

Biomimetic chromatography: effective tool for bioavailability evaluation of aloin and aloe-emodin



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INTRODUCTION:

Aloe vera is the most commercialized Aloe species belonging to the Xanthorrhoeaceae family. Aloin is the major anthraquinone of aloe and characterized as the C-glycoside of aloe-emodin. Due to polyphenolic structure, aloin and aloe-emodin are considered as physiologically active compounds responsible for aloe biological effects such as reduction of inflammation. Despite the frequent use of aloe, limited information is available for their bioavailability which is a very common phenomenon for other phytochemicals as well. A study providing deeper mechanistic insights into the bioavailability of aloin and aloe-emodin is essential to develop better treatment strategies in the future based on botanical products.

METHODOLOGY:

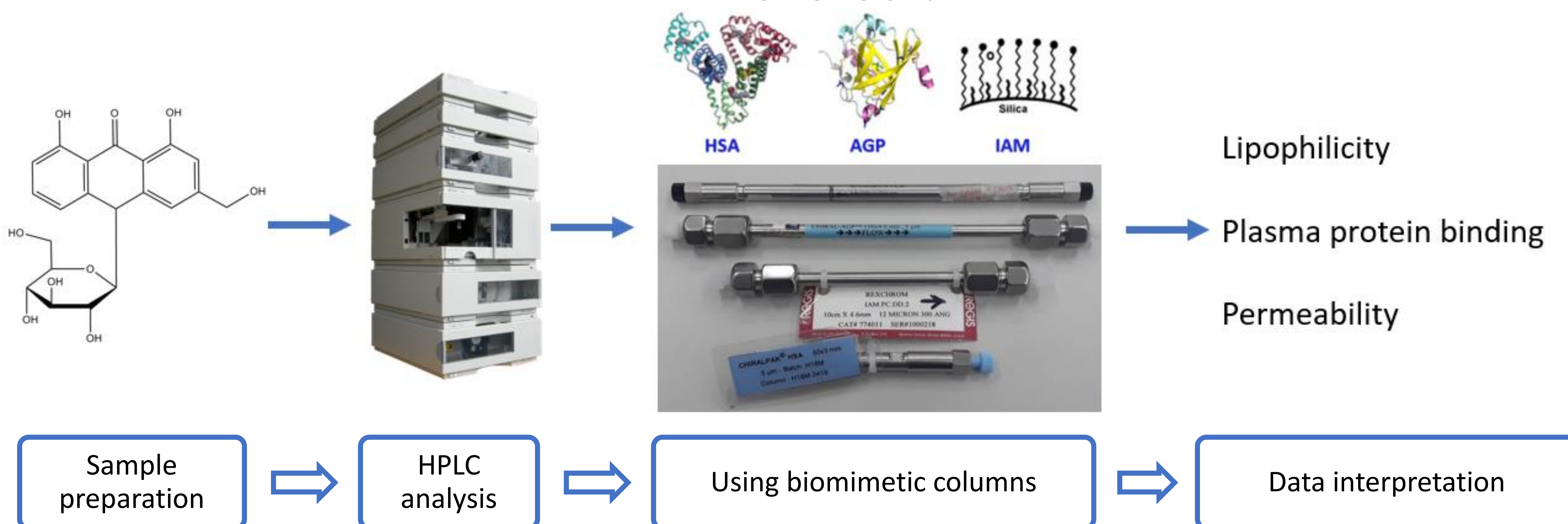


Table 1. HPLC methods for every biomimetic column

HPLC methods for each column				
Prediction parameter	log <i>P</i> , log <i>S</i>	PPB (HSA)	PPB (AGP)	Permeability
HPLC system	Agilent 1100			
Detector	Diode Array Detector (DAD)			
Column	Symetry C18 150x5mm; 4.5μm	Chiralpak HSA 50x3mm; 5μm	Chiralpak AGP 150x4.0 mm; 5μm	IAM DD2 100x4.6mm; 300A
Column temperature/°C	25			
Flow / mL/min	1.0	1.8	1.5	1.0
Mobile phase	MeOH/ 10mM PBS (pH=7.4)	20mM PB (pH=6.8-6.9)/IPA	20mM PB (pH=6.8-6.9)/IPA	MeOH/ 10mM PBS (pH=7.4)

RESULTS AND DISCUSSION:

The aim of this work was to evaluate parameters such as hydrophobicity, lipophilicity, and plasma protein binding using chromatographic tools, especially growing population of biomimetic columns mimicking cell membranes, as well as ones containing plasma proteins (human serum albumin (HSA) and alpha-1-acid glycoprotein (AGP)). As expected, aloin as glycoside showed lower hydrophobicity ($R_{M0}=1.85$, $\log k_0=1.37$) compared to aloe-emodin ($R_{M0}=3.06$, $\log k_0=3.01$). On the other hand, aloin showed superior affinity to phospholipids compared to aloe-emodin ($\Delta \log k_{0 \text{ IAM}}=1.68$). Both compounds showed the higher affinity for HSA (62.7% aloin; 97.5% aloe-emodin) than AGP (44.1% aloin; 84.2% aloe-emodin).

CONCLUSION:

The aim of this work was to evaluate parameters such as hydrophobicity, lipophilicity, and plasma protein binding using chromatographic tools. Innovative biomimetic chromatographic methods have shown to be good approach to bioavailability evaluation.