

ABSTRACT

The root and rhizome of *Salvia miltiorrhiza* Bge. (*Danshen* in Chinese) is one of valuable and commonly used traditional Chinese medicines (TCMs). It is known for its efficacy in promoting blood circulation, removing blood stasis, inducing blood clotting, relieving swelling, and alleviating pain. It has been widely used for treatment of cardio- and cerebro-vascular diseases. A lot of studies showed that some components of *Salvia* have the effect on anti-platelet aggregation and anti-thrombosis. To date, several methods, including HPTLC, HPLC, LC-MS, UPLC, CE and CEC, have been used for qualitative and/or quantitative analysis of chemical components in *Danshen*, but few analytes were determined in these papers. In addition, there is few report on chemical characteristics and markers for discrimination and quality control of *Danshen* produced and used in China.

Modern pharmacological studies have shown that combining with some receptors or channels on cell membrane is the first step of drug action. Therefore, one method named platelet biospecific extraction has been established to find out the effective chemicals from TCMs. If the extract from TCMs had the effect on antiplatelet aggregation, the effective chemicals in it should be binding to the receptors or the other targets on membrane of platelets. After washing out the non-binding substance, the effective chemicals in the herbs were isolated from the receptors or the other targets on membrane. The analysis of the effective chemicals in the herbs can be conducted via chromatography such as HPLC. This method has been confirmed to be available and convenient.

In this study, a UPLC method was developed to analyze 13 components in *Salvia* from different locations and in different parts of *Salvia*, and five components were found out, which suggested to be the appropriate markers

for quality assessment of *S. miltiorrhiza*. And by human platelet biospecific extraction and this established UPLC method for screening potential antiplatelet aggregation active components in *Danshen* was also developed to optimize the appropriate markers for quality control of *Salvia*.

The major contents of this study:

1. A reliable UPLC method had been developed to analyze 13 components in *Salvia*. Using this method, 74 samples of *Salvia* collected from different locations in China were analyzed and the chemical characteristics for different parts of *Danshen* were also investigated. And the contents of the investigated compounds for the roots, rhizome and aerial parts were also compared. The result showed that five components-salvianolic acid B, rosmarinic acid, cryptotanshinone, tanshinone I and IIA may be the appropriate markers for quality assessment of *S. miltiorrhiza*.
2. A method, by human platelet biospecific extraction and UPLC for screening potential antiplatelet aggregation active components in *Danshen*, was developed to optimize the markers for quality control of *Salvia*. Four phenolic acids screened from water extraction of *S. miltiorrhiza* were danshensu, protocatechuic acid, protocatechualdehyde and salvianolic acid B, and 3 compounds of tanshinones were also screened in water extraction of *S. miltiorrhiza*. These ingredients in *Salvia* have been reported to be the antiplatelet aggregation active components in *S. miltiorrhiza* in the related papers. Four compounds, namely salvianolic acid B, rosmarinic acid, cryptotanshinone, and IIA were considered to be the markers for quality assessment of *Salvia*.

Keywords: *Salvia miltiorrhiza* Bge.; UPLC; Antiplatelet aggregation; Human platelet biospecific extraction