



Uptake and Transport of the Nine Active Components from *Inula cappa* extract in Caco-2 Cell Model

Cun XUE^{1,3} #, Hejia HU^{1,3} #, Hongqin XIAO^{1,3}, Jingyu Hou^{1,3}, Qing ZHANG^{1,3},
Guangcheng WANG¹, Yueting LI¹, Siying CHEN¹, Yong HUANG¹,
Lin ZHENG¹, Yanyu LAN², Yonglin WANG^{1*} & Zipeng GONG^{1*}

¹ State Key Laboratory of Functions and Applications of Medicinal Plants,
Guizhou Provincial Key Laboratory of Pharmaceutics,

² Guizhou Provincial Engineering Research Center for the Development
and Application of Ethnic Medicine and TCM,

³ School of Pharmacy, Guizhou Medical University, ⁴ Beijing Road, Guiyang 550004, China

SUMMARY. *Inula cappa* (Asteraceae) is an unique medicinal herb for the treatment of fever, sore throat and other symptoms in China. In the present study, the absorption and transport properties of nine active components from *I. cappa* extract (ICE) by using Caco-2 cell model was evaluated. Firstly, a HPLC-MS/MS method for simultaneously determining the content of the nine active components (including chlorogenic acid, scopolin, neochlorogenic acid, cryptochlorogenic acid, 1,3-dicaffeoylquinic acid, luteolin, 3,4-dicaffeoylquinic acid, 3,5-dicaffeoylquinine, and 4,5-dicaffeoylquinic acid) were established under different matrix backgrounds. Then, the effects of drug concentration, pH, temperature and P-gp inhibitors on the uptake and transport of the above nine active components in *I. cappa* extract were further investigated. The results showed that the uptake and transport of eight active components in Caco-2 cells showed a first-order kinetic process. Scopolin was saturated at high concentrations, but it was not affected by P-gp. The absorption mechanism of nine active components in Caco-2 cells was passively absorbed. Moreover, the intracellular transport and uptake of scopolin was active transport.

RESUMEN. *Inula cappa* (Asteraceae) es una hierba medicinal para el tratamiento de la fiebre, dolor de garganta y otros síntomas en China. En el presente estudio se evaluaron las propiedades de absorción y transporte de nueve componentes activos del extracto de *I. cappa* (ICE) mediante el uso del modelo celular Caco-2. En primer lugar se usó un método HPLC-MS/MS para determinar simultáneamente el contenido de nueve componentes activos (incluidos ácido clorogénico, escopolina, ácido neoclorogénico, ácido criptoclorogénico, ácido 1,3- dicafeilquínico, luteolina, ácido 3,4-dicafeilquínico, 3,5-dicafeilquinina y ácido 4,5- dicafeilquínico) bajo diferentes fondos de matriz. Luego, se investigaron más a fondo los efectos de la concentración del fármaco, el pH, la temperatura y los inhibidores de la P-gp sobre la absorción y el transporte de los nueve componentes activos anteriores en el extracto de *I. cappa*. Los resultados mostraron que la absorción y el transporte de ocho componentes activos en las células Caco-2 mostraron un proceso cinético de primer orden. Escopolina estaba saturada a altas concentraciones, pero no se vio afectada por P-gp. El mecanismo de absorción de nueve componentes activos en las células Caco-2 se absorbió pasivamente. Además, el transporte intracelular y la absorción de escopolina fue transporte activo.

KEY WORDS: absorption, Caco-2 cell, *Inula cappa*, scopolin, transport.

These authors contributed equally to this work.

* Author to whom correspondence should be addressed. E-mail: gywyl@gmc.edu.cn; gzp4012607@126.com