

Evaluation of the pharmacological effects of compound Qingchang Sukang liquid

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ABSTRACT

The pharmacological effects of compound Qingchang Sukang liquid were explored through experiments involving xylene-induced ear swelling, analgesia, acute toxicity, and its antagonistic effects on intestinal flora in mice. The findings show that the compound significantly inhibits ear swelling, reduces the number of twisting movements, and increases the pain relief rate in mice. The maximum tolerated oral dose in mice was determined to be 13.78 g/kg, while the minimum inhibitory concentration against pathogenic bacteria was 0.034 g/kg. These results indicate that compound Qingchang Sukang liquid exhibits strong anti-inflammatory, analgesic, and antibacterial properties. It is recommended that probiotics be supplemented after using this preparation to treat bacterial enteritis.

Keywords: Compound Qingchang Sukang liquid, analgesic, anti-inflammatory, acute toxicity, microecological preparation.

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INTRODUCTION

Compound Qingchang Sukang Liquid is formulated by adding Jinzhi Zi, also known as Cherokee rose, to a traditional Chinese medicine compound historically used in Manchu folk medicine for the effective treatment of appendicitis. It demonstrates significant therapeutic effects on appendicitis, colitis, piglet yellow dysentery, piglet white dysentery, piglet paratyphoid fever, and other conditions caused by pathogenic *Escherichia coli*, *Salmonella typhi*, and similar pathogens. To explore its pharmacological basis and provide reliable data for clinical application, the present study aims to investigate the anti-inflammatory and analgesic properties of Qingchang Sukang liquid, offering pharmacological evidence to support its use.

MATERIALS

Mouse strains and grouping

All strains of mice (randomly selected as either female or male) were purchased from the Laboratory Animal Center of Sichuan Agricultural University, Chengdu, China. The

Kunming mice were aged a few weeks, with an average body weight of 20.0 ± 1.5 g. Mice were randomly divided into groups of nine, as shown in Tables 1 and 2, and housed in cages with sawdust bedding.

The environmental conditions in the animal facility were maintained at $23 \pm 2^\circ\text{C}$, with $55 \pm 5\%$ relative humidity and a 12-hour light/dark cycle. All mice were fed a standard chow diet (Shoobree, Jiangsu, China) for one week to acclimatize before the experiment began. The experimental period lasted one week, after which all mice were sacrificed.

Animal welfare and experimental procedures in this study adhered to the Guide for the Care and Use of Laboratory Animals (NIH Publication No. 8023, revised 1978). The project was reviewed and approved by the Committee for the Protection of Animal Care at the Chongqing Academy of Animal Sciences.

Preparation of Compound Qingchang Sukang Liquid

Based on traditional folk formulas containing ingredients such as honeysuckle, ginseng, *Ophiopogon japonicus*,

Table 1. Effects of drugs on xylene induced ear swelling ($\bar{x} \pm s$).

Group	Oral dose (g/kg)	Number of mice	Weight difference (mg)
Control group	—	9	11.56 ± 4.84
Test drug group A	1.05	9	7.14 ± 2.01*
Test drug group B	2.10	9	6.68 ± 2.65**
Test drug group C	4.20	9	4.57 ± 1.44**
Diclofenate	0.10	9	6.58 ± 2.21**

Note: Compared with the control group, * p< 0.05, **p< 0.01.

Table 2. Effects of drugs on acetic acid writhing response in mice ($\bar{x} \pm s$).

Group	Oral dose (g/kg)	Number of mice	Frequency	Pain relief rate (%)
Control group	—	9	41.78 ± 6.40	—
Test drug group A	1.05	9	12.56 ± 3.96*	69.95
Test drug group B	2.10	9	6.11 ± 3.06**	85.37
Test drug group C	4.20	9	4.67 ± 2.37**	88.83
Diclofenate	0.10	9	2.89 ± 3.09**	93.10

Note: Compared with the control group, *p< 0.05, **p< 0.01.

Eucommia ulmoides, *Angelica sinensis*, Job's tears, and *Scutellaria baicalensis*, golden twigs were added as an additional component. The mixture was boiled three times using 6–8 times the volume of water, following standard procedures. Each boiling session lasted for 1 hour.

The resulting decoctions were combined, concentrated under reduced pressure to a ratio of 1:1, precipitated, and centrifuged to produce a traditional Chinese medicine extract containing 1 g of the original medicinal ingredients per milliliter. The extract was then sterilized under high pressure and stored in a refrigerator for future use (Liao et al., 2018).

Main Instruments

AEL-200 electronic balance, 8 mm punch, No. 12 metal gastric lavage device.

Strains

Escherichia coli and *Salmonella typhi* (donated by the Pharmacology Laboratory of Sichuan Agricultural University), as well as *Bacillus subtilis* and *Bacillus licheniformis* (preserved in the Microecology and Microbial Engineering Laboratory of Sichuan Agricultural University).

METHODS AND RESULTS ANALYSIS

Anti-swelling effect

One hour before the onset of inflammation in mice, 45

mice weighing 20.6 ± 0.5 g were randomly divided into five groups, as shown in Table 1. A drug solution was administered orally to the mice one hour before inflammation. Subsequently, 0.05 mL of xylene was applied to both sides of the right ear of each mouse (Li et al., 1997).

After 20 minutes, the mice were euthanized via cervical dislocation, and their ears were excised. An 8 mm punch was used to create a uniform ear piece from the same region of each ear, and the weight difference between the two ears was measured in milligrams (Vogel et al., 2001). The results are presented in Table 1.

As shown in Table 1, both diclofenac and the three doses of compound Qingchang Sukang solution significantly inhibited xylene-induced ear swelling in mice.

Analgesic effect

Forty-five mice, each weighing 20.4 ± 0.5 g, were randomly divided into 5 groups, as shown in Table 2. One hour after administering the medication, each animal received an intraperitoneal injection of 0.2 mL of 0.6% glacial acetic acid. The number of body twists observed within 20 minutes was recorded (Beijing Agricultural University, 1987). The results are presented in Table 2. The data indicate that both the diclofenac group and the three doses of compound Qingchang sukang solution significantly inhibited the acetic acid-induced writhing response in mice.

Acute toxicity test

The LD50 of Qingchang Sukang liquid could not be determined. However, the maximum tolerated dose for a

single administration was 13.78 g/kg, which is 200 times the actual clinical dosage. This result indicates that the liquid is safe for use in animals.

Antibacterial experiment

The drug was serially diluted from 1:6 to 1:1280 using a standard nutrient agar medium, resulting in a total of nine dilutions. The culture experiment was conducted using the test tube method. A 0.1 ml solution of *Bacillus licheniformis*, *Bacillus subtilis* (probiotic strains), *Escherichia coli*, and *Salmonella typhi* (pathogenic strains), each diluted 1000-fold after 72 hours of culture, was added and incubated at 37 °C for 48 hours.

The results are summarized in Table 3. The data indicate that the minimum inhibitory concentration (MIC) for the probiotic strains tested was 68 mg/ml, while the MIC for the pathogenic bacteria was 34 mg/ml. These findings demonstrate that the tested drug possesses strong antibacterial activity.

Statistical analysis

The data were presented as mean \pm standard deviation (SD). Statistical analyses were performed using Student's *t*-test with the statistical software package SPSS 22.0 (Chicago, IL, USA). A *P* value of <0.05 was considered statistically significant.

Table 3. Minimum inhibitory concentration (mg/ml) of compound Qingchang Sukang liquid on microorganisms.

Strain	<i>Bacillus licheniformis</i>	<i>Bacillus subtilis</i>	<i>Escherichia coli</i>	<i>Typhoid bacillus</i>
MIC	68	68	34	34

DISCUSSIONS

Western medicine attributes diseases such as appendicitis, colitis, piglet dysentery, piglet yellow dysentery, and piglet paratyphoid fever to factors including intestinal obstruction, spasms of the intestinal wall, ischemic necrosis, or low resistance. These conditions create an environment conducive to the rapid proliferation of conditional pathogenic bacteria, such as *Escherichia coli* and *Salmonella*. The resulting bacterial overgrowth disrupts the microbiota balance, enabling endotoxin invasion. This triggers severe intestinal inflammation, leading to significant damage, including the shedding of the intestinal mucosa and potential harm to other organs. For instance, when the appendix or colon is affected, severe abdominal pain is the primary symptom, whereas involvement of the small intestine often manifests as intense diarrhea. Piglets may exhibit symptoms such as dysentery, white dysentery, and paratyphoid fever (He, 1994; Tian and He, 1992).

In contrast, Traditional Chinese Medicine (TCM) categorizes these conditions as "intestinal abscesses." TCM posits that they arise from various factors, including irregular eating habits, such as overeating or consuming excessive raw and cold foods, as well as excessive fatigue. Emotional disturbances, such as anger and worry, and environmental factors, including exposure to cold and dampness, are also considered contributing causes. Physiological changes during or after pregnancy may lead to internal heat and blood stasis. Additionally, the presence of intestinal parasites may result in qi stagnation and blood stasis.

These factors impair gastrointestinal function, disrupting the normal transmission and circulation of

nutrients and waste. This dysfunction leads to waste accumulation, causing stagnation that generates dampness and heat in the body. As a result, blood stasis and turbid qi develop, ultimately forming intestinal abscesses.

Chen Shiduo of the Qing Dynasty, in his book *Strange Stories of Syndrome Differentiation*, attributed intestinal carbuncles to an imbalance of fire (Shiduo, nd). He suggested that when fire becomes excessive but remains unresolved, stagnation leads to carbuncle formation. Importantly, this excess fire often stems from a deficiency of water. As water declines, fire intensifies, and when unchecked, it fosters a poison that cannot be easily neutralized. Therefore, Shiduo emphasized addressing water deficiency rather than solely treating the fire to achieve a more effective resolution.

Compound Qingchang Sukang liquid, a traditional Chinese medicinal preparation, is primarily used for its anti-inflammatory and analgesic properties. The formula incorporates honeysuckle and gardenia, which detoxify, eliminate carbuncles, and nourish yin. When combined with ingredients such as Yuanshen and Ophiopogon japonicus, its ability to nourish yin and reduce fire is significantly enhanced. Modern pharmacological studies have shown that honeysuckle and other ingredients can neutralize bacterial endotoxins (Dong et al., 2003). Furthermore, herbs like Diyu and Danggui promote blood circulation, cool the blood, and moisten the intestines, while Coix seed and *Scutellaria baicalensis* relieve dampness and detoxify the body (Jiangsu New Medical College, 2001). This comprehensive formulation strengthens water, controls fire, detoxifies, and reduces swelling, thereby addressing the root disease mechanisms and achieving therapeutic efficacy.

However, due to compound Qingchang Sukang liquid's strong inhibitory effects on both pathogenic bacteria and probiotics, it is crucial to supplement with probiotics promptly after administration to restore intestinal microbiota balance and prevent dysbiosis.

This formula was originally developed as an effective treatment for human appendicitis but has shown potential in veterinary applications. However, the bitter taste of the oral liquid presents challenges in administering it to piglets and other animals. Further research is needed to develop alternative formulations, such as granules or other palatable dosage forms, to improve its acceptability and ease of use in animals.

CONFLICT OF INTEREST

The authors declare no competing interests.

AUTHORS CONTRIBUTIONS

Yang Jinlong and Liu Wanhong conducted the majority of the experiments and wrote the manuscript, and therefore, should be listed as co-first authors. Wang Ruisheng provided critical revisions to the manuscript and contributed to the experimental design. All authors reviewed and approved the final version of the manuscript.

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