

## LETTER TO THE EDITOR

# Application of High Performance Liquid Chromatography in the Detection of Food Nutrition and Health Assessment Indicators

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High performance liquid chromatography (HPLC) is a new technology developed on the basis of classical liquid chromatography (LC) with the addition of gas chromatography theory and technology. HPLC has the advantages of rapid analysis and efficient separation, which can effectively improve the sensitivity of detection and complete the effective analysis of high boiling point. Therefore, HPLC has been widely used in food nutrition and health assessment. The application of HPLC greatly improves the quality and efficiency of food nutrition and health assessment, and provides a new way to ensure food safety. In this paper, the characteristics of HPLC were described in detail. The application of HPLC in food nutrition and health assessment was analyzed, which could provide reference for improving the quality of food detection. With the improvement of people's quality of life, people attach great importance to food nutrition and health issues, so it is particularly important to do a good job in food testing. Based on this, this paper discussed the application of high performance liquid chromatography in food nutrition and health assessment for reference.

High Performance Liquid Chromatography; Food Nutrition and Health; Application

## 1 INTRODUCTION

With the development of China's economy, the continuous improvement of social comprehensive national strength, the continuous improvement of people's living standards, people pay more attention to food nutrition and health. Food nutrition and health has become a key issue in China's social relations. In recent years, the state has strengthened the supervision of food nutrition and health, but the situation is still grim (Nikolaou et al. 2017). Food additives, chemical pollution and so on have had a tremendous impact on the production of food nutrition and health, endangering people's health. Strengthen the detection of food quality is the main way to improve food quality. Good inspection methods can enable food production enterprises to standardize production and ensure product quality. Therefore, how to accurately and efficiently detect the content of harmful substances in food is the focus of food detection. High performance liquid chromatography (HPLC) is a new detection method in recent years. It has the advantages of fast separation efficiency, good selectivity, high detection sensitivity and automation. It has great practical significance and provides a new detection way for ensuring food safety. This paper elaborates the characteristics of HPLC detection technology, and analyses the application of HPLC in food

detection, so as to provide reference for improving the quality of food detection.

Chao Huang, Lin Shen, Qiuyan Liu, Yutong Zhang, Hongshu Wang published an article in the Journal of Ekoloji (Issue 107, 2019), entitled “Study on the Influence of the Construction of Traceability System in Yichun City on the Forest Ecological Food Industry”, this paper summarizes the development status of forest ecological food industry, the types and scale of special forest products, analyzes the opportunities faced by forest ecological food industry, and summarized the development process of food traceability system (Huang et al. 2019). Then, the paper points out the impact of the traceability system on the food industry and proposes countermeasures for the development of the food industry, which provides a reference for the food nutrition health assessment of our study. According to Liu (2016) proposes a five-dimensional dynamic balanced scorecard model including security dimension. Firstly, the weights of each index are reasonably determined by using network analytic hierarchy process (AHP), and then the performance evaluation of each period of food supply chain is carried out by combining fuzzy comprehensive evaluation. On this basis, the future performance and steady-state distribution of food supply chain are dynamically predicted by using Markov prediction theory, and finally, an example is given to illustrate the results. To verify the rationality of the model, so as to provide a basis for the evaluation of food nutrition and health, due to the shallow level of research in this paper, it is impossible to conduct a comprehensive and profound evaluation of food nutrition and health problems. Gebauer (2017) involves a food nutrition and health evaluation system based on information processing of the federation of food and agriculture. The system includes electronic scales and intelligent mobile devices. The electronic scales include single chip computer, weighing module, LCD display screen and wireless communication module. The single chip computer connects the weighing module mentioned above. The chip computer connects the wireless communication module, the single chip computer connects the liquid crystal display screen, the single chip computer connects the pressure sensor, and the mobile device receives the data from the wireless communication module, so as to calculate the nutritional and health status of the food intake by the user every day. This method can only provide the general nutritional components of food intake for users, and does not have professional scientific and theoretical data.

## **2 IDEA DESCRIPTION**

For substances with low volatility, poor thermal stability and high molecular weight, high performance liquid chromatography is especially suitable for the analysis of aromatic hydrocarbons, polymers and drugs. With the application of HPLC in the field of food detection, the sensitivity of detection has been greatly improved. The application of high performance liquid chromatography in food nutrition and health assessment (Li et al. 2016) is illustrated with specific examples.

### **2.1 Application in the determination of N-nitrosamine**

For smoked bacon, the producer usually adds a certain amount of nitrate or nitrite to it as food chromogenic agent. As far as nitrate itself is concerned, its harm is relatively small, but when the amount of nitrate is too large, it will be reduced to N-nitrosamine under the effect of related reduction. This substance is harmful to human body. Long-term ingestion of this substance will cause diseases such as liver cancer and colon cancer. The traditional method for the determination of N-nitrosamines is gas chromatography, which is used to detect N-nitrosamines in food volatilization. But this method can only detect volatile N-nitrosamines in food, the accuracy of the strategy is not high, and the determination process takes a long time. By using liquid chromatography, the determination time can be greatly shortened, and the whole process only needs 13 minutes.

### **2.2 Application in the determination of polycyclic aromatic hydrocarbons**

Polycyclic aromatic hydrocarbons (PAHs) are often found in fried and roast meat products. Benzopyrene and dibenzo-biphenyl ratio (DBR) are common carcinogens in PAHs. Long-term consumption may lead to cancer risk.

The traditional method of determination is alumina chromatography, which takes a long time and takes 10 hours. By using high performance liquid chromatography, the determination process only takes tens of minutes. The conditions for determination are as follows: the filler used is dialane and chemically bonded thin-shell silica gel, and the stationary phase is 0.5% AgNO<sub>3</sub>. Heterocyclic aromatic hydrocarbons can form complex with silver ions, which can be eluted by ethylene cyanide-n-hexane.

### **2.3 Application in the determination of aromatic amines**

Artificial pigments mostly contain aromatic amines, which are highly toxic to the body and can lead to diseases such as bladder cancer for a long time. As an additive, aromatic amines are not allowed. Therefore, it is important to strengthen the detection of aromatic amines. PermaphaseETH column is commonly used for the determination of aromatic amines, and methanol-cyclopentane combustion is used for mobile phase. The determination time is only 5 minutes, and the traditional TLC analysis method takes 50 minutes.

### **2.4 Application in the determination of azo compounds**

Aromatic amines can react with meat products to form azo compounds, including p-aminoazobenzene and p-dimethylazobenzene, which have been shown to be carcinogenic (Mazzucchelli et al. 2016). Generally, the chromatographic column for the determination of azo compounds can be the MiropakSI-10 column, with dichloromethane-ethane as the eluent gas.

### **2.5 Application in the determination of aflatoxin**

Aflatoxin is produced by *Aspergillus flavus* during its reproduction. It is commonly found in mouldy foods, such as peanuts, corn and rice, which may be contaminated by aflatoxin. The structure of aflatoxins has different forms. Eight kinds of aflatoxins have been found, including B, B<sub>2</sub>, G, G<sub>2</sub> and M<sub>2</sub>. Aflatoxin is highly toxic. Animal experiments have shown that several micrograms of aflatoxin can induce hepatocellular carcinoma. Aflatoxins can be analyzed by high performance liquid chromatography with SiI6-X-II column and chloroform-isooctane as eluent. Several structures of aflatoxins can be eluted at one time and the analysis time is shorter, only 7 minutes.

### **2.6 Application in the determination of pigments**

Edible pigments can be generally divided into natural and synthetic edible pigments, which can effectively improve the hue and color of food. Although pigments can stimulate people's appetite to some extent, they can also cause harm to human health. The effective detection of food pigments can be achieved by HPLC. The most commonly used detection methods are HPLC-UVD method and C-18 column separation method.

### **2.7 Application in the determination of preservatives**

Preservatives are synthetic or natural chemical constituents, which are widely used in pharmaceuticals, pigments, food and biological samples. They can effectively delay the growth of microorganisms and avoid corruption due to chemical changes. With the help of R-high performance liquid chromatography technology, propionic acid, dehydroacetic acid, CA (sorbic acid), BA (benzoic acid) in food can be effectively detected, and cyclamate, BA, CA and so on can also be detected by UVD-R1D series method.

### **2.8 Application in the determination of carbohydrates**

Carbohydrates are used in the determination of nutrients. Usually, sugar is the most widely used component in food. In the process of sugar detection, HPLC has a very high sensitivity, which can effectively remedy the drawbacks of inaccurate results of sugar extraction and determination. The types and contents of oligosaccharides and water-soluble monosaccharides in samples can be detected by high performance liquid Chromatography-Evaporative Light Scattering (ELSD) and fluidity-based divergent light emission (FLED) methods.

### **2.9 Application in vitamin determination**

Vitamin is one of the most important organic substances in human beings, which can play a very good role in maintaining human health. If the human body lacks a certain vitamin, it is very likely to induce physiological dysfunction, resulting in a series of diseases. Vitamin B1 and vitamin B2 can be effectively detected by high performance liquid chromatography. UBondpak C18 column, methanol: water=40:60 (V/V) as mobile phase, flow rate controlled at 0.8 mL/min, are selected in the detection process. Fluorescence detector is used to detect the content of vitamin B1 and vitamin B2. This method is time-saving, simple, and has a very wide range of applications (Meng et al. 2016). Detection of amino acids. Amino acids are indispensable basic substances in the survival and development of organisms, and they are the components of enzymes and proteins. HPLC can effectively detect amino acids according to its wide range and high sensitivity.

#### **2.10 Application in the determination of pesticide residues**

With the improvement of people's living standards, higher requirements are put forward for the quality and output of agricultural products. However, in the process of agricultural growth, a variety of pesticides and organic chemicals have been widely used. While promoting crop growth, they will also remain on crops. If they enter the human body, when they reach a certain concentration, they will have an impact on human health (Cai et al. 2017).

#### **2.11 Application in veterinary drug residue determination**

Veterinary drugs will remain in animals after they are used for food and animals, leading to the inclusion of impurity residues related to veterinary drugs in any part of animal products or metabolites. Common veterinary drug residues include synthetic antibiotics, antibiotics, growth promoters, antiparasitic and insecticides. Antibiotics and antibiotics are common veterinary drugs. At this time, veterinary drug residues can be detected by high performance liquid chromatography-fluorescence detection technology, in order to avoid harm to human body caused by veterinary drug residues.

### **3 RESULTS**

HPLC is a modern analytical method which absorbs the advantages of chromatographic column and gas chromatography. It has high sensitivity, wide applicability and high detection efficiency. It can basically detect all the contents of current food safety detection. At the same time, the detection process of HPLC is realized with the support of modern biology and network information technology. Most of the processes do not need pretreatment and processing steps, which greatly improves the convenience of detection and the efficiency of food detection. Especially for ionic compounds with low volatility and poor thermal stability, the detection effect is better, which can effectively evaluate the nutritional health of food.

### **4 DISCUSSION**

With people's increasing attention to food safety, food nutrition and health has become a major concern of our society. Strengthen the detection of food nutrition and health is the main way to improve food quality. Good inspection methods can enable food production enterprises to standardize production and ensure product quality. HPLC has the advantages of fast separation, high sensitivity and fast detection. It can be used in the field of food detection. It can quickly and accurately determine trace residues and trace substances in food, and effectively guarantee food safety.

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