

## EXPERIMENTAL STUDY

## Medicinals with properties of warming *Yang* and tonifying *Qi* in terms of Traditional Chinese Medicine: their effects on left ventricular ejection fraction and aldosterone in rats with induced failure heart

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### Abstract

**OBJECTIVE:** To investigate on Left ventricular ejection fraction value and aldosterone of two medicinals of Traditional Chinese Medicine (TCM) with the properties of warming *Yang* and tonifying *Qi* in terms of TCM theory.

**METHODS:** An animal model of coronary ligation of heart failure after myocardial infarction was employed to study the influence of these two kinds of drugs on three batches of rats. On the basis of the average score of left ventricle ejection fraction during the investigation, there were some different groups, including WenYang (the warming *Yang*) group, YiQi (tonifying *Qi*) group, WenYang and YiQi group, captopril group, digoxin group. In addition, an artificial operation group was set for compari-

son. The systemic intervention using these medicinal and drugs was taken effects on the 2nd day after the operation of myocardial infarction (MI) with once a day. At week one, two, and four after the MI treatment, evaluated were EF values, and ferritin, angiotensin-II and aldosterone in the rats' plasma.

**RESULTS:** At week one and week two, the medicinal of WenYang, YiQi, WenYang plus YiQi, and digoxin could improve left ventricular ejection fraction in rats with heart failure; Compared to the model group, captopril Left ventricular EF value increased, but there was not significant. At week four, heart failure and left ventricular EF values was improved in the intervention group and the other four captopril drug intervention. At week one in the rats with drug intervention, the medicinals of YiQi, WenYang plus YiQi, and captopril could inhibit activation *in vivo* hormone aldosterone in heart failure rats; aldosterone in WenYang group and digoxin group were not different from that in the model group at week two and four.

**CONCLUSION:** Chinese medicinals with properties of WenYang, YiQi have significant effect on improving left ventricular EF in rats with heart failure; compared to YiQi medicinals, WenYang medicinals that inhibit the effectiveness of the time required for the activation of the role of aldosterone. The medicinals of WenYang and YiQi seems better by inhibiting the activation of the hormone aldosterone after failing to inhibit ventricular remodeling to improve heart failure.

**Key words:** Warming *Yang*, reinforcing *Qi*; Heart failure; Stroke volume; Aldosterone

## INTRODUCTION

Chronic congestive heart failure (CHF) occurs highly in various end stage heart diseases. The main reason for the pathological ventricular remodeling occurs, leading to ventricular enlargement, left ventricular ejection fraction decreases. The neuroendocrine activation in chronic heart failure has become an important cause of ventricular remodeling which the most important reason, is the worsening of heart failure, mainly the renin-angiotensin-aldosterone system (RAAS) activation.<sup>1</sup> The treatment has changed from heart and kidney treatment of chronic heart failure mode, to intervention neuroendocrine mode. Blocking the neuroendocrine system, blocking the ventricular remodeling has become the key to treatment.<sup>2</sup> Chinese medicine believes that heart failure is due to pathological product of weak *Qi*, *Yang* about heart, blood stasis, retained fluid and then caused the accumulation. YiQi, WenYang, Huoxue, Lishui four methods as the basic law of Chinese medicine treatment of heart failure in clinical already obtained made the positive effect. And now widely recognized that the medicinal with properties of YiQi, WenYang in Traditional Chinese Medicine (TCM) can benefit the, such asaconite, cinnamon, ginseng, astragalus.<sup>3-6</sup> While improving the symptoms of heart failure, the representative of cardiac function key indicator-left ventricular ejection fraction and neuroendocrine hormones-aldosterone affect? And both of these drugs interventions relevance? The combination of YiQi and WenYang medicinal in treatment of heart failure is greater than when they were administered alone?

## MATERIALS AND METHODS

### Animals

Clean grade Wistar rats, male, weighing 250 g disabilities 20 g, 8 weeks old rats. (Shandong Lukang Animal Center, Certificate of Conformity: No. 0013891, Shandong, China).

### Experimental drug

WenYang medicinals from the aconite, cinnamon composition ratio of 1: 1, from the Hospital of Henan Province, according to the standard preparation room for the production of dry extract production process, per gram of dry extract crude drug 1.76 g.

Renshen (*Radix Ginseng*), Huangqi (*Radix Astragali Mongolici*) at a ratio of 1: 1, from the Hospital of Henan province, according to the standard preparation room for the production of dry extract production process, per gram of dry extract crude drug 2.82 g. Captopril

was made by American Shanghai Squibb Pharmaceutical Co., (Shanghai, China) 12.5 mg/ piece Zhunxi H31022986. Digoxin was made by Shanghai Pharmaceutical (Group) Co., Ltd., the country medicine accurate H31020678.

When these medicinal drugs are administered with deionized water to dissolve, according to oral dosage adult dose conversion to give (captopril tablets 25 mg/person/day, aconite, cinnamon, ginseng, astragalus crude drugs according to clinical 10 g/person/day) an equivalent dose by the formula  $dB \text{ (mg/kg)} = dA \times (RB / RA) \times (WA / WB)^{1/3}$  (RB, RA is the shape coefficient; WA/WB is known animal weight) conversion after the dosage per kilogram body weight for adults kg of body weight in rats of 6.35 times (to select a person's weight is 70 kg). And configure a variety of drug concentrations in rats guarantee every 100 g of body weight orally 0.5 mL liquid premise.

### Instruments and equipment

Rat IVC independent air supply isolation cages (Suzhou Feng Laboratory Animal Equipment Co., Ltd., Suzhou, China); Clean Benches Laboratory Animal Equipment (Suzhou Feng Laboratory Animal Equipment Co., Ltd., Suzhou, China); Desktop sterilizer (Shandong Xinhua Medical Instrument Co., Ltd., Zibo, China); Low speed centrifuge (Germany Sigma, Darmstadt, Germany); electronic balance (Shanghai Jing Branch Yidian scientific instruments Ltd., Shanghai, China); animals drinking fountains (Shanghai and Thailand Instrument Co., Ltd., Magnetic stirrer Aibo Te Electronics Co., Ltd., Shanghai, China); color doppler echocardiography probe and 7 Mhz (Medical Devices, Florida, USA); aldosterone radioimmunoassay kit (Beijing North Biotechnology Institute Experimental, Beijing, China).

### Animal model

The method according to the literature,<sup>7</sup> select 200-250 g clean male Wistar rats were provided by Beijing Vital River Laboratory Animal Co., license number: SCXK (Beijing, China) 2012-0001, animal certificate number: No. 11400700071767, No. 11400700085618, No. 11400700085488; weighed to 50 mg/kg of 1% sodium pentobarbital intraperitoneal injection of anesthesia. Animal supine position is fixed to the mouse board, left chest area skin preparation, iodine disinfection skin preparation area, the laryngeal tracheal intubation, connecting small animal ventilator and ECG machine to 80 beats/min, tidal volume of 0.7-0.8 mL row ventilation. In the left third and fourth intercostal transverse skin incision, about 1.5 cm, blunt dissection of muscle, open the chest along the third and fourth intercostal space to open heart surgery is expanding horizons, cut the pericardium, arterial cone between the left atrial appendage and at about 1mm line with 6/0 left coronary artery ligation, when I

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