

Research on Food Safety Scientific Supervision and Intelligent Detection Technology Based on Large Data

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Abstract: With the food safety supervision in the era of big data, based on the mass of food safety data, the mode of supervision is undergoing intelligent change. Based on the scientific orientation of food safety, the transformation of food safety regulation needs the support of intelligent supervision mechanism, including intelligent responsibility transfer mechanism and intelligent supervision mechanism, as well as intelligent problem discovery and visualization chain synthesis. We need to study the key technologies of food safety detection, analyze the research hotspots in other related fields, and give future development directions and solutions, emphasizing the importance of food safety analysis and detection in food safety problems.

Keywords: Large data; Food safety; Scientific supervision; Intelligent detection

1. INTRODUCTION

The problem of food safety is directly related to the quality of life and health of the residents. It is the responsibility of the government to strengthen the supervision of food safety and ensure the safety of food. It is the social responsibility of the enterprise and the vital interests of the consumers. Food safety has become one of the focus issues of government, media and scholars at home and abroad. At the same time, the improvement of information level of food producers and operators, the expansion of government food safety information monitoring scope and the establishment of information traceability system of government departments provide massive data for food safety supervision. The supervision and inspection of food safety in China has entered the era of big data [1-2]. In the era of big data, based on modern data mining technology, relying on massive data for intelligent monitoring and detection of food safety, improving the efficiency of regulation and changing the way of supervision become the trend of food safety supervision.

2. ANALYSIS OF FOOD SAFETY PROBLEMS

The problem of food safety is a systematic problem, which involves a wide range of problems, and it is difficult to solve the problem. The problem of food safety in China is not only in common with the food safety problems in developed countries, but also with certain Chinese characteristics. Therefore, no matter

from the perspective of solving food safety problems or correctly understanding the urgent needs of intelligent supervision, we must first scientifically position the current food safety problems.

(1) The problem of food safety has obvious "transition" characteristics

In the transition stage, the food safety problem in China has also shown a clear transition characteristic. From the angle of production, enterprise brand low level of quality and safety awareness is relatively weak, the informatization level is not high; from the consumer perspective, consumers on food quality and safety have become increasingly demanding, health consciousness; from the perspective of the market, "bad money drives out good money" phenomenon is serious [3]. Therefore, the food safety problem is now in high incidence stage, and it will be difficult to solve in the short term.

(2) The problem of food safety can occur in the "whole industry chain"

The whole industry chain of food production and operation is likely to have food safety problems from any raw material input, production, processing, packaging, and ultimately to consumption. Therefore, to solve the problem of food safety, the whole industry chain of food production and management must be controlled.

(3) The key to food safety is the "human" problem
The main causes of food safety are "equipment", "environment" and "human". But the key problem of food safety is not the "food" itself, and in the "people", including producers of raw materials, food producers, processors, packaging, transportation and retail. The basic reasons for the problem of food safety are the poor sense of responsibility and the non-standard production and operation of the main body of production and management. Therefore, to solve the problem of food safety, we must determine the responsible people of the whole food industry chain.

(4) Food safety concerns "multiple" subjects

The occurrence and solution of food safety issues involve government supervision, enterprise management, association norms and consumer supervision. Different subjects have different positions, and their responsibilities are different. Any lack of responsibility or poor supervision in any of

the parties may lead to food safety problems. Therefore, to solve the problem of food safety, we must pay attention to the "top level design" and design a set of regulatory mechanism which is compatible with incentive and constraint.

Generally speaking, China's food safety is the result of irregular operation and strict supervision of the whole industry chain. Therefore, in order to solve the food safety problem effectively, we must establish a supervision system covering the whole industry chain, so as to cover all the subjects of the whole industry chain, define the safety responsibilities of the main body, clarify the main body of responsibility, and achieve seamless handover of the main responsibilities [4].

3. INTELLIGENT SUPERVISION IN THE ERA OF LARGE DATA

With the establishment of the national food safety monitoring network, the information collection of enterprise food production and operation data and the collection and storage of government department's traceability data, massive heterogeneous or isomorphic food safety data are continuously generated and stored. The intelligent food safety supervision method based on the mass food safety data has also come into being. With the establishment of the national unified food safety database and the development of various government or enterprise regulatory software. The intelligent supervision of food safety will gradually become a new direction of food safety supervision, as shown in Table 1.

Table 1. The change of food safety supervision in the era of big data

The characteristics of the present problems	Traditional mode of supervision	Intelligent supervision mode
With obvious track characteristics	Expost supervision	Prevention in advance, monitoring in the event
It can occur in the whole industry chain	Main channel supervision, subsection supervision	Comprehensive supervision and supervision of the whole industry chain
The key is the human problem	Management by punishment, manual supervision	Omni-directional supervision, evidence-based supervision
Design multiple subjects	The limit is unclear and the responsibility is unknown	Intelligent transfer of responsibility

(1) Regulatory responsibility: the supervision of the

whole industry chain

Based on the support of all food safety data in the whole industry chain, all regulatory authorities can develop application platform based on the same database, so as to achieve seamless connection or interoperability between quality and safety supervision [5]. We should clearly define the regulatory responsibilities of all the administrative departments, and achieve seamless connection and transparency between the regulatory departments, mainly the agricultural sector and the "food and drug" department, so as to achieve the supervision of the whole industry chain based on the two sectors.

(2) Supervision mode: according to the "number" supervision

Under the support of massive data, regulators can automatically find out the cause, location and subject of food safety problems through data mining, so as to improve the pertinence and effectiveness of supervision. By making full use of modern information technology and changing the old way of experience supervision, we can effectively overcome the difficulties of many regulatory objects and fewer supervisors, and make complicated data analysis and processing work to the computer.

(3) Regulatory means: full supervision

In the era of big data, government regulators have real-time mass data of food safety, so that they can provide various services for regulatory objects, such as the overall quality and safety report, epidemic prediction and early warning [6]. From "supervision" to "service" change, change the opposite relationship between the two, create a government and enterprise joint efforts to improve the quality of food safety atmosphere. According to the needs of the enterprise, the government's information advantage should be given full play to realize the full supervision management of the regulatory object.

(4) The focus of Supervision: Supervision of things in advance

The core of food safety supervision is to prevent the occurrence of food safety and eliminate the damage in the bud. Therefore, relying on big data support, regulatory authorities can shift the focus of supervision forward, and strengthen the prediction and early warning and operation monitoring in the event. Before the massive outbreak of quality problems, we should carry out prediction and early warning in advance through information means. The main body responsible for normal operation can also strengthen the process monitoring through the fluctuation of food safety data, correct the process bias in time, and eliminate all kinds of food safety problems that may arise.

(5) Scope of supervision: comprehensive supervision

According to Moore's law, the storage of food safety data is no longer a bottleneck that restricts data acquisition and analysis. Using modern data

collection technology and data mining technology, we can collect, collate and store all relevant data of food safety, subjects, regions and varieties in all directions. Relying on the full range of food safety data, we can conduct a comprehensive supervision of the food safety industry, which do not leave any blind spots and corners for the supervision, so as to ensure the quality and safety of all varieties and all regions. In the mass of food safety data under the support of food, if there are problems, the regulation is no longer simply limited to spot checks, quality inspection and so on; through intelligent analysis and processing of food safety data, the synthesis of the whole industry chain, to implement intelligent supervision.

4. KEY TECHNOLOGIES FOR FOOD TECHNOLOGIES AND SAFETY INSPECTION

Before studying the key technology of food safety analysis and testing, there are two points that need to be paid special attention:

- 1) The control of the quality of food raw materials. On the one hand, along with the development of economy and the improvement of living standard, the health of eating is a topic of increasing concern. Green food, nuisance free food and organic food gradually become the goal pursued by people. On the other hand, the emergence of genetically modified foods has also brought some potential hazards to consumers: damage to the body's immune system, the resistance of the human body to drugs, the environmental and ecological system, etc., which has attracted the attention of governments and international organizations all over the world [7].
- 2) Control of food packaging materials. Food packaging material is used to make food (food additives) packaging containers and the composition of the product packaging materials, also known as food additives. Almost all products are inseparable from packaging. The safety problem of food packaging is whether packaging materials can prevent food contamination, so as to protect people's physical and mental health, ensure that packaging materials do not release harmful substances to food, and do not react with food ingredients.

With the progress of science and technology, the food industry has developed many highly automated and accurate safety testing instruments, which not only shortened the detection time and reduced human errors, but also greatly improved the sensitivity and accuracy of food safety testing. China has achieved rapid development in food safety detection and analysis of theoretical research and practical applications, detection of increasingly high technology series, speed test, and modern detection techniques in chromatography, mass spectrometry and spectroscopy technology and bio technology as the representative has also been more and more used in food analysis and safety detection.

- (1) Food analysis and safety inspection pretreatment

method

Pretreatment of samples is the key to accurately determine trace or trace elements in food samples, because pretreatment directly affects the accuracy and accuracy of the analysis results. The pretreatment methods of modern food safety detection technology include fast solvent extraction, solid phase extraction, supported liquid membrane extraction, supercritical fluid extraction, high temperature water extraction, immune affinity chromatography and microwave assisted extraction [8]. It can extract and purify many trace components in food. Compared with traditional methods, it can extract and extract trace and trace components more simply and rapidly, and realizes sample extraction automation.

The microwave digestion method to sample processing center with high temperature digestion and microwave heating double performance, high heating speed, uniform and no hysteresis effect, short processing time, less solvent consumption and no evaporation loss, avoid harmful gas emissions, the advantages of closed sample digestion can effectively reduce the volatile elements loss. Therefore, a lot of detection techniques are combined with microwave digestion technology, such as microwave digestion hydride generation atomic fluorescence spectrometry for the determination of total arsenic in infant food. After digestion with nitric acid as digestion system, atomic fluorescence spectrometry is used to determine the total arsenic. The microwave digestion method can completely dispel the samples. The content of phosphate in the system is determined by phospho molybdenum blue spectrophotometry. When 0~150 is g, the content of phosphate is linear with the absorbance value and the correlation coefficient is 0.9999. The method for the determination of phosphate in meat products by microwave digestion spectrophotometry and the method for the determination of phosphate in meat products by phospho molybdenum blue spectrophotometric method. Microwave should also be used for sample pretreatment in organic analysis, that is, microwave-assisted extraction. For example, the determination of chloramphenicol residues in animal foods can be used by microwave-assisted extraction GC-MS. The recovery rate of the detection method is 75.3%~93.8%, the relative standard deviation is 6.2%~7.9%, and the minimum detection concentration is 0.12g/kg.

- (2) Food analysis and safety detection methods

As a transnational problem, food safety has attracted the attention of all countries in the world. Though different countries have different ways to deal with food safety problems due to their different developmental degrees, they all attach great importance to in-depth research of food analysis and safety detection methods and the formulation of relevant standards. In the International Food Safety Forum in 2011, set up "standards and technology"

and "new technique and new ingredients" project, food safety standards and detection methods of international standardization, rapid detection technology and method of the content of the communication, the application of nanotechnology in food analysis and safety testing are introduced.

In the "food safety law of the People's Republic of China" promulgated by China, the definition of food safety accidents refers to food poisoning, foodborne diseases, food contamination and other food accidents, which are harmful to human health or may cause harm. Among them, food poisoning, food is refers to the pollution of toxic and harmful substances in food or food containing toxic and harmful substances in the food after the acute and subacute disease; food borne diseases, infectious, toxic to diseases such as food enters the human body caused by pathogenic factors. Food poisoning, foodborne diseases and food contamination are usually referred to as food borne hazards. According to their different properties, they can be classified into physical, chemical and biological hazards. Biological hazards are the most important factors that affect food safety in China [9]. The food analysis and safety detection technologies for these hazards include genetically modified food detection, chromatography mass spectrometry, enzyme linked immunosorbent assay, spectral analysis, biosensor, biochip and so on.

(3) Countermeasures of food safety inspection

In recent years, the western developed countries represented by the United States and the Asian countries represented by Japan, Korea and India have made long-term progress in food analysis and safety detection technology. Especially for the research of new technology and new method, it is far ahead of China, and has made more rigorous and detailed food safety regulations and inspection standards, and established relevant food supervision system to effectively control food safety problems.

It can be seen from the above analysis, in order to effectively prevent the occurrence of food safety issues, and further enhance the efficiency of food safety testing and analysis, mainly from the following aspects of the work: 1) innovation and highlight the third party supervision mechanism, supervision mechanism, the implementation of regulatory responsibility, improve the regulatory capacity; 2) attach great importance to food safety publicity and supervision, highlighting the focus of the investigation, timely rectification of hidden dangers; 3) to prevent the pollution of agricultural products from the source, to improve the level of food industry; 4) improve food safety analysis and detection means, to achieve rapid, convenient and accurate, has the characteristics of real-time online.

5. FOOD SAFETY AND MONITORING PLATFORM BASED ON LARGE DATA

Food security cloud services platform architecture design scheme based on cloud computing and big

data technology as the core, as well as the government, enterprises, consumers and social media users to provide information service mode. With cloud computing technology, we can integrate and integrate mass food safety and nutrition detection data and related public opinion information, and establish an interactive platform based on detection data: food safety and detection cloud service platform. Through the strategy of big data, we collect, arrange, process and analyze information, and provide food safety and nutrition information services to the above four users through many ways of data access, such as web page, telephone, mobile device APP and so on. A schematic diagram of the system function is shown in Figure 1. Based on big data, food safety supervision and inspection cloud service platform includes data collection layer, data processing layer, information analysis release layer and user application layer, and the functions of each layer are as follows:

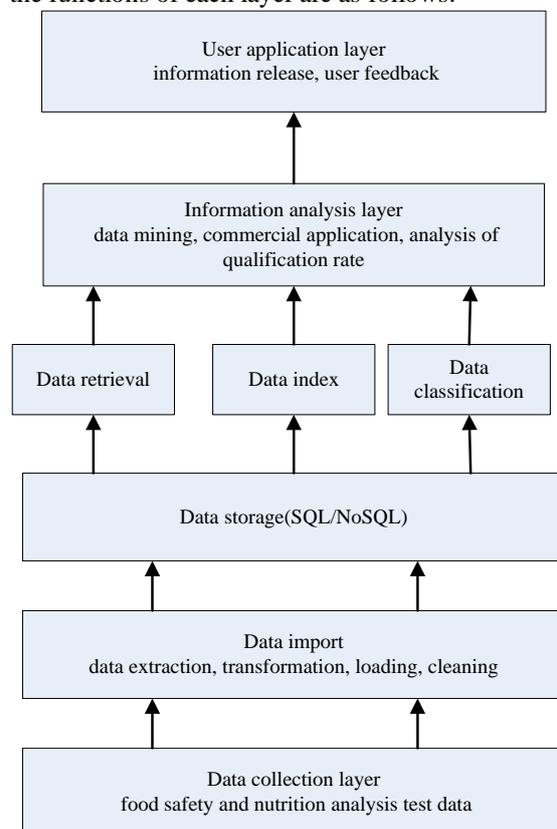


Figure 1. Food safety supervision and detection cloud service platform

(1) Data collection layer

The function of the data aggregation layer is to achieve the collection of analysis and detection data and food safety related public opinion data on the cloud platform. Analysis and testing data collection refers to the transmission of testing data through the public network connecting cloud platform with all the analysis and detection institutions, including laboratory data, enterprise reporting, fast screening and other channels, and is standardized as a standard structured data through the unified LIMS standard.

Related public opinion data collection: the main source of food and public opinion links, including food enterprises, industry associations, food management department website and official micro-blog, local forum, post bar and other targeted monitoring and collection, and to the cloud platform.

(2) Data processing layer

Data processing layer is mainly for the follow-up data mining to meet certain requirements of data, including data cleaning, data integration, data conversion 3 functions. The function of data cleaning is to remove data noise and data that is obviously unrelated to the research target. The role of data integration is to classify the related data from multiple data sources in the future. The role of data conversion is to convert data into a form of data existence that is easy to do data mining.

(3) Information analysis layer

The information analysis layer deals with data by deploying several big data analysis strategies and data mining algorithms, that is, how to do data mining based on business needs. Mainly includes 2 aspects: one is for food safety and nutrition analysis work decision-making needs to predict the future trend of the known data, provide the scientific basis for the future development of food safety and nutrition; two is the hot words the food safety of a large amount of unstructured data analysis, public opinion analysis, information communication mode of event correlation analysis, food management, provide decision-making support; provide the basic data for analysis, food related enterprises competition market opportunity discovery

(4) User application layer

The user application layer is oriented to the government, enterprises, consumers and social media, through a variety of information interaction, such as telephone, mobile phone, notebook, PDA and other terminal equipment, browsing and retrieval of various kinds of test data analysis and information analysis layer information generated by the product convenient and quick access to food safety and nutrition cloud platform. The mobile phone APP service based on two-dimensional code is provided. Consumers automatically connect the food safety information query platform by scanning products barcode and two-dimensional code, and get the safety and nutrition information of the food.

6. CONCLUSIONS

At present, the food safety situation is still grim. We should further speed up and improve the existing food safety supervision and safety inspection technology capabilities, overcome the limitations of

the technology and the inaccuracy of food inspection caused by the imperfect pretreatment technology. Actively explore the application of various advanced control methods and detection technology in food analysis and safety testing, development can be realized at the same time, fast sample analysis technology in one of the following detection pretreatment and sensitive, in order to meet the urgent needs of today's food safety, which is of great significance to the steady development of food safety.

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