

## Inhibitory Effect of Chinese Fermented Soypaste and Catechin-rich Foodstuffs on Renin-angiotensin System

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## **Inhibitory Effect of Chinese Fermented Soypaste and Catechin-rich Foodstuffs on Renin-angiotensin System**

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Hypertension is a major public health problem associating with the incidence of various cardiovascular diseases. Renin-angiotensin system (RAS) plays a crucial physiological role in regulating blood pressure of human body, and renin (EC 3.4.23.15) and angiotensin I-converting enzyme (ACE, EC 3.4.15.1) are two key enzymes for maintaining the operation of this system. The control of RAS, such as by inhibiting the activities of renin and ACE, has been well established as an effective therapy to the treatment of hypertension.

ACE inhibitory activities of aqueous extracts of Chinese commercial soypaste products were investigated in this work. Six samples from northern part of China showed potent ACE inhibitory activities with  $IC_{50}$  values less than 40.0  $\mu\text{g/ml}$ . In order to identify the active components, ACE inhibitors in the sample with the strongest activity were purified by the means of ultrafiltration, solid-phase extraction and gradient RP-HPLC. According to spectroscopic methods, a compound (M328.1) was separated as  $C_{15}H_{21}NO_7$ . It was supposed to be a conjugate of phenylalanine and glucose generated by Maillard reaction, providing support on the contribution of Maillard reaction products to the ACE inhibitory activity of the sample. Results further indicated that the total inhibition by the soypaste sample on ACE activity occurred from the combined function of various bioactive substances, such as Maillaid reaction products, peptides and even large molecules as well.

Concerning the exploration of natural occurring renin inhibitors in foodstuffs, renin inhibitory effect of catechin-related compounds, including catechin (C), epicatechin (EC), epicatechin gallate (ECg), epigallocatechin (EGC), epigallocatechin gallate (EGCg) and gallic acid, was investigated first in this work. EGCg was found to possess the strongest activity ( $IC_{50} = 44.53 \mu\text{M}$ ) and act in an uncompetitive manner. Gallated catechins exerted higher inhibition than the ungallated forms, indicating that the galloyl moiety might be a favorable structure for these compounds to exert renin inhibitory activity.

Renin inhibitory activities of catechin-rich tea products as well as cocoa and coffee were further evaluated. Water extracts from oolong and black tea possessed effect with  $IC_{50}$  values of 20.31 and 17.27  $\mu\text{g/ml}$ , in line with the relatively higher total phenolic contents of 16.71 and 20.34 g/100 g dried weight (gallic acid equivalent), respectively. By spectroscopic methods, four compounds, i.e., theasinensin B, theasinensin C, strictinin and M412.03, were identified from black tea extract, with  $IC_{50}$  values of 19.33, 40.21, 311.09 and 50.16  $\mu\text{M}$ , respectively. Whereas catechins constituted the main bioactive compounds in green tea, they didn't play an essential role in contributing to the renin inhibitory activities of tea products. Results indicated another potential pathway and provided further support on tea consumption as an approach to helping control hypertension.

This work suggested that Chinese soypaste could be a good source of ACE inhibitors and fermented tea products contained abundant renin inhibitors against renin-angiotensin system, which was favorable for developing functional foods or food ingredients with antihypertensive effects.