



Treatment effects and mechanisms of Yujin Powder on rat model of large intestine dampness-heat syndrome



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ABSTRACT

Ethnopharmacological relevance: Yujin Powder (YJP), an old prescription, is one of the most classical prescription for treating the large intestine dampness-heat syndrome (LIDHS). However, its potential modern pharmacological mechanisms remain unclear.

Aim of the study: The present study was designed to explore the essence of LIDHS and treatment mechanisms of the YJP on the LIDHS.

Methods: The rat model of LIDHS was established by such complex factors as high-sugar and high-fat diet, improper diet, high temperature and humidity environment (HTHE), drinking and intraperitoneal injection of *Escherichia coli*, which imitated the inducing conditions of LIDHS. Then the clinical symptoms and signs, blood routine, blood biochemistry, whole blood viscosity (WBV), serum inflammatory cytokines levels and the histopathological changes of main organs were detected and observed, respectively.

Results: The results showed that the clinical symptoms and signs of the model rats were consistent with the diagnostic criteria of LIDHS, moreover, there were obvious systemic inflammatory response and extensive congestion. And after treatment with YJP in different dosages, the clinical symptoms and signs of the rats with LIDHS were improved; the indexes of blood routine and blood biochemistry and inflammatory cytokines levels tended to be normal; the WBV decreased and histopathological changes of major organs were alleviated or returned to normal. There was an obvious dose-effect relationship, and the high dose of YJP (HD-YJP) had the best treatment effects.

Conclusions: These results suggested that in LIDHS, diarrhea was the major clinical manifestation; the large intestine was the main lesion area; mucosa injury, inflammation and congestion of the large intestine with systemic inflammatory response and congestion were the most typical pathological characteristics. Meanwhile, YJP exhibited the comprehensive effects of anti-diarrhea, anti-inflammation, lowering blood lipid, relieving blood stasis, repairing intestinal mucosa and regulation and protection of multiple organs on LIDHS. These findings provided not only important information for understanding the essence of LIDHS but also the theoretical basis for developing new-drugs for treating dampness-heat type of diarrheal diseases.

1. Introduction

Large intestine dampness-heat syndrome (LIDHS) refers to the symptoms mainly showing diarrhea caused by dampness-heat accumulating knot in large intestine and leading to disorder of its

conductive function in Traditional Chinese Medicine (TCM) and Traditional Chinese Veterinary Medicine (TCVM) (Chen, 2012; Deng, 2008; Hu, 2013; Zhu and Yuan, 2011). This syndrome is often caused by exogenous summerheat-dampness and heat-toxin pathogens invading large intestine; or/and improper diet, or/and eating putrid and

Abbreviations: YJP, Yujin Powder; LIDHS, Large intestine dampness-heat syndrome; HTHE, high temperature and humidity environment; WBV, whole blood viscosity; TCM, Traditional Chinese Medicine; TCVM, Traditional Chinese Veterinary Medicine; UC, ulcerative colitis; TCMS, Traditional Chinese medicines; ELISA, enzyme-linked immunosorbent assay; IL, interleukin; TNF, tumor necrosis factor; WBC, white blood cell count; NEU, neutrophil count; LYM, lymphocyte count; RBC, red blood cell count; HCT, hematocrit; MCHC, mean corpuscular hemoglobin concentration; TP, total protein; ALB, albumin; GLB, globulin; A/G, the ratio of albumin to globulin; ALT, alanine transaminase; AST, aspartate aminotransferase; GGT, gamma-glutamyl transpeptidase; TCH, total cholesterol; TG, triglycerides; H & E, hematoxylin and eosin; ANOVA, one-way analysis of variance; LP, lamina propria

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Table 1
Description of Yujin Powder (YJP).

Medicinal plant	Voucher specimen number	Local name	Ratio	Origin (China)	Effect (Hu, 2013; Liu and Xu, 2012)
Curcumae Radix (radix of <i>Curcuma kwangsiensis</i> S. G. Lee et C. F. Liang)	GSAU-CVM-20150018	Yu Jin	2	Guangxi province	The monarch herb, clear heat to cool blood and promote Qi flow to eliminate stasis
Chebulae Fructus (fruit of <i>Terminalia chebula</i> Retz.)	GSAU-CVM-20150019	He Zi	1	Yunnan province	The assistant herb, astringe Yin and astringe intestine to stop diarrhea
Scutellariae Radix (radix of <i>Scutellaria baicalensis</i> Georgi)	GSAU-CVM-20150020	Huang Qin	2	Hebei province	The minister herb, clear stagnated fire of Sanjiao (three warmers) and resolve dampness-heat
Rhei Radix Et Rhizoma (radix and rhizoma of <i>Rheum palmatum</i> L.)	GSAU-CVM-20150021	Da Huang	4	Gansu province	The assistant herb, clear blood heat, eliminate the stagnation, get rid of stool and bring force the fresh
Coptidis Rhizoma (rhizoma of <i>Coptis chinensis</i> Franch.)	GSAU-CVM-20150022	Huang Lian	2	Sichuan province	The assistant herb, clear stagnated fire of Sanjiao (three warmers) and resolve dampness-heat
Gardeniae Fructus (fruit of <i>Gardenia jasminoides</i> Ellis)	GSAU-CVM-20150023	Zhi Zi	2	Zhejiang province	The assistant herb, clear stagnated fire of Sanjiao (three warmers) and resolve dampness-heat
Paeoniae Radix Alba (radix of <i>Paeonia lactiflora</i> Pall.)	GSAU-CVM-20150024	Bai Shao	1	Hebei province	The assistant herb, astringe Yin and astringe intestine to stop diarrhea
Phellodendri Chinensis Cortex (tree bark of <i>Phellodendron chinense</i> Schneid.)	GSAU-CVM-20150025	Huang Bo	2	Sichuan province	The assistant herb, clear stagnated fire of Sanjiao (three warmers) and resolve dampness-heat

dirty food, heat-dampness and dirty-turbid pathogens accumulating in intestine in summer and autumn (Chen, 2012). Its typical clinical manifestations are abdominal pain, bloody mucopurulent stools, tenesmus, or fulminant diarrhea and yellow erosive stinking loose stools, scorch of anus, scanty dark urine, fever and thirsty, red tongue, yellow greasy tongue fur, rapid and slippery pulses (Chen, 2012; Deng, 2008). In fact, LIDHS has some characteristics of dampness-heat syndrome (sticky, refractory lingering, or recurrent) except the general characteristics of diarrhea (Hu, 2006; Li and Liu, 2014).

Modern researches have shown that LIDHS is commonly seen in the course of acute gastroenteritis, bacillary dysentery, amebic dysentery, and ulcerative colitis (UC), etc. (China Society of Integrated Traditional Chinese and Western Medicine digestive system diseases committee, 2011; Hu, 2013), and also in colorectal adenoma (Su, 2015) and colorectal cancer (Yu, 2013). The clinical investigation showed that acute infectious diarrhea induced by bacterial infections accounted for about 15.8% of the diarrheal diseases (Wang, 2016). Moreover, the investigation of distribution of syndrome types of Chinese Medicine in acute infectious diarrhea showed that LIDHS accounted for the highest proportion (57.63%) (Qing-yan et al., 2016). In addition, LIDHS is also the most common syndrome type of Chinese Medicine of UC, a worldwide and stubborn diarrheal disease (Ordas et al., 2012). For instance, some studies reported that the percentage was up to 44.66% (46/103) (Wu, 2014) and 45.78% (38/80) (Cao, 2010), etc. The clinical symptoms range from mild to severe. For instance, there are only stinking loose stools in the mild (Deng, 2008); ulcer formation is induced by the injury of vessels and meridian-collateral networks and blood deteriorating and flesh rotting in the severe (Peng, 2006). Even worse, dampness-heat accumulating in gastrointestinal tract too long could convert into toxin, then pour downward, accumulate in large intestine and further induce cancerization (Li, 2009). In addition, nowadays, improper diet due to the accelerated pace of work and life, changes of diet structure due to the improved living standards (indulgence in a richly fatty, sweet and full-flavored diet and drinking) and emotional stress and depression due to the increase of life pressure are easy to damage spleen-stomach, and further induce LIDHS (Wang, 1997). Therefore, modern researches on LIDHS have great significance.

At present, in modern medicine the commonly used drugs to treat diarrheal diseases such as antibiotics, aminosaliculates and glucocorticoids, etc. have some limitations (Faubion et al., 2001; Ford et al., 2012). However, clinical practices in TCM and TCVM showed that uses of Traditional Chinese medicines (TCMs) to treat LIDHS type of diarrheal diseases under the guidance of TCM theory had good effects. For instance, Yujin Powder (YJP), one classical prescription in TCVM, showed good effects in treating acute gastroenteritis of pigs and dogs, yellow scour of newborn piglets, acute enteritis of cattle and horses, blood dysentery of dogs (Hu, 2006), which decreased or avoided the use of antibiotics or chemicals. And it was difficult to develop drug resistance and residues, which was favorable to human and animal health. YJP was first recorded in *Yuan Heng's Classical Collection on the Treatment of Equine Diseases* and is composed of eight herbs, including Curcumae Radix, Chebulae Fructus, Scutellariae Radix, Rhei Radix Et Rhizoma, Coptidis Rhizoma, Gardeniae Fructus, Paeoniae Radix Alba, and Phellodendri Chinensis Cortex (Hu, 2013; Liu and Xu, 2012). TCVM theory believes that in YJP, Curcumae Radix as the monarch herb can clear heat to cool blood and promote Qi flow to eliminate stasis; Coptidis Rhizoma, Scutellariae Radix, Phellodendri Chinensis Cortex and Gardeniae Fructus as minister herbs can clear stagnated fire of Sanjiao (three warmers) and resolve dampness-heat; Paeoniae Radix Alba and Chebulae Fructus which can astringe Yin and astringe intestine to stop diarrhea, and Rhei Radix Et Rhizoma which can clear blood heat, eliminate the stagnation, get rid of the stale and bring force the fresh are all adjuvant herbs (Hu, 2013; Liu and Xu, 2012). The combination of these herbs has the functions of clearing heat and removing toxin, eliminating dampness, conducting stagna-

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