

Can UPLC-MS Serve Better for TCM Analysis?

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In the history, Traditional Chinese Medicine (TCM), particularly the fungal and herbal medicine, is more popular in eastern Asia and Southern Asia countries such as China, Japan, Korea, Thailand, and Singapore, etc. In recent decades, it has been spread westward very well due to its effective and limited side effects. However, the focus on pragmatism and lacking of understanding of the mechanisms of the actions, the state-of-the-art quality control and protection of intellectual properties has hindered TCM's further acceptance in the West. Since each TCM has many different kinds of components, the components can be classified as general chemical compounds, bioactive compounds, pharmacologically active compounds, and indicative compounds for quality control. This makes it complicated to investigate TCM formulas. Moreover, to the more complex TCM formulas, the diverse compounds may interfere each other to cause drug-drug interaction, including synergic, additive and antagonistic effects. Therefore, more and more researchers focus on studying the crude extracts of intact prescriptions rather than the individual compounds. Just like -omics studies, which present the relationship and interaction of the internal systems biology, systemic research of TCM should also be addressed to know the whole picture. Various techniques, including CE, CE-MS, TLC, GC, GC-MS, LC and LC-MS, etc., are believed to obtain reliable and stable maps.

Over the past 20 years, HPLC-MS fingerprinting method has become one of the main analytical techniques used in profiling TCMs. Nevertheless, development and operation of fingerprinting on HPLC is a rigorous operation as it generally needs about one or more hours for a single run and the resolution seems still poor due to the extreme

complexity of the components contained in herbal products. So, the desire for significantly reduced analysis time with increased sample throughput, resolution, and sensitivity has resulted in the development of ultrafast separation and identification using LC-MS techniques. Among the various LC platforms, UPLC is considered suitable for large-scale untargeted metabolic profiling due to its enhanced reproducibility in retention time. Since the system utilizes high linear velocities with columns packed with porous 1.7 μ m particles, comparing to the conventional HPLC method, UPLC shows many advantages including reduced run time, less solvent consumption and increased peak capacities. When coupled to a tandem mass spectrometer, the system offers dramatically improve peak resolution, sensitivity and speed of analysis. The ability to generate high peak capacities in short time by UPLC has facilitated the simultaneous analysis of the complex samples with diverse chemical characteristics. Hundreds of profound reports have covered the application of UPLC to pharmaceutical analyses particularly in the field of metabolism or metabolomics studies. However, few applications on quality assessment or chemical fingerprint of TCMs using this technique have been reported up to date. It is expected that UPLC can serve as a rapid, reliable powerful tool in chromatographic fingerprinting applications for the authentication and quality evaluation of TCMs. When coupled to a tandem mass spectrometer, the system may offer distinguish identification of the active components and dramatic improvement of peak resolution, sensitivity and speed of analysis. And it is towards this objective that the present study is initiated.

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Received November 15, 2012; **Accepted** November 16, 2012; **Published** November 18, 2012

Citation: Zhang J (2012) Can UPLC-MS Serve Better for TCM Analysis? J Chromat Separation Techniq 3: e110. doi:[10.4172/2157-7064.1000e110](https://doi.org/10.4172/2157-7064.1000e110)

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