Research on Quality Control in Food Physical and Chemical Testing

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Abstract: Food physical and chemical testing is the use of physical and chemical means to test the quality of food, is an important means of food quality and safety control. Nowadays, China's food quality and safety issues are more serious, food insecurity incidents occur frequently, which poses a greater threat to consumers' health and life safety. All relevant departments should pay more attention to food quality and safety. In the process of physical and chemical testing of food, many interference factors, such as environmental factors, human factors, reagent purity, instrument accuracy and experimental method selection, will have adverse effects on food inspection results, affecting the accuracy of data. In the process of physical and chemical testing of food, these interference factors should be strictly controlled to ensure the accuracy of the test results. In this paper, the author will analyze and discuss the means of quality control in the process of physical and chemical testing of food, in order to provide reference for relevant people and improve together. The quality of food physical and chemical testing ensures food safety.

1. Introduction
The physical and chemical testing of food is based on the basic principles of physics and chemistry. The technique of using instruments to test the physical and chemical properties of foods involves a large number of physical experiments and chemical experiments in the physical and chemical testing of foods, so that people can accurately understand Whether there are elements harmful to the human body and their contents in the food and the nutrient content of the food. The routine operation of physical and chemical testing of foods involves the following steps: first, the sample is collected, and the sample is pretreated to prepare for subsequent physical and chemical testing; thereafter, the concentrating method, the extraction method, the extraction method, the distillation method and the like are used. The chemical method separates and purifies the sample to obtain a state that can be directly used for detection; then, the instrument and the chemical analysis means are used to detect and analyze the extracted components, and the composition and content thereof are determined, and finally, the test results are data. Record, check the rationality of the test results, and analyze the test results to produce a physical and chemical test report.

2. Content of Food Physical and Chemical Testing
The main work is the inspection of the raw and auxiliary materials into the factory, the inspection of the production process, and the inspection of the finished products. The specific work requirements still depend on the requirements of your company or factory. The basic conditions for food inspectors are: "Implementation Opinions on Strengthening Food Quality and Safety Supervision and Management Work" stipulates: "Inspectors must master the basic knowledge of the law and the basic knowledge and skills of food inspection." Generally, the following conditions should be met, and only
after passing the training and examination, can bear the food quality inspection work, the practitioners must have a secondary education or above or have qualifications for junior professional and technical positions; have engaged in food inspection or related professional inspection; The above qualifications include secondary school, but do not include high school education. The inspection work of related majors mainly refers to the inspection work similar to the food inspection profession. The food inspectors include the inspectors engaged in food quality inspection by the quality inspection organization and the auditors who audit the inspection results, and the inspectors and inspection department heads of the food production enterprises engaged in factory inspection [1].

The professional quality of food quality inspection posts is very prominent, and the responsibility is also very important. It is not only responsible for the company, but also responsible for consumers. Personnel engaged in food quality inspection should be familiar with the basic knowledge of food quality inspection, familiar with the quality of food technology, and master the basic skills of quality inspection. Personnel engaged in the review of food quality inspection results should not only be familiar with the basic knowledge of quality inspection, familiar with food quality technical regulations, master the basic skills of quality inspection, but also familiar with the basic knowledge of food production and familiar with the basic processes of key processes. All of these need to have a certain knowledge base for support. Without the technical level of secondary school or above, it is difficult to be qualified for food quality inspection. Without training and assessment, it is difficult to guarantee the scientific and accurate test results. The basic conditions for food quality inspectors shall be implemented in accordance with the above conditions before the implementation of the qualification system; after the implementation of the qualification system, the requirements shall be implemented in accordance with the conditions stipulated in the qualification system [1].

3. Basic Procedures for Physical and Chemical Testing of Food

The standard food physicochemical testing process should involve three aspects - the collection of food samples, the pretreatment of samples and the inspection and determination of extracted samples. Among them, the collection of food samples is the basis of all subsequent work, and should be highly valued. In the process of collecting food samples, attention should be paid to the representativeness of the collected samples to ensure that the samples are not contaminated, and the samples are strictly in accordance with the sample collection process. Collect work to ensure the accuracy and reliability of the test results. In the pretreatment of food samples, attention should be paid to the selection of appropriate pretreatment methods, the recovery rate of the components to be tested, and also to ensure that the components to be tested are not contaminated, and the components to be tested are often enriched during pretreatment. At this time, it should be ensured that the concentration of the component to be tested is within the available range, which provides guarantee for the accuracy of subsequent measurements. If there is interference group, it will cause interference to the instrument test. A shielding agent should be added to shield the interference of the component to be tested from the interference component, and less measurement error.

4. Quality Control Measures Before Physical and Chemical Testing of Food

4.1 Sample Collection and Preparation

The collection of samples is the first step in physical and chemical testing. Therefore, the collection of samples has a great impact on the quality of food physical and chemical testing. If the sampling is not representative, the subsequent tests, no matter how accurate, are difficult to represent the overall situation of the food, and can not reflect the safety quality of the food; if the sample obtained by sampling is destroyed, it will affect the final result of the test. Therefore, the sampling process should try to ensure the randomness and representativeness of the sample, and reduce the influence of subjective factors on the sampling results.

The quality control measures during the sampling process include: (1) The sampling instrument should be disinfected and cleaned before sampling to ensure that the sampler will not pollute the
sample, cause interference, ensure the original properties of the sample, and pay attention to the method and strength when sampling. Reduce damage to the biological structure and physical organization of the sample. (2) Determine the appropriate sampling time and environment, and control the number of samples. Foods generally have a shelf life. The more unfresh foods, the more difficult it is to represent the original traits of the food. Therefore, fresher foods should be selected as samples during the sampling process. In addition, if the amount of sampling is small, it is often difficult to represent the overall traits of the food, and the sampling results are one-sided and contingent, so the sampling amount should not be too small. (3) During the sampling process, the sample should be uniform in texture. The liquid sample should be sampled after sufficient agitation to ensure uniform distribution of the solid-liquid phase. When the inorganic salt concentration reaches supersaturation and insoluble solids are present, after sufficient agitation to ensure maximum solubility, it should also be filtered after filtering out the insoluble solids; the solid samples with low physical structure requirements should be ground into powder before sampling.

Preservation of food samples: The principle of preservation of food samples can be summarized by the words “net, dense, cold, fast”. ① Net: Containers and tools for collecting and preserving samples must be clean and must not contain ingredients to be tested and other ingredients that may contaminate the sample. ② Dense: The collected food sample packaging should be sealed to stabilize the moisture, prevent the loss of volatile components, and avoid contamination during sample transportation and preservation. ③ Cold: The sample is transported and stored at low temperature to inhibit enzyme activity and microbial growth. ④ Fast: should be analyzed as soon as possible after sampling to avoid deterioration of food samples [2].

4.2 Preparation of Testing Instruments and Equipment
It is inevitable to use some instruments and equipment to participate in the inspection when conducting physical and chemical testing of food. Therefore, the selection of instruments for physical and chemical testing is a very important part. Firstly, according to the specific conditions of the sample and the requirements of the test target results, the instrument with perfect function and matching model should be selected. The instrument should be calibrated before use to ensure the normal operation of the instrument and ensure the accuracy and high resolution of the instrument. The instrument and various containers are thoroughly cleaned to ensure that the sample is not contaminated and interfere with the test results. Instruments that operate continuously should be regularly inspected and repaired, and problems should be dealt with in a timely manner. When selecting reagents, the validity of the reagents should be ensured. The type, concentration, volume or quality of the reagents should be determined through reasonable calculation and testing experience.

4.3 Testing Staff Training
The subjective factors introduced by the testing staff also have a great influence on the test results. Before the physical and chemical testing of the food, the inspectors should be given a unified pre-job training. The operational procedures for physical and chemical testing shall establish standardized operating standards, and guide the staff to conduct inspection operations in accordance with the specified operational procedures before they are employed. The staff should not only have a mastery of the operation process, but also should understand the working principle of the instrument, the selection criteria of the reagents, avoid the random adjustment of the instrument and the abuse of the reagents, and have the ability to handle the small faults of the instrument during the experiment, and understand the instrument. Daily maintenance means. In addition, the training of testing staff should also include professional ethics training, focusing on the ideological and moral training of staff, focusing on improving staff responsibility and professional ethics, and urging them to maintain a high degree of seriousness and rigor during their work. The spirit of the objective, face the test results, truthfully report, do not fabricate, do not conceal, do not tamper with the experimental results.
4.4 Rational Management of the Work Environment

The working environment will also have a certain impact on the results of physical and chemical testing of food. The working environment includes many factors, such as temperature, humidity, and microbial community in the environment. Unsuitable working conditions can have a major impact on the traits of food samples, and unsanitary work environments can contaminate samples. Under normal circumstances, for food physicochemical testing laboratories, the room temperature should be specified below 20℃, the test for soluble solids, room temperature should be controlled between 10-30℃. Reduce the impact of microorganisms in the experimental environment on the detection process and ensure that the detection environment is clean.

5. Quality Control Measures in the Physical and Chemical Inspection of Food

5.1 Use Appropriate Detection Methods

According to the test standard of the sample, select the appropriate test method. Within the scope of the specified method, the test method should be selected according to the actual conditions of the test to determine the best test method. For the same components in different morphological samples, different test methods are sometimes used. For example, for liquid samples, such as milk, calcium is tested by atomic absorption spectrophotometry, while for solid samples, such as milk tablets, In the case of calcium, X-ray fluorescence spectrometry should be used.

The selection principle of the detection method is: ①the national standard of the People's Republic of China: the food hygiene inspection method - the analysis method of the physical and chemical inspection part; ②when there are more than two inspection methods in the standard, according to the conditions available, the first method is the arbitration method. The standard method of the first method is not specified, and it is in parallel with other methods; ③the analysis method with high sensitivity, good selectivity, accuracy and reliability, short analysis time, economical and practical, and wide application range is used as much as possible [3].

5.2 Food Sample Pretreatment

Inorganic pretreatment of food samples includes wet digestion and dry ashing. Wet digestion method is to add oxidizing strong acid, such as nitric acid, perchloric acid, sulfuric acid, etc., to heat the organic matter, and release the inorganic component to be tested to form a non-volatile inorganic compound for analysis and determination. Among them, dilute sulfuric acid has no oxidizing property, while hot concentrated sulfuric acid has strong oxidizing property; sulfuric acid digestion method has weak oxidizing ability and long time consumption, adding potassium sulfate or copper sulfate to increase boiling point, and adding copper sulfate or mercury sulfate as catalyst to shorten time (Kjeldahl method) [4].

The dry ashing method has the advantages of simple operation, less reagent dosage, complete destruction of organic matter, no addition or addition of few reagents, low blank value, and can process multiple samples at the same time, and the digestion process does not need to be guarded, saves trouble, and has wide application range. Can be used for a variety of trace element analysis. However, the ashing time is long and the temperature is high, which easily causes the volatilization loss of the component to be tested; when the temperature is burned, the structure of the crucible may be deformed to generate minute holes, and the component to be tested is occluded, resulting in a decrease in the recovery rate. The measures for improving the recovery rate of dry ashing method can generally be ashed at the lowest possible temperature by using suitable ashing temperature. Generally, the dry ashing pretreatment should be ashed at 550 °C ± 25 °C for 4 hours, generally not exceeding 600 °C. [5].

Extraction and enrichment methods generally include extraction methods, volatilization and evaporation concentration, distillation, ion exchange, coprecipitation, adsorption, chromatography, sulfonation and saponification, cryogenic freezing, extraction, etc., flexible selection according to the actual needs of the inspection.
5.3 Physical and Chemical Testing, Routine Operation in Actual Work
In the physical and chemical testing, the indispensable operation is to test the blank sample and the standard curve. When testing the blank sample, it is necessary to ensure that the sample is not contaminated, and the validity of the blank value is guaranteed. At least six points are generally selected, and the deterministic coefficient R2 is guaranteed to be greater than 0.999 [5].

5.4 Control of Staff's Operational Behavior During Testing
The inspection staff's operation level and attitude directly affect the credibility and accuracy of the test results. Therefore, the inspection unit should focus on improving the experimental skills and professional ethics of the operators, and encourage the staff to continuously learn advanced technology and improve their business capabilities and ensure the accuracy of the test results.

5.5 Quality Monitoring of Food Physical and Chemical Inspection Results
Quality assurance measures taken to ensure the quality of the test to ensure that the test results meet the specified quality requirements, including the establishment of a quality assurance system, effective testing methods, and implementation of the required analytical quality control procedures. That is to say, the quality assurance work must be carried out throughout the inspection process, including sample collection, sample pretreatment, selection of analytical methods, measurement process and recording of experimental data, data processing and statistical analysis, and report of inspection results.

6. Conclusion
To improve the quality of food physical and chemical testing and to ensure the accuracy of the test results, the entire experimental process should be comprehensively controlled, including ex ante control and post-event control. Reduce the impact of various interference factors and improve the accuracy of test results.

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