation, and storage of food in ways that prevent the occurrence of food-borne illness. It involves the concept that food will not cause harm to the consumer when it is eaten according to intended use. The main media through which food can become contaminated and transmit pathogens includes bacteria, viruses, mold, and fungi. The contamination can be spread from people, domestic pets, and pests [3]. Genomics is having a tremendous impact on food safety because it allows for a more precise and detailed approach to pathogen detection and characterization in contaminated food. In addition, a variety of insecticides, agrochemicals, chemical contaminants, antioxidants, and food additives are commonly used in food production and processing and can be monitored and characterized using standard chemical analysis methods.

Food safety is a concept which embraces three major areas [4]: (i) food quality (food composition); (ii) traceability (food origin); (iii) food safety per se (absence of allergens, pathogens or other contaminants). Food quality is an important issue in the healthcare system from the perspective of basic nutritional requirements. Food traceability involves knowing the composition and geographical origin of food products. It provides a continuous monitoring of a food product in the entire supply chain. Food safety and quality are important for food security, health, and economic development.

Food safety is the joint responsibility of everyone involved in the food supply chain from farm to the consumers. It is particularly a public and moral responsibility of the foodservice industry and the government entities providing food products [5]. It is a top priority for consumers who buy food products online.

### **III. FOOD PRESERVATION**

Proper food preparation, cooking, and storage can enhance food safety. Various efforts for food preservation have been made to reduce food contamination. Sun drying and cooking were among the first methods used to preserve food. Later, fermentation and canning were used. Salt is also commonly used for food preservation. Other preservatives used by the food industry include sodium benzoate, sodium lactate, and sodium propionate [6]. Recently, advanced food-packaging technologies such as vacuum packaging and pasteurization treatments have made food safer. Exposing food to radiation (X-rays, gamma rays, and electron beam) can destroy some of the bacteria in it. Thus, food irradiation is an additional method to increase the safety of foods. Nanotechnology refers to the controlling and manipulating materials at the nano scale. It provides an advanced platform utilizing unique properties of materials. It may improve texture and flavor of food.

Nanotechnology and nanomaterials are used in food processing, food packaging, food machinery, and food detection [7]. Nanotechnology-based platforms have also been developed for detecting infectious agents, nucleic acids, drugs, foodborne pathogens, toxins, and chemical contaminants.

#### **IV. REGULATION ON FOOD**

Food safety is a growing global concern. Every nation has some legislation and controls with respect to food safety with a common goal of protecting public health. Nations differ in their willingness to regulate and reduce food safety risks. The main goal of food safety regulation is to mandate that food suppliers produce high quality food products. Each nation has its own food safety standards, regulations, and risk intelligence strategies. At the International level, the World Health Organization (WHO) cites food safety as one of the top priorities and challenges of this century. WHO has developed the International Food Safety Authorities Network (INFOSAN) to promote food safety information exchange among nations.

In the US, food is regulated by several federal, state and local officials. The United States Food and Drug Administration (FDA) and the US Department of Agriculture (USDA) are key agencies providing food safety guidelines, standards, and policies. The FDA was founded primarily to ensure accurate labeling of food products and additives. It regulates about 80 percent of the food supply, while the USDA oversees the remaining 20 percent of the food supply, with particular emphasis on poultry and meat. The USDA assumes quality responsibilities for packaged meats, fruits, and vegetables [8]. The Center for Disease Control and Prevention (CDC) started to keep records on food-borne illness deaths and prevention of outbreaks in 1970. There is a cooperative effort between the CDC, FDA, and USDA. Restaurants, delis, cafeterias, catering, and other food service establishments (such as street food) are regulated by state or local health departments, which apply best food-handling practices.

#### **V. CHALLENGES**

Food safety poses different challenges in ensuring that people are well fed. Information on food safety is not readily available and most people would like to be better informed. There is also the lack of unified global food standards. Regulating food safety is not easy. There are some challenges in legislating and enforcing the law related to food safety. Food choices and risk are culturally motivated. Thus, food issues are highly personal and involve health, economics, education, and cultural and social behaviors which are difficult to change. Food safety education has issues such as costs that must be borne by the employers of food service workers and participants must use personal time to attend the training. Despite the constant provision of public education about food safety, a significant number of foodservice employees' lack basic food safety knowledge and occasionally follow improper food safety practices [9].

This obviously can increase the risk of foodborne illnesses. Although food safety is an essential element in global food security, there is often a reputational challenge among multinational food service providers. Exporters of meat products will have to meet certain standards for quality control. The adoption of these standards may restrict trade in agricultural products rather than encourage it. Food producers face challenges with the growing complexity of global food supply. Advances in science and technology, such as active packing, tracking technologies, ICT, and big data analysis, can help mitigate some of these food challenges [2].

#### **VI. CONCLUSION**

As food is necessary for life, food safety ensures people's health and safety. Food safety is important for individuals, food industry, and government. The government plays a crucial role in food safety through regulation, supervision, and education. The foodservice industry aims to reduce the risk and occurrence of foodborne illness. Global demand for food-safety regulation will grow due to changes in food demand, demographics, the growth of the international food market, and food production methods. Food safety should be an enabler, not inhibitor of global food security. Global approaches to food safety and consumer education are critically needed to keep the global quality of food at a high level, for the benefit of everyone.

The evolution of the Information Superhighway has led to an abundance of food safety information. A compilation of reliable sources on food safety is available in [10]. For additional information on food safety, one should consult [11-14] and other books on it are available at Amazon.com. One should also consult journals exclusively devoted to food and related issues: Food Control, Food Microbiology, Journal of Food Protection, Trends in Food Science & Technology, and Journal of Food Products Marketing

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## AUTHORS

**Matthew N.O. Sadiku** is a professor in the Department of Electrical and Computer Engineering at Prairie View A&M University, Prairie View, Texas. He is the author of several books and papers. His areas of research interest include computational electromagnetics and computer networks. He is a fellow of IEEE.

**Sarhan M. Musa** is a professor in the Department of Engineering Technology at Prairie View A&M University, Texas. He has been the director of Prairie View Networking Academy, Texas, since 2004. He is an LTD Sprint and Boeing Welliver Fellow.

**Osama M. Musa** is currently Vice President and Chief Technology Officer for Ashland Inc. Dr. Musa also serves as a member of the Advisory Board at Manhattan College's Department of Electrical and Computer Engineering as well as a member of the Board of Trustees at Chemists' Club of NYC. Additionally, he sits on the Advisory Board of the International Journal of Humanitarian Technology (IJHT).

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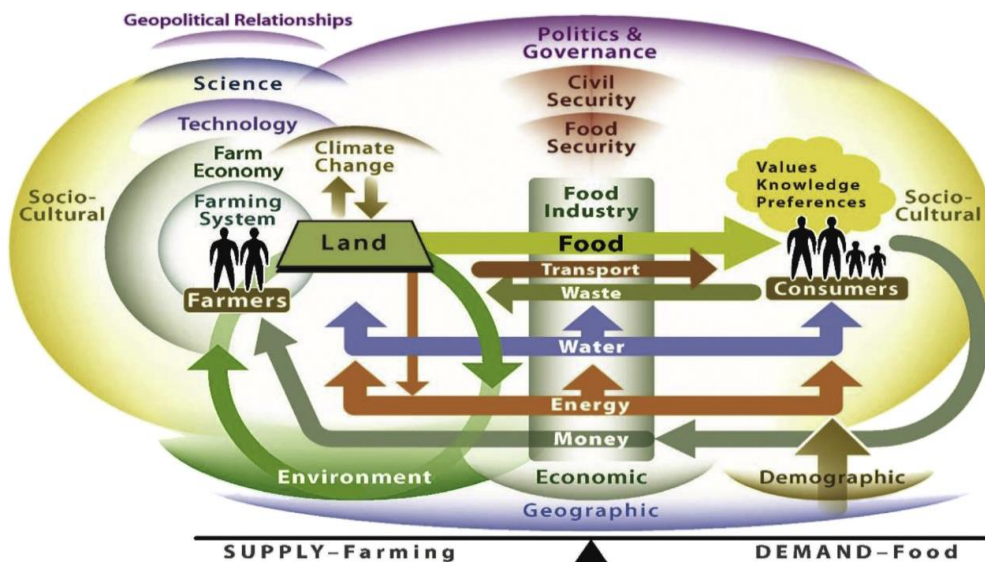


Figure 1. The food system [2].