Food

普通高等教育“十三五”规划教材

A Series of Food Science & Technology Textbooks
食品科技系列

Food Safety with Chinese Translation

英汉对照

食品安全学

张双灵　等编著

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·北京·

本书共分八章，主要包括生物性、化学性（食品添加剂、农药残留、兽药残留、金属、工业化学物、加工过程中形成的化学物）危害对食品安全性的影响，以及食物中的天然有毒物质、包装材料和容器对食品安全性的影响、非热力杀菌食品和转基因食品的安全性、食品安全管理体系。本教材突出的特点是从食品原材料生产、加工、包装和销售环节全方位讲述食品安全的影响因素，并论述了危害识别、危害分析的方法和控制技术，每章配有思考题和双语词汇。

本书主要应用于高等院校食品质量与安全、食品科学与工程、粮食工程、生物工程、发酵工程、葡萄与葡萄酒工程等相关食品类本科专业的教学，也可用于专业研究生、专科生的辅助教学。同时，本书可以作为食品从业人员学习食品安全相关中、英文双语词汇的辅助教材。

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Preface

"Food is the paramount necessity of the people and safety is the first necessity of food". Food safety is closely related to people's health and life safety, and it is crucial to the stability of social development. However, the source of production is contaminated under the accelerating of industrialization and the increasingly severe ecosystem pollution. Besides, some producers have no sense of foods safety or security technology, they do not take responsibility for producing safe foods. In actual production, what they do is to cut costs and chase profit. What is more, many managers employed directly in food safety learn the related knowledge at work rather than accepting the specialized training and education, which are far from enough to meet the need of practical work. All those reasons result in frequent food safety incidents, a critical threat to people's life and health. Students who major in Food Science, are a force in the work of food production, processing, detection, development. It is quite important to develop the students' professional food safety awareness, and to master the knowledge and dynamic state of food safety.

With the globalization of the economy, there are an increasing number of food trades between China and other countries in the world. It is becoming an important work on how to assure the safety of our import and export food. So we need foster large number of interdisciplinary talents with both food safety knowledge and capability of international communication, and English, as a universal language over the world, is one of the basic abilities which the students must have. To enhance students' specialized accomplishment and cultivate their global outlook, to develop individuals with both specialized knowledge and English, to meet the necessary of the developing society, and to improve food safety status, we carry out bilingual education on food safety, develop organic combination of specialized knowledge and English, and learn new realities, recent progresses and the new research achievements on food safety home and abroad.

"*Food Safety (with Chinese Translation)*" is rather extensive, involving a wide variety of subjects, such as Analytical Chemistry, Microbiology, Food Technolo-

前 言

"民以食为天，食以安为先"。食品安全与人们的健康和生命安全密切相关，对社会发展的稳定至关重要。然而，由于工业化进程加快，生态污染日益严重，农产品生产源头受到污染。另外，一些生产者没有生产安全食品的意识，不清楚生产的安全技术，没有主动承担生产安全食品的责任。在实际生产中，仅为了降低成本，追逐利润。并且许多直接从事食品安全的管理者都是在工作中学习相关知识，并没有经过专门知识的培训和教育，远远不能满足实际工作的需要。这些原因导致食品安全事件频发，严重威胁着广大人民群众的生命与健康。作为食品相关专业的学生，毕业后是食品生产、加工、检测、研发等相关工作的主力军，培养学生具有专业素养的食品安全意识并系统掌握食品安全方面的知识及动态就显得十分重要。

随着经济的全球化，我国与世界上其他国家之间的食品贸易日益增多，如何保证我国出口及进口食品的安全成为一项重要的工作，这就需要我们培养大量既有食品安全知识又有国际交流能力的复合型人才，而英语这一国际通用语言就成了这些人才所应该具备的基本能力之一。开展食品安全学课程的双语教学，让学生将专业知识和英语的学习有机结合，了解目前国内外食品安全的新情况、新进展和新成果，从而提高学生的专业素养和拓展学生的国际视野，培养懂专业会英语的食品安全人才，满足社会发展的需要，使食品安全现状得以改善。

《英汉对照食品安全学》课程教学内容广泛，涉及学科众多，包括分析化学、微生物学、食品工艺学、质量管理学、

gy, Quality Management, Toxicology, Epidemiology, Hygiene, Nutrition and so on, it is a subject with strong comprehensive knowledge and practice.

毒理学、流行病学、卫生学、营养学等，是一门知识综合性以及实践操作性很强的学科。

The book consists of eight chapters. Chapter 1 is an introduction part, mainly illustrating the history and modern connotations of food safety; Chapter 2, Chapter 3 and Chapter 4 introduce the biological hazards, chemical hazards and natural toxic substances on food safety respectively; Chapter 5 mainly introduces the effects of packaging materials and containers on food safety; Chapter 6, Chapter 7 introduce the safety of non-thermal sterilization food and the safety of genetically modified food; Chapter 8 mainly introduces the food safety management system. Chapter 1 and Chapter 2 were written by Zhang Shuangling (Qingdao Agricultural University); Chapter 3 and Chapter 4 were written by Zhao Haiyan (Qingdao Agricultural University); Chapter 5 and Chapter 6 were written by Chang Jinghua (Liaoning Technical University); Chapter 7 was written by Zhao Wenying (North University of China); Chapter 8 was written by Zhang Shuangling (Qingdao Agricultural University) & Du Dehong (Qingdao Agricultural University). Food safety technical vocabulary after each chapter was written by Han Yue (Qingdao Agricultural University), Wang Lixin (Qingdao Agricultural University) and Jiang Wenping (Qingdao Agricultural University), and the whole text was checked by Han Yue (Qingdao Agricultural University), Wang Lixin (Qingdao Agricultural University) and Jiang Wenping (Qingdao Agricultural University).

全书分八章，第1章绪论，主要介绍食品安全性的历史观及现代内涵；第2～4章分别介绍了生物性危害、化学性危害及天然有毒物质对食品安全性的影响；第5章主要介绍了包装材料和容器对食品安全性的影响；第6章、第7章分别介绍了非热力杀菌食品和转基因食品的安全性；第8章介绍了目前实施的主要食品安全管理体系。第1章、第2章由张双灵（青岛农业大学）编著；第3章、第4章由赵海燕（青岛农业大学）编著；第5章、第6章由常敬华（辽宁工程技术大学）编著；第7章由赵文英（中北大学）编著；第8章由张双灵（青岛农业大学）、杜德红（青岛农业大学）编著。由韩悦（青岛农业大学）、王立新（青岛农业大学）、姜文平（青岛农业大学）负责每章后食品安全专业词汇英文单词及音标编写，以及全书中英文文字校对工作。

There are 624 thousands words in this book and 431 thousands words accomplished by Zhang Shuangling, 102 thousands words accomplished by Zhao Haiyan, 41 thousands words accomplished by Chang Jinghua, 20 thousands words accomplished by Zhao Wenying, and 30 thousands words accomplished by Du Dehong.

全书共62.4万字，其中张双灵完成43.1万字，赵海燕完成10.2万字，常敬华完成4.1万字，赵文英完成2万字，杜德红完成3万字。

Due to a broad scope of the book, the editor is limited, and deficiencies are inevitable in the book, we are looking forward to your good suggestions for the amendments and revisions in the next edition.

由于本书涉及的领域很广，编者水平有限，书中难免有不足之处，敬请广大读者提出宝贵意见，以便再版时补充修正。

Sincerely,
The Authors
August 2017

编著者
2017年8月

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Chapter 1 Introduction

According to the article 99 of *Food Safety Law of People's Republic of China*, the definition of food is "food includes a variety of finished products and raw materials for human consumption or drink and the items which are both food and medicine in traditional aspects. However, food does not include the items for therapeutic purposes". From the perspective of food safety legislation and management, generalized food also relates to the food production of raw materials, planting food materials, substances and environmental contact the breeding process, food additives, direct or indirect contact with food packaging materials, facilities. Thus, food not only has a wide range in category, but also covers the numerous areas. In all, food is the material basis of our human existence and development, which has a directly influence on the health and safety of consumers. Therefore, to ensure food safety and health is the primary task of food and related industries.

There has been more than 30 years from the Chinese open-up reform applied, with the high speed development of industry and agriculture, especially based on the idea of "as long as economic benefits, regardless of the ecological environment" in former years, lead to a lot of production and domestic waste pollution. People who stay in the most high-end food chain has a great live threat, because of the environmental pollutants seriously polluted the food by the consumption of contaminated agricultural and food production process, and the pollution produced by the enrichment of these contaminants through the food chain; At the same time, agricultural chemicals such as pesticides, fertilizers, etc. which large-scale used in agricultural production process, also lead to the contamination of edible agricultural products; To some extent, abuse and illegal use of non-food additive substances as additives in food production process also affect the safety of food; As the development of science, some of the traditional food processing methods, such as smoking, baking, etc. Will produce some harmful substances, a threat to human health. Therefore, the study of factors affecting food safety and

第 1 章 绪论

《中华人民共和国食品安全法》第九十九条对食品的定义是："食品，指各种供人食用或者饮用的成品和原料以及按照传统既是食品又是药品的物品，但是不包括以治疗为目的的物品"。从食品安全立法和管理的角度看，广义的食品还涉及所生产食品的原料，食品原料的种植、养殖过程中接触的物质和环境，食品添加物，直接或间接接触食品的包装材料、设施。由此可见，食品不仅种类繁多，而且涉及的物质、行业也众多。归根结底，食品是我们人类生存与发展的物质基础，直接关系到食用者的健康和生命安全。因此，保障食品的安全卫生是食品及其相关行业的首要任务。

随着改革开放 30 年来我国工农业生产的大力发展，特别是前几年"只要经济效益，不顾生态环境"的错误观念在一些人的头脑中蔓延，导致大量的生产和生活废弃物污染环境。这些环境污染物通过对食用农产品和食品生产过程的污染而造成对食品的严重污染，而且这些污染物通过食物链的富集作用，使处于食物链最高端的人类健康和生命安全受到威胁；同时农业生产过程中农用化学品如农药、化肥等的大量使用也造成食用农产品的污染；食品生产过程中滥用添加剂和违法使用非食用的物质作添加物也在一定程度上影响食品的安全性；随着科学的发展，发现一些传统的食品加工方法，如烟熏、烘烤等将产生出一些有害物质，威胁人类健康。因此，研究影响食品安全的因素和控制措施，保证食品安全，成为当今世界各国关

control measures to ensure food safety, become one of the focuses of attention around the world now.

注的焦点之一。

1.1 The Historical Context of Food Safety

1.1 食品安全性的历史观

1.1.1 Food Safety Knowledge of Ancient Humans

1.1.1 古代人类对食品安全性的认识

The knowledge of ancient humans about food safety was something about food corruption, disease transmission and other issues. A lot of diet taboos, warnings and ban regulations were established under the basis of a long-term life experience by the various nations of the world and some codes of practice were spread as survival remains today.

大多与食品腐败、疫病传播等问题有关，世界各民族都有许多建立在长期生活经验基础上的饮食禁忌、警语和禁规，有些作为生存守则流传保持至今。

Western culture: the 1st century BC, *the Bible* Moses diet: "Meat not from ruminant hoofed animals can not eat". 2000 BC, the Jewish *Old Testament*: "Not eat those dead in the fields of bush meat".

西方文化：公元前1世纪《圣经》摩西饮食："凡非来自反刍偶蹄类动物的肉不得食用"。公元前2000年，犹太教《旧约全书》："不应食用那些倒毙在田野里的兽肉"。

China: there were "medical food" and "food officials" to protect the ruling class of food nutrition and safety in Western Zhou Dynasty. 2500 years ago, "Confucian ancestral" Confucius *Analects · Xiang dang* that read: "Food rotten stinking, rotting fish and meat, do not eat. Food color ugly, do not eat. Unpleasant odor, do not eat. Improper cooking, do not eat. Inappropriate, do not eat. Not a proper cut meat, do not eat. No certain flavored sauce, do not eat."

中国：西周时期已有"食医"和"食官"来保障统治阶级的食品营养与安全。2500年前"儒家之祖"孔子在《论语·乡党》中提出："食馁而餲，鱼馁而肉败，不食。色恶，不食。臭恶，不食。失饪，不食。不时，不食。割不正，不食。不得其酱，不食。"

1.1.2 Food Safety Knowledge of Recent Humans

1.1.2 近代人类对食品安全性的认识

In the 17th and 18th centuries, the expanding of industry production scale promotes the developing of the commodity economy and the increasing of the amount of the food trade. However, owing to the lack of effective food inspection techniques and the lag of relative food safety laws and regulations, there is a new change in modern food safety issue. False food, adulterated food, mixed with poison, fraud phenomenon has spread to social nuisance. Concentrated sulfuric acid, turpentine, lime, alum were found in British gin; watered milk, carbon-doped coffee, meat with sulfuric acid appeared in the American market.

17、18世纪，由于生产规模不断扩大，促进了商品经济的发展和食品贸易的增长；但由于缺乏有效的食品检验技术，而且食品安全法律法规滞后，近代食品安全问题出现了新的变化。食品交易中的制伪、掺假、掺毒、欺诈等现象已蔓延为社会公害，制伪掺假食品屡禁不绝。英国杜松子酒中查出有浓硫酸、松节油、石灰水、明矾等；美国市场上出现了掺水牛奶、掺炭咖啡、硫酸肉等恶性食品安全问题。

Ban Food Forgery Law was introduced in France in 1851; *Food Law* was introduced in British in 1860; *Pure Food and Drug Law* and *Meat Inspection Law* were introduced in United States in 1906.

1851 年，法国通过《取缔食品伪造法》；1860 年，英国通过《食品法》；1906 年，美国通过了《纯净食品与药品法》《肉类检验法》。

Abundant knowledge of food hygiene and safety has been accumulated in the thousands of years of feudal society. However, the knowledge did not constitute a discipline, which was mainly used as regimen rulers for the exploiting classes, and not being truly services for the majority of people.

我国在几千年的封建社会中，积累了极其丰富的食品安全知识，但未能构成一门学科，主要用来作为统治者和剥削阶级的养生之道，并没有真正地为广大人民服务。

1.1.3 The Knowledge of Modern Humans About Food Safety

1.1.3 现代人类对食品安全性的认识

The knowledge of modern humans about food safety has changed from food unsanitary, spread of epidemics and adulteration to certain chemical contamination on food and the potential threat to consumer health. For example. organic synthetic pesticide which is the source of pollution in agriculture. Food safety incidents continue to occur in our lives.

从食品不卫生、传播流行病、掺假制伪等，转向某类化学品对食品的污染及对消费者健康的潜在威胁。例如：农牧渔业的源头污染——有机合成农药。食品安全事件不断出现在我们生活中。

1.2 The Modern Context of Food Safety

1.2 食品安全性的现代内涵

1.2.1 Concepts About Food Safety

1.2.1 食品安全学的基本概念

1.2.1.1 Food safety

1.2.1.1 食品安全

"Food safety" has the duality. One is quantity safety issue: the food security of a country or society is whether it has sufficient food supply. The other is quality safety issue: the effect of toxic and hazardous substances on human health is a public health problem.

"食品安全"的概念具有双重性，一重是数量安全，一个国家或社会的食品保障，即是否具有足够的食物供应；另一重是质量安全，食物中有毒、有害物质对人体健康影响的公共卫生问题。

1.2.1.2 Food quality

1.2.1.2 食品质量

Food quality involves the other traits for consumers, namely the edible value of food. It not only has positive traits including flavor, color, texture, and nutrition, but also has negative traits, such as corruption, sex, color and taste, etc.

食品质量是指涉及针对消费者而言的其他性状，即食品的使用价值，有正面的性状，如风味、颜色、质地、营养等；也有负面的性状，如腐败性、变色、变味等。

1.2.1.3 Hazard, risk and toxicity

1.2.1.3 危害、风险与毒性

Hazard refers to foods may produce biological, chemical and physical factors or conditions, which will adverse to health effects.

危害是指食品中可能会产生不良健康影响的生物性、化学性或物理性因素或状况。

Risk refers to the possibility of adverse health effects of various hazards and strength.

Toxicity refers to an ability of material producing any kind of damage or injury (chronic or acute) on organism in any condition.

1.2.1.4 Food safety

Food safety is a science, which analysis the risks of the harms to human health by food and reduces or makes sure the food with no risks. The food should not contain toxic and hazardous substances or factors which may do harm to or threat human health. Those substances or factors will lead consumers to acute or chronic toxic or infectious diseases or the health risks which may endanger the health of offspring. Jones, an American scholar, has suggested that divide the food safety into absolute safety and relative safety. Absolute Security: means a commitment which shall make sure that there is no harm to the human health when they eat the food, which means the food has no safety risk. However, on the objective aspect, the diet way and behavior of human always lead to risks. Therefore, absolute safety or zero risk is difficult to achieve. Relative safety: it will be safe if the normal amount of food or ingredient is intake in a reasonable diet way. The safety of food depends on whether the amount of food is properly or not, diet way is reasonable or not, the production process of food and the internal conditions of the consumer.

1.2.1.5 Foodborne disease

Various pathogenic which enter into human body through ingestion always lead to infectious or toxic disease, such as common food poisoning, intestinal infectious diseases, zoonotic diseases, parasitic diseases, and toxic and hazardous chemical substance-induced disorders.

1.2.2 Modern Problems of Food Safety

1.2.2.1 The present situation of food safety of overseas and domestic

1.2.2.1.1 The present situation of food safety of overseas

Since the 1990s, the food safety malignant events often occur in internationally, such as the UK's BSE,

风险是指各种危害产生不良健康作用的可能性及其强度。

毒性是指物质在任何条件下对有机体产生任何种类（慢性或急性）损害或伤害的一种能力。

1.2.1.4 食品安全学

食品安全学是指研究食物对人体健康危害的风险，降低或保障食物无危害风险的科学。食品中不应含有可能损害或威胁人体健康的有毒、有害物质或因素，从而导致消费者急性或慢性毒害或感染疾病，或产生危及消费者及其后代健康的隐患。美国学者 Jones 曾建议区分：绝对安全性和相对安全性。绝对安全性：是指确保不可能因食用某种食品而危及健康或造成伤害的一种承诺，也就是食品应绝对没有风险。由于在客观上人类的任何一种饮食消费甚至其他行为总是存在某些风险，绝对安全性或零风险是很难达到的。相对安全性：一种食物或成分在合理食用方式和正常食量的情况下不会导致对健康损害的实际确定性。一种食品是否安全，取决于：食用数量是否适当、食用方式是否合理、制作过程、食用者自身的一些内在条件。

1.2.1.5 食源性疾病

通过摄食方式进入人体内的各种致病因子引起的通常具有感染或中毒性质的一类疾病，包括常见的食物中毒、肠道传染病、人畜共患传染病、寄生虫病以及化学性有毒有害物质所引起的疾病。

1.2.2 食品安全性的现代问题

1.2.2.1 国内外食品安全现状

1.2.2.1.1 国外食品安全现状

自 20 世纪 90 年代以来，国际上食品安全恶性事件时有发生，如英国的疯牛

Belgium's dioxin events. With the integration of the global economy, food security has become the borderless world food security issues. The food safety problem of particular area may spread to global. Moreover, it may lead to bilateral or multilateral international food trade disputes. Therefore, in recent years, countries around the world have strengthened food safety building, including institutional settings and adjust and strengthen policies and regulations, supervision and management and technology investment. Governments of various countries of the world have taken measures to establish and improve the food management system and relevant laws and regulations. Developed countries and regions like the United States and Europe has established not only a relative comprehensive standards and testing system for raw material of food and processed food, but also a relevant standard and testing system and laws and regulations for food production environment and the impact to environment by food production procedure.

病、比利时的二噁英事件等。随着全球经济的一体化，食品安全已变得没有国界，世界上某一地区的食品安全问题很可能会波及全球，乃至引发双边或多边的国际食品贸易争端。因此，近年来世界各国都加强了食品安全工作，包括机构设置、强化或调整政策法规、监督管理和科技投入。各国政府纷纷采取措施，建立和完善食品管理体系和有关法律、法规。美国、欧洲等发达国家和地区不仅对食品原料、加工品有较为完善的标准与检测体系，而且对食品的生产环境，以及食品生产对环境的影响都有相应的标准、检测体系及有关法规、法律。

1.2.2.1.2 The present situation of food safety at home

1.2.2.1.2 **中国食品安全现状**

Chinese food safety issue is not optimistic. According to special investigation of 2001-2003 years by the State Administration of Quality Inspection and Quarantine, it is found that the amount of employees of 70% of domestic food companies is less than 10 people, more than 10% of companies did not get business license and a quarter of the companies take no measures to control the quality of raw materials. Thus, it is hard to make sure the safety of the food. The food safety faces a credit crisis of the resident, however, Chinese average life expectancy is extended and health conditions are improved significantly. the average life expectancy of Chinese residents in 2016 is 76 years, higher than the world's average. This achievement is closely related to the improvement of the level of China's food safety. The improvement of China's food safety control can be reflected in the following aspects.

中国食品安全问题不容乐观，据国家质量检验检疫总局从2001～2003年的专项调查发现，在全国众多食品企业中70%是10人以下的家庭作坊式企业，超过10%的企业无营业执照，1/4的企业对进厂原料不进行任何把关，难以保证食品质量安全。尽管民众对全国一些食品的安全产生了信誉危机，但是，改革开放以来，中国人口的寿命得到延长，人民健康水平显著提高。中国居民的平均寿命2016年为76岁，高于世界平均水平。这种成就的取得与中国食品安全水平的提高密切相关。中国食品安全水平的提高可以从以下几个方面体现出来。

(1) Establish a total quality control standard system based on the idea of "from land to table", including technical, quality and certification, which forms a safety food production and processing system to meet China's national conditions

(1) 构建了“从农田到餐桌”的技术、质量、认证全程质量监控标准体系，形成了符合国情的安全食品生产和加工体系

Since the 1990s, in accordance with international organic food management experience and combined with the domestic national condition, based on the safe food with clean, safe, high-quality features as the basic characters, our country establish a green good quality standards, monitoring inspection, trademark management etc. industrial development system and form a new and main "standard system-quality certification-mark manage" operation mode. The food face the market in a uniform standard and a unified image and the enterprises and farmers are organized to participate in the research and development process. In some areas, it is formed a "production base-leading enterprises-brand-market" healthy functioning industrial chain. AA grade green food standards and green food quality control standards system has been initially established. Green food has covered grain, edible oil, fruits, vegetables, poultry products, fish, and alcohol, beverage and etc. categories. The purpose of pollution-free agricultural is to solve the agriculture product security problem which is becoming increasingly prominent problem in recent years. Pollution-free agricultural pollution emphasizes on safety and environmental friendly and the main product are agricultural and primary processing products.

20 世纪 90 年代以来，中国借鉴国际上有机食品等方面的管理经验，结合本国国情，首先以无污染、安全、优质的安全食品新概念为基本特征，构建了绿色食品质量标准、监测检验、商标管理等产业发展体系，形成了以“标准体系-质量认证-标志管理”为主线的运行模式。以统一的标准和统一的形象面对市场，组织企业和农户共同参与开发，在一些地区形成了“生产基地-龙头企业-品牌-市场”良性运转的产业链条。AA 级绿色食品标准及绿色食品全程质量控制标准体系已初步建立。绿色食品已覆盖粮食、食用油、水果、蔬菜、畜禽产品、水产品、酒类和饮料等几大类。无公害农产品目的是为了解决近几年来由污染引发的日益突出的农产品安全问题，其产品特色在于强调安全和环保。无公害食品主要是农产品和初级加工产品。

(2) Significantly improvement of the overall level of the industry

(2) 产业整体水平显著提高

① Substantial increase in food hygiene inspection pass rate.

① 食品卫生检测合格率大幅度上升。

② Export food quality improved significantly, market share increased year by year.

② 出口食品质量显著提高，市场份额逐年增大。

③ Focus on learning foreign food quality control techniques.

③ 注重学习国外食品质量控制技术。

④ Chinese food poisoning and poisoning the overall number of persons decreased occurrence.

④ 中国食物中毒总体发生数量和中毒人数呈下降趋势。

(3) Food quality and safety market access system and start making use of "QS" (quality safety) mark

(3) 食品质量安全市场准入制度与“QS”(quality safety) 标志开始实施

"Food quality and safety market access system" is not only the common practice in the international area,

“食品质量安全市场准入制度”既是国际上的通行做法，也符合消费者利益。

but also in line with the interests of consumers. Its main contents include: food production enterprises should implement production license system, and the enterprises which have not obtained the production license of enterprises are not allowed to produce food. From January 14, 2003, for rice, flour, oil, soy sauce and vinegar, which are most common five categories, the State Administration of Quality Supervision, Inspection and Quarantine began full implementation of the "food quality and safety market access system." Implement compulsory inspection system for enterprise production of food, and it is not allowed food without inspection or unqualified food into market; for inspection of food labeled with market access QS, quality and safety of commitment to the society.

它的主要内容包括：对食品生产企业实施生产许可证制度，未取得生产许可证的企业不准生产食品。从2003年1月14日起，对于米、面、油、酱油、醋这五大类老百姓最常接触的食品，国家质量监督检验检疫总局开始全面实施"食品质量安全市场准入制度"。对企业生产的食品实施强制检验制度，未检验或检验不合格的食品不准出厂销售；对检验合格的食品加贴市场准入标志"QS"，向社会做出"质量安全"承诺。

(4) Food quality and safety education personnel training system has been initially formed

(4) 食品质量与安全教育人才培养体系已初步形成

1.2.2.2 Hazard factors in food

1.2.2.2 食品中的危害因素分析

1.2.2.2.1 Biological hazard

1.2.2.2.1 生物性危害

(1) Origin and classification

(1) 来源及分类

Biological hazard includes bacterial, fungus, virus and parasite. Biological hazards in food may both come from the raw material, and come from the food manufacturing process.

生物性危害包括细菌、真菌、病毒和寄生虫。食品中的生物危害既可能来自于原料，也可能来自于食品的加工过程。

(2) Features

(2) 特点

① The impact is easy to see.

① 影响是易见和迅速的。

② Microbiological hazards caused foodborne diseases increased.

② 微生物危害导致了食源性疾病增加。

③ The harm of foodborne diseases is increasing.

③ 食源性疾病的危害正在增加。

④ Risk assessment and risk management system set up is not perfect, which is also not set up based on production.

④ 危险性评估和危险性管理体系建立得并不完善，而且不是基于成果的。

(3) Biological hazard control measures

(3) 生物危害的控制措施

① Pathogenic bacteria: time/temperature control

① 致病菌：时间/温度控制（加热和蒸

(heating and cooking, cooling and freezing); Fermentation/pH control; add salt or other preservatives; dry and source control.

煮，冷却和冷冻）；发酵/pH 值控制；盐或其他防腐剂的添加；干燥以及来源控制。

② Virus: cooking.

② 病毒：蒸煮。

③ Parasite: controlling the diet; inactive/remove.

③ 寄生虫：饮食控制；失活/去除。

1.2.2.2.2 Chemical substances

1.2.2.2.2 ***化学性危害***

(1) Origin

(1) 来源

Chemical hazards exit any step of food procedure. Chemicals, for example, pesticide, veterinary drugs and food additives are not harmful at a suitable level, but if exceed the limit level, they are harmful. Food in the presence of chemical substances potentially harmful to the health of consumers—higher public awareness; outstanding long-term effects of chemical contaminants; food additives, pesticides and veterinary drugs prior to use to carry out comprehensive testing; for cumulative, low-level chemical exposure complex concerns; the establishment of chemical hazards risk assessment and risk management system.

化学污染可以发生在食品生产和加工的任何阶段。化学品，例如：农药、兽药和食品添加剂等适当地、有控制地使用是没有危害的，而一旦使用不当或超量就会对消费者形成危害。食品中化学物质对消费者健康存在潜在危害——公众警觉性较高；化学污染物长期影响突出；食品添加剂、农药和兽药在使用前要进行全面的检测；对于累积性、低水平接触复杂化学物的担心；建立对化学危害危险性评估和危险性管理体系。

(2) Classification

(2) 分类

① Existed naturally: mycotoxin, histamine, fish toxin, mushroom toxins, shellfish toxins and alkaloid, etc.

① 天然存在的化学物质：霉菌毒素、组胺、鱼肉毒素、蘑菇毒素、贝类毒素和生物碱等。

② Added intentionally: food additive (preservative such as nitrites; nutrient supplement and colorant etc).

② 有意加入的化学物质：食品添加剂（防腐剂，如：亚硝酸盐；营养强化剂、着色剂等）。

③ Added unintentionally: agricultural chemical substances (eg. pesticide, herbicide, fertilizer, antibiotics and growth hormone), banned chemicals, toxic elements and compounds (such as lead, arsenic, mercury and prostate), PCBs, factory chemicals (such as lubricant, cleaner, disinfectant and paint).

③ 无意或偶尔进入食品的化学物质：农用的化学物质（如杀虫剂、除草剂、肥料、抗生素和生长激素）、食品法规禁用化学品、有毒元素和化合物（如铅、砷、汞、氰化物）、多氯联苯（PCBs）、工厂化学用品（如润滑油、清洁剂、消毒剂、油漆）。

(3) Precaution

(3) 预防措施

material, process, label.

来源控制、生产控制、标示控制。

1.2.2.2.3 Physical hazard

(1) Origin: material found in food unnaturally and inherent harmfully, for example: metal, glass.

(2) Control measures: source control; production control.

1.2.2.2.3 物理性危害

(1) 来源：物理性危害包括任何在食品中发现的不正常的有潜在危害的外来物，例如：金属、玻璃。

(2) 控制措施：来源控制；生产控制。

1.2.3 The supervision and Control of Food Safety

1.2.3.1 Risk analysis

Risk analysis is a scientific basis for food safety control, but has not yet effectively implemented in China. A large number of pesticides, veterinary medicine, plant growth regulators and food currently used in the food chain, pathogenic organisms in food, etc. are all not yet accept systematic risk assessment and communication, which causes no scientific qualitative for food safety and management blindness at present. Producers, consumers and managers are all lack of considerable extent necessary information and knowledge. Risk analysis based on food safety control capabilities include three aspects: The first one is detection, monitoring and surveillance capability, the technical support department with a comparable level with international food safety inspection, testing capabilities, relying on the ability to form inspection on food production, processing, storage, transportation, consumption of active and passive monitoring network of the whole process, and has implemented management plan according to the network monitoring capabilities; The second one is risk analysis capabilities, which is a risk assessment management and communication ability for foodborne disease, contamination status and related factors based on obtained the testing, inspection and monitoring data and related information, including the assessment results for the control, management, adjusting inspection, monitoring and surveillance program, published scientific information, the ability to guide public education; The third one is continuous improvement and revision of laws, regulations, and standard systems.

1.2.3.1 风险分析

风险分析方法是食品安全控制的科学基础，但在中国尚未有效实行。对目前食物链中大量使用的农药、兽药、植物生长调节剂和食品中致病性微生物等均尚未进行系统的风险评估、管理和交流，导致对食品安全危害物没有科学的定性，管理存在盲目性，生产者、消费者和管理者都相当程度地缺少必要的信息和知识。以风险分析为基础的食品安全控制能力包括3个方面：一是检测、监测和监视能力，有关技术支撑部门具备与国际水平相当的食品安全检验、检测能力，依托检验检测能力形成对食品生产、加工、贮存、运输、消费全过程的主动和被动监测网络，并具有依据该网络实施管理计划的监视能力；二是风险分析能力，在获得检验检测和监测监视数据及相关情况的基础上，有对食源性疾病、污染物、污染状态和相关因素进行风险评估、管理和交流的能力，包括针对评估结果有控制、管理，调整检验检测、监测监视计划，科学公布信息、教育引导公众的能力；三是不断修订完善法律、法规、标准体系的能力。

Food safety risk assessment includes the following steps:

① Hazard identification: identify a known or potential health effect related with a specific factor.

食品安全风险评估包括以下步骤：

① 危害鉴定：识别出与某一特定因素有关的、已知的或潜在的健康效应。

② Hazard characterization: in food which caused by the biological chemical and physical factors of harmful to your health to do the qualitative and quantitative evaluation For chemical factors, must carry on the dose-effect evaluation. If you can obtain the biological and physical factors of a dose-assess, then the dose-assess evaluation should be made.

② 危害特征描述：对食品中生物性、化学性和物理性因素所引发的有害健康的性质进行定性的和定量的评价。对于化学性因素，要进行剂量-效应的评估。如果能获得生物性和物理性因素的剂量-效应数据，则应进行剂量-效应的评估。

③ Exposure assessment: the evaluation of potential intake qualitative and quantitative.

③ 暴露评估：对可能出现的摄入量进行定性的和定量的评价。

④ Risk characterization: through the description of the damage identification of hazard factors and exposure dose estimation of comprehensive analysis, it is concluded that for a given population may produce adverse impact assessment, including with the influence of the uncertainty of the assessment.

④ 风险特征描述：通过对危害因素的识别、危害因素的描述和暴露剂量的估计的综合分析，得出对给定人群可能产生的不利影响的评估，包括伴随的不确定性影响的评估。

1.2.3.2 The regulatory system of food safety in China

1.2.3.2 我国食品安全监管体系

Agricultural products (food) products production chain division multi-sectoral management system: Primary agricultural products (Ministry of Agriculture), processing and export (AQSIQ), circulation areas and bazaars (AIC), catering (Ministry of Health and CFDA), slaughtering, processing and market development (Commerce Department), industry integrity of the building (MIIT), comprehensive coordination (National Food Security Office), *Food Safety Law of the People's Republic of China*, *Product Quality Law of the People's Republic of China*, *Agriculture Law of the People's Republic of China*, *Law of the People's Republic of China on Import and Export commodity Inspection*, *the Special Regulations of the State Council on Strengthening the Supervision and Administration the Safety of Food and Other Products*, *Regulation of the People's Republic of China on the Administration of Production License for Industrial Products*, *Food production and processing enterprise quality and safety supervision and management of the implementation details*.

农产（食）品生产链分工的多部门管理体系：初级农产品（农业部）、加工生产及进出口（国家质检总局）、流通领域和集贸市场（工商局）、餐饮业（卫生部和食药局）、屠宰加工及市场建设（商务部）、行业诚信建设（工信部）、综合协调（国家食品安全办公室）《中华人民共和国食品安全法》《中华人民共和国产品质量法》《中华人民共和国农业法》《中华人民共和国进出口商品检验法》《国务院关于加强食品等产品安全监督管理的特别规定》《中华人民共和国工业产品生产许可证管理条例》《食品生产加工企业质量安全监督管理实施细则》。

1.2.3.3 The strategies of improving food safety

1.2.3.3 提高食品安全性的策略

1.2.3.3.1 Food companies

1.2.3.3.1 食品企业

(1) Hazard Analysis and Critical Control Point (HACCP)

(1) 危害分析与关键控制点（HACCP）