

Application of Modern Molecular Biotechnology in Identification of Traditional Chinese Medicine

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Abstract: The quality of traditional Chinese medicine is the basis and premise to promote the effective improvement of the curative effect of traditional Chinese medicine, which is related to the safety and health of the people. Strictly controlling the quality of traditional Chinese medicine plays an extremely important role in ensuring the safety of people's lives and promoting the international development of traditional Chinese medicine. Under the background of the rapid development of modern science and technology, the application of molecular biotechnology in the field of traditional Chinese medicine identification is conducive to further promote the improvement and development of traditional Chinese medicine identification technology. In view of this, this paper focuses on the role of modern molecular biotechnology such as electrophoresis technology and gene technology in the identification of traditional Chinese medicine, hoping to provide theoretical reference for building a more perfect quality evaluation system of traditional Chinese medicine, promoting the modernization of traditional Chinese medicine, and realizing the safety and controllability of traditional Chinese medicine.

Keywords: Identification of traditional Chinese medicine; Electrophoresis technology; Biochip technology; Gene technology.

1. Introduction

After thousands of years of development and accumulation, traditional Chinese medicine has become the key carrier and core component of Chinese excellent traditional culture, which is crucial to the prevention and treatment of diseases. As we all know, Chinese herbal medicines come from a wide range of sources. Moreover, the efficacy and curative effect of different medicinal materials are closely related to their quality. Therefore, in order to maximize the important role of Chinese herbal medicines in safeguarding the health of the whole people, it is necessary to strictly check and accurately judge the quality and authenticity of Chinese herbal medicines according to relevant standards in the process of identifying and screening Chinese herbal medicines. In recent years, driven by market interests, the adulteration and variety confusion of traditional Chinese medicine have occurred frequently. On the one hand, this has damaged the reputation of traditional Chinese medicine, on the other hand, it also poses a great potential threat to the health and life safety of patients and the general public. For example, some patients will suffer from drug-induced liver injury after taking fake products similar to plant white skin, which will cause serious harm to their own health. Due to some adulterants are similar to traditional Chinese medicinal materials in morphology, it is difficult to effectively distinguish them through traditional identification methods such as physical and chemical identification, character identification and primitive identification. With the rapid development of scientific and technological innovation, there is an urgent need to apply a new method that can effectively and accurately identify traditional Chinese medicine. Under the background of the continuous integration of modern molecular biotechnology, zoology and botany, brand-new theoretical knowledge and experimental methods of traditional Chinese medicine are gradually emerging, which is crucial to the innovation and development of the field of traditional Chinese medicine identification. The new theoretical knowledge and

experimental methods of traditional Chinese medicine are conducive to providing necessary guarantees for improving the safety of the use of traditional Chinese medicinal materials. Compared with traditional identification methods of traditional Chinese medicine, the identification of traditional Chinese medicine with the help of modern molecular biotechnology has many advantages such as reliability, stability and high accuracy. Based on this, this paper systematically expounds the application of modern molecular biotechnology in the identification of traditional Chinese medicine, in order to provide useful reference for ensuring the safe use of traditional Chinese medicine.

2. Electrophoresis technology

In summary, the electrophoresis techniques used in the identification of traditional Chinese medicine mainly include the following two kinds: one is high performance capillary electrophoresis (HPEC). As an analytical method and separation technology with rapid development at this stage, HPEC is a liquid phase separation method with capillary as the separation channel. In terms of in-depth analysis, based on the high-voltage electric field as the core driving force, this technology carries out separation and analysis according to the differences in distribution behavior and mobility between relevant components in traditional Chinese medicine samples. From the perspective of advantages, high performance capillary electrophoresis has strong advantages in resolution, sensitivity and many other aspects. With the above advantages, the technology has a promising prospect in the separation and application of a series of bioactive substances, including proteins and peptides. For example, on the basis of high-performance capillary electrophoresis, scholars such as Chen Zhende and Chen Zhiliang began to analyze the seed proteins of *Torreya* in China, and the results showed that there were significant interspecific differences in the electrophoresis patterns. At the same time, the combination of high-performance liquid chromatography and capillary

electrophoresis can separate and identify isohydroxydigitalis aglycones, which is helpful to further improve the resolution.

The second electrophoresis technique introduced in this paper is polyacrylamide gel electrophoresis (PAGE). In terms of in-depth analysis, as one of the more commonly used and rapidly developing electrophoresis technologies at this stage, page is mainly based on polyacrylamide gel as an important supporting medium, which can start to separate oligonucleotides and proteins. In essence, traditional Chinese medicine usually contains many components, including alkaloids, amino acids, peptides and proteins, and the related components have certain differences in many aspects, including molecular weight, charge number and charge property. Moreover, under the action of electric field, the swimming distance, swimming direction and swimming speed of related components are also different. In view of this situation, the use of gel electrophoresis technology to analyze the number of mass spectra, the degree of staining and the position of the protein is helpful to obtain a large amount of effective information, and finally achieve the purpose of identification of Chinese medicinal materials. For example, on the basis of using polyacrylamide gel electrophoresis technology, some scholars began to carry out soluble protein electrophoresis analysis on seeds with similar shapes such as amaranth, achyranthes, so as to achieve accurate identification of Amaranthaceae seed medicinal materials. The study found that polyacrylamide gel electrophoresis technology has the advantage of simple operation, which can complete the accurate identification of various medicinal materials. In addition, some scholars began to identify seven common colloidal medicinal materials on the basis of SDS polyacrylamide gel electrophoresis, which can provide a new method for the identification of colloidal medicinal materials to a certain extent.

3. Gene technology

At this stage, the gene technology applied to the identification of traditional Chinese medicine mainly includes the following: first, DNA molecular genetic marker technology. Specifically, this technology is not limited by time and space. It is an important method to accurately identify different biological species based on the differences of genetic materials of different biological individuals. In fact, biological species have great differences in many aspects, such as tissue structure, protein, cell morphology and appearance morphology. On the one hand, it is greatly affected by genetic factors, on the other hand, it is also closely related to biological physiological state, external growth environment and other factors. However, as the main carrier of genetic information, DNA will not be directly affected by many of the above factors. Therefore, in the identification of traditional Chinese medicine, the application of DNA molecular genetic marker technology has the unique advantages of high reliability and accuracy.

Specifically, DNA molecular genetic marker technology can be mainly divided into the following technologies: As far as random amplified polymorphic DNA technology (RAPD) is concerned, this technology was proposed by Welsh and Williams in the 1990s. Its principle is mainly to use synthetic random primers, take the genomic DNA isolated from plant tissue as a template, and then analyze the polymorphism of amplified product DNA fragments on the basis of polymerase chain reaction technology. For RAPD technology, it has many advantages such as simplicity, efficiency and speed. In terms

of the application of restriction fragment polymorphism (RFPL), as the first generation of DNA molecular marker technology, it was first proposed by human geneticist Bostein in the 1980s. Specifically, RFPL technology mainly compares the differences of DNA levels of different biological varieties through specific probe hybridization, so as to determine the evolution and classification relationship of organisms. Furthermore, another DNA molecular genetic marker technology introduced in this paper is amplified fragment length polymorphism (AFLP). In retrospect, this technology is a molecular marker technology invented by Zabeau and Vos in the 1990s. Its function is mainly used to detect DNA polymorphism. It is the product of the organic combination of random amplified polymorphic DNA technology and restriction fragment polymorphism technology. From the perspective of application, amplified fragment length polymorphism technology has the reliability of restriction fragment polymorphism technology on the one hand, and the convenience of random amplified polymorphic DNA technology on the other hand. For example, on the basis of amplified fragment length polymorphism technology, researchers set out to establish the fingerprints of American ginseng and ginseng, which are rich in polymorphism, and help to provide an effective tool for ginseng variety identification and true and false ginseng identification.

The second is mRNA differential display technology. This technology is an RNA fingerprinting technology proposed by Dr. Arthur Pardee and Dr. Peng Liang in the 1990s. Specifically, the main purpose of applying mRNA differential display technology is to accurately analyze the differences in gene expression of different kinds of tissues / cells. In the application of mRNA differential display technology, the total RNA is firstly reverse transcribed into single-stranded cDNA. On this basis, it is further amplified by PCR, and then proceed to separate DNA of different molecular sizes. After that, we need to accurately screen the differentially expressed genes and carry out sequence analysis. Because mRNA differential display technology has many advantages, such as fast and good repeatability, it has gradually been widely used in medical related fields. In the long run, the use of mRNA differential display technology can not only accurately identify the differences between common medicinal materials and authentic medicinal materials, but also effectively identify the differences between artificially planted plant medicinal materials and wild plant medicinal materials. It is bound to be further applied to the field of quality identification of Chinese medicinal materials in the future.

4. Biochip technology

In recent years, the gradual penetration and wide application of microelectronics, machinery, information and other related disciplines have promoted the rapid development of the gene industry. In the context of this era, biochips have developed rapidly as a high-tech industry. There are two types of biochips, one is gene chip and the other is peptide chip. From the perspective of the application of biochip technology, the researchers regularly placed a large number of DNA probes on the surface of related supports such as glass slides and silicon wafers on the basis of microprinting methods and in situ synthesis technology, in order to create a two-dimensional DNA probe array and further hybridize with labeled samples. After that, by detecting the hybridization signal, accurate medical detection of biological samples can be performed efficiently and rapidly. The premise and key

point for researchers to apply biochip technology to the identification of traditional Chinese medicine is to obtain the genotyping of diversified traditional Chinese medicine samples. In other words, researchers first need to obtain the DNA sequence or specific genes of traditional Chinese medicine varieties. On this basis, researchers should start to fix specific gene sequences in traditional Chinese medicine varieties as DNA probes to the surface of the support, and then make gene cores. In terms of the reality of the application of this technology, the application of biochip technology in the identification of traditional Chinese medicine is still in its infancy, facing the practical dilemma that the research methods and theoretical system are not yet perfect. Looking forward to the future, with the continuous maturity of biochip research and development technology, biochip technology is bound to be widely used in many fields, such as authentic traditional Chinese medicine identification, automatic identification of traditional Chinese medicine varieties and so on. For example, the application of traditional Chinese medicine identification methods requires practitioners to have strong theoretical foundation on the one hand, and relevant practitioners to have rich practical experience on the other hand. With the help of biochip technology, the varieties of traditional Chinese medicine can be identified automatically and quickly without professional practitioners, so as to ensure the safety of medication. Moreover, biochip technology can also solve the identification of animal drugs, traditional Chinese medicine and their counterfeits from the same genus and multiple sources.

5. DNA sequence marker technology

In fact, DNA direct sequencing technology mainly uses PCR amplification products as sequencing primers. The important role of this technology is to effectively promote the efficiency of DNA sequence analysis. According to the existing research results, Zhang Xiling, Ji Keping and Li Yingdong, on the basis of extracting nuclear DNA from rhubarb seeds and Angelica seeds, began to carry out base sequence determination of rRNA gene internal transcribed spacer. From the research results of Zhang Xiling, Ji Keping and Li Yingdong, it can be known that there are significant differences in the base sequence of the transcribed spacer regions in the rRNA genes of rhubarb seeds and angelica seeds.

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