An UHPLC-MS/MS method for simultaneous quantitation five ingredients in rat plasma after oral administration of Polygonum capitatum extract and its application to pharmacokinetics

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Repeated treatment with antibiotics lead to bacterial resistance, and it brings great difficulty to the clinical treatment of urinary tract infections (UTIs). Various ethnic medicines in China have a long history of using plant-based drugs for the treatment of UTIs. Among these plants, Polygonum capitatum, a well-known Miao’s Medicinal plant, has been widely used with considerable therapeutic efficacy in the treatment of UTIs.

Aim of the study: A selective and sensitive high-performance liquid chromatography coupled with mass spectrometry method (UHPLC-MS/MS) was developed and validated for simultaneous quantification of gallic acid, protocatechuic acid, quercitrin, rutin and methyl gallate in rat plasma after oral administration of Polygonum capitatum.

Materials and methods: Plasma samples were extracted via 0.5% formic acid methanol, detected by UHPLC-ESI-MS/MS. All analytes were monitored under negative ionization conditions and quantified in multiple reactions monitoring (MRM) mode. The current assay was validated for linearity, intra-day and inter-day precisions, accuracy, extraction recovery and stability. The method was applied to a comparative pharmacokinetic study after administration of Polygonum capitatum to rats at different doses (20, 60 and 120mg/kg).

Results: The calibration curves were linear over the ranges 5.208-333.333 ng/mL, 10.416-666.667 ng/mL, 15.625-1000 ng/mL and 5.208-333.333 ng/mL. Intra- and inter-day precisions (relative standard deviations) were from 0.45% to 10.95%, and accuracy (relative recovery) from 95% to 115%. The extraction recoveries were greater than 88.5% for all analytes. Dose-dependence was shown for some constituents in the drug concentration-time profiles. Among all the active ingredients detected, rutin had the highest blood concentration (414.7-1832.1ng/mL), and methyl gallate had the longest retention time in the rat body (20.5-24.1 h).

Conclusion: This analytical method is a selective, sensitive, precise, accurate, and reliable assay for simultaneous determination of gallic acid, protocatechuic acid, quercitrin, rutin and methyl gallate in rat plasma.