**These TCM Herbs Can Help in the Treatment of Symptoms of Covid-19.**

A five hour CEU/PDA course by Dr. Harvey Kaltsas, AP, Dipl. Ac. (NCCAOM)

harvey@kaltsas.com

One thing Traditional Chinese Medicine (TCM) has learned from millennia of experience is how to treat viruses, plagues, and pandemics. In 219 A.D. the Shang Han Lun (Treatise on Cold Injury), the world’s oldest complete medical text, discussed at length the etiology and pathogenesis of febrile diseases contracted externally…that is from viruses and bacteria! The Chinese are still informed by this ancient TCM wisdom and have actively applied its precepts to the treatment of the illnesses caused by Covid-19 virus.

This pandemic originated in 2019 near the site of the Wuhan Institute of Virology research lab, and it has since ravaged the world. However, as of 7-25-2020 official statistics from China document a dramatically less severe death toll there (4,659) than in the USA (146,245). Source = <https://www.kff.org/coronavirus-covid-19/fact-sheet/coronavirus-tracker/>. Why the marked difference in death tolls?

Perhaps China has misrepresented and under reported its death toll, perhaps not. Perhaps America has over reported its own death toll from Covid-19. What is irrefutable is that the Chinese medical establishment has faithfully followed Western medical protocols when treating Covid-19 patients. On some patients it has also used chloroquine or hydroxychloroquine (HCQ) which has been shunned in America, and that may or may not have had an impact in lowering the impact of Covid-19 in China. A much more likely and well documented reason why China’s death rate from Covid-19 has been so low is its widespread use of TCM herb**s.** OnFebruary 17, 2020, the National Health Commission (NHC) of the People's Republic of China reported that 60,107 confirmed COVID-19 patients (85.20% of total confirmed cases) had been treated with TCM!

February 28, 2020 Echo Jie of ***The South China Morning Post*** also reported the following:

*“Gao Xiaojun, a spokesman for the Beijing Health Commission, was equally keen to promote the use of the ancient technique, saying TCM had made a significant contribution to patients’ recovery.*

*“ Traditional Chinese medicine has played an active role in improving the recovery rate and lowering the mortality rate among patients,’ he told a press conference on Monday.*

*“According to him, 87 per cent of coronavirus patients in Beijing had been given traditional medicines and 92 per cent of those had shown improvement.*

*“Wang Xianbo, director of the integrative medicine department at Beijing Ditan Hospital, said 90 per cent of the confirmed coronavirus cases at his hospital were receiving traditional Chinese medicine as part of their treatment. The efficacy rate of TCM was 87.5 per cent and the figure rose to 92.3 per cent with the addition of Western drugs, he said.”*

<https://www.scmp.com/news/china/society/article/3052763/coronavirus-80-cent-patients-china-benefiting-traditional>

Somehow, in this time of medical and social crisis, when Americans are asked to confront racist attitudes which harm us all, we as a country are allowing ourselves to suffer because of our unwillingness to learn from the wisdom of other medical cultures such as China’s. This course hopes to convey some of that wisdom by explaining the signs, symptoms, and TCM patterns of Covid-19 infection, the functions of TCM herbs used to treat Covid-19 diseases, and the efficacy rates of such TCM approaches as reported in research studies.

…………………………………………………………………………………………………..

.

This course will discuss the following:

* Western medical protocols used by China to treat Covid-19
* the signs, symptoms, and TCM patterns of Covid-19 infection,
* the functions of TCM herbs used to treat such signs, symptoms, and patterns
* the TCM herbal formulae most commonly used
* the efficacy rates of such TCM approaches as reported in Chinese studies
* additional herbal and nutritional protocols

**Additional Herbal and Nutritional Protocols**

For a change, we are going to put last things first and start by discussing additional herbal and nutritional protocols. Researchers in China and the West have been working to develop anti-virals and vaccines which will prevent viral replication of Covid-19 in the human body, particular in the lungs and naso-pharyngeal tissue. Two Chinese researchers, Zhang and Liu, summarized China’s approaches to Covid-19 in the Journal of Virology: “Potential interventions for novel coronavirus in China: A systematic review.” <https://onlinelibrary.wiley.com/doi/10.1002/jmv.25707> In it they observed:

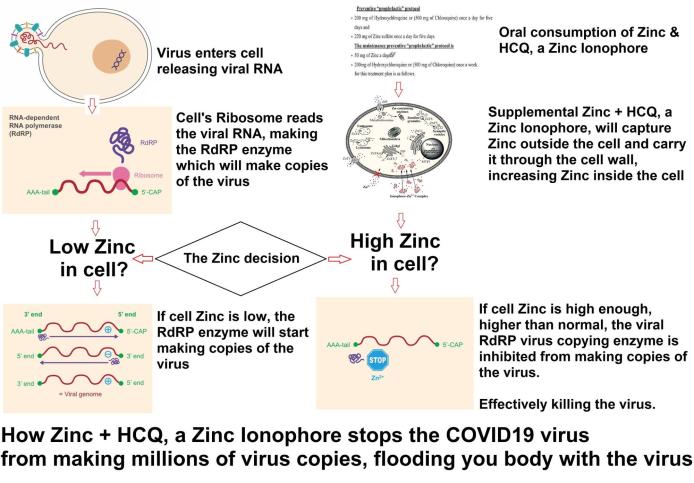
“Increasing the concentration of intracellular zinc with zinc‐ionophores like pyrithione can efficiently impair the replication of a variety of RNA viruses.[**44**](https://onlinelibrary.wiley.com/doi/10.1002/jmv.25707#jmv25707-bib-0044) In addition, the combination of zinc and pyrithione at low concentrations inhibits the replication of SARS coronavirus (SARS‐CoV).[**44**](https://onlinelibrary.wiley.com/doi/10.1002/jmv.25707#jmv25707-bib-0044) Therefore, zinc supplement may have effect not only on COVID‐19‐related symptom like diarrhea and lower respiratory tract infection, but also on COVID‐19 itself.”

Japanese researchers have confirmed the lack of zinc in elderly populations, those most likely to succumb to Covid-19: “Zinc deficiency in the elderly” (Japan, 2007) <https://www.ncbi.nlm.nih.gov/pubmed/18200755>

Perhaps this is why in the **Ben Cao Gao Mu** Li ShiZhen in 1586 recommended patients drink juice from onions during plagues We now know that onion juice is high in quercetin, and quercetin has been shown to be an effective ionophore for zinc:

<https://pubs.acs.org/doi/10.1021/jf5014633>

Doctors worldwide have had marked success using Hydroxychloroquine and chloroquine as ionophores to help transport zinc into the lungs to prevent replication of Covid-19, and China uses chloroquine as a standard antiviral to treat Covid-19. However, HCQ does not transport zinc into naso-pharyngeal tissues, thus the need to take zinc lozenges orally to protect against entry of Covid-19 through the nose and mouth.



This all prompted me to ask, **“What TCM principles can lead us to effective antivirals?”** Knowing that Covid-19 primarily attacks the lungs and spleen and is a function of toxic heat and dampness, I hearkened back to Five Element theory for insight. Since Earth (Spleen) nourishes Metal (Lungs) and controls dampness (Water), why not find a remedy in earth? After much wishing and some prayer, I obtained a translated copy of Volume Seven of the Li ShiZhen’s **Ben Cao Gao Mu**, **the Compendium of Materia Medica**. There, rich as the earth in the Yangtze valley, I found described in detail the healing properties of 61 species of soil, plus three others, many of which were effective against various types of plague and many other ailments.

I had known about the potent anti-viral properties of humic acid, especially for treating viruses such as Herpes Simplex Virus 1 and HIV-1 and HIV-2. Now, I strongly suspect that exploring the healing properties of soil and especially humic acid would be a fruitful course of inquiry into the prevention and treatment of Covid-19.

**Why? Because humic acid stops viral replication in vivo.**

For more on the science behind this, read **“Medical Aspects and Applications of Humic Substances” regarding the Antiviral Activity of Humic Substance.”** The article can be found at this website:

<https://www.clinicaleducation.org/news/medical-aspects-and-applications-of-humic-substances-regarding-the-antiviral-activity-of-humic-substance/>

**Western Medical Protocols Used in China:**

The following information is directly from the official Chinese government report issued March 25, 2020:

**Guidance for Corona Virus Disease Prevention, Control, Diagnosis and Management**

Edited by National Health Commission (NHC) of the PRC National Administration of Traditional Chinese Medicine of the PRC

Compiled and Translated by Chinese Preventive Medicine Association

Translators in Chief : Xiaofeng LIANG, Zijian FENG, Liming LI

PEOPLE’S MEDICAL PUBLISHING HOUSE

WHO COLLABORATION: CENTRE FOR HEALTH INFORMATION AND PUBLISHING

Book edited by Daniel Weber PhD, DSc[an eminent Australian Doctor of TCM]

***“General Treatment***

*“Rest patients in bed, strengthen supportive treatment, and ensure adequate nutrition. Keep the balance of water and electrolyte to maintain the stability of the internal environment. Closely monitor vital signs, oxygen saturation, etc.*

*“Monitor blood routine, urine routine, CRP, biochemical indicators (liver enzyme, myocardial enzyme, renal function, etc.), coagulation function, arterial blood gas analysis, chest imaging, etc. according to the patient’s condition. If possible, cytokine testing should be conducted.*

*“Give effective oxygen therapy measures in time, including nasal cannula, mask oxygen, high flow nasal oxygen therapy.*

***“Antiviral Treatment****: Give alpha-interferon nebulization (5 million units or equivalent per time for adult, add 2 mL of sterile water for injection, aerosol inhalation twice per day); lopinavir/ritonavir (200 mg/50 mg per capsule, 2 capsules each time, twice per day for adults, the course of treatment should be ≤10 days); ribavirin (combining with interferon or lopinavir/ritonavir are recommended, 500 mg for adults per time, inject 2–3 times per day intravenously, the course of treatment should be ≤10 days).* ***Chloroquine phosphate (500 mg for adult, twice per day, the course of treatment should be ≤10 days) [emphasis added],*** *Arbidol (200 mg for adults, three times per day, the course of treatment should be ≤10 days). Keep alert on side effects such as diarrhea, nausea, vomiting, and liver damage related to lopinavir/ ritonavir, as well as harmful interaction with other drugs. Effects of current trial drugs should be further evaluated during clinical usage. Simultaneously use of three or more types of antiviral drugs is not recommended and relevant drug treatment should stop if unbearable side effects occur.*

***“Antibacterial Drug Treatment****: unselective or inappropriate use of antibiotics should be avoided, especially in combination with broad- spectrum antibiotics.*

***“Treatment of Severe and Critical Cases***

***“Treatment Principles****: On the basis of symptomatic treatment, actively prevent complications, treat accompanying diseases, prevent secondary infections, and provide organ function support in time.*

***“Respiratory Support***

***“Oxygen Therapy****: Severe patients should be provided inhalation oxygen with face mask or nasal catheter. Timely assess whether respiratory distress and/or hypoxemia are relieved.*

***“High-Flow Nasal Catheter Oxygen Therapy or Non-Invasive Mechanical Ventilation****: When respiratory distress and/or hypoxemia cannot be relieved after standard oxygen therapy, high flow nasal catheter oxygen therapy or noninvasive ventilation should be considered. If the condition does not improve or even worsen within a short period of time (1–2 hours), endotracheal intubation and invasive mechanical ventilation should be performed promptly.*

***“Invasive Mechanical Ventilation****: Use lung protective ventilation strategies, which means small tidal volume (4–8 mL/kg ideal weight) and low inspiratory pressure (platform pressure <30 cmH2O) for mechanical ventilation to reduce ventilator-related lung injuries. For several patients, human-machine synchronization is not available, and sedative and muscle relaxants should be used in time.*

***“Salvage Treatment****: For patients with severe ARDS, it is recommended to perform lung expansion. If possible,* ***prone position*** *[emphasis added] ventilation should be performed for more than 12 hours per day. For those with poor prone position ventilation, extracorporeal membrane oxygenation (ECMO) should be considered as soon as possible if conditions permit.*

***“Circulation Support****: On the basis of adequate fluid resuscitation, improve microcirculation, use vasoactive drugs, and perform hemodynamic monitoring when necessary.*

***“Convalescent plasma therapy****: suitable for treating rapidly developed cases, severe cases and critical cases. Administrations and dosage refer to Clinical Plasma Therapy Plan for Corona Virus Disease 2019 Convalescents during Recovery (Tentative First Edition).*

***“Other Treatments***

*“According to the severity of respiratory distress and the progress of chest imaging, glucocorticoids can be used within a short period of time (3–5 days) as appropriate. Dosedoes not exceed the equivalent of 1–2 mg/ kg/day of methylprednisolone is recommended. It should be noted that higher doses of glucocorticoids would delay coronavirus clearance due to immunosuppressive effects;* ***Xuebijing Injection (a traditional Chinese medicine) can be given intravenously 100 mL/day****,* ***twice a day for treatment*** *[emphasis added]; microecological preparation can be used to keep the equilibrium for intestinal microecology and prevent secondary bacterial infection; Plasma exchange, adsorption, perfusion, blood/plasma filtering and other extracorporeal blood purification technologies should be considered if possible for critical cases with severe inflammatory reactions.*

*“Anxiety and fear usually occur in many patients; therefore psychological counseling should be strengthened.”*

**Author’s note**: Recent research by Jacobson et alia. has led to the ***Bradykinin Hypothesis*** for how Covid-19 undermines health. The following link to an article by Thomas Smith describes that research in depth:

<https://elemental.medium.com/a-supercomputer-analyzed-covid-19-and-an-interesting-new-theory-has-emerged-31cb8eba9d63>

Simply stated, Jacobson’s team observes that

“the virus… acts pharmacologically as an ACE inhibitor.”

The virus, like ACE inhibitor drugs, gives rise to large amounts of bradykinins and produces similar side effects as ACE inhibitors: dry cough, fatigue, and leaky blood vessels which can even cause a gel type edema filling the lungs.

Smith notes: “Interestingly, Jacobson’s team also suggests [vitamin D](https://elemental.medium.com/what-black-people-need-to-know-about-vitamin-d-and-covid-19-5bf5885d5288) as a potentially useful Covid-19 drug. The vitamin is involved in the RAS system and could prove helpful by reducing levels of another compound, known as REN. Again, this could stop potentially deadly bradykinin storms from forming. The researchers note that vitamin D has already [been shown to help those with Covid-19](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3571484). The vitamin is readily available over the counter, and [around 20% of the population is deficient](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3126987/#:~:text=vitamin%20D%20deficiency-,The%20prevalence%20of%20mild%2C%20moderate%20and%20severe%20vitamin%20D%20deficiencies,%25%2C%20and%2026.9%25%20respectively.). If indeed the vitamin proves effective at reducing the severity of bradykinin storms, it could be an easy, relatively safe way to reduce the severity of the virus.

**Signs and Symptoms of Covid-19:**

**Signs**:As the infection progressesthe tongue almost always presents with a thick, white, sticky coating

**Symptoms**: These usually start within two to fourteen days after someone gets infected with Covid-19:

* Fever (which usually follows other symptoms): 99%
* Fatigue:70%
* Dry cough: 59%
* Loss of appetite: 40%
* Body aches: 35%
* Shortness of breath: 31%
* Phlegm or mucus: 27%

These are other symptoms which may present:

* Sore throat
* Headache
* Chills, with shaking at times
* Loss of sense of taste or smell
* Runny nose or congestion
* Vomiting
* Intestinal discomfort with loose stools or diarrhea

## Emergency Symptoms of Covid-19 which should prompt an immediate call to a doctor or a visit to a hospital:

* Constant pressure or pain in the chest
* Trouble breathing
* Cyanosis (bluish color) of face or lips
* Confusion which appears all of a sudden
* Signs of a stroke: Slurred speech and/or paralysis with sagging of one side of the face and/or one arm

**Lab and Medical Imaging Findings:**

The following is also from China’s publication, **Guidance for Corona Virus Disease Prevention, Control, Diagnosis and Management:**

*“In terms of laboratory examination, this edition adds the following descriptions, “Increased values of liver enzymes, LDH, muscle enzymes and myoglobin can occur in some patients; and raised level of troponin can be seen in some critical patients” and “The nucleic acid of 2019-nCoV can be detected in biological specimens such as nasopharyngeal swabs, sputum, secretions of lower respiratory tract, blood and feces.”*

***“*ChestImaging:** *In the early stage of COVID-19, the images show that there are multiple small patched shadows and interstitial changes, especially in the lung periphery. As the disease progresses, the images of these patients further develop into multiple ground glass shadows and infiltration shadows in both lungs. In severe cases, lung consolidation may occur. It is seldom to find pleural effusion in patients with COVID-19.”*

**From a TCM perspective, these are the most prevalent patterns presenting:**

* Wind Heat
* Deficient Wei Qi (defensive energy)
* Lung Heat
* Stuck Lung Qi
* Stuck Blood
* Dampness in the Spleen

**TCM herbs and formulae are mostly used for these purposes:**

1. To reinforce vital qi (especially wei qi)
2. To nourish yin
3. To clear heat and eliminate heat toxins
4. To dispel wind and release the exterior
5. To support the lungs, spleen, heart, and stomach
6. To dispel dampness and summer heat in the stomach and spleen, to induce perspiration, and to dispel wind dampness (most commonly used in the South of China)

**TCM herbs used in formulae are directed to these meridians in this order of frequency:**

Lungs – 25x

Spleen – 10x

Heart – 7x

Stomach – 7x

Urinary Bladder – 6x

Liver – 5x

Large Intestine – 5x

Kidney – 3 x

Gall Bladder – 3x

Pericardium – 1x

Triple Warmer – 1x

**TCM herbs and herbal formulae most used in China to treat Covid-19, and their functions:**

In their 2020 research paper, ***Traditional Chinese Medicine in the Treatment of Patients Infected with 2019-New Coronavirus (SARS-CoV-2): A Review and Perspective***,Yang Yang, Md Sahidul Islam, Jin Wang, Yuan Li, and Xin Chenreport that these were the ten most commonly used TCM herbs in the treatment of Covid-19::

* Astragalus membranaceus (Huang Qi) – Functions: to replenish the vital energy and stop perspiration; to consolidate the wei qi, to dispel pus and improve wound healing, and to reduce edema and improve water metabolism
* Glycyrrhizae uralensis (Gan Cao)– Functions: to tonify spleen and benefit qi, to moisten the lung and stop cough, to relieve pain, to clear heat and eliminate toxins, and to harmonize other herbs
* Saposhnikoviae divaricate (Fang Feng)– Functions: To dispel wind and release the exterior; to dispel wind, cold and dampness and relieve pain; to dispel internal liver wind, relieve muscle cramps and spasms; to stop bleeding and relieve diarrhea; and as a hemostatic
* Rhizoma Atractylodis Macrocephalae (Bai Zhu)– Functions: to strengthen the spleen and tonify qi, to dispel dampness and summer heat in the stomach and spleen, to eliminate edema, to stop spontaneous perspiration caused by a deficiency of wei qi
* Lonicerae Japonicae Flos (Jin Yin Hua) – Functions: to clear heat and eliminate heat toxins; to treat dysentery and diarrhea created by toxic heat
* Fructus forsythia (Lian Qiao) – Functions: to clear heat and eliminate toxins; to promote urination when heat has invaded the urinary bladder
* Atractylodis Rhizoma (Cang Zhu) – Functions: to strengthen the spleen and dry dampness; to induce perspiration and dispel wind damp
* Radix platycodonis (Jie Geng) – Functions: Clears phlegm, ventilates the lungs, and benefits the throat; dispels pus; raises the qi of the lungs and large intestine
* Agastache rugosa (Huo Xiang) – Functions: To release the exterior, dispel damp, and dispel summer damp; to relieve nausea; to treat fungal infections
* Cyrtomium fortune J. Sm (Guan Zhong) – Functions: to rid the blood of pathogenic heat, to stop bleeding, as an anti-parasitic

There are others since herbs in two of three of the most commonly used and effective TCM herbal formulae are not included in Yang Yang et al.’s list. Those two formulae are Sang Ju Wan and Qing Fei Pai Du Tang, the latter being a combination of four TCM formulae. Qing Fei Pai Du Tang is quite the effective formulae, and later in this course there will be extensive reporting of its remarkable efficacy.

The third most commonly used TCM formula is Yu Ping Feng San, and its herbs are fully represented in Yang Yang’s study.

**The herbs in Yu Ping Feng San are** described in this chart from <https://www.americandragon.com/Herb%20Formulas%20copy/YuPingFengSan.html> :

|  |  |  |  |
| --- | --- | --- | --- |
| **(Honey-prepared) Radix. Astragali** | [***(Mi Zhi) Huang Qi***](https://www.americandragon.com/Individualherbsupdate/HuangQi.html) | 10-120g | **Functions: Strengthens the Spleen, raises the *Yang Qi*of the Spleen and Stomach**, **tonifies *Wei Qi*, stabilizes the exterior and tonifies the Lungs (aids circulation of moisture downward from the face).** With*Fang Feng,*stabilizes the exterior without causing the pathogenic influences to remain. |
| **Rhizome. Atractylodis Macrocephalae** | [***Bai Zhu***](https://www.americandragon.com/Individualherbsupdate/BaiZhu.html) | 9-60g | **Strengthens the Spleen, tonifies *Qi*. stabilizes the exterior and stops sweating**. With*Huang Qi*, for Spleen*Qi*Deficiency with weakness, lassitude and loose stools. With *Huang Qi*and *Fang Feng,*for spontaneous sweat with aversion to Wind . |
| **Radix. Saposhnikoviae** | [***Fang Feng***](https://www.americandragon.com/Individualherbsupdate/FangFeng.html) | 9-60g | **Releases the exterior and expels External Wind.** With *Huang Qi,*prevents Wind from entering the skin. |

**The Herbs in Sang Ju Wan** are

* Morus (Sang Ye) Mulberry Leaf – Functions: Diaphoretic, for disease due to wind and heat.

Therapeutic meridians: Lung and Liver

* Phragmites (Lu Gen) – Functions: To promote secretion of body fluids and reduce fever

Therapeutic meridians: Lung and Stomach

* Chrysanthemum (Ju Hua) – Functions: Diaphoretic, for disease due to wind and heat

Therapeutic meridians: Lung and Liver

* Forsythia (Lian Qiao) – Functions: to rid the body of pathogenic heat and toxin in the blood

Therapeutic meridians: Lung, Heart, and Gall Bladder

* Platycodon (Jie Geng) – Functions: smooth and ventilate the lungs

Therapeutic meridian: Lung

* Armenica (Xing Ren) – Functions: Anti-asthmatic and antitussive

Therapeutic meridian: Lung and large intestine

* Glycyrrhiza (Gan Cao) – see above
* Mentha (Bo He) – Functions:: To dispel wind and heat

Therapeutic meridian: Lung and liver

Yang Yang et al. report that during the SARS Corona virus outbreak of 2003 Sang Ju Wan and Yu Ping Feng San were used together as a preventive measure. Here in part are the results:

*“Lau and colleagues reported that, during SARS outbreak, 1063 volunteers including 926 hospital workers and 37 laboratory technicians working in high-risk virus laboratories used a TCM herbal extract, namely*Sang Ju Yin*plus*Yu Ping Feng San*. Compared with the 0.4% of infection in the control group, none of TCM users infected.”*

**The Herbs in Qing Fei Pai Du Tang** are a combination of four different formulae. In China Ma Huang and Xi Xin are added but their use is prohibited in the USA.

* Morus Alba (Sang Bi Pi) Mulberry Root Bark

Therapeutic meridians: Lung and Liver

* Radix Glycyrrhizae (Gan Cao) Licorice Root (processed with honey)

Therapeutic meridians: Heart, Lung, Spleen, and Stomach

* Semen Armeniacae (Xing Ren) Bitter Apricot Seed

Therapeutic meridians: Lung and Large Intestine

* Gypsum Fibrosum (Shi Gao) Gypsum - Functions: To clear heat in the Qi and in the Lung

Therapeutic meridians: Lung and stomach

* Ramulus Cinnamomi (Gui Zhi) Cassia Twig – Functions: Diaphoretic, to warm the jing and luo; to promote circulation of Yang Qi to the chest

Therapeutic meridians: Heart, Lung, and UB

* Rhizoma Alismatis (Ze Xie) Oriental Water plantain Rhizome – Functions: To resolve dampnes and to eliminate heat and dampness in the lower burner

Therapeutic meridians; Kidney and UB

* Polyporus (Zhu Ling) Chuling – Function: Diuretic

Therapeutic meridians; Kidney and UB

* Rhizoma Atractylodis Macrocephalae (Bai Shu) Large head Atractylodes Rhizome
* Poria (Fu Ling) Indian Bread – Functions: To resolve dampness (diuretic), to tonify spleen and stomach, to regulate the heart

Therapeutic meridians; Lung, Spleen, Heart, and UB

* Radix Bupleuri (Chai Hu) Chinese Thorowax Root – Functions: Antipyretic for intermittent fevers, to relieve stuck qi in the liver, to tonify the spleen

Therapeutic meridians; Liver, GB, PC, and TW

* Radix Scutellariae (Huang Qin) Baical Skullcap Root – Functions: To eliminate heat and dampness, especially in the lung (for cough)

Therapeutic meridians; Lung, Stomach, Heart, Large Intestine, and GB

* Rhizoma Pinelliae (Ban Xia) Pinellia Tuber – Functions: To eliminate dampness and phlegm

Therapeutic meridians; Lung, Spleen, and Stomach

* Radix Asteris (Zi Wan) Tararian Aster Root – Functions: Functions: Expectorant and antitusive

Therapeutic meridian; Lung

* Rhizoma Zingiberis (Gan Jiang) Dried Ginger – Functions: To restore the Yang, to warm Stomach and Spleen, and to resolve phlegm and warm the lung
* Therapeutic meridians; Lung, heart, spleen, and stomach
* Rhizoma Belamcandae (She Gan) Blackberry lily Rhizome: Functions: Anti-inflammatory, to rid fever and detoxify

Therapeutic meridian; Lung

* Rhizoma Dioscoreae (Shan Yao) Common Yam Rhizome – Functions: To tonify stomach and spleen and strengthen the lung and kidney

Therapeutic meridians; Lung, spleen and kidney

* Fructus Aurantii Immaturus (Zhi Shi) Immature Orange Fruit – Functions: To disperse stagnant qi, to resolve damp in the GI tract

Therapeutic meridians: Spleen and stomach

* Pericarpium Citri Reticulatae (Chen Pi) Dried Tangerine Peel – Functions: To resolve dampness and phlegm, to tonify the spleen, and to reverse counterflow qi

Therapeutic meridians: Lung and Spleen

* Agastache Rugosus (Huo Xiang) Pogostemon Cablin Benth –Functions: To release the exterior, dispel damp, and dispel summer damp; to relieve nausea; to treat fungal infections

Therapeutic meridians: Lung, spleen, and stomach

* Flos Farfarae (Kong Dong Hua) Coltsfoot Flower Bud – Functions: To moisten the lung, descend qi, stop cough, and dissolve phlegm

Therapeutic meridians – Lung, large intestine

**Qing Fei Pai Du Tang is now understood to be the most effective early stage treatment for those infected with Covid-19. Here’s what the Yang Yang et al. study said about its efficacy:**

*According to the report of National Administration of Traditional Chinese Medicine, up to February 5th, 2020, 214 COVID-19 patients were treated with*Qing Fei Pai Du Tang*in Shanxi, Hebei, Heilongjiang and Shaanxi Provinces with overall effective rate ≥ 90%. Among them, the symptoms of majority of patients (≥60%) were markedly improved, while illness of others (30%) was stabilized*[*92*](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B92)*. After that, 701 COVID-19 patients were treated with*Qing Fei Pai Du Tang*in 10 provinces in China. The result showed that 130 patients (18.5%) were completely cured after treatment. The treatment also resulted in the disappearance of characteristic symptoms of COVID-19 such as fever and cough in 51 patients (7.27%). In addition, symptom improvement or stabilization were observed in 268 patients (38.2%), and in 212 patients (30.2%), respectively*[*87*](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B87)*.*

In ***Today’s Practitioner***, May 5 and 13, 2020, Dr. Geoff D’Arcy reported that this was the treatment protocol for using Qing Fei Pai Du Tang in the 701-person study:

***“QFPDT Clinical Protocols***

*“In one study announced by China’s State Administration of Traditional Chinese Medicine, 701 confirmed coronavirus cases treated by QFPDT were analyzed. The 701 cases spanned 57 medical institutions in 10 provinces. Out of the 701 patients, 130 were cured and discharged; symptoms of 51 patients completely disappeared; 268 patients showed improvement in symptoms, and 212 presented with stable symptoms (those symptoms did not worsen). The following outlines the protocols:*

*“****Fever****: Before taking QFPADT the herbal decoction was taken for just one day, 51.8% of the patients returned to normal temperature. After taking the remedy for six days, 94.6% of patients’ temperatures returned to normal.*

***“Cough****: And out of the 701 cases, 214 patients presented with cough symptoms. After one day of taking Qing Fei Pai Du Tang, 46.7% of the patients’ cough symptoms disappeared. After six days, that figure increased to 80.6% of patients.*

***“Fatigue Poor Appetite and Sore Throat****: TCM doctors also observed taking Qing Fei Pai Du Tang lessened the severity of other symptoms such as fatigue, poor appetite, and sore throat.*

*“Of the 701 patients, detailed, completed case information of 351 patients has become available. And out of the 351 patients, none of the patients categorized as “light and ordinary” (i.e., mild) were downgraded to severe or critically ill; 3 of the 22 severe patients were cured and discharged; 8 were improved to general condition, and a total of 46 patients were cured and discharged.”*

<https://todayspractitioner.com/traditional-chinese-medicine-tcm/integration-of-traditional-chinese-medicine-in-the-treatment-and-support-against-the-coronavirus/#.Xyrpf1qSmUk>

<https://todayspractitioner.com/traditional-chinese-medicine-tcm/qing-fei-pai-du-tang-herbal-formula-for-integrative-covid-19-therapies-in-china/#.Xyrp7FqSmUk>

**Thus we see that TCM herbs are mostly used for these purposes:**

1. To reinforce vital qi (especially wei qi)

2. To nourish yin

3. To clear heat and eliminate heat toxins

4. To dispel wind and release the exterior

5. To support the lungs, stomach, and spleen

6. To dispel dampness and summer heat in the stomach and spleen, to induce perspiration, and to dispel wind dampness (most commonly used in the South of China)

**The March 25, 2020 official report from the National Health Commission [NHC] of the Peoples Republic of China identifies several other TCM formulae useful in treating these signs, symptoms, and patterns of Covid-19 infection:**

**[The following NHC report has been set in New Times Roman typeface for clarity of attribution]**

**“Traditional Chinese Medicine Treatment**

COVID-19 can also be treated with traditional Chinese medicine, which considers it caused by epidemic pathogenic factors located in the lungs. Different regions can refer to the following schemes for dialectical treatment according to the disease condition, local climate characteristics, and different physical conditions. Use drugs under the guidance of doctors if the dose of drug exceeds the pharmacopoeia.

Clinical Treatment Period (For Confirmed Cases)

**Lung-Clearing and Detoxification Soup**

***Application Scope***: suitable for mild, general and severe cases; reasonable for treating critical cases according to clinical symptoms.

***Basic Prescription***: Herba Ephedrae 9 g, roasted Radix Glycyrrhizae 6 g, Semen Armeniacae Amarum 9 g, raw Gypsum Fibrosum 15–30 g (decocted first), Ramulus Cinnamomi 9 g, Rhizoma Alismatis 9 g, Polyporus Umbellatus 9 g, Rhizoma Atractylodis Macrocephalae 9 g, Poria 15 g, Radix Bupleuri 16 g, Radix Scutellariae 6 g, Rhizoma Pinelliae Preparata 9 g,

Rhizoma Zingiberis Recens 9 g, Radix Asteris 9 g, Flos Farfarae 9 g, Rhizoma Belamcandae 9 g, Herba Asari 6 g, Rhizoma Dioscoreae 12 g, Fructus Aurantii Immaturus 6 g, Pericarpium Citri Reticulatae 6 g, Herba Pogostemonis 9 g.

**Mild Type**

***1)*** ***Cold Dampness Stagnating Lungs***

Clinical Manifestations: fever, fatigue, soreness, coughing, expectoration, chest tightness, suffocation, nausea, vomiting and sticky stools.

***[Tongue]*** Pale or red tongue with fat tooth marks; moss white thick rotten or greasy fur, ***[Pulse]*** - soft and floating or slippery pulse.

***Recommended Prescription:*** Raw Herba Ephedrae 6 g, raw Gypsum Fibrosum 15 g, Semen Armeniacae Amarum 9 g, Rhizoma et Radix Notopterygii 15 g, Semen Lepidii 15 g, Rhizoma Cyrtomii 9 g, Lumbricus 15 g, Radix Cynanchi Paniculati 15 g, Herba Pogostemonis 15 g, Herba Eupatorii 9 g, Rhizoma Atractylodis 15 g, Poria 45 g, raw Rhizoma Atractylodis Macrocephalae 30 g, charred Fructus Hordei Germinatus, charred Fructus Crataegi and charred Massa Medicata Fermentata 9 g each, Cortex Magnoliae Officinalis 15 g, charred Semen Arecae 9 g, Fructus Tsaoko 9 g, Rhizoma Zingiberis Recens 15 g.

***Administrations and Dosage***: One dose per day, decocted with 600 mL water, taken in the morning, noon and evening respectively before meals.

**2) Damp-Heat Accumulated Lung**

***Clinical Manifestations***: low fever or normal body temperature, slight chills alternate, head and body heaviness, muscle soreness, dry cough and less sputum, sore throat, dry mouth and no desire to drink, or chest tightness, epigastric fullness, no sweat or unsmooth sweating, or vomiting, nausea, loose stool or constipation.

Pale or red tongue with white, thick, greasy or thin yellow fur, and smooth or moist pulse.

***Recommended Prescription***: Semen Arecae 10 g, Fructus Tsaoko 10 g, Cortex Magnoliae Officinalis 10 g, Rhizoma Anemarrhenae 10 g, Radix Scutellariae 10 g, Radix Bupleuri 10 g, Radix Paeoniae Rubra 10 g, Fructus Forsythiae 15 g, Herba Artemisiae Annuae 10 g (decocted later), Rhizoma Atractylodis 10 g, Folium Isatidis 10 g, raw Radix Glycyrrhizae 5 g.

***Administrations and Dosage***: One dose per day, decocted with 400 mL water, taken once in the morning and once in the evening.

**General Type**

**1) Damp-Poison Stagnating Lung**

***Clinical Manifestations***: fever, cough with less sputum or yellow sputum, chest tightness, shortness of breath, abdominal distension.

***[Tongue]*** - Dark red and fat tongue with yellow greasy or dry fur,

***[Pulse]*** - rapid and/or slippery pulses.

***Recommended Prescription***: raw Herba Ephedrae 6 g, Semen Armeniacae 12 g, Amarum 15 g, raw Gypsum Fibrosum 30 g, raw Semen Coicis 30 g, Rhizoma Atractylodis 10 g, Herba Pogostemonis 15 g, Herba Artemisiae Annuae 12 g, Rhizoma Polygoni Cuspidati 20 g, Herba Verbenae 30 g, Dry Rhizoma Phragmitis 30 g, Semen Lepidii 15 g, Exocarpium Citri Grandis 15 g, Radix Glycyrrhizae 10 g.

***Administrations and Dosage***: one dose per day, decocted with 400 ml water, taken once in the morning and once in the evening.

**2)** **Cold Dampness Obstructing Lung**

***Clinical Manifestations***: Low fever, hiding fever, or no fever, dry cough, little sputum, fatigue, chest tightness, nausea, or vomiting, loose stools.

***[Tongue]*** - Pale or red tongue, white greasy fur,

***[Pulse]*** - soft and floating pulse.

***Recommended Prescription***: Rhizoma Atractylodis 15 g, Pericarpium Citri Reticulatae 10 g, Cortex Magnoliae Officinalis 10 g, Herba Pogostemonis 10 g, Fructus Tsaoko 6 g, raw Herba Ephedrae 6 g, Rhizoma et Radix Notopterygii 10 g, Rhizoma Zingiberis Recens 10 g, Semen Arecae 10 g.

***Administrations and Dosage***: One dose per day, decocted with 400 mL water, taken once in the morning and once in the evening.

Severe Type

1) Lung Blocked by Epidemic Toxin

Clinical Manifestations: fever, flushing, cough, less yellow sticky sputum

with or without blood, wheezing and shortness of breath, fatigue, bitter and sticky dry mouth,

nausea with anorexia, poor stool movements, less brown urine.

***[Tongue]*** - Red tongue with yellow

***[Pulse]*** - greasy, slippery pulse.

***Recommended Prescription***: Raw Herba Ephedrae 6 g, Semen Armeniacae Amarum 9 g, Gypsum Fibrosum 15 g, Radix Glycyrrhizae 3 g, Herba Pogostemonis 10 g (decocted later), Cortex Magnoliae Officinalis 10 g, Rhizoma Atractylodis 15 g, Fructus Tsaoko 10 g, Rhizoma Pinelliae Preparatum 9 g, Poria 15 g, raw Radix et Rhizoma Rhei 5 g (decocted later), raw Radix Astragali seu Hedysari 10 g, Semen Lepidii 10 g, Radix Paeoniae Rubra 10 g.

***Administrations and Dosage***: One or two doses per day, decocted with 100–200 mL water, taken 2–4 times a day, oral or nasal feeding.

**2) Flaring Heat in Qi and Ying**

***Clinical Manifestations***: severe fever and polydipsia, dyspnea and anhelation, delirium, blurred vision, rash, or hematemesis and epistaxis, or convulsion of the limbs. Tongue with little or no fur, deep and count pulse, or large and rapid pulse.

***Recommended Prescription***: Raw Gypsum Fibrosum 30–60 g (decocted first), Rhizoma Anemarrhenae 30 g, Radix Rehmanniae 30–60 g, Cornu Bubali 30 g (decocted first), Radix Paeoniae Rubra 30 g, Radix Scrophulariae 30 g, Fructus Forsythiae 15 g, Cortex Moutan 15g, Rhizoma Coptidis 6 g, Folium Phyllostachydis Henonis 12 g, Semen Lepidii 15 g, Radix Glycyrrhizae 6 g.

***Administrations and Dosage***: One dose per day, decocted with 100 mL to 200 mL water, decoct Gypsum Fibrosum and Cornu Bubali firstly, taken 2 to 4 times per day, oral or nasal feeding.

***Recommend Chinese Medicine***: Xiyanping injection, Xuebijing injection, Reduning

injection, Tanreqing injection, Xingnaojing injection. Drugs with similar effects may be

selected according to individual conditions or may be used jointly according to clinical

symptoms. Traditional Chinese medicine injection can be used in combination with

decoction.

**Critical Type (Internal Block and Outward Desertion)**

***Clinical Manifestations***: dyspnea, asthma requires assisted ventilation, dizziness, irritability, cold sweaty limbs,

***[Tongue]*** - purple tongue, thick or dry fur,

***[Pulse]*** - large floating and rootless pulse.

***Recommended Prescription***: Radix Ginseng 15 g, Radix Aconiti Lateralis Preparata10 g (decocted first), Fructus Corni 15 g, drinking with Suhexiang Pills or Angong Niuhuang Pills.

***Recommended Chinese Medicine***: Xuebijing Injection, Reduning Injection, Tanreqing Injection, Xingnaojing Injection, Shenfu Injection, Shengmai Injection 1, Shengmai Injection

2. Drugs with similar effects may be selected according to individual conditions or may beused jointly according to clinical symptoms. Traditional Chinese medicine injection can be used in combination with decoction.

**Notes**: **Recommended Usage of Traditional Chinese Medicine Injections for Severe and Critical Cases**

The use of traditional Chinese medicine injections should follow the principle of starting with low dose and modifying gradually and dialectically according to the drug instructions. The recommended usage is as follows:

***Viral Infection or Combined with Mild Bacterial Infection***: 0.9% Sodium Chloride Injection 250 mL and Xiyanping Injection 100 mg bid, or 0.9% Sodium Chloride Injection 250 mL and Reduning Injection 20 mL, or 0.9% Sodium Chloride Injection 250 mL and Tanreqing Injection 40 mg bid.

***Severe Fever with Consciousness Disturbance***: Xingnao Injection 20 mL and 0.9% Sodium Chloride Injection 250 mL, bid, twice daily.

***Systemic Inflammatory Response Syndrome (SIRS) and/or multiple organ failure***: Xuebijing Injection 100 mL and 0.9% Sodium Chloride Injection 250 mL, bid, twice daily.

Immunosuppression: Shengmai Injection 100 mL and 0.9% Sodium Chloride Injection 250 mL, bid, twice daily.

***Shock***: Shenfu Injection 100 mL and 0.9% Sodium Chloride Injection 250 mL, bid, twice daily.

**Recovery Period**

***1) Lung Deficiency and Spleen Qi***

***Clinical Manifestations***: shortness of breath, tiredness, anorexia,

distention and fullness, constipation, loose stool,

***[Tongue]*** - pale tongue, whitish greasy fur.

***Recommended Prescription***: Rhizoma Pinelliae Preparatum 9 g, Pericarpium Citri Reticulatae 10 g, Radix Codonopsis 15 g, roasted Radix Astragali seu Hedysari 30 g, roasted Rhizoma Atractylodis Macrocephalae 10 g, Poria 15 g, Herba Pogostemonis 10 g, Fructus Amomi Villosi 6 g (decocted later), Radix Glycyrrhizae 6 g. Administrations and Dosage: One dose per day, decocted with 400 mL water, take once in the morning and once in the evening.

***2)*** ***Deficiency of Qi and Yin***

***Clinical Manifestations:*** fatigue, shortness of breath, dry mouth, thirst, hyperhidrosis,

anorexia, low fever or no fever, dry cough, less sputum,

**[Tongue]** - dry tongue,

**[Pulse]** -thin or weak pulse.

***Recommended Prescription***: Radix Adenophorae 10 g, Radix Glehniae 10 g, Radix Ophiopogonis 15 g, Radix Panacis Quinquefolii 6 g, Fructus Schisandrae Chinensis 6 g, raw Gypsum Fibrosum 15 g, Herba Lophatheri 10 g, Folium Mori 10 g, Rhizoma Phragmitis 15 g, Radix Salviae Miltiorrhizae 15 g, Radix Glycyrrhizae 6 g.

***Administrations and Dosage***: One dose per day, decocted with 400 mL water, intake once in the morning and once in the evening.

**Release of isolation should meet with the following four standards**

1) Having normal body temperature for more than 3 days;

2) With significantly recovered respiratory symptoms;

3) Lung imaging shows obvious absorption and recovery of acute exudative lesion;

4) With negative results of the nucleic acid tests of respiratory pathogens for consecutive

**The Yang Yang et al. study:**

What follows after my analysis of preventive TCM herbal formulae is the complete study by Yang Yang, et al. It is an open source document published for free access by the public. These are their most important TCM herbal recommendations. I have enlarged this part of the Yang Yang et al. text to 18 point type and set in bold:

**“To date [March 15,2020], NHC has published 6 editions Guidelines of Diagnosis and Treatment for COVID-19**[**88**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B88)**. Since the fourth versions, different herbal medicines used in TCM system has been recommended for the treatment of COVID-19, based on the stage of disease and symptom differentiation**[**89**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B89)**. According to the latest edition of Guideline**[**88**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B88)**, following multiple component Chinese herbal products are recommended for the patients in the medical observation period, presumably as a** **preventive measure:****Huo Xiang Zheng Qi Shui, Lian Hua Qing Wen Capsule, Shu Feng Jie Du Capsule and Jin Hua Qing Gan Granule.**

**“In the clinical treatment period, Qing Fei Pai Du Tang, Xi Yan Ping Injection, Xue Bi Jing injection, Re Du Ning Injection, Tan Re Qing Injection, Xing Nao Jing Injection and some other Chinese medicine formulae should be selected**[**90**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B90)**.**

**“In addition, for the patients in critical condition, Shen Fu Injection, Sheng Mai Injection, Shen Mai Injection, Su He Xiang Pill and An Gong Niu Huang Pill should be administered (Table**[**​(Table 55**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/table/T5/)**).”**

Here are my analyses of the four preventive herbal formulae recommended in the Yang Yang et al. study:

**Huo Xiang Cheng Chi Pien**:

Agastachee (Huo Xiang) 13.2%

Poria (Fu Ling) 13.2%

Areca (Da Fu Pi) 13.2%

Angelica (Bai Zhi) 13.2%

Perilla (Zi Su Ye) 13.4%

Magnolia (Hou Po) 9.4%

Atractylodes (Cang Zhu) 9.4%

Citrus (Chen Pi) 9.4%

Lycyrrhiza (Gan Cao) 5.6%

**Lian Hua Qing Wen Capsule:**

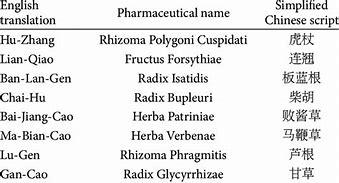
Ingredients -  forsythia, honeysuckle, ephedra, fried bitter almond, gypsum, isatis root, mianma Guanzhong, Houttuynia cordata, patchouli, rhubarb, rhodiola, menthol, licorice.

**Note: Ephedra is prohibited in the USA! This has been warned against by the FDA:** <https://www.fda.gov/inspections-compliance-enforcement-and-criminal-investigations/warning-letters/lianhuaqingwencapscom-608667-07062020>

It is most unfortunate that Lian Hua Qing Wen Capsules contain ephedra, because it has been shown to be very effective at treating Covid-19. Perhaps someone in the USA can get the exact percentages of ingredients and formulate it in the USA without ephedra. Here’s what Yang Yang et al. say Chinese research has shown about Lian Hua Qing Wen’s efficacy:

*“Yao,*et al*. and Lu,*et al.[*93*](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B93)*,*[*94*](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B94)*retrospectively analyzed the clinical efficacy of*Lian Hua Qing Wen Capsule*in treatment of confirmed and suspected COVID-19 patients. The results indicated that* *this herbal product could markedly relieve major symptoms such as fever and cough and had the capacity to promote the recovery.*

***S*hu Feng Jie Du Capsule:**



These studies affirm its efficacy: <https://bmccomplementmedtherapies.biomedcentral.com/track/pdf/10.1186/s12906-020-02924-5>

<https://covid19immune.com/articles/shufeng-jiedu-capsule>

**Jin Hua Qing Gan:**

I could not find a list of its ingredients. Here are research articles about it:

<https://www.medrxiv.org/content/10.1101/2020.06.08.20124453v1>

<https://journals.lww.com/md-journal/Fulltext/2020/06120/Efficacy_and_safety_of_Jinhua_Qinggan_granules_for.51.aspx>

**Here is the complete Yang Yang et al. study:**

[Int J Biol Sci](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/). 2020; 16(10): 1708–1717.

Published online 2020 Mar 15. doi: [10.7150/ijbs.45538](https://dx.doi.org/10.7150%2Fijbs.45538)

PMCID: PMC7098036

PMID: [32226288](https://www.ncbi.nlm.nih.gov/pubmed/32226288)

# Traditional Chinese Medicine in the Treatment of Patients Infected with 2019-New Coronavirus (SARS-CoV-2): A Review and Perspective

[Yang Yang](https://www.ncbi.nlm.nih.gov/pubmed/?term=Yang%20Y%5BAuthor%5D&cauthor=true&cauthor_uid=32226288),\* [Md Sahidul Islam](https://www.ncbi.nlm.nih.gov/pubmed/?term=Islam%20MS%5BAuthor%5D&cauthor=true&cauthor_uid=32226288),\* [Jin Wang](https://www.ncbi.nlm.nih.gov/pubmed/?term=Wang%20J%5BAuthor%5D&cauthor=true&cauthor_uid=32226288), [Yuan Li](https://www.ncbi.nlm.nih.gov/pubmed/?term=Li%20Y%5BAuthor%5D&cauthor=true&cauthor_uid=32226288), and [Xin Chen](https://www.ncbi.nlm.nih.gov/pubmed/?term=Chen%20X%5BAuthor%5D&cauthor=true&cauthor_uid=32226288)✉

[Author information](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/) [Article notes](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/) [Copyright and License information](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/) [Disclaimer](https://www.ncbi.nlm.nih.gov/pmc/about/disclaimer/)

This article has been [cited by](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/citedby/) other articles in PMC.

## Associated Data

[Supplementary Materials](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/)

[Go to:](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/)

## Abstract

Currently, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2, formerly known as 2019-nCoV, the causative pathogen of Coronavirus Disease 2019 (COVID-19)) has rapidly spread across China and around the world, causing an outbreak of acute infectious pneumonia. No specific anti-virus drugs or vaccines are available for the treatment of this sudden and lethal disease. The supportive care and non-specific treatment to ameliorate the symptoms of the patient are the only options currently. At the top of these conventional therapies, greater than 85% of SARS-CoV-2 infected patients in China are receiving Traditional Chinese Medicine (TCM) treatment. In this article, relevant published literatures are thoroughly reviewed and current applications of TCM in the treatment of COVID-19 patients are analyzed. Due to the homology in epidemiology, genomics, and pathogenesis of the SARS-CoV-2 and SARS-CoV, and the widely use of TCM in the treatment of SARS-CoV, the clinical evidence showing the beneficial effect of TCM in the treatment of patients with SARS coronaviral infections are discussed. Current experiment studies that provide an insight into the mechanism underlying the therapeutic effect of TCM, and those studies identified novel naturally occurring compounds with anti-coronaviral activity are also introduced.

**Keywords:**SARS-CoV-2, Traditional Chinese Medicine (TCM), coronavirus pneumonia

[Go to:](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/)

## Introduction

In December 2019, there was an outbreak of unexplainable pneumonia in Wuhan city, Hubei province, China [1](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B1). By Jan 7, 2020, it was confirmed that a new type of coronavirus named SARS-CoV-2 (formerly named as 2019-nCoV) had emerged [2](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B2). The World Health Organization (WHO) named the Wuhan pneumonia as Coronavirus Disease-2019 (COVID-19) on Feb 11, 2020 [3](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B3). The COVID-19 patients showed typical respiratory symptom (such as cough, fever, and lung damage) and some other symptoms such as fatigue, myalgia, and diarrhea [4](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B4),[5](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B5). As of February 17, 2020, a total of 73,332 cases of the SARS-CoV-2 infected pneumonia has been reported in China and 25 other countries, of which 72,528 cases was found in China [6](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B6). Due to the rapid spread of SARS-CoV-2 through human-to-human transmission, the cases currently continue to rise. SARS-CoV-2 extracted from patients with pneumonia in Wuhan is an enveloped single stranded RNA-type beta-coronavirus [7](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B7). The genome sequences of SARS-CoV-2 shared 79.5% sequence identity to severe acute respiratory syndrome-related coronaviruses (SARS-CoV) [8](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B8),[9](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B9). In addition, the spike (S) protein of SARS-CoV-2 and SARS-CoV enters human alveolar epithelial cells through binding angiotensin- converting enzyme 2 (ACE2) receptor [8](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B8).

COVID-19 can be diagnosed by either chest CT radiography or a laboratory testing. Unfortunately, specific antiviral drugs or vaccines currently have not been available for the treatment [10](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B10),[11](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B11). According to the current clinical guideline in China and the experiences in the treatment of SARS or Middle East Respiratory Syndrome (MERS) patients, both conventional medicine and traditional Chinese medicine (TCM) are used for the treatment of patients with infection of SARS-CoV-2 in China [12](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B12)-[14](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B14). This review mainly focuses on the discussion of TCM usage in the treatment of COVID-19 patients, in the context of current conventional management. Due to the homology in epidemiology, genomics, and pathogenesis of the SARS-CoV-2 and SARS-CoV [8](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B8),[9](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B9), and widely usage of TCM in the treatment of patients infected with SARS-CoV in 2002-2003 [15](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B15), the clinical evidence showing the efficacy and safety of TCM in the treatment of patients with the emerging coronaviral will be summarized and analyzed, including the laboratory studies that provide an insight into molecular basis of therapeutic benefits.

[Go to:](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/)

## Conventional treatment of SARS-CoV-2: is there a room for Chinese medicine?

Due to the absence of a specific antiviral therapeutics and vaccine, main treatment strategy for COVID-19 is supportive care, which is supplemented by the combination of broad-spectrum antibiotics, antivirals, corticosteroids and convalescent plasma [16](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B16) (Table [​(Table1).1](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/table/T1/)). HIV protease inhibitors ritonavir and lopinavir have been used, typically in combination with appropriate antibiotics or with IFNα-2b, in the treatment of SARS-CoV-2 infected patients [7](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B7),[17](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B17). Nucleoside analogs such as ribavirin [12](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B12) may be potentially beneficial for the treatment of COVID-19, since ribavirin was approved for treating respiratory syncytial virus (RSV) infection [18](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B18) and used extensively during the SARS and MERS outbreak [10](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B10). However, ribavirin had severe side effects such as anemia [18](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B18) and whether it had sufficient antiviral activity against SARS-CoV-2 is unclear. Nucleoside analogs favipiravir (T-705) can effectively inhibit the activity of RNA polymerase of RNA viruses such as influenza [19](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B19). A recent in vitro study found that it had the anti-SARS-CoV-2 activity [20](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B20), but the in vivo effect remains elusive. Remdesivir may be the most promising antiviral drug for treating COVID-19. It has in vitro and in vivo antiviral activity against a wide array of RNA viruses including SARS and MERS [21](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B21), and could decrease viral loads and pathology of lungs in animal models [22](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B22). A study showed remdesivir markedly inhibited the infection of SARS-CoV-2 in Vero E6 cells [20](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B20), and most symptoms of the first US patient infected with SARS-CoV-2 had resolved swiftly after intravenous administration with remdesivir [23](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B23). Currently, it is under clinical trial to evaluate the safety and efficacy of intravenous remdesivir for patients with SARS-CoV-2 infection [24](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B24). Oral oseltamivir has been used for the treatment of the cases with SARS-CoV-2 [7](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B7), while its efficacy currently remains uncertain.

### Table 1

Conventional treatment of patients with SARS-CoV-2 infection

| **Type of treatment** | **Therapeutic agent or device** | **Reference** |
| --- | --- | --- |
| **Oxygen therapy** | Nasal cannula Non-invasive mechanical ventilation Invasive mechanical ventilation ECMO\* | [16](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B16) |
| **Antibiotics combination** | Amoxicillin Azithromycin Fluoroquinolones | [16](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B16) |
| **Antivirals** | Lopinavir/ ritonavir | [16](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B16), [17](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B17) |
| Ribavirin | [16](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B16), [18](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B18) |
| Favipiravir (T-705) | [19](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B19), [20](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B20) |
| Remdesivir | [20](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B20)-[23](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B23) |
| Oseltamivir | [7](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B7) |
| Chloroquine | [20](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B20), [36](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B36) |
| Interferon | [7](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B7), [17](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B17) |
| **Corticosteroids** | Methylprednisolone | [7](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B7) |
| **Convalescent plasma** | Convalescent plasma | [22](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B22) |

\*ECMO, extracorporeal membrane oxygenation.

Host-targeted small molecules approved for other human diseases may modulate the virus-host interactions of SARS-CoV-2. Chloroquine, a potential broad-spectrum antiviral drug [25](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B25),[26](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B26), was shown by a recent study had anti-SARS-CoV-2 activity [20](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B20). Its clinical efficacy is under study in an open-label trial (ChiCTR2000029609) [12](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B12). IFNα (5 million U) atomization inhalation was recommended as antiviral therapy to treat SARS-CoV-2 [16](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B16). A trial testing IFNα-2b combination of the approved anti-HCV inhibitors has been initiated [17](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B17), however, whether it could act synergistically against SARS-CoV-2 is unclear.

Corticosteroids were frequently used to suppress the elevated cytokine levels in patients with SARS-CoV [27](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B27),[28](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B28) and MERS-CoV [29](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B29),[30](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B30). However, there are no evidence showing that the mortality of SARS and MERS patients was reduced by the treatment with corticosteroids, while the clearance of viral was delayed by such treatment [31](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B31)-[33](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B33). Consequently, corticosteroids are not suggested to systemically use in SARS-CoV-2 infected patients [34](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B34),[35](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B35).

Previously, it was shown that, either in severe influenza or SARS-CoV infection, convalescent plasma treatment could significantly decrease viral load and reduce the mortality [31](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B31),[36](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B36). Convalescent plasma has been used for severe SARS-CoV-2 infection in China [22](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B22), although promising, the efficacy and safety need to be carefully further evaluated.

Consistent with previous analysis, WHO also concluded "to date, there is no specific medicine recommended to prevent or treat SARS-CoV-2" [37](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B37). TCM has been used in control of infectious diseases for thousands of years. There is a clear room for the intervention of TCM as a complementary therapy for COVID-19 patients. It is reported that the patients with SARS-CoV infection have benefited from TCM treatment [38](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B38), including amelioration of side effect of conventional therapeutics [39](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B39),[40](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B40). Based on these factors, there is a general expectation that TCM would be a valuable weapon in the armory against SARS-CoV-2.

[Go to:](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/)

## Traditional Chinese Medicine in the treatment of patients infected with SARS-CoV: clinical evidence

Application of TCM in the treatment of SARS-CoV-2 is largely inspired by the treatment of SARS caused by outbreak of SARS coronavirus (SARS-CoV) in the late of 2002 in the Guangdong Province of China which spread rapidly during the 2003, with the cumulative number worldwide of over 8,000 [41](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B41)-[43](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B43). Ranging from case reports, case series, controlled observational studies and randomized clinical trials, clinical studies aiming to examine the effect of TCM on SARS have been carried out and reported. There are quite compelling evidences support the notion that TCM has beneficial effect in the treatment or prevention of SARS. For example, the rate of fatality in Hong Kong and Singapore was approximately 18%, while the rate for Beijing was initially more than 52% until the 5th of May and decreased gradually to 4%-1% after the 20th of May in 2003. The dramatic reduced fatality from late May in Beijing was believed to be associated with the use of TCM as a supplement to the conventional therapy [44](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B44). Lau and colleagues reported that, during SARS outbreak, 1063 volunteers including 926 hospital workers and 37 laboratory technicians working in high-risk virus laboratories used a TCM herbal extract, namely Sang Ju Yin plus Yu Ping Feng San. Compared with the 0.4% of infection in the control group, none of TCM users infected. Furthermore, there was some evidence that Sang Ju Yin plus Yu Ping Feng San could modulate T cells in a manner to enhance host defense capacity [45](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B45),[46](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B46). In a controlled clinical study, the supplementary treatment with TCM resulted in marked improvement of symptoms and shortened the disease course [47](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B47). The clinical beneficial effect of TCM appears to be supported by laboratory studies. For example, a high-profile research published in the Lancet reported that glycyrrhizin, a major active constituent liquorice root which is the most frequently used Chinese herb, potently inhibited the replication of clinical isolates of SARS virus [48](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B48). Another independent study confirmed the antivirus activity of glycyrrhizin by plaque reduction assays and this study found that another Chinese herbal compound baicalin also had the anti-SARS activity [49](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B49). Furthermore, Wang et al. found MOL376, a compound derived from TCM, may become a lead compound for SARS therapy by inhibition of cathepsin L, a target for the treatment of SARS [50](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B50).

There is a myriad of literature on TCM treatments for SARS published after the SARS epidemic in China. A critical analysis of these publications would be useful to confirm the beneficial effect of TCM. Liu et al. systematically reviewed eight randomized controlled trials, and concluded that, by combination with conventional medicine, TCM showed the beneficial effects such as decrease of mortality and relief of symptom, as well as control of fungal infections in patients with SARS. However, the evidence is not sufficient enough due to the poor quality of methodology used in the trials [13](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B13). Leung analyzed 90 peer-reviewed papers with reasonable quality from 130 publications and concluded that TCM used together with conventional treatment had some positive effects, including better control of fever, quicker clearance of chest infection and other symptoms. However, such beneficial effect of TCM is not conclusive and more high-quality clinical studies are required [15](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B15). In another thorough literature analysis, Liu and colleagues concluded that there was no benefit of adjuvant treatment with TCM in terms of mortality [39](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B39). Due to the lack of high quality TCM trials and biases that influenced the validity of results, Wu and colleagues suggested to re-run clinical trials of TCM for the treatment of acute respiratory tract infections (ARTIs) [51](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B51).

[Go to:](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/)

## Identification of anti-novel coronaviral compound from Traditional Chinese Medicine

Natural products used in TCM remains to be a wealthy source for the identification of novel therapeutic agents for the treatment of human diseases [52](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B52). In the past decade, scientists have made a considerable effort to identify multiple component herbal formulae in TCM with anti-SARS-CoV activity (Table [​(Table2).2](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/table/T2/)). Further identification of chemical entities contained in TCM herbs responsible for the anti-SARS- CoV effect was also pursued (Table [​(Table3).3](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/table/T3/)). Due to the homology of SARS-CoV and SARS-CoV-2, these previous studies may shed light on the naturally occurring compounds with the capacity to inhibit SARS-CoV-2.

### Table 2

TCM herb formulae used for the Treatment of SARS-CoV infection

| **TCM Formula** | **Composition** | **Therapeutics effect** | **Reference** |
| --- | --- | --- | --- |
| Yin Qiao San | Fructus Forsythiae, Flos Lonicerae, Radix Platycodonis, Herba Menthae, Herba Lophatheri, Radix Glycyrrhizae, Herba Schizonepetae, Fermented soybean, Fructus arctii, and Rhizoma Phragmitis | “Disperses wind-heat, clears heat, and relieves toxicity”, according to TCM theory Treatment of upper respiratory tract infection. Improvement of the function of upper respiratory mucosal immune system | [111](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B111), [112](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B112) |
| Yu Ping Feng San | Astragali radix, Astragalus membranaceus, Atractylodes macrocephala, and Saposhnikoviae Radix | “Tonifying qi” to protect from external pathogens”, according to TCM theory Reportedly have antiviral, anti-inflammatory and immunoregulatory effects | [113](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B113)-[115](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B115) |
| Sang Ju Yin and Yu Ping Feng San | Sang Ju Yin [made with chrysanthemum, mulberry leaf, and 6 other herbs] and Yu Ping Feng San | Reportedly have anti-viral and immunoregulatory effects | [46](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B46) |
| Lian Hua Qing Wen Capsule | Forsythia suspensa, Ephedra sinica, Lonicera japonica, Isatis indigotica, Mentha haplocalyx, Dryopteris crassirhizoma, Rhodiola rosea, Gypsum Fibrosum, Pogostemon cablin, Rheum palmatum , Houttuynia cordata, Glycyrrhizae, uralensis, and Armeniaca sibirica | “Clear heat and detoxify, removes lung hotness”, according to TCM theory Reportedly have antiviral, anti-inflammatory and immunoregulatory effects. | [82](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B82), [83](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B83) |
| Shuang Huang Lian | Lonicera japonica, Scutellaria baicalensis, and Forsythia suspensa | “Clear heat and detoxify, remove lung hotness”, according to TCM theory Reportedly has anti-SARS-CoV-2 activity Reportedly has immunosuppressive effects | [78](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B78), [80](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B80), [116](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B116) |
| Ma Xin Gan Shi Tang | Ephedrae herba, Armeniacae semenamarum), Glycyrrhizae radix et rhizome, Gypsum fibrosum, and Da Yuan Yin [Arecae semen, Magnoliae officinalis cortex, Tsaoko fructus,Anemarrhenae rhizoma, Dioscoreae rhizoma, Scutellariae radix, and Glycyrrhizae raadix et rhizome] | “Facilitate the flow of the lung “qi” and clear away heat”, according to TCM theory Reportedly have anti-SARS-CoV activity | [117](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B117), [118](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B118) |

[Open in a separate window](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/table/T2/?report=objectonly)

### Table 3

TCM herbal extracts or TCM-derived Compounds with anti-HCoV Activity

| **TCM Compound (s)** | **Mode of action** | **Reference** |
| --- | --- | --- |
| Plant-derived phenolic compounds and Root extract of Isatis indigotica | Inhibit the cleavage activity of SARS-3CLpro enzyme | [57](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B57) |
| Water extract of Houttuynia cordata | Inhibit the viral SARS-3CLpro activity Block viral RNA‑dependent RNA polymerase activity (RdRp) Immunomodulation | [54](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B54), [55](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B55) |
| Scutellarein and myricetin | Inhibit nsP13 by affecting the ATPase activity | [61](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B61) |
| Glycyrrhizin from Glycyrrhizae radix | Inhibit viral adsorption and penetration | [48](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B48), [75](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B75) |
| Herbacetin, quercetin, isobavaschalcone, 3‐β‐D‐glucoside and helichrysetin | Inhibit cleavage activity of MERS-3CLpro enzyme | [60](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B60) |
| Tetrandrine, fangchinoline, and cepharanthine | Inhibit the expression of HCoV- OC43 spike and nucleocapsid protein. Immunomodulation | [106](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B106), [119](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B119) |
| Chinese Rhubarb extracts | Inhibit SARS-3CLpro activity | [53](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B53) |
| Flavonoids (For example: extracted from litchi seeds, herbacetin, rhoifolin, pectolinarin, quercetin, epigallocatechin gallate, and gallocatechin gallate) | Inhibit SARS-3CLpro activity | [56](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B56), [58](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B58), [59](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B59) |
| Quercetin and TSL-1 from Toona sinensis Roem | Inhibit the cellular entry of SARS-CoV | [76](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B76) |
| Emodin derived from genus Rheum and Polygonum | Inhibit interaction of SARS-CoV Spike protein and ACE2 Inhibit the 3a ion channel of coronavirus SARS‐CoV and HCoV‐OC43 | [67](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B67), [72](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B72) |
| Kaempferol derivatives | Inhibit 3a ion channel of coronavirus | [73](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B73) |
| Baicalin from Scutellaria baicalensis | Inhibit Angiotensin-converting enzyme (ACE) | [44](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B44), [68](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B68) |
| Saikosaponins | Prevent the early stage of HCoV‑22E9 infection, including viral attachment and penetration | [74](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B74) |
| Tetra-O-galloyl-β-D-glucose and luteolin, from Galla chinensis and Veronicalina riifolia respectively | Avidly binds with surface spike protein of SARS-CoV | [71](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B71) |

[Open in a separate window](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/table/T3/?report=objectonly)

3- chymotrypsin-like protease (3CLpro) is vital for replication of virus, and thus represents a promising drug target for the development of therapeutics agents for SARS-CoV as well as other human coronaviruses including SARS-CoV-2. It was reported that following TCM herbal extracts had the capacity to inhibit the enzymatic activity of SARS 3CLpro: Chinese Rhubarb extracts (IC50: 13.76 ± 0.03 μg/mL) [53](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B53), water extract of Houttuynia cordata [54](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B54),[55](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B55), flavonoid extracted from litchi seeds [56](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B56) and beta-sitosterol (IC50: 1210µM) extracted from the root extract of Isatis indigotica [57](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B57). Further, following herb-derived naturally occurring compounds including sinigrin (IC50: 217µM), indigo (IC50: 752µM), aloe-emodin (IC50: 366 µM), hesperetin (IC50:8.3 µM) [57](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B57), quercetin (IC50: 73µM), epigallocatechin gallate (IC50: 73µM), gallocatechin gallate (IC50: 47 µM) [58](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B58), herbacetin, rhoifolin and pectolinarin [59](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B59) were able to inhibit the SARS 3CLpro activity. Moreover, the flavonoids namely herbacetin, isobavaschalcone, quercetin 3‐β‐D‐glucoside, and helichrysetin had the potential to block the enzymatic activity of MERS‐CoV 3CL protease [60](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B60).

The helicase protein is also considered as a potential target for the development of anti-HCoV (human coronavirus) agents. Yu et al. reported scutellarein and myricetin potently inhibited the nsP13 (SARS-CoV helicase protein) in vitro by affecting the ATPase activity [61](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B61). The RNA- dependent RNA polymerase (RdRp), a key enzyme responsible for both positive and negative-strand RNA synthesis, also represents another potential druggable target. It was shown that the extracts of Kang Du Bu Fei Tang (IC50:471.3 µg/mL), Sinomenium acutum (IC50:198.6 µg/mL), Coriolus versicolor (IC50:108.4 µg/mL) and Ganoderma lucidum (IC50:41.9 µg/mL) inhibited SARS-CoV RdRp in a dose- dependent manner [54](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B54). Wu et al. performed large- scale screening of existing drugs, natural products, and synthetic compounds (>10000 compounds) to identify effective anti-SARS-CoV agents through a cell-based assay with SARS virus and Vero E6 cells [62](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B62). They found that ginsenoside-Rb1 isolated from Panax ginseng, aescin isolated from the horse chestnut tree, reserpine contained in the genus Rauwolfia and extracts of eucalyptus and Lonicera japonica inhibited SARS-CoV replication at non-toxic concentrations [62](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B62).

Same as SARS-CoV and HCoV-NL63, SARS-CoV-2 uses host receptor ACE2 for the cellular entrance [63](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B63)-[66](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B66). Therefore, TCM with the capacity to target ACE2 holds the promise to prevent the infection of SARS-CoV-2. Emodin from genus Rheum and Polygonum [67](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B67), baicalin from in Scutellaria baicalensis [44](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B44),[68](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B68), nicotianamine from foodstuff (especially “soybean ACE2 inhibitor (ACE2iSB)”) [69](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B69), scutellarin [70](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B70), tetra-O-galloyl-β-D-glucose (TGG) from Galla chinensis and luteolin from Veronicalina riifolia [71](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B71) markedly inhibited the interaction of SARS-CoV S-protein and ACE2. However, the anti-SARS-CoV activity of these compounds remain to be evaluated. In addition, inhibition of the 3a ion channel by emodin [72](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B72) or kaempferol derivatives- juglanin [73](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B73) could potentially prevent the viral release from the infected cells. Saikosaponins [74](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B74), glycyrrhizin [48](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B48),[75](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B75), quercetin and TSL-1 extracted from Toona sinensis Roem [76](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B76) purportedly had potent anti-SARS-CoV effects by inhibition of viral cellular entry, adsorption, and penetration.

Overwhelming inflammatory responses are attributable to the deaths of patients with infection of SARS-CoV, or MERS-CoV, or COVID-19. Thus, anti-inflammatory agents presumably could reduce the severity and mortality rate [77](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B77). Shuang Huang Lian, a TCM herbal product prepared from Lonicerae japonicae Flos, Scutellariae radix and Fructus Forsythiae, purportedly had the activity to inhibit SARS-CoV-2 [78](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B78). Interestingly, We have shown that this herbal preparation potently inhibited staphylococcal toxic shock syndrome toxin 1 (TSST-1)-induced production of cytokines (IL-1β, IL-6, TNF-α, IFN-γ) and chemokines (MIP-1α, MIP-1β and MCP-1) by peripheral blood mononuclear cell (PBMC) [79](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B79). In line with our results, this herbal product was shown to markedly reduced the transcriptional and translational levels of inflammatory cytokines TNF-α, IL-1β, and IL-6 in lipopolysaccharide-stimulated murine alveolar macrophages [80](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B80). Indirubin is an active ingredient of a TCM preparation Dang Gui Long Hui Pill, had strong antiviral and immunomodulatory effects, as shown by a study based on the observation of influenza H5N1 virus-infected human macrophages and type-I alveolar epithelial cells [81](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B81). Lian Hua Qing Wen Capsule was reported to have in vitro activity in inhibition of propagation of various influenza viruses. This TCM herbal product not only blocked the early stages of influenza virus infection but also inhibited virus-induced gene expression of IL-6, IL-8, TNF-a, IP-10, and MCP-1 [82](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B82). Additionally, a study by Dong et al. reported that the levels of IL-8, TNF-α, IL-17, and IL-23 in the sputum and of IL-8 and IL-17 in the blood were markedly decreased after Lian Hua Qing Wen Capsule treatment in patients with acute exacerbation of chronic obstructive pulmonary disease [83](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B83). A self-control study by Poon et al. showed that the administration of the TCM herbal formulas (Sang Ju Yin and Yu Ping Feng San) may have beneficial immunomodulatory effects for the prevention of viral infections including SARS-CoV [46](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B46).

Moreover, a number of anti-coronaviral agents have been identified from TCM herbs, although the mechanisms of action have not yet been elucidated. For example, extracts from Lycoris radiata, Artemisia annua, Pyrrosia lingua, and Lindera aggregate possessed the anti-SARS‑CoV activity [84](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B84), 3β-Friedelanol isolated from Euphorbia neriifolia [85](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B85), Blancoxanthone isolated from the roots of Calophyllum blancoi [86](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B86) exhibited anti-HCoV-229E activity.

[Go to:](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/)

## Traditional Chinese Medicine used in the treatment of SARS-CoV-2-infected patients: the current situations

TCM is highly valued by the government of China in their campaign to contain and eradiate SARS-CoV-2. For example, Health Commission in 26 provinces have officially declared that TCM should be used in combination with conventional medicine in the treatment of COVID-19 patients. On 17, February, National Health Commission (NHC) of the People's Republic of China reported that 60,107 confirmed COVID-19 patients (85.20% of total confirmed cases) had been treated with TCM [87](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B87). As for March 1, 2020, a total of 303 ongoing clinical trials aiming to evaluate the efficacy and safety of treatments for CoV-19 patients have been launched in China. Among them, 50 trials (16.5%) are about the use of TCM, including 14 cases (4.6%) to examine the effect of combined treatment with TCM and Western medicine. In 22 TCM trials (7.3%), the effect of self-made herbal preparations such as Xin Guan-1 Formula, Xin Guan-2 Formula and Qing Yi-4 are examined. In another 14 TCM trials (4.6%), commercially available TCM products such as Tan Re Qing Injection and Lian Hua Qing Wen Capsule are studied (Table [​(Table44](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/table/T4/)).

### Table 4

Ongoing TCM Clinical Trials for the treatment of SARS-CoV-2 infection

| **Registration number** | **Design type** | **Title** | **TCM herbal medicine** | **Sample size** | **Phase** |
| --- | --- | --- | --- | --- | --- |
| ChiCTR2000029432 | CCT | A real world study for the efficacy and safety of large dose Tanreqing Injection in the treatment of patients with novel coronavirus pneumonia (COVID-19) | Tan Re Qing Injection | 72 | 4 |
| ChiCTR2000029434 | RCT | A randomized, open-label, blank-controlled trial for Lian-Hua Qing-Wen Capsule/Granule in the treatment of novel coronavirus pneumonia (COVID-19) | Lian Hua Qing Wen Capsule/Granule | 400 | 4 |
| ChiCTR2000029487 | CCT | Clinical study for Gu-Biao Jie-Du-Ling in preventing of novel coronavirus pneumonia (COVID-19) in children | Gu Biao Jie Du Ling | 200 | 0 |
| ChiCTR2000029589 | CCT | An open, prospective, multicenter clinical study for the efficacy and safety of Reduning injection in the treatment of ovel coronavirus pneumonia (COVID-19) | Re Du Ning Injection | 60 | 0 |
| ChiCTR2000029605 | RCT | A randomized, open-label, blank-controlled, multicenter trial for Shuang-Huang-Lian oral solution in the treatment of novel coronavirus pneumonia (COVID-19) | Shuang Huang Lian Oral Liquid | 400 | 4 |
| ChiCTR2000029780 | RCT | A multicenter, randomized, open, controlled trial for the efficacy and safety of Shen-Qi Fu-Zheng injection in the treatment of novel coronavirus pneumonia (COVID-19) | Shen Qi Fu Zheng Injection | 160 | 4 |
| ChiCTR2000029781 | RCT | A multicenter, randomized, open and controlled trial for the efficacy and safety of Kang-Bing-Du granules in the treatment of novel coronavirus pneumonia (COVID-19) | Kang Bing Du Granules | 160 | 4 |
| ChiCTR2000029822 | RCT | A randomized controlled trial for honeysuckle decoction in the treatment of patients with novel coronavirus (COVID-19) infection | Jin Yin Hua Tang | 110 | 0 |
| ChiCTR2000029991 | RCT | A randomized, open-label, controlled trial for the safety and efficiency of Kesuting syrup and Keqing capsule in the treatment of mild and moderate novel coronavirus pneumonia (COVID-19) | Ke Su Ting Syrup /Ke Qing Capsule | 72 | 4 |
| ChiCTR2000030043 | RCT | Shen-Fu injection in the treatment of severe novel coronavirus pneumonia (COVID-19): a multicenter, randomized, open-label, controlled trial | Shen Fu Injection | 300 | 4 |
| ChiCTR2000030117 | RCT | A multicenter, randomized, open, parallel controlled trial for the evaluation of the effectiveness and safety of Xiyanping injection in the treatment of common type novel coronavirus pneumonia (COVID-19) | Xi Yan Ping Injection | 348 | 4 |
| ChiCTR2000030255 | RCT | Efficacy and safety of Jing-Yin Granule in the treatment of novel coronavirus pneumonia (COVID-19) wind-heat syndrome | Jing Yin Granule | 300 | 4 |
| ChiCTR2000030388 | RCT | Efficacy and safety of Xue-Bi-Jing injection in the treatment of severe cases of novel coronavirus pneumonia (COVID-19) | Xue Bi Jing Injection | 60 | 0 |
| ChiCTR2000029813 | RCT | Clinical Trial for Tanreqing Capsules in the Treatment of Novel Coronavirus Pneumonia (COVID-19) | Tan Re Qing Capsules | 72 | 0 |

[Open in a separate window](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/table/T4/?report=objectonly)

Notes: RCT: randomized controlled trial; CCT: controlled clinical trial.

**To date, NHC has published 6 editions Guidelines of Diagnosis and Treatment for COVID-19**[**88**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B88)**. Since the fourth versions, different herbal medicines used in TCM system has been recommended for the treatment of COVID-19, based on the stage of disease and symptom differentiation**[**89**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B89)**. According to the latest edition of Guideline**[**88**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B88)**, following multiple component Chinese herbal products are recommended for the patients in the medical observation period, presumably as a preventive measure: Huo Xiang Zheng Qi Shui, Lian Hua Qing Wen Capsule, Shu Feng Jie Du Capsule and Jin Hua Qing Gan Granule.**

**In the clinical treatment period, Qing Fei Pai Du Tang, Xi Yan Ping Injection, Xue Bi Jing injection, Re Du Ning Injection, Tan Re Qing Injection, Xing Nao Jing Injection and some other Chinese medicine formulae should be selected**[**90**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B90)**.**

**In addition, for the patients in critical condition, Shen Fu Injection, Sheng Mai Injection, Shen Mai Injection, Su He Xiang Pill and An Gong Niu Huang Pill should be administered (Table**[**​(Table 55**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/table/T5/)**).**

### Table 5

TCM recommended by 6th editions Guidelines of Diagnosis and Treatment for COVID-19 [88](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B88).

| **Stage of disease** | **Symptom** | **Recommended Chinese patent medicine** |
| --- | --- | --- |
| **Medical observation period** | Fatigue with gastrointestinal discomfort | Huo Xiang Zheng Qi Shui |
| Fatigue with fever | Lian Hua Qing Wen Capsule, Shu Feng Jie Du Capsule, Jin Hua Qing Gan Capsule |
| **Clinical treatment period** **(Confirmed patients)** | Mild cases | Qing Fei Pai Du Tang |
| General cases | Qing Fei Pai Du Tang |
| Several cases | Xi Yan Ping Injection, Xue Bi Jing Injection, Re Du Ning Injection, Tan Re Qing Injection, Xing Nao Jing Injection, Qing Fei Pai Du Tang |
| Critical cases | Xue Bi Jing Injection, Re Du Ning Injection, Tan Re Qing Injection, Shen Fu Injection, Sheng Mai Injection, Shen Mai Injection, Su He Xiang Pill, An Gong Niu Huang Pill |

Through analysis of the frequency of TCM used in 23 provinces, Luo, et al. [37](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B37) concluded that Astragalus membranaceus, Glycyrrhizae uralensis, Saposhnikoviae divaricata, Rhizoma Atractylodis Macrocephalae, Lonicerae Japonicae Flos, Fructus forsythia, Atractylodis Rhizoma, Radix platycodonis, Agastache rugosa, and Cyrtomium fortune J. Sm were 10 most commonly used Chinese herbs in the treatment of COVID-19. Xu, et al. [91](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B91) reported that Astragalus membranaceus and Yu Ping Feng were used in the 13 prevention programs (in Beijing, Tianjin, et al.) for “reinforcing vital qi”, a terminology used in TCM that is similar to boosting host defense capacity. Ophiopogon japonicas and Scrophularia ningpoensisand are TCM herbs which were most frequently used for “nourishing yin” in northern China, while Atractylodis Rhizoma, Agastache rugosa and other Chinese medicinal herbs with the property of “aromatic dehumidification” were commonly used in southern China (Table [​(Table66](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/table/T6/)).

### Table 6

Frequently used TCM herbs for the Prevention of COVID-19 infection

| **Reported by** | **Herbs (Latin name)** | **Herbs (Chinese Pin Yin)** | **Applicable regions** |
| --- | --- | --- | --- |
| **Luo, et al.**[**37**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B37) | Astragalus membranaceus | Huangqi | 23 provinces covered Northeast, North, Central (including Wuhan), South, East, Northwest, and Southwest China. |
| Glycyrrhizae uralensis | Gancao |
| Saposhnikoviae divaricata | Fangfeng |
| Rhizoma Atractylodis Macrocephalae | Baizhu |
| Lonicerae Japonicae Flos | Jinyinhua |
| Fructus Forsythiae | Lianqiao |
| Atractylodis Rhizoma | Cangzhu |
| Radix platycodonis | Jiegeng |
| Agastache rugosa | Huoxiang |
| Cyrtomium fortune J. Sm | Guanzhong |
| **Xu, et al.**[**91**](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B91) | Astragalus membranaceus | Huangqi | Beijing, Tianjin, Shandong, Shaanxi, Gansu, Hebei, Shanxi, Henan, Hubei, Jiangxi, Hunan, and Yunnan |
| Atractylodis Rhizoma | Cangzhu | Five regions in southern China (Hubei, Jiangxi, Hunan, Yunnan, and Wuhan) |
| Eupatorii Herba | Peilan |
| Agastache rugosa | Huoxiang |
| Ophiopogon japonicas | Maidong | Eight regions in northern China (Beijing, Tianjin, Hebei, Henan, Shaanxi, Shanxi, Gansu, and Shandong) |
| Scrophularia ningpoensis | Xuanshen |
| Rhizoma phragmitis | Lugen |
| Adeinophora stricta Miq | Shashen |
| Dendrobium nobile Lindl. | Shihu |

[Open in a separate window](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/table/T6/?report=objectonly)

According to the report of National Administration of Traditional Chinese Medicine, up to February 5th, 2020, 214 COVID-19 patients were treated with Qing Fei Pai Du Tang in Shanxi, Hebei, Heilongjiang and Shaanxi Provinces with overall effective rate ≥ 90%. Among them, the symptoms of majority of patients (≥60%) were markedly improved, while illness of others (30%) was stabilized [92](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B92). After that, 701 COVID-19 patients were treated with Qing Fei Pai Du Tang in 10 provinces in China. The result showed that 130 patients (18.5%) were completely cured after treatment. The treatment also resulted in the disappearance of characteristic symptoms of COVID-19 such as fever and cough in 51 patients (7.27%). In addition, symptom improvement or stabilization were observed in 268 patients (38.2%), and in 212 patients (30.2%), respectively [87](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B87). Yao, et al. and Lu, et al. [93](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B93),[94](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B94) retrospectively analyzed the clinical efficacy of Lian Hua Qing Wen Capsule in treatment of confirmed and suspected COVID-19 patients. The results indicated that this herbal product could markedly relieve major symptoms such as fever and cough and had the capacity to promote the recovery.

Some patients with mild illness in the early stage could suddenly progress to severe disease, and eventually died due to septic shock with multiple organ dysfunction syndrome (MODS), which was associated with cytokine storm [95](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B95). There is compelling evidence that some TCM herbal products or its components have potent immunosuppressive effects, as shown by our own and other's studies [79](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B79),[96](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B96)-[103](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B103). For example, Wang, et al. [104](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B104) reported that Shen Fu Injection could inhibit the lung inflammation and decrease the levels of IL-1β, IL-6 and other cytokines. Chang, et al. [105](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B105) reported that Re Du Ning Injection could markedly reduce the levels of IL-1β, TNF-α, IL-8, IL-10, and some other cytokines of LPS-induced model of acute lung injury in rats. We recently reported that tetrandrine, a compound isolated from an anti-rheumatic Chinese herb, could potently inhibit proinflammatory Th1, Th2 and Th17 responses in LPS-challenged mice [106](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B106). Therefore, TCM with the capacity to inhibit cytokine storm and its devastating consequences may be harnessed in the treatment of severe COVID-19 patients.

Currently, the laboratory study on the effect of TCM is apparently lagging behind the clinical application of TCM in the treatment of COVID-19 patients. Nevertheless, some scientists have started to examine the effect of TCM products or its components on SARS-CoV-2 in their laboratories. For example, an in vitro study showed that Shuang Huang Lian Oral Liquid had the inhibitory effect on SARS-CoV-2 [78](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B78). However, its clinical efficacy and safety for the treatment of COVID-19 patients has not been evaluated. We noticed that this TCM product was not recommended by HNC's Guideline [89](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B89). Same as SARS-CoV, SARS-CoV-2 uses receptor ACE2 for the cellular entrance [8](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B8). Theoretically, blockade of ACE2 can prevent the infection of SARS-CoV-2. Chen and Du thus performed the molecular docking study and they found that TCM-derived compounds, including as baicalin, scutellarin, hesperetin, glycyrrhizin and nicotianamine could interact with ACE2 [107](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B107). Therefore, these compounds as well as herbs containing these ingredients may have the capacity to inhibit the infection of SARS-CoV-2. We anticipate more experiment studies showing anti-SARS-CoV-2 activity of TCM or its components will be published in the near future.

[Go to:](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/)

## Closing remarks

TCM has accumulated thousand-of-year's experiences in the treatment of pandemic and endemic diseases. Providing complementary and alternative treatments are still urgently needed for the management of patients with SARS-CoV-2 infection, experiences in TCM is certainly worth learning. Fighting against current epidemics also provide an opportunity to test the true value of TCM in treating emerging contagious diseases. Randomized, double-blind and placebo-controlled studies is the best way to provide the most reliable evidence for a therapy, including TCM. It is encouraging that the controlled clinical studies to evaluate the efficacy of TCM in the treatment of SARS-CoV were conducted and reported. However, the most of these studies were found to be poorly designed and the results could lead to potential biases in evaluating the effectiveness of TCM treatment [13](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B13). Hopefully, current clinical study to evaluate the effect of TCM on COVID-19 will use more strict protocols, concealment of allocation, and double-blinding, in order to ensure the compliance of international acceptable standards. Furthermore, standardized products of TCM, rather than self-prepared formulations, should be used in clinical study. Experiment study may be able to elucidate the mechanism underlying the therapeutic effect of TCM in the treatment of COVID-19. The further study of TCM may lead to the identification of novel anti human coronavirus compounds that may eventually prove to be useful in the treatment of SARS-CoV-2 or other emerging fatal viral diseases as conventional therapeutic agents.

The safety of TCM in the treatment of emerging coronavirus diseases was not included in the observation on SARS patients [13](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B13). It was reported that some herbs used in TCM contain nephrotoxins and mutagens [108](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B108), while the toxicological features of the most of Chinese herbal medicines remain to be fully understood [109](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B109). Furthermore, herbs used in TCM can mimic, or magnify, or oppose the effect of conventional medicines [110](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/#B110). Thus, the safety of TCM used in treatment of emerging coronavirus infections should be carefully evaluated. It is particularly important to avoid toxicity or interfere with the efficacy of conventional treatment caused by herb-drug interaction.

[Go to:](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/)

## Supplementary Material

Supplementary figures and tables.

[Click here for additional data file.](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/bin/ijbsv16p1708s1.pdf)(178K, pdf)

[Go to:](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/)

## Acknowledgments

This project has been funded by Macau Science and Technology Development Fund (FDCT) research grant 201/2017/A3 and 0056/2019/AFJ and University of Macau research grant MYRG2017-00120- ICMS and MYRG2019-00169-ICMS.

[Go to:](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7098036/)

## References

1. Gralinski LE, Menachery VD. Return of the Coronavirus: 2019-nCoV. Viruses. 2020. 12. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7077245/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/31991541)]

2. Burki TK. Coronavirus in China. Lancet Respir Med. 2020. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7130021/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32027848)]

3. World Health Organization. WHO Director-General's remarks at the media briefing on 2019-nCoV on 11 February 2020. https://www.who.int/dg/speeches/detail/who-director-general-s-remarks-at-the-media-briefing-on-2019-ncov-on-11-february-2020. 2020.

4. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, Clinical characteristics of 2019 novel coronavirus infection in China. medRxiv. 2020. 2020. 02.06.20020974.

5. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y. et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395(10223):497–506. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7159299/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/31986264)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Lancet&title=Clinical+features+of+patients+infected+with+2019+novel+coronavirus+in+Wuhan,+China&author=C+Huang&author=Y+Wang&author=X+Li&author=L+Ren&author=J+Zhao&volume=395&issue=10223&publication_year=2020&pages=497-506&pmid=31986264&)]

6. World Health Organization. Situation Report-29. https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200218-sitrep-29-covid-19.pdf?sfvrsn=6262de9e\_2. 2020.

7. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y. et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet. 2020;395(10223):507–513. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7135076/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32007143)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Lancet&title=Epidemiological+and+clinical+characteristics+of+99+cases+of+2019+novel+coronavirus+pneumonia+in+Wuhan,+China:+a+descriptive+study&author=N+Chen&author=M+Zhou&author=X+Dong&author=J+Qu&author=F+Gong&volume=395&issue=10223&publication_year=2020&pages=507-513&pmid=32007143&)]

8. Zhou P, Yang XL, Wang XG, Hu B, Zhang L, Zhang W, A pneumonia outbreak associated with a new coronavirus of probable bat origin. Nature. 2020. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7095418/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32015507)]

9. Wu A, Peng Y, Huang B, Ding X, Wang X, Niu P, Genome Composition and Divergence of the Novel Coronavirus (2019-nCoV) Originating in China. Cell Host Microbe. 2020. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7154514/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32035028)]

10. Zumla A, Chan JF, Azhar EI, Hui DS, Yuen KY. Coronaviruses - drug discovery and therapeutic options. Nat Rev Drug Discov. 2016;15:327–47. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7097181/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/26868298)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Nat+Rev+Drug+Discov&title=Coronaviruses+-+drug+discovery+and+therapeutic+options&author=A+Zumla&author=JF+Chan&author=EI+Azhar&author=DS+Hui&author=KY+Yuen&volume=15&publication_year=2016&pages=327-47&pmid=26868298&)]

11. Xie X, Zhong Z, Zhao W, Zheng C, Wang F, Liu J. Chest CT for Typical 2019-nCoV Pneumonia: Relationship to Negative RT-PCR Testing. Radiology. 2020: 200343. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7233363/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32049601)]

12. Li G, Clercq ED. Therapeutic options for the 2019 novel coronavirus (2019-nCoV) Nat Rev Drug Discov. 2020. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32127666)]

13. Liu J, Manheimer E, Shi Y, Gluud C. Chinese herbal medicine for severe acute respiratory syndrome: a systematic review and meta-analysis. J Altern Complement Med. 2004;10:1041–51. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/15674000)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Altern+Complement+Med&title=Chinese+herbal+medicine+for+severe+acute+respiratory+syndrome:+a+systematic+review+and+meta-analysis&author=J+Liu&author=E+Manheimer&author=Y+Shi&author=C+Gluud&volume=10&publication_year=2004&pages=1041-51&pmid=15674000&)]

14. Li T, Peng T. Traditional Chinese herbal medicine as a source of molecules with antiviral activity. Antiviral Res. 2013;97:1–9. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7114103/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/23153834)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Antiviral+Res&title=Traditional+Chinese+herbal+medicine+as+a+source+of+molecules+with+antiviral+activity&author=T+Li&author=T+Peng&volume=97&publication_year=2013&pages=1-9&pmid=23153834&)]

15. Leung PC. The efficacy of Chinese medicine for SARS: a review of Chinese publications after the crisis. Am J Chin Med. 2007;35:575–81. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/17708624)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Am+J+Chin+Med&title=The+efficacy+of+Chinese+medicine+for+SARS:+a+review+of+Chinese+publications+after+the+crisis&author=PC+Leung&volume=35&publication_year=2007&pages=575-81&pmid=17708624&)]

16. Jin YH, Cai L, Cheng ZS, Cheng H, Deng T, Fan YP. et al. A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia (standard version) Mil Med Res. 2020;7:4. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7003341/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32029004)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Mil+Med+Res&title=A+rapid+advice+guideline+for+the+diagnosis+and+treatment+of+2019+novel+coronavirus+(2019-nCoV)+infected+pneumonia+(standard+version)&author=YH+Jin&author=L+Cai&author=ZS+Cheng&author=H+Cheng&author=T+Deng&volume=7&publication_year=2020&pages=4&pmid=32029004&)]

17. Habibzadeh P, Stoneman EK. The Novel Coronavirus: A Bird's Eye View. Int J Occup Environ Med. 2020;11:65–71. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7205509/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32020915)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Int+J+Occup+Environ+Med&title=The+Novel+Coronavirus:+A+Bird%27s+Eye+View&author=P+Habibzadeh&author=EK+Stoneman&volume=11&publication_year=2020&pages=65-71&pmid=32020915&)]

18. Jordan PC, Stevens SK, Deval J. Nucleosides for the treatment of respiratory RNA virus infections. Antivir Chem Chemother. 2018;26:2040206618764483. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5890544/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/29562753)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Antivir+Chem+Chemother&title=Nucleosides+for+the+treatment+of+respiratory+RNA+virus+infections&author=PC+Jordan&author=SK+Stevens&author=J+Deval&volume=26&publication_year=2018&pages=2040206618764483&pmid=29562753&)]

19. De Clercq E. New Nucleoside Analogues for the Treatment of Hemorrhagic Fever Virus Infections. Chem Asian J. 2019;14:3962–8. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7159701/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/31389664)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Chem+Asian+J&title=New+Nucleoside+Analogues+for+the+Treatment+of+Hemorrhagic+Fever+Virus+Infections&author=E+De+Clercq&volume=14&publication_year=2019&pages=3962-8&pmid=31389664&)]

20. Wang M, Cao R, Zhang L, Yang X, Liu J, Xu M, Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) in vitro. Cell Res. 2020. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7054408/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32020029)]

21. Sheahan TP, Sims AC, Graham RL, Menachery VD, Gralinski LE, Case JB, Broad-spectrum antiviral GS-5734 inhibits both epidemic and zoonotic coronaviruses. Sci Transl Med. 2017. 9. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5567817/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/28659436)]

22. Zhang L, Liu Y. Potential Interventions for Novel Coronavirus in China: A Systemic Review. J Med Virol. 2020. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7166986/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32052466)]

23. Holshue ML, DeBolt C, Lindquist S, Lofy KH, Wiesman J, Bruce H, First Case of 2019 Novel Coronavirus in the United States. N Engl J Med. 2020. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7092802/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32004427)]

24. Lai CC, Shih TP, Ko WC, Tang HJ, Hsueh PR. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and corona virus disease-2019 (COVID-19): the epidemic and the challenges. Int J Antimicrob Agents. 2020: 105924. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7127800/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32081636)]

25. Savarino A, Di Trani L, Donatelli I, Cauda R, Cassone A. New insights into the antiviral effects of chloroquine. Lancet Infect Dis. 2006;6:67–9. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7129107/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/16439323)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Lancet+Infect+Dis&title=New+insights+into+the+antiviral+effects+of+chloroquine&author=A+Savarino&author=L+Di+Trani&author=I+Donatelli&author=R+Cauda&author=A+Cassone&volume=6&publication_year=2006&pages=67-9&pmid=16439323&)]

26. Yan Y, Zou Z, Sun Y, Li X, Xu KF, Wei Y. et al. Anti-malaria drug chloroquine is highly effective in treating avian influenza A H5N1 virus infection in an animal model. Cell Res. 2013;23:300–2. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3567830/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/23208422)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Cell+Res&title=Anti-malaria+drug+chloroquine+is+highly+effective+in+treating+avian+influenza+A+H5N1+virus+infection+in+an+animal+model&author=Y+Yan&author=Z+Zou&author=Y+Sun&author=X+Li&author=KF+Xu&volume=23&publication_year=2013&pages=300-2&pmid=23208422&)]

27. Wong CK, Lam CW, Wu AK, Ip WK, Lee NL, Chan IH. et al. Plasma inflammatory cytokines and chemokines in severe acute respiratory syndrome. Clin Exp Immuno. 2004;136:95–103. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1808997/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/15030519)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Clin+Exp+Immuno&title=Plasma+inflammatory+cytokines+and+chemokines+in+severe+acute+respiratory+syndrome&author=CK+Wong&author=CW+Lam&author=AK+Wu&author=WK+Ip&author=NL+Lee&volume=136&publication_year=2004&pages=95-103&)]

28. He L, Ding Y, Zhang Q, Che X, He Y, Shen H. et al. Expression of elevated levels of pro-inflammatory cytokines in SARS-CoV-infected ACE2+ cells in SARS patients: relation to the acute lung injury and pathogenesis of SARS. J Pathol. 2006;210:288–97. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7167655/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/17031779)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Pathol&title=Expression+of+elevated+levels+of+pro-inflammatory+cytokines+in+SARS-CoV-infected+ACE2++cells+in+SARS+patients:+relation+to+the+acute+lung+injury+and+pathogenesis+of+SARS&author=L+He&author=Y+Ding&author=Q+Zhang&author=X+Che&author=Y+He&volume=210&publication_year=2006&pages=288-97&pmid=17031779&)]

29. Faure E, Poissy J, Goffard A, Fournier C, Kipnis E, Titecat M. et al. Distinct immune response in two MERS-CoV-infected patients: can we go from bench to bedside? PLoS One. 2014;9:e88716. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3925152/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/24551142)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=PLoS+One&title=Distinct+immune+response+in+two+MERS-CoV-infected+patients:+can+we+go+from+bench+to+bedside?&author=E+Faure&author=J+Poissy&author=A+Goffard&author=C+Fournier&author=E+Kipnis&volume=9&publication_year=2014&pages=e88716&pmid=24551142&)]

30. Falzarano D, de Wit E, Rasmussen AL, Feldmann F, Okumura A, Scott DP. et al. Treatment with interferon-alpha2b and ribavirin improves outcome in MERS-CoV-infected rhesus macaques. Nat Med. 2013;19:1313–7. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4093902/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/24013700)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Nat+Med&title=Treatment+with+interferon-alpha2b+and+ribavirin+improves+outcome+in+MERS-CoV-infected+rhesus+macaques&author=D+Falzarano&author=E+de+Wit&author=AL+Rasmussen&author=F+Feldmann&author=A+Okumura&volume=19&publication_year=2013&pages=1313-7&pmid=24013700&)]

31. Stockman LJ, Bellamy R, Garner P. SARS: systematic review of treatment effects. PLoS Med. 2006;3:e343. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1564166/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/16968120)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=PLoS+Med&title=SARS:+systematic+review+of+treatment+effects&author=LJ+Stockman&author=R+Bellamy&author=P+Garner&volume=3&publication_year=2006&pages=e343&pmid=16968120&)]

32. Lansbury L, Rodrigo C, Leonardi-Bee J, Nguyen-Van-Tam J, Lim WS. Corticosteroids as adjunctive therapy in the treatment of influenza. Cochrane Database Syst Rev. 2019;2:Cd010406. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6387789/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/30798570)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Cochrane+Database+Syst+Rev&title=Corticosteroids+as+adjunctive+therapy+in+the+treatment+of+influenza&author=L+Lansbury&author=C+Rodrigo&author=J+Leonardi-Bee&author=J+Nguyen-Van-Tam&author=WS+Lim&volume=2&publication_year=2019&pages=Cd010406&pmid=30798570&)]

33. Arabi YM, Mandourah Y, Al-Hameed F, Sindi AA, Almekhlafi GA, Hussein MA. et al. Corticosteroid Therapy for Critically Ill Patients with Middle East Respiratory Syndrome. Am J Respir Crit Care Med. 2018;197:757–67. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/29161116)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Am+J+Respir+Crit+Care+Med&title=Corticosteroid+Therapy+for+Critically+Ill+Patients+with+Middle+East+Respiratory+Syndrome&author=YM+Arabi&author=Y+Mandourah&author=F+Al-Hameed&author=AA+Sindi&author=GA+Almekhlafi&volume=197&publication_year=2018&pages=757-67&pmid=29161116&)]

34. Russell CD, Millar JE, Baillie JK. Clinical evidence does not support corticosteroid treatment for 2019-nCoV lung injury. Lancet. 2020. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7134694/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32043983)]

35. World Health Organization. https://www.who.int/internal-publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected. 2020.

36. Hung IFN, To KKW, Lee CK, Lee KL, Yan WW, Chan K. et al. Hyperimmune IV immunoglobulin treatment: a multicenter double-blind randomized controlled trial for patients with severe 2009 influenza A(H1N1) infection. Chest. 2013;144:464–73. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/23450336)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Chest&title=Hyperimmune+IV+immunoglobulin+treatment:+a+multicenter+double-blind+randomized+controlled+trial+for+patients+with+severe+2009+influenza+A(H1N1)+infection&author=IFN+Hung&author=KKW+To&author=CK+Lee&author=KL+Lee&author=WW+Yan&volume=144&publication_year=2013&pages=464-73&pmid=23450336&)]

37. Luo H, Tang QL, Shang YX, Liang SB, Yang M, Robinson N, Can Chinese Medicine Be Used for Prevention of Corona Virus Disease 2019 (COVID-19)? A Review of Historical Classics, Research Evidence and Current Prevention Programs. Chin J Integr Med. 2020. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7088641/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32065348)]

38. Tong X, Li A, Zhang Z, Duan J, Chen X, Hua C. et al. TCM treatment of infectious atypical pneumonia-a report of 16 cases. J Tradit Chin Med. 2004;24:266–9. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/15688692)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Tradit+Chin+Med&title=TCM+treatment+of+infectious+atypical+pneumonia-a+report+of+16+cases&author=X+Tong&author=A+Li&author=Z+Zhang&author=J+Duan&author=X+Chen&volume=24&publication_year=2004&pages=266-9&pmid=15688692&)]

39. Liu X, Zhang M, He L, Li Y. Chinese herbs combined with Western medicine for severe acute respiratory syndrome (SARS) Cochrane Database Syst Rev. 2012;10:Cd004882. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6993561/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/23076910)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Cochrane+Database+Syst+Rev&title=Chinese+herbs+combined+with+Western+medicine+for+severe+acute+respiratory+syndrome+(SARS)&author=X+Liu&author=M+Zhang&author=L+He&author=Y+Li&volume=10&publication_year=2012&pages=Cd004882&pmid=23076910&)]

40. Zhang MM, Liu XM, He L. Effect of integrated traditional Chinese and Western medicine on SARS: a review of clinical evidence. World J Gastroenterol. 2004;10:3500–5. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4576235/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/15526373)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=World+J+Gastroenterol&title=Effect+of+integrated+traditional+Chinese+and+Western+medicine+on+SARS:+a+review+of+clinical+evidence&author=MM+Zhang&author=XM+Liu&author=L+He&volume=10&publication_year=2004&pages=3500-5&pmid=15526373&)]

41. Zhong N, May RM, McLean AR, Pattison J, Weiss RA. Management and prevention of SARS in China. Philos Trans R Soc Lond B Biol Sci. 2004;359:1115–6. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1693398/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/15306397)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Philos+Trans+R+Soc+Lond+B+Biol+Sci&title=Management+and+prevention+of+SARS+in+China&author=N+Zhong&author=RM+May&author=AR+McLean&author=J+Pattison&author=RA+Weiss&volume=359&publication_year=2004&pages=1115-6&pmid=15306397&)]

42. JSM P, D P, Yuen KY ea. The Severe Acute Respiratory Syndrome. New Engl J Med. 2003;249:2431–41. [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=New+Engl+J+Med&title=The+Severe+Acute+Respiratory+Syndrome&author=P+JSM&author=P+D&author=ea+Yuen+KY&volume=249&publication_year=2003&pages=2431-41&)]

43. Jr TMF, Tsang KWT. Severe Acute Respiratory Syndrome. Nat Med. 2005;4:95–106. [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Nat+Med&title=Severe+Acute+Respiratory+Syndrome&author=TMF+Jr&author=KWT+Tsang&volume=4&publication_year=2005&pages=95-106&)]

44. Chen Z, Nakamura T. Statistical evidence for the usefulness of Chinese medicine in the treatment of SARS. Phytotherapy research: PTR. 2004;18:592–4. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/15305324)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Phytotherapy+research:+PTR&title=Statistical+evidence+for+the+usefulness+of+Chinese+medicine+in+the+treatment+of+SARS&author=Z+Chen&author=T+Nakamura&volume=18&publication_year=2004&pages=592-4&pmid=15305324&)]

45. T.F. Lau, Leung PC, Wong ELY, Fong C, Cheng KF, Zhang SC, et al. Using Herbal Medicine as a Means of Prevention Experience During the SARS Crisis. Am J Chin Med. 2005;33:345–56. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/16047553)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Am+J+Chin+Med&title=Lau,+Leung+PC,+Wong+ELY,+Fong+C,+Cheng+KF,+Zhang+SC,+et+al.+Using+Herbal+Medicine+as+a+Means+of+Prevention+Experience+During+the+SARS+Crisis&volume=33&publication_year=2005&pages=345-56&pmid=16047553&)]

46. Poon PM, Wong CK, Fung KP, Fong CY, Wong EL, Lau JT. et al. Immunomodulatory effects of a traditional Chinese medicine with potential antiviral activity: a self-control study. Am J Chin Med. 2006;34:13–21. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/16437735)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Am+J+Chin+Med&title=Immunomodulatory+effects+of+a+traditional+Chinese+medicine+with+potential+antiviral+activity:+a+self-control+study&author=PM+Poon&author=CK+Wong&author=KP+Fung&author=CY+Fong&author=EL+Wong&volume=34&publication_year=2006&pages=13-21&pmid=16437735&)]

47. Hsu CH, Hwang KC, Chao CL, Chang SG, Ho MS, Chou P. Can herbal medicine assist against avian flu? Learning from the experience of using supplementary treatment with Chinese medicine on SARS or SARS-like infectious disease in 2003. J Altern Complement Med. 2006;12:505–6. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/16884338)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Altern+Complement+Med&title=Can+herbal+medicine+assist+against+avian+flu?+Learning+from+the+experience+of+using+supplementary+treatment+with+Chinese+medicine+on+SARS+or+SARS-like+infectious+disease+in+2003&author=CH+Hsu&author=KC+Hwang&author=CL+Chao&author=SG+Chang&author=MS+Ho&volume=12&publication_year=2006&pages=505-6&pmid=16884338&)]

48. Cinatl J, Morgenstern B, Bauer G, Chandra P, Rabenau H, Doerr HW. Glycyrrhizin, an active component of liquorice roots, and replication of SARS-associated coronavirus. The Lancet. 2003;361:2045–6. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7112442/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/12814717)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=The+Lancet&title=Glycyrrhizin,+an+active+component+of+liquorice+roots,+and+replication+of+SARS-associated+coronavirus&author=J+Cinatl&author=B+Morgenstern&author=G+Bauer&author=P+Chandra&author=H+Rabenau&volume=361&publication_year=2003&pages=2045-6&)]

49. Chen F, Chan KH, Jiang Y, Kao RY, Lu HT, Fan KW. et al. In vitro susceptibility of 10 clinical isolates of SARS coronavirus to selected antiviral compounds. J Clin Virol. 2004;31:69–75. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7128415/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/15288617)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Clin+Virol&title=In+vitro+susceptibility+of+10+clinical+isolates+of+SARS+coronavirus+to+selected+antiviral+compounds&author=F+Chen&author=KH+Chan&author=Y+Jiang&author=RY+Kao&author=HT+Lu&volume=31&publication_year=2004&pages=69-75&pmid=15288617&)]

50. Wang SQ, Du QS, Zhao K, Li AX, Wei DQ, Chou KC. Virtual screening for finding natural inhibitor against cathepsin-L for SARS therapy. Amino Acids. 2007;33:129–35. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7087620/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/16998715)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Amino+Acids&title=Virtual+screening+for+finding+natural+inhibitor+against+cathepsin-L+for+SARS+therapy&author=SQ+Wang&author=QS+Du&author=K+Zhao&author=AX+Li&author=DQ+Wei&volume=33&publication_year=2007&pages=129-35&pmid=16998715&)]

51. Wu T, Yang X, Zeng X, Poole P. Traditional Chinese medicine in the treatment of acute respiratory tract infections. Resp Med. 2008;102:1093–8. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7134919/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/18590956)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Resp+Med&title=Traditional+Chinese+medicine+in+the+treatment+of+acute+respiratory+tract+infections&author=T+Wu&author=X+Yang&author=X+Zeng&author=P+Poole&volume=102&publication_year=2008&pages=1093-8&)]

52. Cragg GM, Newman DJ. Natural products: a continuing source of novel drug leads. Biochimica et biophysica acta. 2013;1830:3670–95. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3672862/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/23428572)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Biochimica+et+biophysica+acta&title=Natural+products:+a+continuing+source+of+novel+drug+leads&author=GM+Cragg&author=DJ+Newman&volume=1830&publication_year=2013&pages=3670-95&pmid=23428572&)]

53. Luo W, Su X, Gong S, Qin Y, Liu W, Li J, Anti-SARS coronavirus 3C-like protease effects of Rheum palmatum L. extracts. BioScience Trends. 2009. 3. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/20103835)]

54. Fung KP, Leung PC, Tsui KW, Wan CC, Wong KB, Waye MY. et al. Immunomodulatory activities of the herbal formula Kwan Du Bu Fei Dang in healthy subjects: a randomised, double-blind, placebo-controlled study. Hong Kong Med J. 2011;17(Suppl 2):41–3. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/21368336)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Hong+Kong+Med+J&title=Immunomodulatory+activities+of+the+herbal+formula+Kwan+Du+Bu+Fei+Dang+in+healthy+subjects:+a+randomised,+double-blind,+placebo-controlled+study&author=KP+Fung&author=PC+Leung&author=KW+Tsui&author=CC+Wan&author=KB+Wong&volume=17&issue=Suppl+2&publication_year=2011&pages=41-3&)]

55. Lau KM, Lee KM, Koon CM, Cheung CS, Lau CP, Ho HM. et al. Immunomodulatory and anti-SARS activities of Houttuynia cordata. J Ethnopharmacol. 2008;118:79–85. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7126383/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/18479853)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Ethnopharmacol&title=Immunomodulatory+and+anti-SARS+activities+of+Houttuynia+cordata&author=KM+Lau&author=KM+Lee&author=CM+Koon&author=CS+Cheung&author=CP+Lau&volume=118&publication_year=2008&pages=79-85&pmid=18479853&)]

56. Gong SJ, Su XJ, Yu HP, Li J, Qin YJ, Xu Q. et al. A study on anti-SARS-CoV 3CL protein of flavonoids from litchi chinensis sonn core. Chinese Pharmacological Bulletin. 2008;24:699–700. [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Chinese+Pharmacological+Bulletin&title=A+study+on+anti-SARS-CoV+3CL+protein+of+flavonoids+from+litchi+chinensis+sonn+core&author=SJ+Gong&author=XJ+Su&author=HP+Yu&author=J+Li&author=YJ+Qin&volume=24&publication_year=2008&pages=699-700&)]

57. Lin CW, Tsai FJ, Tsai CH, Lai CC, Wan L, Ho TY. et al. Anti-SARS coronavirus 3C-like protease effects of Isatis indigotica root and plant-derived phenolic compounds. Antiviral Res. 2005;68:36–42. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7114321/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/16115693)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Antiviral+Res&title=Anti-SARS+coronavirus+3C-like+protease+effects+of+Isatis+indigotica+root+and+plant-derived+phenolic+compounds&author=CW+Lin&author=FJ+Tsai&author=CH+Tsai&author=CC+Lai&author=L+Wan&volume=68&publication_year=2005&pages=36-42&pmid=16115693&)]

58. Nguyen TTH, Woo HJ, Kang HK, Nguyen VD, Kim YM, Kim DW. et al. Flavonoid-mediated inhibition of SARS coronavirus 3C-like protease expressed in Pichia pastoris. Biotechnol Lett. 2012;34:831–8. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7087583/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/22350287)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Biotechnol+Lett&title=Flavonoid-mediated+inhibition+of+SARS+coronavirus+3C-like+protease+expressed+in+Pichia+pastoris&author=TTH+Nguyen&author=HJ+Woo&author=HK+Kang&author=VD+Nguyen&author=YM+Kim&volume=34&publication_year=2012&pages=831-8&pmid=22350287&)]

59. Jo S, Kim S, Shin DH, Kim M-S. Inhibition of SARS-CoV 3CL protease by flavonoids. J Enzyme Inhib Med Chem. 2020;35:145–51. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6882434/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/31724441)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Enzyme+Inhib+Med+Chem&title=Inhibition+of+SARS-CoV+3CL+protease+by+flavonoids&author=S+Jo&author=S+Kim&author=DH+Shin&author=M-S+Kim&volume=35&publication_year=2020&pages=145-51&pmid=31724441&)]

60. Jo S, Kim H, Kim S, Shin DH, Kim MS. Characteristics of flavonoids as potent MERS-CoV 3C-like protease inhibitors. Chem Biol Drug Des. 2019. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7162010/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/31436895)]

61. Yu MS, Lee J, Lee JM, Kim Y, Chin YW, Jee JG. et al. Identification of myricetin and scutellarein as novel chemical inhibitors of the SARS coronavirus helicase, nsP13. Bioorg Med Chem Lett. 2012;22:4049–54. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7127438/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/22578462)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Bioorg+Med+Chem+Lett&title=Identification+of+myricetin+and+scutellarein+as+novel+chemical+inhibitors+of+the+SARS+coronavirus+helicase,+nsP13&author=MS+Yu&author=J+Lee&author=JM+Lee&author=Y+Kim&author=YW+Chin&volume=22&publication_year=2012&pages=4049-54&pmid=22578462&)]

62. Wu CY, Jan JT, Ma SH, Kuo CJ, Juan HF, Cheng YSE. et al. Small molecules targeting severe acute respiratory syndrome human coronavirus. Proc Natl Acad Sci U S A. 2004;101:10012–7. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC454157/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/15226499)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Proc+Natl+Acad+Sci+U+S+A&title=Small+molecules+targeting+severe+acute+respiratory+syndrome+human+coronavirus&author=CY+Wu&author=JT+Jan&author=SH+Ma&author=CJ+Kuo&author=HF+Juan&volume=101&publication_year=2004&pages=10012-7&pmid=15226499&)]

63. Kuhn JH, Radoshitzky SR, Li W, Wong SK, Choe H, Farzan M. The SARS Coronavirus receptor ACE 2 A potential target for antiviral therapy. In: Holzenburg A, Bogner E, editors. New Concepts of Antiviral Therapy. Boston, MA: Springer US. 2006. p. 397-418.

64. Letko M, Munster V. Functional assessment of cell entry and receptor usage for lineage B β-coronaviruses, including 2019-nCoV. bioRxiv. 2020. 2020. 01.22.915660. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7095430/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32094589)]

65. Lin HX, Feng Y, Wong G, Wang L, Li B, Zhao X. et al. Identification of residues in the receptor-binding domain (RBD) of the spike protein of human coronavirus NL63 that are critical for the RBD-ACE2 receptor interaction. J Gen Virol. 2008;89:1015–24. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/18343844)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Gen+Virol&title=Identification+of+residues+in+the+receptor-binding+domain+(RBD)+of+the+spike+protein+of+human+coronavirus+NL63+that+are+critical+for+the+RBD-ACE2+receptor+interaction&author=HX+Lin&author=Y+Feng&author=G+Wong&author=L+Wang&author=B+Li&volume=89&publication_year=2008&pages=1015-24&pmid=18343844&)]

66. Xu XT, Chen P, Wang JF, Feng JN, Zhou H, Li X, Evolution of the novel coronavirus from the ongoing Wuhan outbreak and modeling of its spike protein for risk of human transmission. Sci China Life Sci. 2020. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7089049/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32009228)]

67. Ho T, Wu S, Chen J, Li C, Hsiang C. Emodin blocks the SARS coronavirus spike protein and angiotensin-converting enzyme 2 interaction. Antiviral Res. 2007;74:92–101. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7114332/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/16730806)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Antiviral+Res&title=Emodin+blocks+the+SARS+coronavirus+spike+protein+and+angiotensin-converting+enzyme+2+interaction&author=T+Ho&author=S+Wu&author=J+Chen&author=C+Li&author=C+Hsiang&volume=74&publication_year=2007&pages=92-101&pmid=16730806&)]

68. Deng YF, Aluko RE, Jin Q, Zhang Y, Yuan LJ. Inhibitory activities of baicalin against renin and angiotensin-converting enzyme. Pharm Biol. 2012;50:401–6. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/22136493)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Pharm+Biol&title=Inhibitory+activities+of+baicalin+against+renin+and+angiotensin-converting+enzyme&author=YF+Deng&author=RE+Aluko&author=Q+Jin&author=Y+Zhang&author=LJ+Yuan&volume=50&publication_year=2012&pages=401-6&pmid=22136493&)]

69. Takahashi S, Yoshiya T, Yoshizawa-Kumagaye K, Sugiyama T. Nicotianamine is a novel angiotensin-converting enzyme 2 inhibitor in soybean. Biomed Res. 2015;36:219–24. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/26106051)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Biomed+Res&title=Nicotianamine+is+a+novel+angiotensin-converting+enzyme+2+inhibitor+in+soybean&author=S+Takahashi&author=T+Yoshiya&author=K+Yoshizawa-Kumagaye&author=T+Sugiyama&volume=36&publication_year=2015&pages=219-24&pmid=26106051&)]

70. Wang W, Ma X, Han J, Zhou M, Ren H, Pan Q. et al. Neuroprotective Effect of Scutellarin on Ischemic Cerebral Injury by Down-Regulating the Expression of Angiotensin-Converting Enzyme and AT1 Receptor. PLoS One. 2016;11:e0146197. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4711585/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/26730961)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=PLoS+One&title=Neuroprotective+Effect+of+Scutellarin+on+Ischemic+Cerebral+Injury+by+Down-Regulating+the+Expression+of+Angiotensin-Converting+Enzyme+and+AT1+Receptor&author=W+Wang&author=X+Ma&author=J+Han&author=M+Zhou&author=H+Ren&volume=11&publication_year=2016&pages=e0146197&pmid=26730961&)]

71. Yi L, Li Z, Yuan K, Qu X, Chen J, Wang G. et al. Small molecules blocking the entry of severe acute respiratory syndrome coronavirus into host cells. J Virol. 2004;78:11334–9. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC521800/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/15452254)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Virol&title=Small+molecules+blocking+the+entry+of+severe+acute+respiratory+syndrome+coronavirus+into+host+cells&author=L+Yi&author=Z+Li&author=K+Yuan&author=X+Qu&author=J+Chen&volume=78&publication_year=2004&pages=11334-9&pmid=15452254&)]

72. Schwarz S, Wang K, Yu WJ, Sun B, Schwarz W. Emodin inhibits current through SARS-associated coronavirus 3a protein. Antiviral res. 2011;90:64–9. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7114100/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/21356245)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Antiviral+res&title=Emodin+inhibits+current+through+SARS-associated+coronavirus+3a+protein&author=S+Schwarz&author=K+Wang&author=WJ+Yu&author=B+Sun&author=W+Schwarz&volume=90&publication_year=2011&pages=64-9&pmid=21356245&)]

73. Schwarz S, Sauter D, Wang K, Zhang R, Sun B, Karioti A. et al. Kaempferol Derivatives as Antiviral Drugs against the 3a Channel Protein of Coronavirus. Planta Medica. 2014;80:177–82. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7171712/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/24458263)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Planta+Medica&title=Kaempferol+Derivatives+as+Antiviral+Drugs+against+the+3a+Channel+Protein+of+Coronavirus&author=S+Schwarz&author=D+Sauter&author=K+Wang&author=R+Zhang&author=B+Sun&volume=80&publication_year=2014&pages=177-82&pmid=24458263&)]

74. Cheng PW, Ng LT, Chiang LC, Lin CC. Antiviral effects of saikosaponins on human coronavirus 229E in vitro. Clin Exp Pharmacol Physiol. 2006;33:612–6. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7162031/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/16789928)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Clin+Exp+Pharmacol+Physiol&title=Antiviral+effects+of+saikosaponins+on+human+coronavirus+229E+in+vitro&author=PW+Cheng&author=LT+Ng&author=LC+Chiang&author=CC+Lin&volume=33&publication_year=2006&pages=612-6&pmid=16789928&)]

75. Pilcher H. Liquorice may tackle SARS. Nature. 2003.

76. Chen CJ, Michaelis M, Hsu HK, Tsai CC, Yang KD, Wu YC. et al. Toona sinensis Roem tender leaf extract inhibits SARS coronavirus replication. J Ethnopharmacol. 2008;120:108–11. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7127248/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/18762235)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Ethnopharmacol&title=Toona+sinensis+Roem+tender+leaf+extract+inhibits+SARS+coronavirus+replication&author=CJ+Chen&author=M+Michaelis&author=HK+Hsu&author=CC+Tsai&author=KD+Yang&volume=120&publication_year=2008&pages=108-11&pmid=18762235&)]

77. Lu H. Drug treatment options for the 2019-new coronavirus (2019-nCoV) Biosci Trends. 2020. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/31996494)]

78. Science CAo. Researchers in Shanghai Institute of Drugs and Wuhan Virus Institute discovered that the Chinese patent medicine Shuanghuanglian oral liquid can inhibit the 2019-new coronavirus.; 2020.

79. Chen X, Howard OM, Yang X, Wang L, Oppenheim JJ, Krakauer T. Effects of Shuanghuanglian and Qingkailing, two multi-components of traditional Chinese medicinal preparations, on human leukocyte function. Life Sci. 2002;70:2897–913. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/12269401)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Life+Sci&title=Effects+of+Shuanghuanglian+and+Qingkailing,+two+multi-components+of+traditional+Chinese+medicinal+preparations,+on+human+leukocyte+function&author=X+Chen&author=OM+Howard&author=X+Yang&author=L+Wang&author=JJ+Oppenheim&volume=70&publication_year=2002&pages=2897-913&pmid=12269401&)]

80. Gao Y, Fang L, Cai R, Zong C, Chen X, Lu J. et al. Shuang-Huang-Lian exerts anti-inflammatory and anti-oxidative activities in lipopolysaccharide-stimulated murine alveolar macrophages. Phytomedicine. 2014;21:461–9. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/24192210)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Phytomedicine&title=Shuang-Huang-Lian+exerts+anti-inflammatory+and+anti-oxidative+activities+in+lipopolysaccharide-stimulated+murine+alveolar+macrophages&author=Y+Gao&author=L+Fang&author=R+Cai&author=C+Zong&author=X+Chen&volume=21&publication_year=2014&pages=461-9&pmid=24192210&)]

81. Chan MC, Chan RW, Mok CK, Mak NK, Wong RN. Indirubin-3'-oxime as an antiviral and immunomodulatory agent in treatment of severe human influenza virus infection. Hong Kong Med J. 2018;24(Suppl 6):45–7. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/30229739)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Hong+Kong+Med+J&title=Indirubin-3%27-oxime+as+an+antiviral+and+immunomodulatory+agent+in+treatment+of+severe+human+influenza+virus+infection&author=MC+Chan&author=RW+Chan&author=CK+Mok&author=NK+Mak&author=RN+Wong&volume=24&issue=Suppl+6&publication_year=2018&pages=45-7&)]

82. Ding Y, Zeng L, Li R, Chen Q, Zhou B, Chen Q. et al. The Chinese prescription lianhuaqingwen capsule exerts anti-influenza activity through the inhibition of viral propagation and impacts immune function. BMC Complement Altern Med. 2017;17:130. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5324200/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/28235408)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=BMC+Complement+Altern+Med&title=The+Chinese+prescription+lianhuaqingwen+capsule+exerts+anti-influenza+activity+through+the+inhibition+of+viral+propagation+and+impacts+immune+function&author=Y+Ding&author=L+Zeng&author=R+Li&author=Q+Chen&author=B+Zhou&volume=17&publication_year=2017&pages=130&pmid=28235408&)]

83. Dong L, Xia JW, Gong Y, Chen Z, Yang H-H, Zhang J. et al. Effect of Lianhuaqingwen Capsules on Airway Inflammation in Patients with Acute Exacerbation of Chronic Obstructive Pulmonary Disease. Evid Based Complement Alternat Med. 2014;2014:1–11. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4058171/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/24971150)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Evid+Based+Complement+Alternat+Med&title=Effect+of+Lianhuaqingwen+Capsules+on+Airway+Inflammation+in+Patients+with+Acute+Exacerbation+of+Chronic+Obstructive+Pulmonary+Disease&author=L+Dong&author=JW+Xia&author=Y+Gong&author=Z+Chen&author=H-H+Yang&volume=2014&publication_year=2014&pages=1-11&)]

84. Li S, Chen C, Zhang H, Guo H, Wang H, Wang L. et al. Identification of natural compounds with antiviral activities against SARS-associated coronavirus. Antiviral Res. 2005;67:18–23. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7114104/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/15885816)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Antiviral+Res&title=Identification+of+natural+compounds+with+antiviral+activities+against+SARS-associated+coronavirus&author=S+Li&author=C+Chen&author=H+Zhang&author=H+Guo&author=H+Wang&volume=67&publication_year=2005&pages=18-23&pmid=15885816&)]

85. Chang FR, Yen CT, Ei-Shazly M, Lin WH, Yen MH, Lin KH. et al. Anti-Human Coronavirus (anti-HCoV) Triterpenoids from the Leaves of Euphorbia Neriifolia. Nat Prod Commun. 2012;7:1934578X1200701103. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/23285797)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Nat+Prod+Commun&title=Anti-Human+Coronavirus+(anti-HCoV)+Triterpenoids+from+the+Leaves+of+Euphorbia+Neriifolia&author=FR+Chang&author=CT+Yen&author=M+Ei-Shazly&author=WH+Lin&author=MH+Yen&volume=7&publication_year=2012&pages=1934578X1200701103&)]

86. Shen YC, Wang LT, Khalil AT, Chiang LC, Cheng PW. Bioactive Pyranoxanthones from the Roots of Calophyllum blancoi. Chem Pharm Bull. 2005;53:244–7. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/15684529)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Chem+Pharm+Bull&title=Bioactive+Pyranoxanthones+from+the+Roots+of+Calophyllum+blancoi&author=YC+Shen&author=LT+Wang&author=AT+Khalil&author=LC+Chiang&author=PW+Cheng&volume=53&publication_year=2005&pages=244-7&pmid=15684529&)]

87. National Health Commission of the People's Republic of China. Transcript of press conference in 17, February, 2020. http://www.nhc.gov.cn/xcs/s3574/202002/f12a62d10c2a48c6895cedf2faea6e1f. shtml. 2020.

88. National Health Commission of the People's Republic of China. Notice on the issunance of guidelines of diagnosis and treatment for 2019-nCoV infected pneumonia (version 6) 6 ed; http://www.nhc.gov.cn/yzygj/s7653p/202002/8334a8326dd94d329df351d7da8aefc2.shtml?from=timeline. 2020.

89. Han YY, Zhao MR, Shi B, Song ZH, Zhou SP, He Y. Application of integrative medicine protocols on treatment of coronavirus disease 2019. Chi Tradit Herbal Drugs. 1-5.

90. Zhu YG, Deng ZW, Liu LH, Liu XH, Li XZ, Chen WH, Compilation of drug information for the diagnosis and treatment of COVID-19 (version 1) Central South Pharmacy. 1-14.

91. Xu X, Zhang Y, Li X, Li XX. Analysis on prevention plan of corona virus disease-19 (COVID-19) by traditional Chinese medicine in various regions. Chin Herb Med. 2020. pp. 1–7.

92. Zhao J, Tian SS, Yang J, Liu J, Zhang WD. Investigating the mechanism of Qing-Fei-Pai-Du-Tang for the treatment of Novel Coronavirus Pneumonia by network pharmacology. Chin Herb Med. 2020. pp. 1–7.

93. Yao KT, Liu MY, Li X, Huang JH, Cai HB. Retrospective Clinical Analysis on Treatment of Novel Coronavirus-infected Pneumonia with Traditional Chinese Medicine Lianhua Qingwen. Chin J Exp Tradit Med Form. 2020. pp. 1–7.

94. Lv RB, Wang WJ, Li X. Treatment of suspected new coronavirus pneumonia with Chinese medicine Lianhua Qingwen Clinical observation of 63 suspected cases. J Tradit Chin Med. 2020. pp. 1–5.

95. Zhang JW, Hu X, Jin PF. Cytokine storms caused by 2019-nCoV and drug therapy. Chinese Pharmaceutical Journal. 2020. pp. 1–9. 96.

96. Chen X, Yang D, Shen W, Dong HF, Wang JM, Oppenheim JJ. et al. Characterization of chenodeoxycholic acid as an endogenous antagonist of the G-coupled formyl peptide receptors. Inflamm Res. 2000;49:744–55. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/11211928)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Inflamm+Res&title=Characterization+of+chenodeoxycholic+acid+as+an+endogenous+antagonist+of+the+G-coupled+formyl+peptide+receptors&author=X+Chen&author=D+Yang&author=W+Shen&author=HF+Dong&author=JM+Wang&volume=49&publication_year=2000&pages=744-55&pmid=11211928&)]

97. Chen X, Mellon RD, Yang L, Dong H, Oppenheim JJ, Howard OM. Regulatory effects of deoxycholic acid, a component of the anti-inflammatory traditional Chinese medicine Niuhuang, on human leukocyte response to chemoattractants. Biochem Pharmacol. 2002;63:533–41. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/11853704)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Biochem+Pharmacol&title=Regulatory+effects+of+deoxycholic+acid,+a+component+of+the+anti-inflammatory+traditional+Chinese+medicine+Niuhuang,+on+human+leukocyte+response+to+chemoattractants&author=X+Chen&author=RD+Mellon&author=L+Yang&author=H+Dong&author=JJ+Oppenheim&volume=63&publication_year=2002&pages=533-41&pmid=11853704&)]

98. Chen X, Beutler JA, McCloud TG, Loehfelm A, Yang L, Dong HF. et al. Tannic acid is an inhibitor of CXCL12 (SDF-1alpha)/CXCR4 with antiangiogenic activity. Clin Cancer Res. 2003;9:3115–23. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/12912963)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Clin+Cancer+Res&title=Tannic+acid+is+an+inhibitor+of+CXCL12+(SDF-1alpha)/CXCR4+with+antiangiogenic+activity&author=X+Chen&author=JA+Beutler&author=TG+McCloud&author=A+Loehfelm&author=L+Yang&volume=9&publication_year=2003&pages=3115-23&pmid=12912963&)]

99. Chen X, Yang L, Zhang N, Turpin JA, Buckheit RW, Osterling C. et al. Shikonin, a component of chinese herbal medicine, inhibits chemokine receptor function and suppresses human immunodeficiency virus type 1. Antimicrob Agents Chemother. 2003;47:2810–6. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC182643/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/12936978)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Antimicrob+Agents+Chemother&title=Shikonin,+a+component+of+chinese+herbal+medicine,+inhibits+chemokine+receptor+function+and+suppresses+human+immunodeficiency+virus+type+1&author=X+Chen&author=L+Yang&author=N+Zhang&author=JA+Turpin&author=RW+Buckheit&volume=47&publication_year=2003&pages=2810-6&pmid=12936978&)]

100. Chen X, Oppenheim JJ, Howard OM. Chemokines and chemokine receptors as novel therapeutic targets in rheumatoid arthritis (RA): inhibitory effects of traditional Chinese medicinal components. Cell Mol Immunol. 2004;1:336–42. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/16285892)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Cell+Mol+Immunol&title=Chemokines+and+chemokine+receptors+as+novel+therapeutic+targets+in+rheumatoid+arthritis+(RA):+inhibitory+effects+of+traditional+Chinese+medicinal+components&author=X+Chen&author=JJ+Oppenheim&author=OM+Howard&volume=1&publication_year=2004&pages=336-42&pmid=16285892&)]

101. Chen X, Murakami T, Oppenheim JJ, Howard OM. Triptolide, a constituent of immunosuppressive Chinese herbal medicine, is a potent suppressor of dendritic-cell maturation and trafficking. Blood. 2005;106:2409–16. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1569904/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/15956285)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Blood&title=Triptolide,+a+constituent+of+immunosuppressive+Chinese+herbal+medicine,+is+a+potent+suppressor+of+dendritic-cell+maturation+and+trafficking&author=X+Chen&author=T+Murakami&author=JJ+Oppenheim&author=OM+Howard&volume=106&publication_year=2005&pages=2409-16&pmid=15956285&)]

102. He J, He ZD, Chen X. Effects of Chinese medicinal components on chemokine receptors: theory, results and methodology. Evidence-based Research Methods for Chinese Medicine. 2016. pp. 187–97.

103. Chen YB, Chen X. Ancient herbal component may be a novel therapeutic for gouty arthritis. J Leukoc Biol. 2019;105:7–9. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/30517770)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Leukoc+Biol&title=Ancient+herbal+component+may+be+a+novel+therapeutic+for+gouty+arthritis&author=YB+Chen&author=X+Chen&volume=105&publication_year=2019&pages=7-9&pmid=30517770&)]

104. Wang J, Qiao LF, Li YS, Yang GT. Shen Fu injection activate the macrophage NF-kB of rats' alveolar induced by LPS. Acta Medicinae Universitatis Scientiae et Technologiae Huazhong. 2009;1:15–8. [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Acta+Medicinae+Universitatis+Scientiae+et+Technologiae+Huazhong&title=Shen+Fu+injection+activate+the+macrophage+NF-kB+of+rats%27+alveolar+induced+by+LPS&author=J+Wang&author=LF+Qiao&author=YS+Li&author=GT+Yang&volume=1&publication_year=2009&pages=15-8&)]

105. Chang XJ, Xiao W, Zhang S, Chang YP, Chen CM, Chen J. et al. Mechanism of Re Du Ning injection on anti-acute lung injury in rats based on cytokines storm. Chin Herb Med. 2014;46:236–9. [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Chin+Herb+Med&title=Mechanism+of+Re+Du+Ning+injection+on+anti-acute+lung+injury+in+rats+based+on+cytokines+storm&author=XJ+Chang&author=W+Xiao&author=S+Zhang&author=YP+Chang&author=CM+Chen&volume=46&publication_year=2014&pages=236-9&)]

106. Zou HM, He TZ, Chen X. Tetrandrine inhibits differentiation of proinflammatory subsets of T helper cells but spares de novo differentiation of iTreg cells. Int Immunopharmacol. 2019;69:307–12. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/30769211)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Int+Immunopharmacol&title=Tetrandrine+inhibits+differentiation+of+proinflammatory+subsets+of+T+helper+cells+but+spares+de+novo+differentiation+of+iTreg+cells&author=HM+Zou&author=TZ+He&author=X+Chen&volume=69&publication_year=2019&pages=307-12&pmid=30769211&)]

107. Chen H, Du Q. Potential Natural Compounds for Preventing 2019-nCoV Infection. Preprints. 2020.

108. Ng AWT, Poon SL, Huang MN, Lim JQ, Boot A, Yu W, Aristolochic acids and their derivatives are widely implicated in liver cancers in Taiwan and throughout Asia. Sci Trans Med. 2017. 9. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/29046434)]

109. Zeng ZP, Jiang JG. Analysis of the adverse reactions induced by natural product-derived drugs. Br J Pharmacol. 2010;159:1374–91. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2850395/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/20233209)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Br+J+Pharmacol&title=Analysis+of+the+adverse+reactions+induced+by+natural+product-derived+drugs&author=ZP+Zeng&author=JG+Jiang&volume=159&publication_year=2010&pages=1374-91&pmid=20233209&)]

110. Fugh-Berman A. Herb-drug interactions. Lancet. 2000;355:134–8. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10675182)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Lancet&title=Herb-drug+interactions&author=A+Fugh-Berman&volume=355&publication_year=2000&pages=134-8&pmid=10675182&)]

111. Liu LS, Lei N, Lin Q, Wang WL, Yan HW, Duan XH. The Effects and Mechanism of Yinqiao Powder on Upper Respiratory Tract Infection. Int J Biotechnol Wellness Ind. 2015;4:57–60. [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Int+J+Biotechnol+Wellness+Ind&title=The+Effects+and+Mechanism+of+Yinqiao+Powder+on+Upper+Respiratory+Tract+Infection&author=LS+Liu&author=N+Lei&author=Q+Lin&author=WL+Wang&author=HW+Yan&volume=4&publication_year=2015&pages=57-60&)]

112. Fu YJ, Yan YQ, Qin HQ, Wu S, Shi SS, Zheng X. et al. Effects of different principles of Traditional Chinese Medicine treatment on TLR7/NF-κB signaling pathway in influenza virus infected mice. Chin Med. 2018;13:42. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6102858/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/30151032)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Chin+Med&title=Effects+of+different+principles+of+Traditional+Chinese+Medicine+treatment+on+TLR7/NF-%CE%BAB+signaling+pathway+in+influenza+virus+infected+mice&author=YJ+Fu&author=YQ+Yan&author=HQ+Qin&author=S+Wu&author=SS+Shi&volume=13&publication_year=2018&pages=42&pmid=30151032&)]

113. Lau JT, Leung PC, Wong EL, Fong C, Cheng KF, Zhang SC. et al. The use of an herbal formula by hospital care workers during the severe acute respiratory syndrome epidemic in Hong Kong to prevent severe acute respiratory syndrome transmission, relieve influenza-related symptoms, and improve quality of life: a prospective cohort study. J Altern Complement Med. 2005;11:49–55. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/15750363)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Altern+Complement+Med&title=The+use+of+an+herbal+formula+by+hospital+care+workers+during+the+severe+acute+respiratory+syndrome+epidemic+in+Hong+Kong+to+prevent+severe+acute+respiratory+syndrome+transmission,+relieve+influenza-related+symptoms,+and+improve+quality+of+life:+a+prospective+cohort+study&author=JT+Lau&author=PC+Leung&author=EL+Wong&author=C+Fong&author=KF+Cheng&volume=11&publication_year=2005&pages=49-55&pmid=15750363&)]

114. Du CY, Zheng KY, Bi CW, Dong TT, Lin H, Tsim KW. Yu Ping Feng San, an Ancient Chinese Herbal Decoction, Induces Gene Expression of Anti-viral Proteins and Inhibits Neuraminidase Activity. Phytother Res. 2015;29:656–61. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/25586308)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Phytother+Res&title=Yu+Ping+Feng+San,+an+Ancient+Chinese+Herbal+Decoction,+Induces+Gene+Expression+of+Anti-viral+Proteins+and+Inhibits+Neuraminidase+Activity&author=CY+Du&author=KY+Zheng&author=CW+Bi&author=TT+Dong&author=H+Lin&volume=29&publication_year=2015&pages=656-61&pmid=25586308&)]

115. Gao J, Li J, Shao X, Jin Y, Lu XW, Ge JF. et al. Antiinflammatory and immunoregulatory effects of total glucosides of Yupingfeng powder. Chin Med J (Engl) 2009;122:1636–41. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/19719964)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Chin+Med+J+(Engl)&title=Antiinflammatory+and+immunoregulatory+effects+of+total+glucosides+of+Yupingfeng+powder&author=J+Gao&author=J+Li&author=X+Shao&author=Y+Jin&author=XW+Lu&volume=122&publication_year=2009&pages=1636-41&pmid=19719964&)]

116. Zhang H, Chen Q, Zhou W, Gao S, Lin H, Ye S. et al. Chinese medicine injection shuanghuanglian for treatment of acute upper respiratory tract infection: a systematic review of randomized controlled trials. Evid Based Complement Alternat Med. 2013;2013:987326. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3625553/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/23606893)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Evid+Based+Complement+Alternat+Med&title=Chinese+medicine+injection+shuanghuanglian+for+treatment+of+acute+upper+respiratory+tract+infection:+a+systematic+review+of+randomized+controlled+trials&author=H+Zhang&author=Q+Chen&author=W+Zhou&author=S+Gao&author=H+Lin&volume=2013&publication_year=2013&pages=987326&pmid=23606893&)]

117. Xiao GL, Song K, Yuan CJ ea. A literature report on the treatment of SARS by stages with traditional Chinese medicine. J Emerg Chin Med Hunan. 2005. pp. 53–5.

118. Bao L, J M. Research progress of Da Yuan Yin on the treatment of infectious diseases. Emerg Tradit Chin Med. 2010;2:263–87. [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Emerg+Tradit+Chin+Med&title=Research+progress+of+Da+Yuan+Yin+on+the+treatment+of+infectious+diseases&author=L+Bao&author=M+J&volume=2&publication_year=2010&pages=263-87&)]

119. Kim DE, Min JS, Jang MS, Lee JY, Shin YS, Song JH. et al. Natural Bis-Benzylisoquinoline Alkaloids-Tetrandrine, Fangchinoline, and Cepharanthine, Inhibit Human Coronavirus OC43 Infection of MRC-5 Human Lung Cells. Biomolecules. 2019;9:696. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6921063/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/31690059)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Biomolecules&title=Natural+Bis-Benzylisoquinoline+Alkaloids-Tetrandrine,+Fangchinoline,+and+Cepharanthine,+Inhibit+Human+Coronavirus+OC43+Infection+of+MRC-5+Human+Lung+Cells&author=DE+Kim&author=JS+Min&author=MS+Jang&author=JY+Lee&author=YS+Shin&volume=9&publication_year=2019&pages=696&)]

Articles from International Journal of Biological Sciences are provided here courtesy of **Ivyspring International Publisher**