

# ADAPTOGENS

## INTRODUCTION

**Note:** Please refer to the [Passport to Whole Health](#), Chapter 15 on Dietary Supplements for more information about how to determine whether or not a specific supplement is appropriate for a given individual. Supplements are not regulated with the same degree of oversight as medications, and it is important that clinicians keep this in mind. Products vary greatly in terms of accuracy of labeling, presence of adulterants, and the legitimacy of claims made by the manufacturer.

Adaptogens are herbs that support the body's ability to deal with stress—whether that stress is from anxiety, fatigue, trauma, infection, etc. They are used to strengthen the immune system and increase overall vitality. Studies of adaptogens are limited, and many have focused on isolated properties of the herbs rather than the whole plants, which are traditionally used. One theory is that adaptogens work by influencing the hypothalamic-pituitary-adrenal (HPA) axis which orchestrates the stress response and also plays a significant role in immune regulation, digestion, metabolism, and mood. For example, ashwagandha has been found to decrease urinary markers of stress in animal models and rasayana given to rats exposed to chronic stress showed smaller rises in corticosterone and fewer gastric ulcerations. Another theory is that adaptogens have the ability to strengthen the antioxidant status of mitochondria.[1,2]

There are three main qualities an herb must have to be considered an adaptogen:

1. It must be nontoxic at normal doses.
2. It should support the entire body's ability to cope with stress.
3. It should help the body return to a state of homeostasis regardless of how the body has changed in response to stress—i.e., it should temper that which is hyperfunctioning and support that which is hypofunctioning.[2]

The most effective use of specific adaptogens comes with the knowledge of the constitution of the patient, the particular actions of the individual herbs, and how these two interface. Herbal medicine in general is an art and a science. Understanding which parts of the plants are most potent and how they should be harvested to reap their full medicinal value are important aspects of herbalism. Because herbs and supplements are not regulated by the Federal Drug Administration, it can be tricky to find a quality product. Looking for a product that is standardized to the active or marker components can be helpful, as can knowing the actual therapeutic doses used either traditionally or in available research—unfortunately, many products on store shelves contain very low doses of multiple herbs that may not be of benefit. Resources such as the [Natural Medicines Comprehensive Database](#) can provide some of this information. Also, unless the growing and manufacturing processes of a company are well known to the individual or provider, looking for products that have a United States Pharmacopeia (USP) or Good Manufacturing Practice (GMP) seal can help ensure a quality product.

Adaptogens are often the foundation for any herbal medicine recommendation, the thought being to start first with something that can help restore balance and then proceed to work on the individual symptoms/needs. Selection of which adaptogen to use requires knowledge of the patient as an individual as well as an understanding of the properties of the plant. Below are a number of specific adaptogens and a review of their most common uses. The focus is specifically on immune health.

## **SPECIFIC ADAPTOGENS**

### **ASIAN GINSENG (*PANAX GINSENG*) AND AMERICAN GINSENG (*PANAX QUINQUEFOLIUS*)**

Asian and American ginsengs are the prototype adaptogens used to support the function of the immune system and the resilience of the physical body.[3] White ginseng refers to the raw, dried root. Traditionally, red ginseng is made from raw ginseng that is harvested after 6 years of growth, sprayed to wash away soil, steamed to gelatinize the ginseng starch, dried, and then sealed from oxygen. This dried root is used in making an extract, paying attention to the ratio of main roots, lateral roots, and fine roots. Variation in these processes among nontraditional products can grossly change ginsenoside content and resultant products may not have the same effect as those used in Asia for hundreds of years.[4] Ginseng's antiproliferative, anti-inflammatory, and antioxidant effects on the immune system give it potential as an anticancer agent. Some of its compounds can help release nitrous oxide and therefore are used in the treatment of erectile dysfunction.[5]

Asian ginseng has been used for thousands of years in China, Korea, and India for its ability to strengthen the body's natural defenses to cure and protect from illness. The profitability of harvesting wild Asian ginseng resulted in its near extinction by the 1600s. The discovery of American ginseng in the 1700s, therefore, brought rich rewards to those involved in the ginseng trade with Asia. American ginseng was used by several Native American tribes before Europeans discovered it for themselves. Today, the world's supply of Asian ginseng is nearly entirely cultivated, mostly in northeast China and South Korea. American ginseng can be found in rich, rocky, deep-shaded slopes from Quebec to Manitoba and south to northern Florida, Alabama, and Oklahoma as well as in the Cumberland Gap region of the southern Appalachians. Due to overharvesting, it is very rare, and even endangered, in other areas.[6]

The evidence for the use of ginseng for respiratory tract infections is relatively good. When taken daily during cold and flu season, it has been shown to decrease the risk of developing symptoms of an upper respiratory tract infection (URI) and to decrease the duration and severity if a URI develops. It may be more effective at decreasing repeated URIs than for treating an initial cold-season infection. It has been shown to decrease the risk of influenza in institutionalized elderly individuals. Many of these studies used ginseng *in addition* to influenza vaccination.[7,8] Ginseng should not be used as a substitute for influenza vaccination, especially in high-risk individuals. Various *in vitro* and *in vivo* studies have shown that ginsenosides have direct antiviral, antibacterial, and antifungal activity against

a wide range of organisms. They also have been shown to have a significant ability to enhance host immunity and potentially act as vaccine adjuvants.[9-13]

There is some data that Korean red ginseng is unlikely to cause significant herb-drug interaction with drug-metabolizing enzymes or drug transporters, and it can improve cancer-related fatigue and quality of life. However, levels of active components (ginsenosides) in different products and the resultant plasma ginsenoside concentrations in different individuals who take it is not consistent.[14,15] Increased monitoring of laboratory tests such as anticoagulation markers and blood sugars may be prudent in patients who are on chronic anticoagulation, have diabetes, have multiple medical conditions, or take a significant number of different medications.

- **Dose:**

- Extract: Standardized extracts of Asian ginseng should contain 4%-7% ginsenosides 100-200 mg daily.
- Tincture: 1-2 mL, up to 3 times daily.
- Tea: Simmer 3-6 tsp of root for 45 minutes in 3-4 cups water. Strain and cool. Drink 1-3 cups daily.
- Capsules: 500-1000 mg dried, powdered root taken 1-2 times daily.[6]

Ginseng has the potential to raise blood pressure, so this should be monitored. It can also decrease blood glucose levels, so caution is advised in diabetics. Because of its stimulating properties, ginseng can cause some anxiety and insomnia.[6]

### **ELEUTHERO (*ELEUTHEROCOCCUS SENTICOSUS*)**

Eleuthero was formerly known as Siberian ginseng, but this created confusion as it is not in the *Panax* genus. It has been used traditionally to increase vital energy, improve sleep in those bothered by many dreams, improve appetite, and treat lower back and kidney pain, as well as rheumatoid arthritis.[1] Herbalists will often use it as an adaptogen for individuals who work hard, play hard, and barely sleep.[5]

The combination of eleuthero and andrographis (in this case, Kan Jang, prepared by the Swedish Herbal Institute), taken within 72 hours of onset of URI at 400 mg, 3 times daily, significantly decreased symptoms if taken for 4-5 days.[16] Elagen, an oral Eleuthero extract containing 0.3% eleutherosides, at a dose of 400 mg daily has been shown to decrease the frequency, severity, and duration of herpes simplex virus type II infections).[17]

Eleuthero is generally considered safe when used in standard doses (as above). Side effects such as mild drowsiness, anxiety, irritability, melancholy, mastalgia, and uterine bleeding are more likely at higher-than-recommended doses. Use with caution in patients with cardiovascular disease given its potential to cause palpitations, tachycardia, and elevate blood pressure. Avoid long-term use due to potential for inflammation of nerves, especially the sciatic.[16]

## **SCHISANDRA (*SCHISANDRA CHINENSIS*)**

Schisandra is one of the 50 fundamental herbs in Chinese medicine; historically it was thought to protect health and prolong life. It was in the 1960s that it began to be recognized as an adaptogen, based on research out of Russia. It was found to increase physical stamina, provide protection from stress, and protect the liver from a variety of toxins).[6]

Studies on Schisandra have found it is likely beneficial for improving concentration, coordination, and endurance. It also seems to reduce serum glutamic-pyruvic transaminase levels in those with viral or drug-induced hepatitis.[18]

- **Dose:**

- Tincture: 1-2 mL, 3 times per day.
- Tea: Bring 1 cup water to a boil then simmer. Add 1-2 tsp of the dried fruits for 10 minutes. Strain, cool, and drink 1-3 times per day.
- Extract: Refer to manufacturer's dosing. Typically standardized for Schisandrins.

Use Schisandra with caution in diabetics, those with high blood pressure, those sensitive to mildly stimulating herbs, and those on psychiatric medications.[6]

## **ASHWAGANDHA (*WITHANIA SOMNIFERA*)**

The word ashwagandha translates into “sweat of a horse,” presumably because the root, which is the part of the plant used medicinally, is thought to smell like a damp horse.[1] While it is sometimes referred to as Indian ginseng because of its adaptogenic properties, it is not in the *Panax* genus. It has a calming effect, rather than a stimulating effect like American and Asian ginseng. There is some evidence that it can improve anemia in children, not to mention libido and sexual function in adults, and it may have a role in cancer treatment by improving efficacy of radiation and chemotherapy and reducing side effects. Animal studies have shown ashwagandha to slow tumor growth. [6] As an adaptogen, this herb can be helpful for those who are fatigued during the day but have a hard time sleeping at night—i.e., those that are “wired and tired”.[19]

- **Dose:**

- Tea: Simmer 1 tsp of powdered root in 1 cup water for 10 minutes. Strain and drink a third of a cup three times daily.
- Capsule: 1-6 gm per day of dried root, taken in 2-3 divided doses.
- Extract: 500 mg, 2-3 times daily of a standardized extract containing 2.5% anolides.
- Tincture: 2-4 mL, 3 times daily.

Ashwagandha is generally well tolerated but should be used with caution in those on thyroid medication as it can stimulate thyroid hormonal activity. It should not be used in pregnancy. Because of its sedative properties, use with caution in those already on sedating medications.[6]

## **RHODIOLA, GOLDEN ROOT (*RHODIOLA ROSEA*)**

Rhodiola is thought to have been used by Vikings to improve physical strength and endurance. The major therapeutic constituents of rhodiola are salidroside and tyrosol, which have been shown to have adaptogenic, antioxidant, anti-inflammatory, anticancer and immunomodulatory activities. Rhodiola has several targets in the cell response to stress, including neuroendocrine, neurotransmitter receptor and molecular networks. Rhodiola shows promise for helping with symptoms of fatigue, depression, and pain as well as potentially in prevention of cardiovascular, neuronal, liver, and skin disorders.[20-22]

In a small study, it was found to be similarly effective to prescription anxiolytics in the treatment of generalized anxiety disorder. There is evidence that it can improve depressive symptoms of low mood, insomnia, and mood instability. In those with chronic fatigue syndrome, it has been shown to improve fatigue and mental focus and decrease the cortisol response to stress.[6]

- **Dose:**
  - Tea: Steep 1 tsp rhodiola root in 1 cup hot water for 5 minutes. Strain, drink 3 times daily.
  - Tincture: 3-5 mL, twice daily or as directed.
  - Extract: 100-576 mg extract standardized to 3.6% rosavin and 1.6% salidroside.

Use rhodiola with caution in those on antidepressant medications.[6]

## **HOLY BASIL (*OCIMUM SANCTUM, O. GRATISSIMUM*)**

Holy Basil has been described as an uplifting herb for those with mental fog, used by yogis to embrace enlightenment.[5] It is also often used in those with significant fatigue. Limited research has shown effectiveness for anxiety; an extract of 500 mg twice daily after meals for 60 days decreased depression, anxiety, and stress in those with general anxiety disorder. Early studies have shown it to have significant hypoglycemic effects. A preliminary study of a holy basil extract (manufactured by Natural Remedies Pvt. Ltd., India), taken at a dose of 400 mg in the morning and 800 mg at night for six weeks, resulted in improvement in stress-related symptoms including forgetfulness, sexual problems, exhaustion, and sleep disturbances. No side effects have been reported, but preliminary studies in animal models show a possible decrease in sperm count and fertility.[23] A 2017 review of 24 small studies indicate this traditional Indian herb may be beneficial in normalizing blood glucose, blood pressure, and lipid profiles and in dealing with psychological and immunological stress.[24]

## **ASTRAGALUS (*ASTRAGALUS MEMBRANACEUS*)**

In Chinese medicine, astragalus (or *huang qi*) has been traditionally praised for its ability to stimulate the body's protective energy (qi), fight fatigue and prevent disease. As an

adaptogen in Western herbal medicine, it is used to protect the body from physical, mental, and emotional stress by supporting the immune system.[6]

The main therapeutic components of astragalus are polysaccharides, flavonoids, and saponins which account mainly for its immunomodulating, antioxidant/anti-inflammatory, and anticarcinogenic properties, respectively.[25]

Studies have shown that when taken regularly, astragalus can improve white blood cell function, increase antibody levels and levels of interferons (immune system proteins that help fight viral infections and tumors). These impacts can help prevent colds and flu during peak winter months. A fairly large (1,000 patients) Chinese study supports its role in URI prevention.[6] Other studies have shown it to be helpful in decreasing symptoms of allergic rhinitis. Some herbal combinations which have included astragalus have shown it to have some benefit as an adjunctive treatment in those with breast and lung cancer.[26] Astragalus may also play a role in prevention of hepatic fibrosis.[27]

- **Dose:**

- Tea: 3-6 tbsp of dried, chopped root simmered in 2-4 cups water for 10-15 minutes.
- Capsule: 1-3 gm of dried, powdered root daily.
- Tincture: 2-4 mL, 3 times daily.

Astragalus should not be used to treat an acute infection, especially in higher doses. It should be used with caution in those with autoimmune disorders as, theoretically, its immune-stimulating properties could increase disease activity.[6]

### ***CORDYCEPS (CORDYCEPS SINENSIS)***

Although it can now be cultivated in a laboratory, *Cordyceps* is actually a fungal parasite that lives on caterpillars in the high mountains of China. It is sometimes considered an adaptogen due to its immune-boosting properties. Small studies have shown it can be beneficial in cyclosporine and aminoglycoside-induced renal damage, for improving quality of life and cellular immunity following chemotherapy treatment in cancer, and for supporting liver function in those with hepatitis B.[28] A small, double-blind, randomized placebo controlled study of *Cordyceps* found that 1.68g/day of culture extract enhanced natural killer cell cytotoxic activity.[29]

- **Dose:**

- 3 gm daily of fermented *Cordyceps sinensis*.

While its immune-stimulating properties could theoretically increase autoimmune disease activity, there is some preliminary research showing benefit in treating systemic lupus erythematosus.[28]

## **REISHI (*GANODERMA LUCIDUM*)**

Reishi mushroom has been used for immune boosting effects, for treatment of upper respiratory viral infections, and for reducing stress. Anecdotal evidence suggests it may be beneficial for the treatment of post-herpetic neuralgia in those who don't respond to conventional treatment. The dose used was 32-72 gm dry weight daily. A 2016 Cochrane Review found that *Ganoderma lucidum* may help prolong long-term survival in cancer patients as an adjunct to conventional cancer treatment, due to its potential to enhance tumor response and stimulate host immunity.[30] Reishi mushroom is generally considered quite safe. It can occasionally cause dryness of the upper respiratory mucosa, itchiness, stomach upset, and nosebleeds. There are reports of blood stools with prolonged use of 3 to 6 months).[31]

Uses, dosing, safety, and other key information about adaptogens is summarized in below.

## **SUMMARY OF COMMONLY-USED ADAPTOGENS**

### **ASIAN GINSENG (*PANAX GINSENG*) & AMERICAN GINSENG (*PANAX QUINQUEFOLIUS*)**

#### **USES/ACTIONS**

- Immune function support
- Prevention of influenza and recurrent URIs when taken daily during cold and flu season
- Supports resilience of the body to physical stress
- Erectile dysfunction

#### **DOSE**

- Extract: Should contain 4%-7% ginsenosides. 100-200 mg daily,
- Tincture: 1-2 mL, up to 3 x daily
- Tea: Simmer 3-6 tsp of root for 45 minutes in 3-4 cups water. Strain and cool. Drink 1-3 cups daily
- Capsules: 500-1000 mg dried, powdered root taken 1-2 x daily

#### **SAFETY**

- Potential to raise blood pressure
- Can decrease blood glucose levels
- Somewhat stimulating and can cause anxiety and insomnia in some

#### **COMMENTS**

- Prototypic adaptogen

## **ELEUTHERO (*ELEUTHEROCOCCUS SENTICOSUS*)**

### **USES/ACTIONS**

- Decrease symptoms of URI
- Decrease frequency, severity, and duration of herpes simplex virus 2 (HSV2) infections

### **DOSE**

- For URI: Eleuthero and andrographis (Kan Jang, Swedish Herbal Institute) taken within 72 hours of onset of URI at 400 mg, 3 times daily for 4-5 days
- For HSV: Elagen, an oral Eleuthero extract containing 0.3% eleutherosides, at a dose of 400 mg daily

### **SAFETY**

- Generally safe in standard doses
- Mild drowsiness, anxiety, irritability, melancholy, mastalgia, and uterine bleeding at higher-than-normal doses
- Caution in patients with cardiovascular disease, given its potential to cause palpitations, tachycardia, and increases in blood pressure
- Avoid long-term use due to potential for inflammation of nerves, especially the sciatic

### **COMMENTS**

- Formerly known as Siberian ginseng
- Used in those who “work hard, play hard and barely sleep”

## **SCHISANDRA (*SCHISANDRA CHINENSIS*)**

### **USES/ACTIONS**

- Increase physical stamina and provide protection from stress
- Protect liver from a variety of toxins
- Improve concentration, coordination, and endurance
- Reduce serum glutamic-pyruvic transaminase levels in those with viral or drug-induced hepatitis

### **DOSE**

- Tincture: 1-2 mL, 3 times per day
- Tea: Bring 1 cup water to a boil then simmer. Add 1-2 tsp of the dried fruits for 10 minutes. Strain, cool and drink 1-3 times per day.
- Extract: Refer to manufacturer’s dosing; typically standardized for Schisandrins



## SAFETY

- Use with caution in diabetics, those with high blood pressure, those sensitive to mildly stimulating herbs, and those on psychiatric medications

## **ASHWAGANDHA (*WITHANIA SOMNIFERA*)**

### USES/ACTIONS

- Modulate impacts of chronic stress
- Improve libido and sexual function
- May improve efficacy of radiation and chemotherapy and reduce their side effects
- Potential to slow tumor growth

### DOSE

- Tea: Simmer 1 tsp of powdered root in 1 cup water for 10 minutes. Strain and drink 1/3 cup, 3 times daily
- Capsule: 1-6 gm per day of dried root, taken in 2-3 divided doses
- Extract: 500 mg of a standardized extract containing 2.5% anolides, 2-3 times daily
- Tincture: 2-4 mL, 3 times daily

## SAFETY

- Generally well tolerated
- Use with caution in those on thyroid medication as it can stimulate thyroid hormonal activity
- Should not be used in pregnancy
- Due to sedative properties, use with caution in those already on sedating medications

## COMMENTS

- Seems to work well to even-out those that are wired at night but tired during the day
- More calming than ginseng

## **RHODIOLA (*RHODIOLA ROSEA*)**

### USES/ACTIONS

- Improve mental focus and stamina
- Improve depressive symptoms of low mood, insomnia, and mood instability
- Reduce symptoms generalized anxiety disorder
- Decrease the cortisol response to stress

## DOSE

- Tea: Steep 1 tsp rhodiola root in 1 cup hot water for 5 minutes. Strain, and drink 3 times daily.
- Tincture: 3-5 mL twice daily or as directed
- Capsule: 360 mg, 1-2 times daily
- Extract: 100-576 mg extract standardized to 3.6% rosavin and 1.6% salidroside

## SAFETY

- Use with caution in those on antidepressant medications

## COMMENTS

- Thought to have been used by Vikings to improve physical strength and endurance
- More stimulating
- Consider for those with chronic fatigue syndrome

## **HOLY BASIL (*OCIMUM SANCTUM, O. GRATISSIMUM*)**

### USES/ACTIONS

- Help with mental fog, fatigue, anxiety and depression
- Help with stress related symptoms such as forgetfulness, sexual problems, exhaustion, and sleep problems
- Decrease hyperglycemia

## DOSE

- 500 mg twice daily after meals
- Or, 400 mg in the morning and 800 mg at night

## SAFETY

- No side effects have been reported, but preliminary studies in animal models show a possible decrease in sperm count and fertility

## COMMENTS

- Used by Yogis to enhance enlightenment

## **ASTRAGALUS (*ASTRAGALUS MEMBRANACEUS*)**

### USES/ACTIONS

- Protect the body from physical, mental and emotional stress
- Improve white blood cell function, increase antibody levels and levels of interferon
- Prevent colds and flu during peak winter months

- Decrease symptoms of allergic rhinitis

#### DOSE

- Tea: 3-6 tbsp of dried, chopped root simmered in 2-4 cups water for 10-15 minutes
- Capsule: 1-3 gm of dried, powdered root daily
- Tincture: 2-4 mL, 3 times daily

#### SAFETY

- Not to be used in an acute infection, especially in higher doses
- Use with caution in those with autoimmune disorders as, theoretically, its immune-stimulating properties could increase disease activity

#### COMMENTS

- Consider in those who are predisposed to recurrent URIs

### ***CORDYCEPS (CORDYCEPS SINENSIS)***

#### USES/ACTIONS

- Decrease cyclosporine and aminoglycoside-induced renal damage
- Improve quality of life and cellular immunity following chemotherapy treatment in cancer
- Improve liver function in those with hepatitis B

#### DOSE

- 3 gm daily of fermented *Cordyceps sinensis*

#### SAFETY

- Could theoretically increase autoimmune disease activity, but some research shows benefit in treating systemic lupus erythematosus

### ***REISHI (GANODERMA LUCIDUM)***

#### USES/ACTIONS

- Support immune function
- Treat URI
- Reduce stress
- Treat post herpetic neuralgia

#### DOSE

- 32-72 gm dry weight daily

## SAFETY

- Generally considered safe
- Can cause dryness of the upper respiratory mucosa, itchiness, stomach upset and nosebleeds
- Reports of bloody stools with prolonged use of 3-6 months

## RESOURCE LINKS

- [Passport to Whole Health:](https://www.va.gov/WHOLEHEALTHLIBRARY/docs/Passport_to_WholeHealth_FY2020_508.pdf)  
[https://www.va.gov/WHOLEHEALTHLIBRARY/docs/Passport\\_to\\_WholeHealth\\_FY2020\\_508.pdf](https://www.va.gov/WHOLEHEALTHLIBRARY/docs/Passport_to_WholeHealth_FY2020_508.pdf)
- [Natural Medicines Comprehensive Database:](https://naturalmedicines.therapeuticresearch.com/)  
<https://naturalmedicines.therapeuticresearch.com/>

## AUTHOR(S)

“Adaptogens” was written and updated by [Greta Kuphal](#), MD (2014, updated 2020).

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## REFERENCES

- 1 Yarnell E, Abascal K, Rountree R. *Clinical Botanical Medicine*. New Rochelle, NY: Mary Ann Liebert, Inc.; 2009.
- 2 Falk H, Wijk H. Natural activity: an explorative study of the interplay between cage-birds and older people in a Swedish hospital setting. *Int J Older People Nurs*. 2008;3(1):22-28.
- 3 Lee SM, Bae BS, Park HW, et al. Characterization of Korean red ginseng (panax ginseng meyer): history, preparation method, and chemical composition. *J Ginseng Res*. 2015;39(4):384-391.
- 4 Ahuja A, Kim JH, Kim JH, Yi YS, Cho JY. Functional role of ginseng-derived compounds in cancer. *J Ginseng Res*. 2018;42(3):248-254.
- 5 *Herbal Actions: Integrative Medicine Concepts*, LLC.; 2013.
- 6 Johnson RL, Foster S, National Geographic Society. *National Geographic Guide to Medicinal Herbs: The World's Most Effective Healing Plants*. Washington, D.C.: National Geographic; 2012.
- 7 American ginseng. Natural Medicines Comprehensive Database website. <https://naturalmedicines.therapeuticresearch.com/databases/food,-herbs-supplements/professional.aspx?productid=967>. Accessed June 30, 2020.
- 8 Family Practice Notebook. Serum estradiol. 2014; <http://www.fpnotebook.com/Gyn/Lab/SrmEstrdl.htm>.
- 9 Im K, Kim J, Min H. Ginseng, the natural effectual antiviral: protective effects of Korean red ginseng against viral infection. *J Ginseng Res*. 2016;40(4):309-314.

- 10 Kachur K, Suntres ZE. The antimicrobial properties of ginseng and ginseng extracts. *Expert Rev Anti Infect Ther.* 2016;14(1):81-94.
- 11 Kim YR, Yang CS. Protective roles of ginseng against bacterial infection. *Microb Cell.* 2018;5(11):472-481.
- 12 Nguyen NH, Nguyen CT. Pharmacological effects of ginseng on infectious diseases. *Inflammopharmacology.* 2019;27(5):871-883.
- 13 Wang L, Huang Y, Yin G, et al. Antimicrobial activities of Asian ginseng, American ginseng, and notoginseng. *Phytother Res.* 2020;34(6):1226-1236.
- 14 Choi MK, Song IS. Interactions of ginseng with therapeutic drugs. *Arch Pharm Res.* 2019;42(10):862-878.
- 15 So SH, Lee JW, Kim YS, Hyun SH, Han CK. Red ginseng monograph. *J Ginseng Res.* 2018;42(4):549-561.
- 16 Eleuthero. Natural Medicines Comprehensive Database website. <https://naturalmedicines.therapeuticresearch.com/databases/food,-herbs-supplements/professional.aspx?productid=985>. Accessed June 30, 2020.
- 17 Family Practice Notebook. Follicle stimulating hormone. 2014; <http://www.fpnotebook.com/Endo/Lab/FIclStmltngHrmn.htm>.
- 18 Field T. Massage therapy. In: Jonas WB, Levin JS, eds. *Essentials of Complementary and Alternative Medicine*. Baltimore, MD: Lippincott, Williams & Wilkins; 1999.
- 19 Low Dog T. *Healthy at Home: Get Well and Stay Well Without Prescriptions*. Washington, D.C.: National Geographic; 2014.
- 20 Chiang HM, Chen HC, Wu CS, Wu PY, Wen KC. Rhodiola plants: chemistry and biological activity. *J Food Drug Anal.* 2015;23(3):359-369.
- 21 Khanna K, Mishra KP, Ganju L, Singh SB. Golden root: A wholesome treat of immunity. *Biomed Pharmacother.* 2017;87:496-502.
- 22 Amsterdam JD, Panossian AG. Rhodiola rosea L. as a putative botanical antidepressant. *Phytomedicine.* 2016;23(7):770-783.
- 23 Holy Basil. Natural Medicines Comprehensive Database website. <https://naturalmedicines.therapeuticresearch.com/databases/food,-herbs-supplements/professional.aspx?productid=1101>. Accessed June 30, 2020.
- 24 Jamshidi N, Cohen MM. The clinical efficacy and safety of tulsi in humans: a systematic review of the literature. *Evid Based Complement Alternat Med.* 2017;2017:9217567.
- 25 Auyeung KK, Han QB, Ko JK. Astragalus membranaceus: a review of its protection against inflammation and gastrointestinal cancers. *Am J Chin Med.* 2016;44(1):1-22.
- 26 Astragalus. Natural Medicines Comprehensive Database website. <https://naturalmedicines.therapeuticresearch.com/databases/food,-herbs-supplements/professional.aspx?productid=963>. Accessed June 30, 2020.
- 27 Liu YT, Lv WL. Research progress in astragalus membranaceus and its active components on immune responses in liver fibrosis. *Chin J Integr Med.* 2019.
- 28 Finocchiaro C, Segre O, Fadda M, et al. Effect of n-3 fatty acids on patients with advanced lung cancer: a double-blind, placebo-controlled study. *Br J Nutr.* 2012;108(02):327-333.
- 29 Jung SJ, Jung ES, Choi EK, Sin HS, Ha KC, Chae SW. Immunomodulatory effects of a mycelium extract of Cordyceps (*Paecilomyces hepiali*; CBG-CS-2): a randomized and double-blind clinical trial. *BMC Complement Altern Med.* 2019;19(1):77.

- 30 Jin X, Ruiz Beguerie J, Sze DM, Chan GC. Ganoderma lucidum (Reishi mushroom) for cancer treatment. *Cochrane Database Syst Rev*. 2016;4(4):Cd007731.
- 31 Reishi mushroom. Natural Medicines Comprehensive Database website. <https://naturalmedicines.therapeuticresearch.com/databases/food,-herbs-supplements/professional.aspx?productid=905>. Accessed June 30, 2020.