

FOOD CONTROL AND INTERNATIONAL FOOD TRADE

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Keywords: Food poisoning, heavy metal contamination, food law, international trade, food additives, pesticides, food irradiation, Codex Alimentarius Commission, food safety, low acid canned food, epizootics, tariffs, phytosanitation, quarantine, residues, food chemistry, consumer protection, public health, micronutrients, nutrition, WHO, biotechnology, food labeling, packaging technologies, veterinary drugs, risk analysis, quick frozen foods

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Summary

Food chemistry, as a science, dates from the mid to late 1800s, and most early food standards and the basic startup food control systems also date from about this time.

New and different approaches to food control and consumer protection were required to address public concerns for food problems emerging from these dramatic changes. The response of most countries undergoing these changes was to enact food laws and regulations, and to establish official organizations and institutions to administer food control activities.

Food control plays an important role in assuring high quality, safe, and nutritious food for the public, for their good health, and for the economic benefits derived from trade in safe and high-quality food products.

Although food control has been described in many different ways, the Food and Agriculture Organization of the UN (FAO) adopted a definition that appears to be most suitable. It is defined as “a mandatory regulatory activity of enforcement by national or local authorities to provide consumer protection and ensure that all foods during production, handling, storage, processing, and distribution are safe, wholesome, and fit for human consumption; conform to the quality and safety requirements; and, are honestly and accurately represented in its labeling as prescribed by law.”

Official food control has its foundation in law. Any effort to revise food law should incorporate the input of the affected sectors, such as the food industry and consumers. Effective control requires commitment and resources. The laboratory function is critical to food control. Compliance functions in food control vary from country to country. Scientific advisory services are absolutely necessary for a food control system. Using a risk-based programmed approach to food control requires understanding food hazards and how to control, reduce, or eliminate these hazards to decrease consumer health risks. Consumer Affairs is another important aspect of food control.

Most countries need to update their food laws and regulations to reflect rapidly developing changes coming about from the implementation of modern food control methods. Many countries place their food control emphasis in laboratory analysis of finished food products, consequently, laboratory personnel have graduate level university degrees.

The Impact of International Food Trade is increasing as the volumes of food moving across international borders increases. The World Trade Organization's (WTO) statistics indicate international trade in food to be more than US\$400 billion dollars. The World Trade Organization (WTO) has had a dramatic impact on the food trade. As it relates specifically to food, it includes the control of food additives, food contaminants, toxins, and disease-causing organisms.

Since 1962, the Codex Alimentarius Commission (CAC) has been responsible for implementing the Joint FAO/WHO Food Standards Program. The name Codex Alimentarius is taken from Latin and translates literally as food code or food law. The Commission's primary objectives are the protection of the health of consumers, the assurance of fair practices in the food trade, and the coordination of all food standards work. This action created a new emphasis and importance being placed on the work of the Codex in establishing international food quality and safety standards. The role of Codex in establishing quality and safety standards for food in international trade become exceptionally more important.

At the international level, there are some dramatic changes taking place in food control, somewhat driven from the changes being made in the international food trade. There has been a reorientation in the direction of food control. For example, in the Western nations, single food safety agencies are being considered.

This article reviews the measures being taken (and planned) in all matters of food quality and safety.

1. Introduction

The use of food standards to protect consumers and facilitate trade has a long tradition. Rules were laid down by Moses to prevent the consumption of meat from unclean animals, especially animals that had died from causes other than supervised slaughter. Assyrian writing tablets provided descriptions on how one goes about determining the correct weights and measures for food grains. In the early history of Athens, beer and wines were inspected to ensure the purity and soundness of these products. The Romans provided a well-organized state-controlled food control system to protect consumers from fraud by preventing the sale of bad quality or adulterated produce.

In the European Middle Ages, individual countries passed laws concerning the quality and safety of eggs, sausages, cheese, beer, wine, and bread. Some of these statutes are still in use today. The Industrial Revolution gave technological and economic impetus to trade in foods across and between continents. Food chemistry, as a science, dates from the mid to late 1800s, and most early food standards and the basic startup food control systems also date from about this same time (see *History of Food Quality Standards*).

Since the early 1900s comprehensive food laws providing for food standards and other consumer protection measures have continued to evolve and expand to provide a greater degree of protection and to deal with the increased levels of sophistication of the problems associated with food. This was particularly true following the introduction of mass production technology and to the emergence of larger urban centers in the late eighteenth century and early nineteenth century. New and different approaches to food control and consumer protection were required to address public concerns for food problems emerging from these dramatic changes. The response of most countries undergoing these changes was to enact food laws and regulations, and to establish official organizations and institutions to administer food control activities. This approach laid the foundation and became the forerunner of today's food control system.

2. Concerns for Food Quality and Safety

Food control plays an important role in assuring high quality, safe, and nutritious food for the public, for their good health, and for the economic benefits derived from trade in safe and high-quality food products. But to put matters in their proper perspective, there are from time to time episodes which come to the attention of the public that are alarming and created some concerns about the effectiveness of the food control systems. In the light of these events, it points to the need for continuous monitoring and surveillance and to closely examine what may be occurring at the national and international levels in food control and toward what may need to be strengthened. Innovated approaches are needed to deal with emerging technologies, controlling any risks associated with foods in the past, present, and future. Decisions are needed on changes to address and reverse what appears to be trends, which threaten public health, and to strengthen consumer protection.

On a worldwide basis, nearly 800 million people each year suffer from malnutrition due to lack of access to adequate amounts of good quality and safe foods. Most of those affected reside in developing countries. Malnutrition is not only caused from not having a sufficient supply of a variety of foods but is also caused by the consumption of poor quality and unsafe foods which do not provide the appropriate levels of macro-nutrients and micro-nutrients necessary for good health.

Every year, 3 million children die from diarrhoeal diseases (including dysentery) brought about by consumption of poor quality food and unsafe drinking water. Twenty five percent of all childhood deaths each year are now considered to be as a result of inadequate diets that lead to protein and energy deficiency and lack of essential vitamins and minerals.

Every year, according to the World Health Organization statistics, more than 100 million people suffer from food poisoning in one form or another. This number is probably underestimated, since most developing countries do not have technical means or resources to collect, record, or report this data. Those countries that do report this data are countries with lower incidences of foodborne outbreaks because of more effective food control systems in place.

If we examine the basic concerns of most people throughout the world, we will find that consumers are most concerned about chemical contaminants in the food supply. They are particularly concerned about mycotoxin contamination, including Aflatoxin; industrial chemicals such as poly chlorinated bi-phenols and toxic heavy metals; residues of agricultural chemicals, such as pesticides and fertilizers; and the safety of food additives and colors added to the food supply.

Biological contamination has become a more important concern to consumers in light of the news media's coverage of major food bornedisease outbreaks stemming from imported and domestically produced foods in the US and in Europe. Increasing concerns have been expressed about pathogenic organisms, which may exhibit antimicrobial resistance. *Cyclospora* contamination of imported strawberries and raspberries from a Central American country caused illness in more than 1000 people in the US and cost the country millions of dollars in trade, a loss which they could ill afford. In the US, a salmonella outbreak from ice cream mix reportedly caused sickness in more than 10 000 people, however it has been estimated that as many as 240 000 people may have been affected by this outbreak. The producer recalled the product at a considerable financial loss and with a cost in reputation and marketability of its products. In the Pacific Northwest part of the US, an outbreak of food poisoning attributed to the microorganism *Escherichia coli* resulted in the deaths of four children who consumed hamburgers from a convenience restaurant. In Japan nearly 9000 schoolchildren suffered from food poisoning from white radish sprouts suspected of being infected with *E. coli*.

There has also been considerable concern expressed by the consumers and some scientists over the safety aspects associated with the use of new food technologies. Among the concerns are the safety assessments of biotechnologies related to gene modification food product development. Consumers still resist purchasing food that has been irradiated, despite the fact that this technology has received considerable scrutiny

and has been considered to be safe for some number of years when used with the proper and effective food control measures in place. Other technologies of concern are the use of packaging innovations such as modified atmosphere packing and food fortification as a means to overcome micronutrient deficiencies.

3. Elements of a Food Control System

Although food control has been described in many different ways, the Food and Agriculture Organization of the United Nations (FAO) adopted a definition that appears to be most suitable. It is defined as “a mandatory regulatory activity of enforcement by national or local authorities to provide consumer protection and ensure that all foods during production, handling, storage processing, and distribution are safe, wholesome and fit for human consumption; conform to the quality and safety requirements; and, are honestly and accurately represented in its labeling as prescribed by law.” This definition was published by FAO in the Food and Nutrition Paper (FNP) series on Food Quality Control; Manual 14/11 entitled *Management of Food Control Programs*. Official food control has its foundation in law. Without legal authority as indicated by a legal instrument of the government, there is no authority for official activities and no creditability for those carrying out the activity.

Therefore, to begin improving a food control system, the legal framework on which food control is based, should be reviewed, revised where necessary, and updated to meet the current environment. Food law is an expression of the will of the government to assure food quality and safety and to carry out the required consumer protection measures as a matter of public policy. Food law should provide clear definition of the terms used in the law. It establishes the procedures to administer the law, including the authority to promulgate rules, regulations, codes of practices, quality, and safety standards, and procedures for food handling, processing, storage, shipping, and sale. It should define the role and authority of the competent agency of government and the powers granted to the agency and to the personnel of the agency. It should define the role and responsibility of the private sector and other institutions where applicable, such as industry, academic institutions, scientific committees and consumers. Any effort to revise food law should incorporate the input of the effected sectors, such as the food industry and consumers.

General regulations issued under authority of the law should be specific and clear and in plain language so as to be understood by nontechnical people as much as possible. It is useful to obtain the input of those affected by the regulations to consider before issuing the final rules. There are occasions when the agency may issue regulations, which are sensitive from a regulatory point of view, and these may issue without outside agency input. In either case, they should clearly state the requirements, limits, or other restrictions. It is a good policy to follow up the issuance of any regulation with information material designed to provide explanations and answers to anticipated questions. When possible, educational programs, training seminars, and workshops can be carried out to facilitate understanding and compliance.

Official food control requires commitment and resources. It is important to obtain this commitment and the resource through developing an appropriate strategy as to what is

to be achieved, how it will be done, who will do it, and in what time frame it will happen. The development and implementation of a national strategy is an endeavor that should involve all the interested parties. In many countries, a working committee has been established to make a review of the existing situation in the country related to food control, health, and trade, often with the assistance of an international organization or expert consultants. The committee should be made up of individuals with technical skills (academic, science, legal, and industrial), social/cultural and economic skills, and knowledge from as many of the affected sectors as possible.

The primary functional units of a food control system at the basic and minimal level includes an inspectorate, an analytical service, and a regulatory compliance unit. The Inspectorate conducts inspections and investigations of industry's performance in complying with official control requirements. The Analytical Service performs the testing and examination of products for determination of compliance with mandatory requirements of law and regulations, including mandatory food standards, established quality and safety limits for chemical and biological contaminants, packaging requirements, and other factors for which testing is required. The Compliance Unit serves as the enforcement function to oversee the bringing of legal cases when warranted. Other functional units support these activities and include administrative, planning, programming, research and information, education and training support, to assist both internal agency units and affected external sectors.

The Information and Training Services can conduct workshops and seminars on timely subjects of concern to industry or consumers, or can develop informational materials to be used for public distribution. A science and technology services group provides the support needed in research planning and support, or for review of the latest technologies in food control or food processing, and can liaison with academia on technology transfer, to assist in solving technical problems. Finally, a consumer affairs unit would relate to consumer issues, and work with consumer groups and the media and public in general to describe the food control programs, get input and provide information that is useful and informative. The unit can also assist in dealing with information and press media relations to get important food quality and safety messages to the public, particularly during times when emergency situations require public involvement in protection against health-threatening hazards related to the food supply.

3.2. Inspectorate

A primary functional unit of official food control is an adequately staffed and trained inspectorate. The role of the inspectorate is to inspect domestic food manufacturing, processing, and handling facilities, and import/export foods, and their facilities for compliance with the national legal and regulatory requirements. The inspector normally collects necessary samples for all types of food analysis to demonstrate the compliance level of any suspected foods, and for market samples for monitoring and surveillance purposes. In many countries, the inspectors also conduct investigations of suspected food poisoning or injury, fraudulent marketing and handling practices, complaints by consumers or industry, and illegal importation or exportation of food products.

It is important that the inspectors be trained in the latest investigative techniques, and be fully educated on the latest food safety and quality assurance methods, including the strengths and weakness of each method. They should receive up-to-date training in the new technologies used in processing and manufacturing, including what is required to control these technologies to function at maximum effectiveness and to assure proper technological performance. They must also be able to evaluate the performance of equipment and instruments used in production to assure they are appropriately controlled and monitored. In short, they must be well trained and understand the importance of Good Manufacturing Practices (GMPs), recognize deviations from GMPs, and know the impact on product quality and safety when they occur. And finally, the inspector should understand the utilization and application of Hazard Analysis and Critical Control Point (HACCP) based systems for the added margin of safety needed to the existing quality assurance and control measures used by the food industry.

The laboratory function is critical to food control. The laboratory personnel confirm the suspicion of the inspector that the food products sampled are not in compliance. They also confirm the quality and safety of food by determining if mandatory levels or limits of contaminants, additives, or other restricted materials are met and if the product complies with mandatory food standards. The laboratory is the gathering place of analytical data related to monitoring activities such as for food contaminants, microbiological contamination, meeting quality and safety standards, and so on. Laboratories deal with complex analytical problems caused by product composition interference. The problems can only be overcome by using the latest in analytical instruments and sophisticated methods of analysis. This also requires up-to-date technical knowledge acquired only through a continuous personal training program.

Because the analytical results may serve as one of the aspects for legal action against a food producer, they must therefore be accurate and precise. In the legal system of most countries, these matters come under careful scrutiny, with the laboratory analyst frequently forced to defend his technical abilities, the method and techniques used in the analysis, the accuracy and precision of the instruments used, and finally, the results of analysis. Official food control laboratories must maintain an internal quality assurance program to assure their credibility under such circumstances.

Compliance functions in food control vary from country to country. It is not always the responsibility of the food control authority to carry out court actions, and more commonly it is the responsibility of a legal unit in the Ministry of Justice. However, the food control unit is usually the unit that recommends that penalty actions should be taken based on evidence of violations documented during their inspection or investigation. In some cases, the food control authority may have limited powers to take minor penalty actions without court or legal intervention, commonly referred to as administrative action on the order of the Minister, such as establishment closure, or license suspension. In either case, the food control unit then should have a compliance unit. This unit would assure that the recommendations for legal action to the legal unit meet legal criteria for the matter to be referred onward to the courts and that evidence is available to prove violations. In penalty actions handled directly by the food control authority, the compliance unit would be the agency's legal representative and would

deal with the administrative action as required by law and within government policy requirements.

The compliance unit would be responsible for both actions that are considered as regulatory in nature, such as court actions, and for programs intended to achieve compliance through voluntary means. It is an accepted premise in food control that most food establishments and businesses will comply with reasonable rules and laws provided they understand what they must do to comply, and that they believe it is in their best interest to do so. Consequently, keeping the industry informed about the requirements, and working with them to assist in achieving these requirements, will go a long way in assuring food is safe and of suitable quality without having to resort to penalty actions. Some of the supporting functions to the food control activity include information, education, and training services. These functions may not be a direct part of the food control functional unit, but may be in other agencies of government acting in a horizontal manner across government agency lines. In this case, they may have functions in a variety of areas, such as health education, trade, and industry information services, consumer information services, and so on. In either case, it is an important element of the food control process because industry and consumers alike need to have available information to make decisions in the business world and marketplace. Food control officials must recognize the need for the development of information in a useable format that keeps people informed about important aspects of the food supply. Communications through public media announcement, published brochures, information bulletins, even the development of an Internet home page can go a long way in keeping people informed. Programs of education and training can be arranged directly or through educational institutions.

Scientific advisory services are absolutely necessary for a food control system. Using a risk based programmed approach to food control requires understanding food hazards and how to control, reduce, or eliminate these hazards to decrease consumer health risks. The scientific community plays an important role in developing methods, conducting research, and defining the severity of the risk to consumers. They can assist in solving technical problems and provide sound scientific information to support and defend actions taken. They can provide risk assessment estimates on additives to food, contaminants, and residues when necessary, particularly in circumstances when a higher level of protection is needed for the public than international standards provide, or where international standards do not exist. Consumer Affairs is another important aspect of food control. Consumers must understand there is no such thing as an absolutely safe food supply. They must understand how they can protect food in the household, during food handling, preparation, and serving, and when handling and storing food left over to prevent this food from becoming a health hazard. Consumers need a focal point in the food control system to let their dissatisfactions be known, to complain about product deception and poor quality, and to report injury and illness caused by food. The Consumer Affairs support function provides opportunity for food control officials to have a channel directly to consumers in time of emergency and need for public awareness or warning. A trained specialist in public relations and consumer affairs with reasonable technical skills can be an exceptional asset and resource to the food control unit.

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Biographical Sketches

John R. Lupien is a former Director, Food and Nutrition Division, Food and Agriculture Organization of the United Nations (FAO), Rome, Italy, and Adjunct Associate Professor in the Nutrition Department, College of Health and Human Development, Pennsylvania State University, US. He was formerly with the US Food and Drug Administration (FDA) as Director, International Affairs Staff, in Washington, DC, and as a FDA investigator in San Francisco, California, Brownsville, Texas, and as an FDA Compliance Officer in Washington, DC.

John Lupien carried out his undergraduate and graduate studies at the University of Massachusetts, Amherst, Massachusetts, US. He has worked in nutrition, food quality and food safety since 1960. In his FDA and FAO work, John Lupien has been involved in extensive nutrition-related policy formulation work. He has also carried out in-depth nutrition, food quality, and food safety surveys and prepared and implemented nutrition-related projects in about 50 countries. As Director of the FAO Food and Nutrition Division, he supervised 70 professionals and support staff, oversaw the technical organization of the December 1992 Rome Joint FAO/WHO International Conference on Nutrition, and coordinated FAO's overall nutrition program.

Anthony Whitehead is a Senior Officer, Food Quality and Standards Service, of the Food and Nutrition Division, Food and Agriculture Organization of the United Nations (FAO), Rome, Italy. He worked with the US Food and Drug Administration prior to joining FAO and has extensive operational and high-level supervisory experience in food quality and safety programs at national and international levels. He has worked with the FAO/WHO Codex Alimentarius Commission and with the World Trade Organization and has developed and provided technical assistance for projects on control of food quality, safety, and food contamination in more than 80 developing countries in all parts of the world.