

Exploring the Teaching Ideas of Applying Ultra High Performance Liquid Chromatography in Drug Experimental Courses

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Abstract: The use of ultra performance liquid chromatography in high throughput studies and experimental research on the separation of complex mixtures in trace amounts can have a very important analytical effect and has been applied to several research projects. In the analysis of this paper, the idea of applying ultra performance liquid chromatography in drug analysis is mainly described to provide some reference for related researchers.

Keywords: Drug analysis; Ultra performance liquid chromatography; Drug analysis

1. Introduction

In the analysis of chemical components, the use of ultra-high performance liquid chromatography (UHPLC) is a conventional technical approach and has been widely applied to the drug analysis segment in China. The use of ultra-high performance liquid chromatography has various technical advantages, such as simple processing, high efficiency of drug analysis, easy absorption, etc., and coupled with the high sensitivity and fully automated analysis, it is gaining more and more attention.

2. Principle of Ultra-high Performance Liquid Chromatography Technology

In the study of this technique, the basic theory is the Van der Miett equation. This equation is calculated and analyzed in such a way that the reduction in particle size is accompanied by a significant increase in column efficiency. At the same time, the optimal column flow rate is reasonable for different particle sizes. The smaller the particle size, the wider the range of linear velocities. This technique allows for a higher flow rate in the direction of the highest column as the particle size decreases. The use of such a calculation equation, in order to achieve the chromatographic column efficiency as well as speed, it is possible to reduce the size of the granularity.

3. Ultra High Performance Liquid Chromatography Technical Value

3.1 Technical Advantages

Compared with HPLC technology, these two technologies are the same in terms of separation principle, but the use of ultra-high performance liquid chromatography has more advantages in the analysis of separation and sensitivity detection. For example, with the increase of separation, the square root of particle size forms an inverse relationship with the separation, so that when the particle size is below 1.7-2 μm , the use of ultra-high liquid chromatography can be very good to improve the efficiency of the increase of injection. After the increase of the analysis speed, the column length is also greatly shortened, and the technical effect of increasing the flow rate is achieved. In such a technical treatment, the sensitivity is not only improved, but also correspondingly shortened the effect of the use of liquid chromatography, the overall reduction of particle size basis, so that the particles have more narrow channels, but also correspondingly can further improve the detection sensitivity [1].

3.2 Technical Disadvantages

In the actual use of technology, the use of ultra-high liquid chromatography often faces certain technical disadvantages, and also the corresponding use of all the instruments and equipment, have a high price, which brings a certain challenge for the promotion of the technology. Secondly, the high technical requirements of the columns make the operation of the relevant technical personnel face a high technical challenge. In order to carry out a comprehensive and reasonable treatment, it is necessary to use a perfect technical treatment in order to achieve a good experimental analysis. However, the subsequent processing of the low injection volume and the use of a half-loop approach to the injection of the sample are relatively demanding in order to avoid clogging of the column

4. Ultra High Performance Liquid Chromatography in Drug Analysis

4.1 Drug Analysis

Usually, in the analysis of pharmaceutical formulations, separation is not possible due to the small number of samples and high time consumption. The application of this technology can provide good theoretical support for drug analysis. In the process of ultra-high liquid chromatography, the mobile phase of the solution can be maintained for the determination of human coagulation factors.

4.2 Pharmacokinetics

In the analysis of pharmacokinetics, the distribution, absorption and metabolism of drugs in vivo involve many research fields. Based on different types of research and analysis, the determination of drug analysis, the metabolism of complex matrices in drugs, and the separation and analysis of drugs should be given attention by researchers. In these research processes, ultra-high performance liquid chromatography (UHPLC) technology was used to detect and evaluate metabolites, and the separation effect was strong.

4.3 Analysis of Traditional Chinese Medicine Components

Traditional Chinese medicine contains various alkaloids, which are important active ingredients and important components. Therefore, in the analysis process, using ultra-high liquid chromatography technology can achieve more accurate analysis and evaluation of important components. In specific applications, for the analysis of alkaloids, fixing the residual silicone hydroxyl groups on the surface of crude oil can cause changes in the chromatographic peaks of the compounds in that area, making the chromatographic peaks more severe and also causing tailing problems. When analyzing the specific sites of alkaloids, it is necessary to add certain additives to the flow equivalent [5]. The commonly used additives are basically concentrated types, including organic amines and ion pair reagents. In the analysis of residual silicon hydroxyl groups on the surface of fixed crude oil, there is also a corresponding shielding effect. After the addition of additives, it will cause certain unreasonable problems in many aspects. Therefore, it is necessary to add certain acid suppressants in the corresponding testing and analysis, which can reduce the pollution of mass spectrometry and control the noise of mass spectrometry, ensuring the smooth progress of analysis work.

4.4 Biochemical Drug Metabolites

During the use of ultra-high liquid chromatography technology, the effects of histamine and its metabolites on mouse hair can be analyzed. When studying the cycle and lifespan of mouse hair, this technology allows for the analysis and processing of various histamines in mice. In the specific analysis section, on the one hand, corresponding labeling and processing are carried out, while using ultra-high performance liquid chromatography technology to analyze and study various compounds in hair, as well as determine and evaluate them, which can effectively achieve the evaluation and processing of this technology. Secondly, the isomers were analyzed, and the application of this technology also provided good analysis results.

5. Establishment of Experimental Courses

How can we effectively carry out corresponding experimental teaching after the experimental task is determined? For precision instruments such as high-performance liquid chromatography, the actual setting of experimental courses is the key to the entire experimental teaching. Although students have gained a preliminary understanding of the instruments and equipment, as well as the operation, by combining their own theoretical knowledge and consulting relevant literature after receiving the experimental content arrangement, in order to do a good job in practical operations, students still need to be trained in the experiment. While satisfying students' thirst for knowledge, inform them of reasonable operating procedures and precautions, eliminate their fear awareness, and cultivate their bold and meticulous experimental thinking. To this end, small class teaching is implemented for students to ensure that every student can effectively learn.

(1) In order to provide students with a deeper understanding and mastery of the experimental equipment, a simple disassembly explanation of each component of the experimental equipment is provided

(2) To ensure the smooth progress of the experiment and to better maintain the experimental equipment. After students have understood the various components of the instrument and mastered simple instrument operations, the teacher will conduct a simple demonstration experiment. After mastering the use of instruments and equipment, it is not difficult to sample and collect data once. However, as a design experiment, all experimental parameters require students to refer to relevant literature, combine their professional basic knowledge, and gradually improve in the experiment to find a more optimized method.

5.1 Experimental Results Report

Like all other experiments, students need to compile a complete experimental report based on their own experimental results after completing all the experimental operations. A complete experimental report includes: experimental preview content, experimental operations, original experimental record data, processing methods, and discussion of results. In this design experiment, we require students to record the principles for selecting all experimental parameters, as well as the basis for selecting experimental parameters during their own experiments, and ultimately combine their own experimental results as their own further evidence of the basic knowledge you have learned.

In summary, in the process of using ultra-high liquid chromatography, it is often necessary to utilize the technical characteristics and advantages of drug analysis to rationalize the processing and analysis, coupled with targeted analysis ideas, in order to achieve good results in actual processing and avoid certain negative impacts on people.

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