Food Safety and Quality

Edmund Parker

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As the food industry is experiencing a boom, new players are entering the market every day. This makes the process of checking the quality of food difficult. Therefore, new laws and regulations are being passed by the government to ensure the safety and quality of food. To provide the best preparation, handling and storage is referred to as food safety. Food safety and quality is a field of science that has undergone rapid development over the past few decades. This book is designed to provide students with knowledgeable insights about the field of food safety and food quality. Most of the topics introduced in this text cover new techniques and the applications of this subject. Coherent flow of topics, student-friendly language and extensive use of examples make this book an invaluable source of knowledge.

Edmund Parker attained his Master of Science in Food Safety and Quality Management from University of Greenwich, United Kingdom. He is actively engaged in the researches focused on food storage techniques, foodborne illness and food defense. He was also awarded the "Distinguished Contributions to Lifelong Learning" award for his outstanding contribution to the student community in the field of food safety and quality. He has authored and edited a number of academic periodicals, journal papers, articles and books in the field of food safety.

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Preface

As the food industry is experiencing a boom, new players are entering the market every day. This makes the process of checking the quality of food difficult. Therefore, new laws and regulations are being passed by the government to ensure the safety and quality of food. To provide the best preparation, handling and storage is referred to as food safety. Food safety and quality is a field of science that has undergone rapid development over the past few decades. This book is designed to provide students with knowledgeable insights about the field of food safety and food quality. Most of the topics introduced in this text cover new techniques and the applications of this subject. Coherent flow of topics, student-friendly language and extensive use of examples make this book an invaluable source of knowledge.

Given below is the chapter wise description of the book:

Chapter 1- The proper handling, preparation and storage of food in ways that prevent illnesses caused by food items is food safety. Food quality on the other hand is the quality of food, which is accepted by the consumer. This chapter is an overview of the subject matter incorporating all the major aspects of food safety and food quality.

Chapter 2- The measures taken for food safety are the preservation of food, storage of food and food defense. While food defense is the protection of food products from adulteration by biological, chemical and physical agents, food preservation involves the prevention of bacteria, fungi and also slows the oxidation of fats. This chapter helps develop a comprehensive understanding on food safety.

Chapter 3- Some of the methods of preservation related to food safety are food drying, refrigeration, frozen food, pickling and antioxidants. Food drying is a method in which food is dried, which stops the growth of bacteria and yeasts. Preservation of food by freezing is also a common practice, freezing food preserves it from the time it is prepared, till the time it is eaten. This chapter discusses the methods of food safety in a critical manner providing key analysis to the subject matter.

Chapter 4- Food safety is the basic concern of humans and with evolving times, better techniques have been introduced in this regard. Some of the modern techniques are pasteurization, vacuum packing, food irradiation, bio preservation and acidity regulator. The chapter serves as a source to understand these major categories.

Chapter 5- Contaminated food has certain effect on people; the effects discussed in this chapter are foodborne illness, food allergy, diarrhea, nausea and vomiting. Foodborne illness is any illness caused from contaminated food, by bacteria, viruses, or parasites that contaminate food and the symptoms often include vomiting, fever, and may also include diarrhea. The abnormal immune response to food is called food allergy, its symptoms usually include swelling of the tongue, vomiting, trouble breathing or low blood pressure. This chapter helps the reader in understanding the illnesses and problems that can be caused by food contamination.

Chapter 6- The inspection of food to make sure its fresh and to confirm its market value is food grading whereas the process of adding micronutrients to food items is food fortification. This chapter elucidates on topics such as, food grading, food fortification, optical sorting and food intolerance.

At the end, I would like to thank all those who dedicated their time and efforts for the successful completion of this book. I also wish to convey my gratitude towards my friends and family who supported me at every step.

Editor

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Introduction to Food Safety and Food Quality

The proper handling, preparation and storage of food in ways that prevent illnesses caused by food items is food safety. Food quality on the other hand is the quality of food, which is accepted by the consumer. This chapter is an overview of the subject matter incorporating all the major aspects of food safety and food quality.

Food Safety

Food safety is a scientific discipline describing handling, preparation, and storage of food in ways that prevent foodborne illness. This includes a number of routines that should be followed to avoid potentially severe health hazards. In this way food safety often overlaps with food defense to prevent harm to consumers. The tracks within this line of thought are safety between industry and the market and then between the market and the consumer. In considering industry to market practices, food safety considerations include the origins of food including the practices relating to food labeling, food hygiene, food additives and pesticide residues, as well as policies on biotechnology and food and guidelines for the management of governmental import and export inspection and certification systems for foods. In considering market to consumer practices, the usual thought is that food ought to be safe in the market and the concern is safe delivery and preparation of the food for the consumer.

Food can transmit disease from person to person as well as serve as a growth medium for bacteria that can cause food poisoning. In developed countries there are intricate standards for food preparation, whereas in lesser developed countries the main issue is simply the availability of adequate safe water, which is usually a critical item. In theory, food poisoning is 100% preventable. The five key principles of food hygiene, according to WHO, are:

1. Prevent contaminating food with pathogens spreading from people, pets, and pests.
2. Separate raw and cooked foods to prevent contaminating the cooked foods.
3. Cook foods for the appropriate length of time and at the appropriate temperature to kill pathogens.
4. Store food at the proper temperature.
5. Do use safe water and safe raw materials.

ISO 22000

ISO 22000 is a standard developed by the International Organization for Standardization dealing with food safety. This is a general derivative of ISO 9000. ISO 22000 standard: The ISO 22000 in-

ternational standard specifies the requirements for a food safety management system that involves interactive communication, system management, prerequisite programs, HACCP principles.

Incidence

A 2003 World Health Organization (WHO) report concluded that about 30% of reported food poisoning outbreaks in the WHO European Region occur in private homes. According to the WHO and CDC, in the USA alone, annually, there are 76 million cases of foodborne illness leading to 325,000 hospitalizations and 5,000 deaths.

Regulatory Agencies

WHO and FAO

In 2003, the WHO and FAO published the Codex Alimentarius which serves as an guideline to food safety.

However, according to Unit 04 - Communication of Health & Consumers Directorate-General of the European Commission (SANCO): "The Codex, while being recommendations for voluntary application by members, Codex standards serve in many cases as a basis for national legislation. The reference made to Codex food safety standards in the World Trade Organizations' Agreement on Sanitary and Phytosanitary measures (SPS Agreement) means that Codex has far reaching implications for resolving trade disputes. WTO members that wish to apply stricter food safety measures than those set by Codex may be required to justify these measures scientifically." So, an agreement made in 2003, signed by all member states, inclusive all EU, in the codex Stan Codex 240 – 2003 for coconut milk, sulphite containing additives like E223 and E 224 are allowed till 30 mg/kg, does NOT mean, they are allowed into the EU. Only for the latter the EU amended its regulations with (EU) No 583/2012 per 2 July 2012 to allow this additive, already used for decades and absolutely necessary.

Australia

Food Standards Australia New Zealand requires all food businesses to implement food safety systems. These systems are designed to ensure food is safe to consume and halt the increasing incidence of food poisoning, and they include basic food safety training for at least one person in each business. Food safety training is delivered in various forms by, among other organisations, Registered Training Organizations (RTOs), after which staff are issued a nationally recognised unit of competency code on their certificate. Basic food safety training includes:

- Understanding the hazards associated with the main types of food and the conditions to prevent the growth of bacteria which can cause food poisoning and to prevent illness.
- Potential problems associated with product packaging such as leaks in vacuum packs, damage to packaging or pest infestation, as well as problems and diseases spread by pests.

- Safe food handling. This includes safe procedures for each process such as receiving, re-packing, food storage, preparation and cooking, cooling and re-heating, displaying products, handling products when serving customers, packaging, cleaning and sanitizing, pest control, transport and delivery. Also covers potential causes of cross contamination.
- Catering for customers who are particularly at risk of food-borne illness, as well as those with allergies or intolerance.
- Correct cleaning and sanitizing procedures, cleaning products and their correct use, and the storage of cleaning items such as brushes, mops and cloths.
- Personal hygiene, hand washing, illness, and protective clothing.

Food safety standards and requirements are set out at the national level in the Food Standards Code, and brought Into force in each state by state-based Acts and Regulations. Legislation means that people responsible for selling or serving unsafe food may be liable for heavy fines.

China

Food safety is a growing concern in Chinese agriculture. The Chinese government oversees agricultural production as well as the manufacture of food packaging, containers, chemical additives, drug production, and business regulation. In recent years, the Chinese government attempted to consolidate food regulation with the creation of the State Food and Drug Administration in 2003, and officials have also been under increasing public and international pressure to solve food safety problems. However, it appears that regulations are not well known by the trade. Labels used for "green" food, "organic" food and "pollution-free" food are not well recognized by traders and many are unclear about their meaning. A survey by the World Bank found that supermarket managers had difficulty in obtaining produce that met safety requirements and found that a high percentage of produce did not comply with established standards.

Traditional marketing systems, whether in China or the rest of Asia, presently provide little motivation or incentive for individual farmers to make improvements to either quality or safety as their produce tends to get grouped together with standard products as it progresses through the marketing channel. Direct linkages between farmer groups and traders or ultimate buyers, such as supermarkets, can help avoid this problem. Governments need to improve the condition of many markets through upgrading management and reinvesting market fees in physical infrastructure. Wholesale markets need to investigate the feasibility of developing separate sections to handle fruits and vegetables that meet defined safety and quality standards.

European Union

The parliament of the European Union (EU) makes legislation in the form of directives and regulations, many of which are mandatory for member states and which therefore must be incorporated into individual countries' national legislation. As a very large organisation that exists to remove barriers to trade between member states, and into which individual member states have only a proportional influence, the outcome is often seen as an excessively bureaucratic 'one size fits all' approach. However, in relation to food safety the tendency to err on the side of maximum protec-

tion for the consumer may be seen as a positive benefit. The EU parliament is informed on food safety matters by the European Food Safety Authority.

Individual member states may also have other legislation and controls in respect of food safety, provided that they do not prevent trade with other states, and can differ considerably in their internal structures and approaches to the regulatory control of food safety.

From 13 December 2014, new legislation - the EU Food Information for Consumers Regulation 1169/2011 - require food businesses to provide allergy information on food sold unpackaged, in for example catering outlets, deli counters, bakeries and sandwich bars.

France

Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (anses) is a French governmental agency dealing with food safety.

Germany

The Federal Ministry of Food, Agriculture and Consumer Protection (BMEL) is a Federal Ministry of the Federal Republic of Germany. History: Founded as Federal Ministry of Food, Agriculture and Foresting in 1949, this name did not change until 2001. Then the name changed to Federal Ministry of Consumer Protection, Food and Agriculture. At the 22nd of November 2005, the name got changed again to its current state: Federal Ministry of Food, Agriculture and Consumer Protection. The reason for this last change was that all the resorts should get equal ranking which was achieved by sorting the resorts alphabetically. Vision: A balanced and healthy diet with safe food, distinct consumer rights and consumer information for various areas of life, and a strong and sustainable agriculture as well as perspectives for our rural areas are important goals of the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV). The Federal Office of Consumer Protection and Food Safety is under the control of the Federal Ministry of Food, Agriculture and Consumer Protection. It exercises several duties, with which it contributes to safer food and thereby intensifies health-based consumer protection in Germany. Food can be manufactured and sold within Germany without a special permission, as long as it does not cause any damage on consumers' health and meets the general standards set by the legislation. However, manufacturers, carriers, importers and retailers are responsible for the food they pass into circulation. They are obliged to ensure and document the safety and quality of their food with the use of in-house control mechanisms.

Hong Kong

In Hong Kong SAR, the Centre for Food Safety is in charge of ensuring food sold is safe and fit for consumption.

India

Food Safety and Standards Authority of India, established under the Food Safety and Standards Act, 2006, is the regulating body related to food safety and laying down of standards of food in India.

New Zealand

The New Zealand Food Safety Authority (NZFSA), or Te Pou Oranga Kai O Aotearoa is the New Zealand government body responsible for food safety. NZFSA is also the controlling authority for imports and exports of food and food-related products. The NZFSA as of 2012 is now a division of the Ministry for Primary Industries (MPI) and is no longer its own organization.

Pakistan

Pakistan does not have an integrated legal framework but has a set of laws, which deals with various aspects of food safety. These laws, despite the fact that they were enacted long time ago, have tremendous capacity to achieve at least minimum level of food safety. However, like many other laws, these laws remain very poorly enforced. There are four laws that specifically deal with food safety. Three of these laws directly focus issues related to food safety, while the fourth, the Pakistan Standards and Quality Control Authority Act, is indirectly relevant to food safety.

The Pure Food Ordinance 1960 consolidates and amends the law in relation to the preparation and the sale of foods. All provinces and some northern areas have adopted this law with certain amendments. Its aim is to ensure purity of food being supplied to people in the market and, therefore, provides for preventing adulteration. The Pure Food Ordinance 1960 does not apply to cantonment areas. There is a separate law for cantonments called "The Cantonment Pure Food Act, 1966". There is no substantial difference between the Pure Food Ordinance 1960 and The Cantonment Pure Food Act. Even the rules of operation are very much similar.

Pakistan Hotels and Restaurant Act, 1976 applies to all hotels and restaurants in Pakistan and seeks to control and regulate the rates and standard of service(s) by hotels and restaurants. In addition to other provisions, under section 22(2), the sale of food or beverages that are contaminated, not prepared hygienically or served in utensils that are not hygienic or clean is an offense. There are no express provisions for consumer complaints in the Pakistan Restaurants Act, 1976, Pakistan Penal Code, 1860 and Pakistan Standards and Quality Control Authority Act, 1996. The laws do not prevent citizens from lodging complaints with the concerned government officials; however, the consideration and handling of complaints is a matter of discretion of the officials.

South Korea

Korea Food & Drug Administration

Korea Food & Drug Administration (KFDA) is working for food safety since 1945. It is part of the Government of South Korea.

IOAS-Organic Certification Bodies Registered in KFDA: "Organic" or related claims can be labelled on food products when organic certificates are considered as valid by KFDA. KFDA admits organic certificates which can be issued by 1) IFOAM (International Federation of Organic Agriculture Movement) accredited certification bodies 2) Government accredited certification bodies – 328 bodies in 29 countries have been registered in KFDA.

Food Import Report: According to Food Import Report, it is supposed to report or register what you import. Competent authority is as follows:

Product	Authority
Imported Agricultural Products, Processed Foods, Food Additives, Utensils, Containers & Packages or Health Functional Foods	KFDA (Korea Food and Drug Administration)
Imported Livestock, Livestock products (including Dairy products)	NVRQS (National Veterinary Research and Quarantine Service)
Packaged meat, milk & dairy products (butter, cheese), hamburger patties, meat ball and other processed products which are stipulated by Livestock Sanitation Management Act	NVRQS (National Veterinary Research and Quarantine Service)
Imported Marine products; fresh, chilled, frozen, salted, dehydrated, eviscerated marine produce which can be recognized its characteristics	NFIS (National Fisheries Products Quality Inspection Service)

National Institute of Food and Drug Safety Evaluation

National Institute of Food and Drug Safety Evaluation (NIFDS) is functioning as well. The National Institute of Food and Drug Safety Evaluation is a national organization for toxicological tests and research. Under the Korea Food & Drug Administration, the Institute performs research on toxicology, pharmacology, and risk analysis of foods, drugs, and their additives. The Institute strives primarily to understand important biological triggering mechanisms and improve assessment methods of human exposure, sensitivities, and risk by (1) conducting basic, applied, and policy research that closely examines biologically triggering harmful effects on the regulated products such as foods, food additives, and drugs, and operating the national toxicology program for the toxicological test development and inspection of hazardous chemical substances assessments. The Institute ensures safety by investigation and research on safety by its own researchers, contract research by external academicians and research centers.

Taiwan

In Taiwan Health and Welfare Ministry in charge of Food and Drug Safety, also evaluate the Catering industry to maintenance the food product quality.

United Kingdom

In the UK the Food Standards Agency is an independent government department responsible for food safety and hygiene across the UK. They work with businesses to help them produce safe food, and with local authorities to enforce food safety regulations. In 2006 food hygiene legislation changed and new requirements came into force. The main requirement resulting from this change is that if you own or run a food business in the UK, you must have a documented Food Safety Management System, which is based on the principles of Hazard Analysis Critical Control Point HACCP.

United States

The US food system is regulated by numerous federal, state and local officials. It has been criticized as lacking in "organization, regulatory tools, and not addressing food borne illness."

Federal Level Regulation

The Food and Drug Administration publishes the Food Code, a model set of guidelines and pro-