

## EXPERIMENTAL &amp; INFORMATION STUDY

**Information integration research on cumulative effect of 'Siqi, Wuwei, and Guijing' in Traditional Chinese Medicine**

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and repeated treatment. The slope of the regression line represented the cumulative trend of the effect of the herbs ( $\beta$ ), and the standard deviation of the slope ( $S\beta$ ) was compared with those of the untreated animals (*t* 'test). All significantly cumulative effect trends were applied with an artificial neural network, which integrated the relationship among Siqi, Wuwei, and Guijing with tissues and organs.

**RESULTS:** There is a certain relationship among the Siqi, Wuwei, Guijing and the anatomy of organs and tissues, but the different scores indicate that influence of Siqi, Wuwei, Guijing to anatomy of organs and tissues was a nonlinear state.

**CONCLUSION:** Results demonstrated that the effects of Siqi, Wuwei, and Guijing have a morphological basis, and each concept was associated with multiple anatomical structures.

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**Key words:** Four natures; Five flavors; Channel tropism; Morphological and microscopic findings; Least-squares estimation; BP algorithm of artificial neural networks

**Abstract**

**OBJECTIVE:** To study the morphological basis of the role of Siqi (cold as winter, cool as autumn, warm as spring, hot as summer), Wuwei (five flavors: sweet, pungent, salty, sour, and bitter), and Guijing (meridian tropism) through the use of information integration.

**METHODS:** A  $^{14}\text{C}$ -2-deoxy-glucose autoradiography method was adopted to determine the overall impact of treatment with 39 herbs on functions of various tissues and organs. Data was measured at 4 hs after a single dose and following the last treatment of repeated doses for a week. Least-squares estimation was used and fitted for each herb regression effect of organs and tissues after single

**INTRODUCTION**

Research into Traditional Chinese Medicine (TCM) has continued to expand and become more in-depth, and results have suggested that the mechanism of TCM does not take place along a single path.<sup>1</sup> Regardless of the ingredients contained in herbs of TCM or the structure of the body to respond to herbs of TCM, all of which were multi-faceted and multi-leveled. Ex-

perimental research focused on Siqi, Wuwei, and Guijing has taken place for some time now; and it is believed that these factors are associated with body heat production processes or metabolic activities, and may also play a role in gastrointestinal organ function, the liver, the nervous system, and other organs<sup>1</sup> Results have also suggested many indicators (multiple parameter) association with neuroendocrine activities.<sup>1</sup>

There is no evidence to suggest that a single physiological and biochemical index, or even several indices, could be used to distinguish between the different roles of Siqi, Wuwei and Guijing. The relationships among Siqi, Wuwei, Guijing and organs and tissues, as well as the involved mechanisms, remain poorly understood. Therefore, we chose 39 types of commonly used herbs that are known to have varying indications and studied the effect of Siqi, Wuwei, and Guijing on various organs and tissues.

In the present study, we explored the morphological and structural basis of Siqi, Wuwei, and Guijing to establish the relationship between TCM concepts and various organs and tissues. The results will hopefully promote the integration of TCM, modern medical science, and information technology to further the development of TCM theory. This study adopted an information integration method to analyze experimental data and to provide an experimental basis for further basic and clinical research.

## MATERIALS AND METHODS

### Animals

CD-1CF1 mice (female ICR mice and male Balb/c mice, 28 day) were purchased from Sino-British Sippr/BK Lab Animal Ltd. (Shanghai, China). The animals were specific pathogen-free and weighed 18-22 g. The animals were group-housed (*n* = 5 per cage) and maintained under standard laboratory conditions: 12-h light-dark cycles (light on at 7:00 and off at 19:00), temperature range: 20-26 °C, relative humidity: 40%-70%, food and water ad libitum) (Certificate of

quality No. SCXK (hu) 2003-0002). The study was approved by the Medical Ethics Committee, Shanghai University of TCM (No. 09048).

### Experimental herbs

The selection principle of the TCM herbs was the commonly used. The herbal properties were characterized by low ambiguity with varying therapeutic functions to allow for rapid statistical analysis and a reduced experimental workload. The properties of each herb have been previously described,<sup>2,3</sup> The TCM herbs selected for the present study included: Chaihu (*Radix Bupleuri Chinensis*), Chuipencao (*Herba Sedi Sarmentosi*), Lianqiao (*Fructus Forsythiae Suspensae*), Xuanshen (*Radix Scrophulariae*), Huangqin (*Radix Scutellariae Baicalensis*), Huangbai (*Cortex Phellodendri Amurensis*), Dahuang (*Radix et Rhizoma Rhei Palmati*), Fuling (*Poria*), Muxiang (*Radix Aucklandiae*), Zhuling (*Polyporus*), Cheqianzi (*Semen Plantaginis*), Shanzhuyu (*Fructus Macrorrhizae*), Wumei (*Fructus Mume*), Gegen (*Radix Puerariae Lobatae*), Wuyao (*Radix Linderae Aggregatae*), Xiangfu (*Rhizoma Cyperi*), Shanzha (*Fructus Crataegus Pinnatifidae*), Jinei jin (*Endothelium Coreneum Gigeriae Galli*), Fuzi (*Radix Aconiti Lateralis Preparata*), Rougui (*Cortex Cinnamomi Cassiae*), Gouteng (*Ramulus Uncariae Rhynchophyllae cum Uncis*), Muli (*Concha Ostreae*), Jinqiancao (*Herba Lysimachiae*), Heshouwu (*Radix Polygoni Multiflori*), Roucongong (*Herba Cistanches Deserticolae*), Xianmao (*Rhizoma Curculiginis*), Mangxiao (*Natrii Sulfas*), Yiyiren (*Semen Coicis*), Chuanxiong (*Rhizoma Chuanxiong*), Lingxiaohua (*Flos Campsis*), Puhuang (*Pollen Typhae*), Wuzhuyu (*Fructus Evodiae Rutaecarpae*), Gaoliangjiang (*Rhizoma Alpiniae Officinari*), Zhizi (*Fructus Gardeniae*), Huoxiang (*Herba Agastaches Rugosa*), Meihua (*Flos Mume*), Xuanfuhua (*Flos Inulae Japonicae*), Shudi (*Radix Rehmanniae*), and Diyu (*Radix Sanguisorbae*), totaling 39 species. The herbs were purchased from Shanghai Cambridge Chinese Medicine Yin Pian Factory (Shanghai, China), which covered all records of Siqi, Wuwei, and Guijing attributes, and each property of used herbs appeared more than five times. The attributes are listed in Table 1.

Table 1 Attributes of Bupleium and Sedum sarmentosum in 39 TCM herbs

Name	1	2	3	4	5	6	7	8	9	10	11	12	
Bupleium	+									+			
Sedum sarmentosum				+		+			+		+		
...													
Name	13	14	15	16	17	18	19	20	21	22	23	24	25
Bupleium					+					+			
Sedum sarmentosum					+					+			
...													

Notes: 1: cold; 2: heat; 3: warm; 4: cool; 5: even; 6: sweet; 7: pungent; 8: salty; 9: sour; 10: bitter; 11: odorless; 12: astringency; 13: poison; 14: spleen; 15: lung; 16: kidney; 17: liver; 18: heart; 19: stomach; 20: large intestine large intestine; 21: bladder; 22: bile; 23: small intestine; 24: triple energizer; 25: pericardium.

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