“十二五”普通高等教育规划教材

# 食品专业英语

SHIPIN ZHUANYE YINGYU

李向阳　张建友　主编

中国质检出版社
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## 内 容 提 要

本书依据食品专业学生的实际学习需要，系统地选编了食品安全质量管理、食品科学基础、食品工艺学等方面的内容。本书突出了食品安全和质量管理的重要性，但食品安全与质量管理是建立在食品化学和食品工艺学基础之上的，因此，在第二章介绍了食品化学与营养的相关知识，第三章介绍了食品工艺学的部分知识。

本书可作为高等学校食品及相关专业的英语教材，亦可供食品管理、食品生产企业相关人员学习和参考。

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# 序　言

近年来，人们对食品安全的关注度日益增强，食品行业已成为支撑国民经济的重要产业和社会的敏感领域。随着食品产业的进一步发展，食品安全问题层出不穷，对整个社会的发展造成了一定的不利影响。为了保障食品安全，规制食品产业的有序发展，近期国家对食品安全的监管和整治力度不断加强。经过各相关主管部门的不懈努力，我国已基本形成并明确了卫生与农业部门实施食品原材料监管、质监部门承担食品生产环节监管、工商部门从事食品流通环节监管的制度完善的食品安全监管体系。

在整个食品行业快速发展的同时，行业自身的结构性调整也在不断深化，这种调整使其对本行业的技术水平、知识结构和人才特点提出了更高的要求，而与此相关的高等教育正是在食品科学与工程各项理论的实际应用层面培养专业人才的重要渠道。因此，近年来教育部对食品类各专业的高等教育发展日益重视，并连年加大投入以提高教育质量，以期向社会提供更加适应经济发展的应用型技术人才。为此，教育部对高等院校食品类各专业的具体设置和教材目录也多次进行了相应的调整，使高等教育逐步从偏重基础理论的教育模式中脱离出来，使其真正成为为国家培养应用型的高级技术人才的专业教育，“十二五”期间，这种转化将加速推进并最终得以完善。为适应这一特点，编写高等院校食品类各专业所需的教材势在必行。

针对以上变化与调整，由中国质检出版社牵头组织了“十二五”普通高等教育规划教材（食品类）的编写与出版工作，该套教材主要适用于高等院校的食品类各相关专业。由于该领域各专业的技术应用性强、知识结构更新快，因此，我们有针对性地组织了西南大学、南昌大学、上海交通大学、浙江大学、上海海洋大学、中国海洋大学、南京农业大学、华中农业大学、浙江工业大学以及河北农业大学等 40 多所相关高校、科研院所以及行业协会中兼具丰富工程实践和教学经验的专家学者担当各教材的主编与主审，从而为我们成功推出这套

框架好、内容新、适应面广的好教材提供了必要的保障，以此来满足食品类各专业普通高等教育的不断发展和当前全社会范围内对建立食品安全体系的迫切需要；这也对培养素质全面、适应性强、有创新能力的应用型技术人才，进一步提高食品类各专业高等教育教材的编写水平起到了积极的推动作用。

针对应用型人才培养院校食品类各专业的实际教学需要，本系列教材的编写尤其注重了理论与实践的深度融合，不仅将食品科学与工程领域科技发展的新理论合理融入教材中，使读者通过对教材的学习，可以深入把握食品行业发展的全貌，而且也将食品行业的新知识、新技术、新工艺、新材料编入教材中，使读者掌握最先进的知识和技能，这对我国新世纪应用型人才的培养大有裨益。相信该套教材的成功推出，必将会推动我国食品类高等教育教材体系建设的逐步完善和不断发展，从而对国家的新世纪人才培养战略起到积极的促进作用。

教材审定委员会

2012 年 12 月

# 前言

## • FOREWORD •

食品工业是我国国民经济的重要支柱产业。无论是食品的国际贸易还是食品专业技术的发展，都离不开国际交流。尤其是加入WTO以来，国际间的信息交流异常活跃。因此，掌握食品专业英语及相关知识，学会与国外同行进行技术交流与沟通是食品专业学生的一项基本技能。

本书系统地选编了食品安全质量管理、食品科学基础、食品工艺学等方面的内容。加强食品安全与质量管理，提高食品的安全和质量是目前各国政府、企业和个人特别关注的事情。因此，本书突出了食品安全和质量管理的重要性，但食品安全与质量管理是建立在食品化学和食品工艺学基础之上的，了解其基础知识也是相当重要的，因此第二章介绍了食品化学与营养的相关知识，第三章介绍了食品工艺学的部分知识。

本书内容具有较强的实用性和指导性，可为食品管理者、企业和食品专业的学生提供理论指导。通过本书的学习，可使学生们提

高灵活运用与食品相关的词汇和用语以及在食品听、说、读、写等方面的能力，为以后的进一步学习或就业打下良好的英语基础。

由于资料收集和撰写水平有限，不妥之处，敬请读者指正。

编　者

2012 年 11 月

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# Chapter 1 Food Safety and Management

## Unit 1 Overview of Food Safety

### 1.1 Definition of Food Safety

The concept of safe and wholesome food encompasses many diverse elements. From a nutritional aspect, it is food that contains the nutrients humans need and that helps prevent long - term chronic disease, promoting health into old age. From a food safety aspect, it is food that is free not only from toxins, pesticides, and chemical and physical contaminants, but also from microbiological pathogens such as bacteria and viruses that can cause iliness.

Food safety is defined as the assurance that the food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.

The term "safe food" represents different ideals to different audiences. Consumers, special interest groups, regulators, industry, and academia will have their unique descriptions based on their perspectives.

Consumers are the end users and thus are at the last link of the food supply chain from production, through processing and distribution, to retail and food service businesses. Consumers are multidimensional and multifaceted. Population differ in age, life experiences, health, knowledge, culture, sex, political views, nutritional needs, purchasing power, media inputs, family status, occupation, and education. Safe food means food that has been handled properly, including thorough washing of food that will be cooked and anything to be eaten raw. Safe food means food prepared on clean and sanitized surfaces with utensils and dishes that also are cleaned and sanitized. Other consumers want safe food that retains vitamins and minerals but does not have harmful pesticides.

Safe food is a composite of all of the views and descriptions held by consumers, special interest groups, academicians, regulatory authorities, and industry. Almost any single definition of safe food will be overly simplistic, because safe food is a complex, multifaceted concept.

### 1.2 Hazards Associated with Foods

A hazard is a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect. All three types of hazards are associated with fresh produce comprise.

**Biological hazards** are composed of bacteria, parasites and viruses; **Chemical hazards** include naturally occurring hazards, added chemical hazards and contaminants; **Physical hazards** are foreign bodies like glass, wood, stones, insulation, plastic, etc.

### 1.2.1 Biological hazards

**Biological hazards** include disease-causing bacteria, viruses, and parasites. Many of microorganisms occur naturally in the environment and can be foodborne, waterborne, or transmitted from a person or an animal. Cooking kills or inactivates most pathogens, while proper cooling and storage can control them before or after cooking.

***Bacteria***

Bacteria are single-celled organisms so small they can only be seen with a microscope. Bacteria are everywhere and most are not pathogenic (disease-causing). The human gastrointestinal tract is home to more than 300 species of bacteria. Fortunately, only a few of these cause illness. Some bacteria are beneficial and are used in making foods such as yogurt, cheese, and beer. Others cause food to spoil, but do not cause human sickness. This difference between spoilage bacteria and pathogenic bacteria is important in the prevention of foodborne illness. Since pathogenic bacteria generally cannot be detected by looks, smell, or taste, we rely on spoilage bacteria to indicate that a food should not be eaten. Not many people will eat food that has become slimy or that smells bad. Pathogenic bacteria cause foodborne illness in three different ways:

***Infection*** Some bacteria damage the intestines directly. This type of illness occurs from eating food contaminated with live pathogenic bacteria. Cells that are alive and reproducing are vegetative cells. Many bacteria are killed in the acidic environment of the stomach, but some survive, pass through to the small intestine, and begin to grow in number. When the bacteria have multiplied to a high enough number (this depends on the strain of bacteria, its virulence or strength, and the health and susceptibility of the individual), the person becomes ill.

***Intoxication*** Some bacteria produce harmful toxins or other chemicals that are not present in the food. It is not the bacteria itself that causes illness, but rather the toxin the bacteria produce. This can happen even if the pathogen itself has been killed, as long as it had sufficient time to produce enough toxin before dying.

***Toxico-infection*** Some bacteria enter the intestines live, survive the acidic environment of the stomach, and then produce a harmful toxin inside the human digestive system. Toxico-infection is a combination of the previous two examples in that live cells must be consumed, but the toxin is produced in the intestine and it is the toxin that really causes the illness.

***Viruses***

Several viruses also cause foodborne illness. Viruses differ from bacteria in that they are smaller, require a living animal or human host to grow and reproduce, do not multiply in foods, and are not complete cells. Ingestion of only a few viral particles is enough to produce an infection. Humans are host to a number of viruses that reproduce in the intestines and then are excreted in the feces. Thus, transmission of viruses comes from contact with sewage or water contaminated by fecal matter or direct contact with human fecal material. Human pathogenic viruses are often discharged into marine waters through treated and untreated sewage. The other main source of transmission is from infected food workers who have poor personal hygiene. An infected worker can transfer viral

particles to any food. Therefore, proper handwashing and using a clean water supply are vital to controlling the spread of foodborne viruses.

Hepatitis A is a virus commonly associated with foodborne infections. The incubation period for hepatitis A, before a person develops any symptoms, is anywhere from10 to 50 days. It is during this period before symptoms appear that a carrier is most infectious and most likely to spread the disease. Hepatitis A, and many other viral and bacterial pathogens, is most often transmitted via a fecal-oral route. The fact that a person is infectious even before they know they have the disease makes it difficult to control.

***Parasites***

Some parasites also cause foodborne illness. Parasites must live on or inside a living host to survive. The most common foodborne parasites are *Anisakis simplex*, *Cryptosporidium parvum*, *Toxoplasma gondii*, *Giardia lamblia*, and *Cyclospora cayetanensis*. *Giardia*, *Cryptosporidium*, and *Toxoplasma* are all protozoa, or single-celled organisms.

### 1.2.2 Chemical Hazards

Chemical hazards in food processing can include chemicals which are intentionally added to foods, incidental or unintentionally added chemicals, as well as naturally occurring toxins. Intentionally added chemicals can be preservatives, such as sulfiting agents, nutritional additives, such as niacin and color additives. Unintentionally added chemical hazards can include drug residues, unapproved food and color additives and even cleaning compounds and sanitizers commonly used in the processing facility. Naturally occurring chemical hazards include mycotoxins, such as aflatoxin in nut products; shellfish and seafood toxins; and food allergens. Control strategies for chemical hazards include effective, facility-specific Good Manufacturing Practices (cGMP's), food security and other prerequisite programs. proper labeling and understanding of all components of ingredients and rigorous control of non-ingredient chemicals.

### 1.2.3 Physical Hazards

Physical hazards are foreign objects such as insects, dirt, jewelry, and pieces of metal, wood, plastic, glass, etc. that inadvertently get into a food and could cause harm to someone eating that food. FDA has established maximum levels of natural or unavoidable defects in foods for substances that present no major human health hazard. These are called Food Defect Action Levels. This is the maximum amount of unavoidable defects that might be expected to be in food when handled under good manufacturing and sanitation practices. They are allowed because it is economically impractical, and sometimes impossible, to grow, harvest, or process raw products that are totally free of natural defects. Unavoidable defects include insect fragments, larvae, and eggs; animal hair and excreta; mold, mildew, and rot; shells, stems, and pits; sand and grit. The allowable levels of these substances are set at very specific levels deemed not to be a threat to human health. If a food contains more than these allowable levels, it is considered adulterated. While it may be unpleasant to find such substances in food, eating them at such low levels is not a health hazard and will not lead

to illness.

## 1.3 History of Food Safety

Very little about foodborne illness or food safety is found in historical records. Scientists did not begin to understand bacteria, and their relationship to disease, until the late nineteenth century. People did recognize that food spoils, but the reasons for that and the potential for becoming ill from food were not known. Perhaps the absence of food safety from historical chronicles is an indication that it was less of a concern than were other problems in the past. Even early food regulations were not aimed at making food safer, but rather at preventing economic fraud. So, a history of food safety really does not exist, but numerous discoveries, inventions, and regulations have led to the present knowledge and state of affairs in food safety.

Food preservation methods such as drying, smoking, freezing, marinating, salting, and pickling had their beginnings thousands of years ago. Whether these methods were employed solely to keep food for later use, to improve flavor, or for other reasons is not known. But they also had the effect of keeping food safer. Even cooking can be viewed as an ancient method of making food safer. The Chinese Confucian Analects of 500 B. C. E. warned against consumption of sour rice, spoiled fish or flesh, food kept too long or insufficiently cooked food. The Chinese disliked eating uncooked food believing, "Anything boiled or cooked cannot be poisonous." Among the earliest of food safety manuals was one published in China in the year 2. It is possible that the practice of drinking tea originated because tea required using hot water, which would make it safer than using unheated contaminated water. Doubtless other cultures in antiquity, while oblivious to the causes or prevention of foodborne disease, experienced it and prescribed methods to avoid it.

Early scientists grappled with the nature of disease and bacteria, which would set the stage for later discoveries. Much of the present knowledge about pathogens that cause foodborne illness is built on a foundation of scientific discoveries spanning back over three centuries. Aristotle (384 – 322 B. C. E.) and his Greek philosopher/scientist predecessors believed in the spontaneous generation of organisms—that insects and animals arose spontaneously from soil, plants, or other species of animals. Francisco Redi, an Italian physician and poet, set out to disprove this theory in 1668. He believed that maggots did not arise spontaneously in meat, which challenged the common wisdom of the day. He prepared eight flasks with meat in them; four sealed and four left open to the air. No flies could land on the meat in the sealed flasks, thus no maggots grew. The clear conclusion was that maggots did not form by spontaneous generation, but that flies laid eggs that were too small to be seen. This, however, was not enough to convince skeptics. Italian biologist Lazzaro Spallanzani in 1768 disproved the spontaneous generation theory. Even though Redi proved that insects did not arise from spontaneous generation, scientists still believed that microorganisms did. In his experiments, Spallanzani boiled solutions that would normally breed microorganisms for prolonged periods of time, which killed any microorganisms that might be in the solution, on the walls of the flask, or in the air inside the flask. Then he sealed the flasks to prevent any new spores or microorganisms from entering. No microorganisms grew no matter how long he left them standing. The fact that no new

microorganisms appeared meant that there was no spontaneous generation.

The discovery of bacteria in the late nineteenth century, the increased understanding of bacteria's role in disease, and the realization that there is a connection between human diseases and animal diseases led to the ideas that cleanliness is important and that unsanitary conditions can contribute to disease. In 1847 Hungarian physician Ignaz Semmelweiss wondered why women who bore their children in hospitals died of fever during childbirth, while those who gave birth at home usually did not. Noting that doctors went straight from the operating room to laboring mothers, he concluded that the doctors themselves were carrying disease to the women from the dissecting room. In those days the doctors didn't wash their hands, but wiped them on their aprons, which were already coated with body fluids. Semmelweiss ran experiments in which he had the doctors wash their hands with soap and water, and then rinse them in a chlorinated lime solution before entering the maternity wards. Death rates plummeted from 10 percent to 1.5 percent, only to climb again when the experiments were discontinued. Thereafter, he forced doctors to wash their hands before treating patients. Unfortunately, the validity of his work was not recognized at the time. His colleagues greeted his theory with ridicule, refusing to believe that their own hands were a vehicle for disease. Instead they attributed the deaths to a phenomenon arising from the "combustible" nature of the pregnant women. Historians attribute Semmelweiss's eventual despondency to the ridicule of his theories and attacks on his character. He was committed to an insane asylum, where he died of blood poisoning. Lack of personal hygiene remains one of the main causes of foodborne illness 150 years later.

In a classic case of epidemiologic sleuthing, Dr. John Snow demonstrated in 1848 how cholera spread throughout London. He noticed that people who obtained their water from a particular well were more likely to become ill than those drawing their water from another well. He persuaded city officials to remove the pump handle from that particular well, which forced inhabitants to draw water from another well. The number of cholera cases dropped immediately. Louis Pasteur further elucidated the linkage among spoilage, disease, and microorganisms with his work on fermentation and pasteurization in the 1860s and 1870s. In 1872 German scientist Ferdinand Julius Cohn published a three-volume treatise on bacteria, and essentially founded the science of bacteriology. He was the first to attempt to classify bacteria into genera and species, and the first to describe bacterial spores. But this new field of bacteriology needed bacteria on which to conduct experiments and to study. It took Robert Koch in the 1880s to perfect the process of growing pure strains of bacteria in the laboratory. At first he used flat glass slides to grow the bacteria. His assistant, Julius Richard Petri, suggested using shallow glass dishes with covers, now commonly called Petri dishes. Koch also established strict criteria for showing that a specific microbe causes a specific disease. These are now known as Koch's Postulates. Using these criteria scientists can identify bacteria that cause a number of diseases, including foodborne diseases. In 1947 Joshua Lederberg and Edward Lawrie Tatum discovered that bacteria reproduce sexually, and opened up a whole new field of bacterial genetics.

Even though Anthony van Leeuwenhook, a Dutch biologist and microscopist, had improved the microscope to the degree that small microscopic organisms could be seen for the first time as far back

as 1673, the discovery of foodborne disease-causing microorganisms developed slowly. In 1835 James Paget and Richard Owen described the parasite *Trichinella spiralis* for the first time. German pathologists Friedrich Albert von Zenker and Rudolph Virchow were the first to note the clinical symptoms of trichinosis in 1860. However, the association between trichinosis and the parasite *Trichinella spiralis* was not realized until much later. In 1855 the non-pathogenic form of *Escherichia coli* was discovered. It later became a major research tool for biotechnology. Englishman William Taylor showed in 1857 that milk can transmit typhoid fever. In 1885 USDA veterinarian Daniel Salmon described a microorganism that caused gastroenteritis with fever when ingested in contaminated food. The bacteria were eventually named *Salmonellae*. August Gärtner, a German scientist, was the first to isolate *Bacillus enteritidis* from a case of food poisoning in 1888. The case was the result of a cow with diarrhea slaughtered for meat; 57 people who ate the meat become ill. Emilie Pierre-Mare van Ermengem, a Belgian bacteriologist, was the first to isolate the bacterium that causes botulism, *Clostridium botulinum*, in 1895. The case concerned an uncooked, salted ham served at a wake in Belgium. Twenty-three people became ill; three died. Van Ermengem isolated *C. botulinum* from both the ham and one of the victim's intestines. He demonstrated that the organism grows in an oxygen-free environment, and that it produces a toxin that causes the illness. In a perhaps overzealous use of the scientific method, M. A. Barber demonstrated that *Staphylococcus aureus* causes food poisoning. He became ill after each of three visits to a farm in the Philippines in 1914. Suspecting cream from a cow with an udder infection, Barber took home two bottles of cream, let them sit out for five hours, drank some of the cream, and became ill two hours later with the same symptoms he experienced on the farm. He isolated a bacterium from the milk, placed it in a germ-free container of milk, waited a while, and then convinced two hapless volunteers to drink the milk with him. They all became ill with the same symptoms (Asimov 1972). In 1945 *Clostridium perfringens* was first recognized as a cause of foodborne illness. It wasn't until the years between 1975 and 1985 that some of today's major foodborne pathogens—*Campylobacter jejuni*, *Yersinia enterocolitica*, *Escherichia coli* O157:H7, and *Vibrio cholerae*—were first recognized.

## New Words

nutrient 营养物
chronic 慢性的，延续很长的
toxin 【生化】毒素
pathogen 【微生物】病菌，病原体
multidimensional 多面的，多维的
multifaceted 多面的，多维的
sanitize 清洁
bacteria 细菌
parasites 寄生的
virusin 病毒菌素