

Regional Food Safety Testing Risk Analysis and Early Warning Research



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Abstract Food safety issues have become increasingly serious in recent years, and food safety has affected life safety. With the development of the economy, people are increasingly pursuing material life, especially in food. Food safety, which is increasingly demanding, has caused frequent food safety problems due to excessive pursuit of interests, imperfect food safety, and contamination of food materials. In order to solve food safety problems, food safety risk analysis and early warning can effectively improve the quality and safety of food. This paper focuses on the problems of food safety, combined with the needs of food safety development, to study regional food safety testing risk analysis and early warning, and established a food safety early warning model through food safety standards and risk analysis. A useful attempt has been made to promote food safety in China.

Keywords Food safety testing · Risk analysis · Risk warning

1 Introduction

As a necessity for the growth and production of food, food has shown its importance from the moment of its existence. Food is the guarantee of a day's life in biological growth and development. Human beings are the most obvious in them, and food safety issues are also the most prominent. People's requirements for food are no longer enough to fill their stomachs. Safe, healthy, and high-quality foods are more sought after. Improving the level of food quality and safety has become part of the Scientific Development Concept. Realizing China's requirements from the overall well-off society to a comprehensive well-off society than to a harmonious society will benefit hundreds of millions of people. More food safety related issues have been exposed. For example, the poisonous rice incident in Guangzhou in 2001 caused some Cantonese people who loved rice to stop eating rice for a while. The Ground Ditch incident in Guangzhou in 2011 caused panic in the country. In 2013, Taiwan's

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Black Heart Oil incident once again brought the public's attention back to food safety issues, [1] which triggered the attention of the whole society. How to ensure food safety is the top priority of product quality supervision in various countries.

The adverse effects of food safety on the food market, people's physical and mental health, and the country's international image have begun to show. People and countries are increasingly aware of the importance of food safety. Food safety testing tests food raw materials, auxiliary materials, finished products, semi-finished products [2] according to certain standards to ensure food quality and safety. Food testing includes many aspects, such as food nutrition, food additives, hazardous substances, etc. In the food safety testing organization, the food inspection also includes the business processes of the series of work nodes, such as order placement, distribution, inspection, result filling, review, evaluation, report editing, report stamping, and each work node is completed by different person. Food safety has received more attention in recent years, and related research is increasing. For example, the National Committee of the Chinese People's Political Consultative Conference held a consultation meeting on the key proposals held in the previous period [3], and negotiated exchanges on promoting the quality and safety of agricultural products. Pei Sheng Zhou analyzed the common problems in the quality inspection of agricultural products [4] and proposed related countermeasures for the safety quality inspection of agricultural products.

Food safety risk analysis helps to identify factors that pose a threat to food safety, provide a reference for other work on food safety, and promote food safety. The food safety risk analysis should follow the principles of scientific rationality, clear division of duties and reliability, and include factors that may pose a threat to food safety, to ensure the effectiveness of the corresponding analytical work [5, 6]. With the advantages of food safety risk analysis, it can provide technical support for the scientific response to food safety issues and broaden the working ideas of food safety risk factors. If we can pay attention to the application of food quality and safety risk analysis in its quality management, it can make its management work more effective. And continuously increase the technical content and advantages in food quality management to meet its scientific management requirements. Increasing the focus on the use of food quality and safety risk analysis in quality management is conducive to optimize the way food safety management works, minimize the incidence of food quality and safety issues, and effectively protect food quality and improve safety [7].

Food safety risk warnings are issued, transmitted, and disseminated before food safety incidents, providing relevant risk warning information. It uses related technologies, equipment, to track, monitor, and analyze foods to determine the possible risks of food, so that relevant departments, enterprises, and consumers can take appropriate prevention and control measures in a timely manner, thereby reducing health and economic losses. There are also many studies on food safety warnings. For example, the food quality and safety risk warning model of dairy products based on the supply chain and extension method proposed by Zeng Xinping [8], improved the early warning ability of food quality and safety of dairy products enterprises and improved the quality and safety of food. Wang Lingling designed a food safety

risk warning system based on the application of data mining technology based on association rules [9]. Food safety warning is a functional system for safety warnings of food safety [10], which is mainly through monitoring food safety risks and quantifying risks.

2 Methods

2.1 Food Safety Standards

1. In order to ensure the quality and safety of food and the uniform regulations and requirements of various links and factors that may affect food quality and safety during the production and operation of food [11], it is necessary to establish standardized food safety standards. Standardized and effective food safety standards play an important role in ensuring people's health. It contains the following aspects.
2. Requirements for substances in foods and related products that cause harm or threat to human life safety and health.
3. Requirements for the type of food additive in food production and the range and amount of use.
4. Hygienic requirements for food production and management.
5. Relevant quality requirements directly related to food safety.
6. Methods and normative requirements for food safety testing.
7. Requirements for labeling and instructions of food safety and nutrients.
8. Requirements for food ingredients for specific populations, etc.

2.2 Types of Food Testing

Factory inspection system

Factory inspection is the focus of food testing, it is located at the front end of the food inspection system. It has a more effective role in the inspection of circulation and food and beverage or food supervision and inspection by government regulatory authorities. Moreover, it has a multiplier effect on early detection and early resolution of food quality and safety issues.

Sampling and testing system

Sampling testing can be divided into sampling and testing. Sampling needs to be random and effective, while testing is guaranteed to be true and fair. Sampling and testing play an important technical support role in food safety assurance and food safety supervision and management. It is an indispensable part of food safety testing and the most common testing method.

Entrusted inspection system

Entrusted testing refers to the testing of food production, distribution companies, and social organizations and consumers entrusting food testing institutions that comply with the law to comply with relevant standards, technical conditions, or contract requirements. In some cases, this system will also be chosen.

2.3 Risk Analysis

1. Risk is defined in the quality system ISO31000 as the impact of uncertainty on the target. Risk is the error between expectation and reality. If the probability of occurrence of the event is set to P , the consequence of the event is C , and the risk function is Eq. 1.

$$R = f(P|C) \quad (1)$$

2. Risk analysis of food safety can be an important reference for the development of food safety standards. In the process of food quality management, the formulation of food safety standards is the basic link. In practice, the consideration of food safety risk analysis can provide a reference for food quality management. The specific performance is as follows.
3. In the process of formulating the food quality management work plan, give full play to the application advantages of food safety risk analysis, obtain the corresponding analysis results, and give the reference basis for food quality management, so that its management work is more targeted, Avoid affecting the implementation of the corresponding management work.
4. Food safety risk analysis can provide professional support for food safety management and obtain a reference for good application value, thereby reducing the occurrence of food quality problems and refining the content of its management work.
5. Risk assessment has become the guiding basis for the establishment of national food safety standards.
6. The purpose of risk analysis is as follows.
7. Under the overall understanding of the overall quality and safety of food, scientific evaluation of food pollution, food-borne diseases, and harmful factors that will cause harm to health will provide effective technical support for the formulation of food safety supervision and management policies.
8. Knowing the level of specific contaminants present in specific foods and the trends in the level of control made into monitoring data can provide an important basis for developing food safety standards.
9. It reflects the overall level of food safety supervision in a region, guides the supervision and sampling work to identify key areas, evaluates the effectiveness

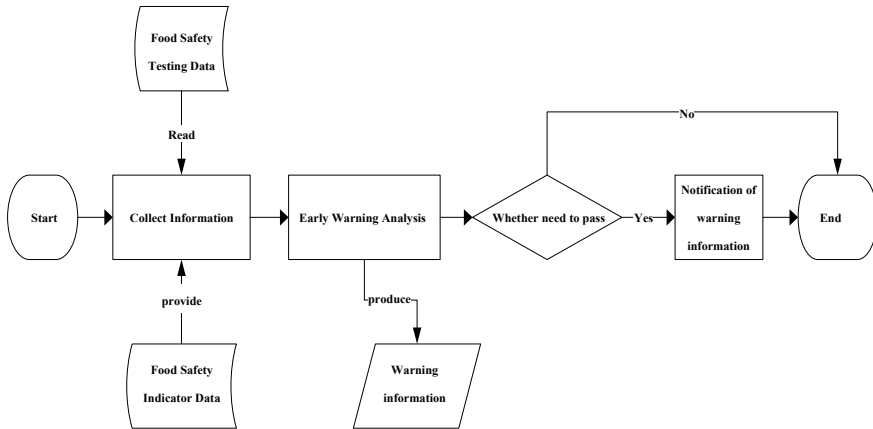


Fig. 1 Risk warning flow chart

of interventions, and provides the government with scientific information on food safety supervision.

10. It can provide guidance for the release of food safety warning information to the social sciences, objectively evaluate the actual situation of food safety, and effectively boost consumer confidence.

2.4 Risk Warning

Food safety warnings require food safety data and corresponding safety indicators to be used for risk warnings. When conducting risk warning, according to the analysis strategy, the data processing analysis will generate the early warning analysis result, and if there is an alarm, the warning information will be generated. When conducting risk warning, analyze the data processing to generate early warning analysis results, and if there is an alarm, the warning information will be generated. Supervisors will judge and analyze the early warning information, and decide whether it is necessary to issue an alarm based on relevant guidelines and experience. The workflow is shown in Fig. 1.

3 Analysis and Discuss

3.1 Classification of Early Warning Types

1. According to the needs of food and drug supervision and management, food risk warnings are classified into the following types.

2. The item that requires testing, the unchecked item that is triggered without full detection is abnormally predicted, called the Class A warning.
3. The early warning triggered by the detected food containing pathogenic microorganisms or prohibited substances called Class B warning.
4. The warning triggered by the unqualified items of the food packaging, such as the outer packaging, smell, color, etc., is called Class C warning.
5. An early warning triggered by the detection of a limited amount of hazardous substances in food that exceeds the prescribed standard is called a Class D warning.
6. The warning triggered by improper frequency of inspection of hazardous materials during inspection is called E-type warning.

3.2 Establish an Early Warning Model

1. Take milk quality safety testing as an example. According to the national regulations on the safety of milk safety indicators and parameters, a number of early warning indicators reflecting milk safety are shown in Fig. 2. Specific steps are as follows.

	Test items	Sample Name: Pure Milk		Testing base	Index	Conclusion
		Unit	Value			
1	Protein	g/100g	3.1	GB/T 5009.5-2003	≥ 2.9	Qualified
2	Adipose	g/100g	3.1	GB/T 5009.41-2003	≥ 3.1	Qualified
3	Lead	mg/kg	0.0001	GB/T 5009.22-2003	≤ 0.05	Qualified
4	Nitrate	mg/kg	1.4	GB/T 5413.31-2003	≤ 6.0	Qualified
5	Nitrite	mg/kg	0.07	GB/T 5413.31-2003	≤ 0.2	Qualified
6	Penicillin	—	Negative	GB/T 4789.25-2003	Negative	Qualified
	Streptomycin	—	Negative	GB/T 4789.25-2003	Negative	Qualified
	Gentamicin	—	Negative	GB/T 4789.25-2003	Negative	Qualified
	Kanamycin	—	Negative	GB/T 4789.25-2003	Negative	Qualified
7	Salmonella	—	Not detected	GB/T 4789.27-2003	Not checked out	Qualified
	Shigella	—	Not detected	GB/T 4789.4-2003	Not checked out	Qualified
	Staphylococcus aureus	—	Not detected	GB/T 4789.11-2003	Not checked out	Qualified
	Hemolytic streptococcus	—	Not detected	GB/T 4789.10-2003	Not checked out	Qualified
8	Total number of colonies	cfu/g	0	GB/T 4789.3-2003	≤ 10	Qualified
9	Colonic colony	MPN/100g	<3	GB/T 4789.4-2003	≤ 3	Qualified
10	Melamine	mg/kg	<2	GB/T 22388-2008	<2.5	Qualified

Fig. 2 Milk safety warning indicator

2. Get milk detection data and indicator data and start analyzing.
3. Class A warning is issued when it is found that the detected item is not detected.
4. Class B warning is issued when milk detects deadly bacteria or prohibited substance hazards.
5. Class C warning is issued when the outer packaging, smell and color of the milk can only be qualified for the qualitative inspection.
6. Class D warning is issued when a hazardous substance exceeding the milk standard limit is detected.
7. Class E warning is issued when the frequency of inspection of milk is abnormal.
8. When all warning information is not triggered, it indicates that the food has passed the security verification.
9. Real-time monitoring, providing early warning information for all walks of life.

3.3 Application of Early Warning Model

Implement the warning model through computer technology. First, perform data query analysis on the detected data existing in the database to find out the data that meets the warning requirements. The sample type and the project name are grouped, and the grouped data is determined according to the user-defined warning level determination condition.

For the realization of regional food safety risk analysis and early warning, the key needs data interaction technology, automatic collection of instrument data, and implementation of food safety risk early warning model to meet customer needs.

4 Conclusion

Food is the basic condition and the fundamental element of social development. Food safety is related to both personal safety and national security. Faced with frequent food safety incidents and increasingly serious food safety problems in China, improving its own food safety testing and supervision capabilities and effective prevention of food safety accidents have become an urgent problem to be solved. This study starts from the reality, through the analysis of food safety, combined with the needs of food safety development and taking milk as an example proposes a food risk warning model. Hoping to provide weak help for future research on food safety.

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