

Long-Haul Covid Syndrome

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DISCLAIMER: It is important to note that no US government agency has approved—and likely will never approve—any herbal treatment for COVID-19. We remind you that they are correct to take this position. Classical Chinese herbal formulas are not virus-specific, nor are they generally intended to treat specific diseases, at least not as they are identified and classified by modern biomedicine. Rather, Chinese medicine addresses disease patterns. Use of the formulas discussed herein is recommended only for treating variations of certain traditional patterns. With this in mind, we are not specifically recommending any formula for the treatment of COVID-19. If an individual's signs and symptoms fit a traditional Chinese medical pattern, whether she or he is suspected to have COVID-19 or some other externally-contracted pathogen, it is only within the context of the correct pattern that Chinese herbal medicine makes its recommendation to use the associated formula. This has been the case for over 2000 years.

INTRODUCTION

The recognition of a condition now commonly known variously as “Long-haul COVID,” “Long COVID,” or “Chronic COVID” began as a concept circulating among social media support groups and was shortly thereafter accepted into the scientific community. Recovering patients, whether they had experienced severe, mild, or moderate cases of the disease, observed that some symptoms lingered and some new ones emerged beyond the initial expectations and beyond the time they were pronounced “recovered” from the acute illness. They shared this information among themselves, seeking answers and help. The movement from support groups to real science was facilitated by the fact that so many medical personnel and scientists were experiencing the syndrome themselves. It therefore managed to escape the stigma in the medical community that many other chronic, but difficult-to-diagnose conditions had to endure, such as Chronic Lyme, Chronic Fatigue Syndrome, Candidiasis, and Fibromyalgia. This recognition, however, does not yet come with a clear understanding of the pathogenesis; nor is there a generally accepted precise definition for Long-haul COVID. In February of 2021, the President's Chief Medical Adviser and renowned infectious disease expert, Anthony Fauci, officially recognized the reality of Long-haul COVID and announced the official scientific name of the new syndrome: **Post Acute Sequelae of SARS-CoV-2 (PASC)**, but research papers still tend to use the terms “Long-COVID” or “Long-haul COVID.” A surprising feature of Long-haul COVID is that it seems to affect survivors of mild and moderate cases just as frequently as it does the severe cases that required hospitalization. Young and healthy people too—even children—are just as likely (or nearly as likely) to be affected by PASC, it seems, as the elderly or those with weak constitutions. Even initially asymptomatic cases can develop the chronic form of the disease.

The office for National Statistics in the UK reportedⁱ that

approximately 1 in 5 individuals who test positive for COVID-19 have lingering symptoms after 5 weeks; 1 in 10 experience lingering symptoms for more than 12 weeks. There have been many similar surveys of this phenomenon conducted in most of the developed countries in the world. A quick comparison of these studies shows that 10% seems to be the lowest conservative estimate for the proportion of the “recovered” COVID cases that develop PASC for an extended amount of time (greater than 12 weeks). Other studies put the number at over 30%.ⁱⁱ Prominent risk factors for developing Long-haul COVID, supported by at least three studies, are: female, more than five early symptoms, and having developed a severe (hospitalized) version of COVID during the acute phase.ⁱⁱⁱ

Various postviral syndromes have been observed for a long time in the West; there are even some ICD-10 codes used for insurance billing, such as Postviral Fatigue Syndrome (G93.3) or Postpolio Syndrome (G14.) or Postherpetic Myelitis (B02.24). Most notable to the present discussion, post-viral syndromes were observed with other species of human coronavirus diseases. Many survivors of MERS and SARS are documented as having experienced symptoms such as myalgia, fatigue, and psychiatric impairments for up to four years after recovering from the acute infection.^{iv, v} In traditional Eastern medicine, post-viral syndromes are a long recognized phenomenon with multiple patterns. In fact, the *Shang Han Lun* (circa 220CE) devotes a great deal more lines to the discussion of lingering disease patterns than it does acute patterns! With such a rich history in treating lingering and chronic disease, traditional Eastern medicine is well equipped to deal with all sorts of variants and presentations of post-viral syndromes.

WHAT DOES LONG-HAUL COVID LOOK LIKE?

A study published in July of 2020 surveyed over 1500 survivors of COVID-19 who were complaining of lingering symptoms.^{vi} 98 different symptoms were identified and ranked according to prevalence. In general, these symptoms can be divided into 1) physical, 2) organic (lung, kidney, heart, and gastroenteric issues especially), 3) neurological, and 4) psychiatric. Different studies reveal different percentages of symptom occurrence, but fatigue always tops the list and is always accompanied by other symptoms. In other words, long-haulers experience a cluster of (often changing) symptoms, not just one. Besides fatigue, the most common general symptoms are body aches/myalgia, dyspnea/cough/chest pain, headache, palpitations, smell/taste dysfunction, cognitive impairment (“brain fog” or difficulty with mental focus), sleep disturbance, and depression. Less common symptoms include hair loss, rhinorrhea, and chronic gastrointestinal disorders. At this time, there is no clear understanding of the precise pathomechanisms involved with developing Long-haul COVID, though the primary focus of investigations is through the context of myalgic encephalomyelitis (ME), more commonly known as chronic fatigue syndrome, specifically, “post-viral fatigue syndrome” or “post-infectious myalgic encephalomyelitis.”



Myalgic Encephalomyelitis

Myalgic encephalomyelitis (ME) is not well understood itself, in no small part because it was largely ignored until quite recently, but also because it seems to have multiple possible etiologies. Sequelae of a viral infection is only one cause of ME. The clear statistical connection between the SARS-CoV-2 virus and post-viral fatigue syndrome has generated serious interest in studying this phenomenon and has validated the suffering of millions. The current consensus is that long-haul ME is the result of either 1) tissue damage, 2) unresolved inflammation, or 3) both.^{vii} The first group is closely associated with survivors of more severe cases of COVID-19 and tends to affect cardiological, pulmonary, and nerve tissues, including the brain. Less severe cases of COVID-19 tend to belong to the “unresolved inflammation” group. This is a much larger group than the first and includes lymphopenia, gut dysbiosis, autoimmune activation, and viral persistence. Severe inflammatory factors can cause someone from the second group to develop tissue damage, putting them in the third group. Similarly, lingering inflammation from tissue damage can cause someone from Group 1 to become part of Group 3. Given that many SARS and MERS survivors continue to have persistent post infection symptoms, it may be too early to know if persistent unresolved forms of either Groups 1 or 2 inevitably develop into Group 3.

In terms of research into the phenomenon of Long-haul COVID syndrome, several subdisciplines of study have been engaged. Presently, slightly more funding is going into neurological research in connection to the post-viral fatigue syndrome from SARS-CoV-2. But cardiovascular research is a close second, followed by gastroenterological research. Interestingly, pulmonary research is the primary focus of acute infection, but not in the top four areas of research for the chronic condition.^{viii} Many different inflammatory markers have been identified in connection with PASC. Some of these, like d-dimer are clear indicators of ongoing clotting issues in response to inflammation in the endothelium of the blood vessels. Others indicate clear ongoing pro-inflammatory signaling proteins from cytokine and bradykinin responses. In simplified terms, what everyone seems to agree on is that Post Acute Sequelae of SARS-CoV-2 involves ongoing inflammation. A clear understanding of the root cause, location, and mechanism of the inflammation is the real underlying objective of these studies.

A CHINESE MEDICINE PERSPECTIVE

Inflammation arises from our innate immune response. In Chinese medicine terms, inflammation is *wei qi* entangled with a pathogen in the interior. Normally, *wei qi* circulates in the sinew channels on the exterior, but it will enter the internal terrain to try and push out pathogenic factors that have penetrated to deeper levels. *Wei qi* is a product of, and conduit for, *yang qi*. When it is trying to move something out, it will concentrate heat on the affected area. The heat can either kill off an invading microbe or, due to the expanding nature of heat, the pathogenic *qi* can be moved outward through the surface. *Wei qi* also controls muscle movement in both the interior and exterior, even the micromovements that push foreign materials and pathogenic *qi* back out. Fluids play an equally important role in the elimination of pathogens, but fluids are in themselves a passive mediumship. The movement of fluids, when not governed by gravity alone, is dependent upon the *wei qi* for each and every tissue contraction that moves unwanted material to the exterior. *Wei qi* and *jin* (thin) fluids are interdependent when moving out unusable materials, whether pathogens or byproducts of physiologic chemical reactions.

If the *wei qi* is overwhelmed by a pathogen or the fluids become depleted, this mechanism of elimination cannot work. Similarly, the *wei qi* function of concentrating yang (as heat) in an invaded area in order to destroy a pathogen or push the pathogenic *qi* outward to vent through the surface can be compromised if the yin is deficient in that area. So, the *wei qi* relies upon sufficient yin to balance out the concentration of yang (heat) in its inflammatory agency. Yin restrains yang and anchors it. In order for the eliminatory agency to work, sufficient *wei qi*, *jin* (thin) fluids, and open routes of elimination (pores, urination, defecation, vomiting, sweating) are required. For the inflammatory function to be successful, sufficient yin and yang are required; they need to be in a balanced relationship, and the surface needs to be able to open. The details of how these two aspects of *wei qi* function constitute our innate immune system, our *zheng qi*.

An external invasion that transforms into a chronic condition, such as Long-haul COVID, does so by virtue of the *wei qi* getting overwhelmed by a pathogen that is simply too strong for the body’s resources at the time of the initial invasion. When we test negative following an acute infection, it is assumed that the body is no longer shedding the virus and therefore the individual is no longer contagious. By this time, any lingering symptoms are due to tissue damage from the acute infection, or because the virus now resides entirely in the interior, or both. When the virus is fully integrated into the organism like this, the *wei qi* can no longer rely on its elimination function to rid the body of the virus. Hence, there is no viral shedding. Viral replication settles down in this phase of the illness because the virus has succeeded in preserving its existence within the host. The fight is over; the battle zone has become occupied territory, and the tension between invader and host remains.

SARS-CoV-2 is a damp-heat pathogen. Dampness has the ability to seep and sink into deeper areas of the interior and convey the heat aspect into areas where it normally would not have easy entry. What is insidious about externally-contracted damp-heat pathogens is that the normal *wei* qi response of using the *jīn* (thin) fluids to carry the pathogens out through one of the common routes of elimination (defecation, urination, vomiting, sweating) can be rendered ineffective because the qi of the pathogen can easily convert *jīn* (thin) fluids into more dampness. This is the explanation for why, in the majority of acute infections of COVID-19, the fever is relatively mild: wherever the *wei* qi tries to concentrate yang (heat), the dampness prevents the expansion and intensification of the heat.

In the chronic phase, the nature of the tension between invader and host is the continued efforts of the *wei* qi to find a way to fulfill its function. Since the elimination function is no longer an option, only the inflammatory function remains. Inflammation can be found wherever the spike protein is forcing entry. The microscopic violence of this forced entry necessarily causes an inflammatory response wherever it is taking place. This is the *wei* qi at work: breaches, even at the cellular level, cause the *wei* qi to react with its only two tools: heat or moving fluids. The problem is that wherever the virus is actively entering a new site (or a new cell at the same site), the *wei* qi will sustain an inflammatory response and the individual will experience chronic symptoms.



TREATMENT STRATEGIES

Myalgic Encephalomyelitis (ME)

The majority of long-haulers will manifest as basic post-viral fatigue syndrome, with its cluster of associated symptoms such as exacerbation with physical exertion, body aches, headaches, sleep disturbance or sleep that does not rejuvenate, orthostatic intolerance (unable to stand for long periods), cognitive impairment, and possibly depression. Herbal medicine has been treating similar patterns for millennia, but not until the West formally recognized ME as a real condition was specific research conducted into its treatment under that specific banner. The basic treatment strategy involves combining adaptogenic herbs (these are usually qi tonics) with damp-heat-clearing/detoxifying herbs, regulating liver qi, and invigorating blood. This can be accomplished in a number of ways and tailored to the patient's needs and presentation.

Bupleurum & Cinnamon Formula (*Chai Hu Gui Zhi Tang*) + Viola Clear Fire Formula (*Di Ding Qing Huo Pian*)

Bupleurum & Cinnamon Formula regulates the liver and frees the chest, releases the *shaoyang*, and rectifies the *ying* and *wei* qi. It possesses a mild ability to eliminate damp-heat with the scutellaria (*huang qin*), while codonopsis (*dang shen*) serves in the adaptogenic role. **Viola Clear Fire Formula**

dredges chronic viral toxin, especially from the liver and the blood. Use this combination when the ME presents with joint pain or body aches and with mild gastrointestinal issues, such as bloating or mild gastritis.

Minor Bupleurum Formula (*Xiao Chai Hu Tang*) + Ginseng and Astragalus Formula (*Bu Zhong Yi Qi Tang*)

This combination was recommended by a Chinese study published in 2020^x for the treatment of ME when the pattern is liver qi stagnation with spleen qi deficiency. After three weeks of treatment, the total effectiveness rate was 97% in a study involving 68 patients, and 89% in a separate study involving 72 patients.^x The observation groups were not necessarily suffering from ME due to postviral chronicity. So, whereas **Minor Bupleurum Formula** is an excellent choice to use in combination in most any strategy addressing

ME, **Ginseng & Astragalus Formula** should be considered for short-term use only, to get the patient's strength up. Once they feel stronger, replacing the **Ginseng & Astragalus Formula** with **Reed & Seed Formula (*San Ren Wei Jing Tang*)** will be a stronger combination to rid the body of the latent damp-heat.

Reed & Seed Formula (*San Ren Wei Jing Tang*) + Ginseng Endurance Formula (*Ren Shen Pian*)

This combination will best serve those patients whose ME is moderate to severe or with more than four symptoms of post-viral chronic fatigue. **Reed & Seed Formula** eliminates damp-heat from the body while **Ginseng Endurance Formula** is a strong adaptogenic formula. The combination strengthens the immune system and the central qi while strongly removing lurking damp-heat from everywhere in the body. **Ginseng Endurance Formula** will help guide some of the action into the skeletal muscles and **Reed & Seed Formula** clears damp-heat from all three burners as well as the blood.

Neurological Issues Predominating

It is now well established that SARS-CoV-2 gains entry into the interior through the ACE2 receptors. It is also well known that ACE2 receptors line the nasal passages, the alveoli of the lungs, the entire gut, the endothelium of the blood vessels, and the tubules of the kidneys and liver. Not as well known, and only very recently explored in any detail, is the fact that "ACE2 is robustly expressed in human neurons."^{xi} It is also found in cerebral spinal fluid and has been detected in human brain tissue.^{xii} It is a separate question whether SARS-CoV-2 or the spike protein from the virus can cross the blood-brain barrier and hijack the ACE2 in the brain. What has been demonstrated, however, is that the spike protein (S1) from SARS-CoV-2 does cross the blood-brain barrier in mice.^{xiii} If the spike protein (S1 or S2) can cross the blood-brain barrier in humans, it would readily explain the neurological and psychiatric symptoms experienced by COVID long-haulers. Neurological presentations of ME have been

explored in the scientific literature for several years now and there is significant new funding to support specific neurological research into PASC. In Chinese medicine, there has been immense interest in finding herbs that can effectively reduce inflammation in the brain and CNS to reduce neurological symptoms caused by inflammation. Among the substances they found to be effective^{xiv} (in mostly murine and rat models) are eleuthero (*wu jia shen*), gastrodia (*tian ma*), pueraria (*ge gen*), ilex root (*mao dong qing*), carthamus (*hong hua*), sophora root (*ku shen*), ganoderma (*ling zhi*), rabdosia (*hong jing tian*), and notoginseng (*san qi*). A separate study looked exclusively at antineuroinflammatory actions of ginkgo leaf (*ying guo ye*).^{xv} There are some excellent formulas that utilize these herbs in treating various neurological conditions.

The three main products we are interested in here are **Eleuthero Tablets** (*Wu Jia Shen Pian*), **Ginkgo Formula** (*Yin Guo Ye Pian*), and **Gastrodia & Uncaria Formula** (*Tian Ma Gou Teng Yin*). All three contain significant amounts of the substances listed above, and all three are indicated for neurological symptoms. Since **Eleuthero Tablets** contain only eleuthero (*wu jia shen*),^{xvi} adding it to any herbal strategy where there is or may be neurological involvement may be beneficial. Eleuthero an antineuroinflammatory herb, a major adaptogen, it invigorates blood, and unblocks the collaterals.

Gastrodia & Uncaria Formula is the first choice when the main symptoms are neurological and fall under the designation of “liver wind.” Vertigo, twitching, tremors, and distending headaches that were triggered by a SARS-CoV-2 infection can be treated effectively with this formula.

Ginkgo Formula (*Yin Guo Ye Wan*) is based on *Jian Nao Wan* (healthy brain) formulas. The chief ingredient is ginkgo leaf (*ying guo ye*), which not only has antineuroinflammatory action, but clears liver fire, sedates liver wind, and protects the lung qi. It is cardioprotective, hepatoprotective, and is used to treat psychiatric disorders and degenerative neurological disorders.^{xvii} The formula contains some adaptogens and more substances that clear heat from the liver. If there seems to be no lingering damp-heat from the acute infection, **Ginkgo Formula** can be used on its own. If there is lingering damp-heat, combine with **Reed & Seed Formula**.

Ling Zhi Lung Formula (*Ling Zhi Fei Pian*) should get an honorable mention here. It was originally designed to treat chronic asthmatic breathing, but it has high percentages of both ganoderma (*ling zhi*) (46%) and sophora root (*ku shen*) (21%), both of which are listed above as proven antineuroinflammatory herbs. It can be very effective to help clear heat from the nervous system when combined with **Eleuthero Tablets**. The combination of **Ling Zhi Lung Formula** and **Eleuthero Tablets** strongly supports the lung-kidney connection while reducing inflammation in the nervous system. You can use it for when it is difficult to take a deep breath (impairment with kidneys grasping lung qi) or when there are neurological symptoms implicating the lungs, such as dysfunction of smell and taste.

Pulmonary Issues Predominating

The main reasons for chronic pulmonary issues in post-COVID syndromes are due to either a) lingering damp-heat or b) damage sustained by the lung tissue. In the first instance, **Reed & Seed Formula** (*San Ren Wei Jing Tang*) can be combined with **Ling Zhi Lung Formula** (*Ling Zhi Fei Pian*). **Reed & Seed Formula** resolves damp-heat in the lungs as well as the middle and lower burners, protects the heart and pericardium, clears heat and toxin from the blood while breaking up blood stasis, and nourishes lung yin, which likely has become damaged from the heat component of the pathogen. **Ling Zhi Lung Formula** supports the lung-kidney connection, relieves wheezing and cough, and clears heat from the nervous system. If there is damage to the lung tissue, the patient will have dyspnea, low O₂ levels, and often frequent headaches. **Lung Defense Formula** was designed specifically for this pattern and can help repair scarred lungs.

Cardiovascular Issues Predominating

The spike protein in SARS-CoV-2 induces hypercoagulation and inflammation.^{xviii} In some patients with PASC, the chief concern is cardiovascular. This includes hypercoagulation, arrhythmia, lingering inflammation of the heart/pericardium, damage from inflammation during the acute phase, dysregulation of blood pressure, and dermatological issues. One of the important herbs to include with this strategy is salvia (*dan shen*).^{xix} This herb invigorates blood and dispels stasis, clears heat in the blood, liver, heart, and pericardium, nourishes blood and calms *shen*. In modern medicine, salvia has been shown to be anti-inflammatory, immunomodulatory, antiviral, cardioprotective, hepatoprotective, and a useful vasodilator.^{xx} Another good option is knotweed (*hu zhang*), which invigorates blood and dispels stasis, cools blood, and opens the collaterals like salvia (*dan shen*). In addition to these actions, knotweed (*hu zhang*) can help free the lungs and eliminate dampness throughout the body. For this reason, it is good to include knotweed (*hu zhang*) in strategies where an external damp-heat pathogen (like SARS-CoV-2) has induced chronic inflammation and coagulation problems.

Salvia Ten Formula (*Dan Shen Jia Si Jun Zi Tang*) with **Reed & Seed Formula** (*San Ren Wei Jing Tang*) is an excellent combination to leach out damp-heat and rectify the blood. **Salvia Ten Formula** has a high percentage of salvia (*dan shen*) as well as other herbs that cool and invigorate blood, reduce inflammation, and calm *shen*.^{xxi} In addition it contains the entire **Six Gentlemen Formula** (*Si Jun Zi Tang*), which is adaptogenic, supports the qi, and helps with the deficiency component of ME. **Reed & Seed Formula** will focus its actions on clearing the damp-heat, but it also contains knotweed (*hu zhang*) and can therefore help rectify the blood.

Baked Licorice Formula (*Zhi Gan Cao Tang*) and **Rehmania Cool Blood Formula** (*Tu Fu Ling Sheng Di Huang Wan*) can be used in combination to break up stasis, cleanse the blood of heat-toxin, and protect the heart. This is also the best combination for dermatological issues that arise from heat in the blood with stasis. **Baked Licorice Formula** is an important formula for restoring a heart that has been de-

pleted or damaged from warm disease. But when there is a lingering pathogen, it should not be used by itself. We therefore suggest adding the blood-cooling, stasis dispersing, and toxin-resolving actions of **Rehmannia Cool Blood Formula**.

Gastrointestinal Issues

The chief chronic gastrointestinal presentations are due to either lingering dampness or chronic gastroenteritis from inflammation.

Shen Ling Bai Zhu San has been used in China since the very beginning of the SARS-CoV-2 outbreak to treat dampness trapped in the gut.^{xxii} It is especially effective for chronic loose stools when the spleen qi has been weakened by dampness. But it is a warming, tonifying formula and is not the best choice if there is lingering damp-heat or any other persistent inflammation. If the loose stools are the main symptom, but heat is combined with the dampness, you can add **Wu Hua Formula** (*Wu Hua Tang*) to the *Shen Ling Bai Zhu San*.

Bupleurum & Cinnamon Formula (*Chai Hu Gui Zhi Tang*) is used for chronic gastritis characterized by distention and oppression in the epigastrium. There may be retching; and the patient may have recurring episodes of alternating warm and cold sensations. **Bupleurum & Cinnamon Formula** is used in Japan to regulate hydrochloric acid in the stomach, whether hyper or hypo.^{xxiii}

Reed & Seed Formula (*San Ren Wei Jing Tang*) will be the best choice, again, if there is lingering damp-heat causing gastroenteritis. Be sure to check the tongue for signs of dampness and heat in any of the three burners. **Reed & Seed Formula** cools stomach fire and nourishes stomach fluids while it dispels dampness from all three burners.

ENDNOTES

ⁱ Office for National Statistics. "The prevalence of Long COVID symptoms and COVID-19 complications." December 2020. <https://www.ons.gov.uk/>

ⁱⁱ Puaschunder JM, "Generation COVID-19 Long-haulers." *Scientia Morality Conference Proceedings*, DOI: 10.5281/zenodo.4762557.

ⁱⁱⁱ Rando HM, Bennet TD, Byrd JB, et al. "Challenges in defining Long COVID: striking differences across literature, electronic health records, and patient-reported information," *MedRxiv* (Med Archive online), 2021. DOI:0.1101/2021.03.20.21253896.

^{iv} Rogers JP, Chesney E, Oliver D, et al. "Psychiatric and neuropsychiatric presentations associated with severe coronavirus infections: a systematic review and meta-analysis with comparison to the COVID-19 pandemic," *The Lancet Psychiatry*, 2020;7(7):611-627.

^v Das KM, Lee EY, Singh R, et al. "Follow-up chest radiographic findings in patients with MERS-CoV after recovery." *Indian Journal of Radiological Imaging*, 2017;27(3)342-349.

^{vi} Lambert N, and Survivor Corps, "COVID-19 'Long-hauler' symptoms survey report," Indiana University School of Medicine, 2020.

^{vii} Yong SJ, "Long COVID or post-COVID-19 syndrome: putative pathophysiology, risk factors, and treatments," *Infectious Diseases*, DOI: 10.1080/23744235.2021.1924397, May 2021.

^{viii} The reason for less focus on pulmonary research for PASC is because it is believed that chronic respiratory issues that develop from this disease are due to persistent low-intensity inflammation and/or damage to the lung tissue, such as scarring. These are areas that have been under research for many years now and do not seem to require a great deal

additional attention, even though they are taken very seriously. In other words, the pulmonary features of Long-haul COVID, though important, are less of a mystery than the neurological and cardiovascular features.

^{ix} Zhang XY, Wang M, Zhou SG, "Advances in clinical research on traditional Chinese medicine treatment of chronic fatigue syndrome," *Evidence-Based Complementary and Alternative Medicine*, (2020) Article ID 4715679, 2020.

^x Ibid.

^{xi} Xu JX, Lazartigues E, "Expression of ACE2 in human neurons supports the neuro-invasive potential of COVID-19/virus." *Cellular and Molecular Neurobiology*, published online on 27 June 2020 at <https://doi.org/10.1007/s10571-020-00915-1>.

^{xii} Ibid.

^{xiii} Rhea EM, Logsdon AF, Hansen KM, Erickson MA, et al. "The S1 protein of SARS-CoV-2 crosses the blood-brain barrier in mice," *Nature Neuroscience*, March 2021 24:368-378.

^{xiv} Su SY, Hsieh CL, "Anti-inflammatory effects of Chinese medicinal herbs on cerebral ischemia," *Chinese Medicine*, 6(26)2011.

^{xv} Gargouri B, Carstensen J, Bhatia HS, Huell M, Dietz GPH, and Fiebich BL, "Anti-neuroinflammatory effects of Ginkgo biloba extract EGB761 in LPS-activated primary microglial cells," *Phytomedicine*, 15(44)45-55, 2018.

^{xvi} Eleuthero Tablets contain eleuthero (*wu jia shen*) plus a maximum of 2.5% binding substance.

^{xvii} For a summary of the action of Ginkgo Formula and its chief ingredient specifically, see the monograph published by Herbal Medicine Press on the Golden Flower Website <https://www.gfcherbs.com/>. Go to "Resources" and then click on the "Published Papers" tab and find "Ginkgo Formula". All the listed actions are cited clearly in the monograph.

^{xviii} There are many studies that implicate the spike protein as initiating hypercoagulation and/or provoking an inflammatory response. For an overview, see Dr. Liji Thomas's paper: "SARS-CoV-2 spike S1 subunit induces hypercoagulability," published in March 2021 online at <https://www.news-medical.net/news/20210310/SARS-CoV-2-spike-S1-subunit-induces-hypercoagulability.aspx>. For a more formal paper, see Grobelaar LM et al, "SARS-CoV-2 spike protein S1 induces fibrinogen resistant to fibrinolysis: implications for microclot formation in COVID-19," *Bioscience Reports*, 27:41(8)2021.

^{xix} The famous herbalist, Stephen Harrod Buhner, writes prolifically about COVID-related issues and continues to post new articles or updated articles on his website (www.stephenharrodbuhner.com). Buhner is a major advocate for the use of salvia (*dan shen*) in the treatment of PASC in general, but for the coagulation and other cardiovascular complications as well. There are a number of studies that support the use of salvia (*dan shen*) in PASC that are easily found in web searches. See, for example, Wang, W, Li, Ss, Xu, Xf, et al. "Danshensu alleviates pseudo-typed SARS-CoV-2 induced mouse acute lung inflammation." *Acta Pharmacologica Sinica* (2021). <https://doi.org/10.1038/s41401-021-00714-4>. Another source is Akalin E, & Ekici M, Alan Z, Ozbir E, & Bucak, Üresin A, et al. "Traditional Chinese medicine practices used in COVID-19 (Sars-cov 2/Coronavirus-19) treatment in clinic and their effects on the cardiovascular system COVID-19," published online by researchgate.net at https://www.researchgate.net/publication/342589130_Traditional_Chinese_medicine_practices_used_in_COVID-19_Sars-cov_2Coronavirus-19_treatment_in_clinic_and_their_effects_on_the_cardiovascular_system_COVID-19_Sars-cov_2Koronavirus-19_tedavisinde_klinik.

^{xx} Ibid.

^{xxi} The additional herbs with these actions are curcuma (*yu jin*), red peony (*chi shao*), and mimosa leaf (*he huan hua*).

^{xxii} See, for example, the English language version of the official Chinese government recommendation for treating COVID that was published in Spring of 2020. Online version can be found at <https://mp.weixin.qq.com/s/nOAmosQ4YqkXHKdJbBE9GA>

^{xxiii} Discussed in *Notes from South Mountain* by Andrew Ellis, Thin Moon Publishing, 2003.