05/06/2001

Genechip Technology Enables Fast Track Chinese Medicine Identification

Researchers at the Hong Kong University of Science and Technology (HKUST) have developed a genechip-based technology that provides an efficient, accurate and cheaper means of testing the authenticity of traditional Chinese medicines (TCM).

"The novel technology for TCM identification, quality assurance and standardization now being developed at HKUST will significantly add to the medical potential and commercial profitability of TCM," says Professor Nancy Ip, Director of HKUST's Biotechnology Research Institute (BRI).

A researcher is preparing the microarray for genetic analysis.

Identification of TCM raw materials, which commonly consist of dried or processed parts, is difficult, even for TCM experts. This is particularly true for similar looking herbal materials that can often vary greatly in their medicinal properties and market value.

One such example is the difficulty in distinguishing different species of the common TCM, Fritillaria (¨©¥À). The well-known F. cirrhosae (¤t¨©) is far more effective in treating coughs than its closely related "cousin" F. thunbergii (®ý¨©). However, due to their very similar appearances, these two species of Fritillaria (¨©¥À) are often mistaken for one another. More importantly, unscrupulous dealers have been known to sell the much cheaper and more toxic F. thunbergii (®ý¨©) as F. cirrhosae (¤t¨©) to the consumer.

Display of genechip and Chinese medicine samples in BRI

"With the latest genechip technology developed at HKUST, researchers are able to tell very accurately, within just one day, whether a sample of material is the genuine F. cirrhosae (¤t¨©) or some other species, while conventional chemical methodologies usually take several days for verification," says Dr Nikolaus Sucher, Assistant Professor of Biology at HKUST and one of the project leaders.

To utilize genechips, researchers first have to identify a distinct DNA sequence that is unique to each species of TCM of plant or animal origin. The DNA sequence information is then used to synthesize a corresponding probe on a silicon-based genechip. These probes are then capable of detecting complementary target DNA sequences if present in the test sample being analyzed. At present, the technology enables researchers at BRI to test hundreds of samples simultaneously. In the near future, these researchers hope to utilize genechips that comprise thousands of probes for designing more diverse applications.

HKUST is the only research institution in Hong Kong employing silicon chip technology for the development of genechip-based TCM identification technology. The technology combines the most advanced aspects of molecular biology and microfabrication. Additionally, research is continuing towards the development of a "lab-on-a-chip", engineered to integrate a number of molecular biological and biophysical technologies in order to expand the genechip throughput potential.

"The general goal is to fabricate an integrated device that will allow sample preparation and analysis within a single microchip device," says Dr I-Ming Hsing, Assistant Professor of Chemical Engineering at HKUST, another key member of the project.

Genechip applications not only benefit the TCM industry but also provide a technology platform that can facilitate the identification of regulated TCMs by regulatory authorities. BRI's Prof Nancy Ip says: "Since the genechip technology allows for the simultaneous analysis of complex genetic data, this powerful tool can also be applied to drug discovery research."

A grant from the Industry Department (now the Commission of Innovation and Technology) was awarded to the BRI in October 1999 for the strategic development of this cutting-edge technology. The Chinachem Group, which is interested in establishing this enabling technology in Hong Kong, is BRI's industrial partner in the project.