Analysis of Mahuang Chinese herbal medicine by capillary electrophoresis

Application Note

Abstract
Mahuang (*Ephedra sinica* stapf) is a Chinese herbal medicine commonly used in the treatment of asthma and respiratorial infections. Its active ingredients (ephedrine, norephedrine, pseudo-ephedrine and norpseudoephedrine) are strong central nervous system stimulants. Mahuang can be used alone or to potentiate the effects of other herbal medicine. In order to evaluate the herbal quality, HPLC may be used to determine the concentrations of these active ingredients. However, this is complicated by the long run time necessary (30 minutes) and contamination of the LC column. The LC method is also a gradient method which requires column re-equilibration and washing between runs. The CE method described here is simple and rapid requiring only a 4-minute capillary wash between runs.

Author
Gordon Ross
Agilent Technologies,
Waldbronn, Germany
**Experimental**

All experiments were performed using the Agilent Capillary Electrophoresis system equipped with diode array detection by Agilent ChemStation software. Herbal samples were the kind gift of Professor Liu, Beijing University, PRC.

Figure 1 shows the separation of Mahuang extract. The ephedrine peak appears at approximately 5 minutes, however, the rest of the sample shows an enormous complexity. If using LC, after detection of the active ingredients the remaining sample must be washed from the column. However, in CE the capillary is simply flushed through with fresh buffer.

Figure 2 shows the analysis of a standard solution and a Mahuang extract. Ephedrine was identified by its spectra, spiking and its migration time compared to a standard. For ephedrine the analysis was linear over the range 1 µg/mL to 1 mg/mL with $r^2 = 0.9995$.

**Equipment**

- Agilent Capillary Electrophoresis system
- Agilent ChemStation software

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**Chromatographic conditions**

- Sample: 1 g herb extracted with 20 ml water and heated to 80 °C for 30 minutes, then filtered through 0.2 µm pore
- Injection: 10 s @ 50 mbar
- Capillary: total length 80.5 cm, effective length 72 cm, internal diameter 75 µm
- Buffer: 25 mM borate pH 9.3
- Voltage: 30 kV
- Temperature: 20 °C
- Detection: signal 200/10 nm, reference 275/10 nm