

Herbal Support For A Healthy Cardiovascular System

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ABSTRACT: *The body needs constant nourishment to ensure that the cardiovascular system operates efficiently. However, 60 million Americans suffer from cardiovascular disease (CVD), which includes a wide range of diseases of the heart and blood vessels such as chronic venous insufficiency and high blood pressure. These can lead to potentially life threatening events such as a heart attack and stroke, as well as chronic congestive heart failure. When one part of the cardiovascular system is damaged or injured it affects other parts of the system. Even as the threat of cancer and AIDS is given so much attention by the media and health educators, CVD has remained the leading cause of death in developed nations for many years. Risks of cardiovascular dis-*

ease include uncontrollable factors such as heredity, age, and ethnicity and controllable factors such as tobacco use, diet, high blood pressure, high blood cholesterol, and physical inactivity. Controlling these factors is key to reducing the risk of CVD. Along with implementing a healthy diet and getting plenty of exercise, herbs such as hawthorn, horse chestnut, arjuna bark, guggul resin, coleus root, inula, and butcher's broom may be able to provide positive support to the cardiovascular system. These herbs may help with the prevention of atherosclerosis, lowering blood pressure, reducing angina attacks, increasing capillary integrity, reducing edema, preventing destructive enzyme activity, and lowering LDL cholesterol and triglyceride levels.

For decades, the major causes of death in many developed countries have been diseases of the heart and blood vessels (the venous system), collectively known as cardiovascular disease, or CVD. In the United States, CVD accounts for more deaths than all other diseases combined. Well over one million people die annually, or more than 2,500 daily, from CVD. About 60 million Americans have one or more forms of CVD and the economic drain, in cost of treatment and loss of productivity, approaches 50 billion dollars.^{1,2}

Because the cardiovascular system is very intricate and involves many different factors, when one part of this system is damaged it affects the other parts and unfortunately results in a number of different types of diseases of the heart and blood vessels. Therefore, it is important to nourish the heart and ensure optimal circulation throughout the body. Early signs of circulatory insufficiency can result in serious CVD such as heart failure and chronic venous insufficiency, and can ultimately lead to a heart attack. Although this paper will focus on CVD, it is important to understand that since the blood vessels also supply oxygen and other nutrients to the brain, stomach, large intestines, liver, spleen, and kidneys, these parts of the body can be affected by CVD as well.

• Risk Factors of Cardiovascular Disease

Cardiovascular risk factors are those activities and conditions that may lead to heart disease (Table 1). Efforts to fight CVD have led to the discoveries that smoking, a high-fat diet, high blood pressure, high blood cholesterol, and physical inactivity are its major modifiable risk factors, and contributing risk factors include diabetes, obesity, and stress. Risk factors that are not modifiable include heredity, age, and ethnicity.

Table 1. Risk Factors of Cardiovascular Disease³

Factors You Can Change
Cigarette Smoking —Smokers are twice as likely to have heart attacks. People who are exposed to second-hand smoke also have a greater risk.
High-Fat Diet —Leads to obesity and free radical production, both of which increase your risk of heart disease.
High Blood Pressure —Increases the heart's workload and your risk of suffering a stroke.
High Blood Cholesterol —As your blood cholesterol level increases, so does your risk of heart disease.
Physical Inactivity —Regular aerobic exercise helps keep your heart healthy.
Factors You Can't Change
Heredity —Relatives who die of heart disease before the age of 60 increases your risk. You are also at greater risk if diabetes, high cholesterol, and high blood pressure run in your family.
Age —People age 65 and older account for more than half of heart attack victims.
Ethnicity —All ethnic groups are susceptible to heart disease. However, African-Americans have a greater incidence of high blood pressure, so their risk of heart disease is greater.

• Common Symptoms of Cardiovascular Disease

Progression of CVD varies considerably from patient to patient, but early diagnosis is important for the future health and survival of every person afflicted with problems or diseases of the cardiovascular system. Describing where it hurts, the character of the pain, and other symptoms and signs that go along with pain to a physician or health care practitioner is important in diagnosing the existing problem or problems. Although it is important to pay attention to any changes or discomfort in the body, common symptoms of CVD include chest pain, breathing problems, fatigue, palpitations, leg pain, and fainting.⁴

Decreasing your risk factors, such as incorporating a healthy diet, implementing a good exercise program, and addressing early signs of circulatory insufficiency, can help prevent or delay further damage to the cardiovascular system. The use of herbs such as hawthorn, horse chestnut, arjuna bark, inula root, guggul resin, and butcher's broom have been researched and tested for their positive effects on the cardiovascular system and may be able to provide support.

HERBAL SUPPORT

HAWTHORN

Hawthorn, *Crataegus oxyacantha*, is derived from tall shrubs that are found throughout Europe. Beginning in the Renaissance, the fruits and leaves of hawthorn were considered good remedies for digestive and urinary tract ailments. Only in the late 1800s did European physicians begin experimenting with it clinically for heart disease and cardiovascular disorders,⁵ using only the white-blooming hawthorn for therapeutic purposes.

The main therapeutic constituents that have been isolated from hawthorn are flavonoids and procyanidins. Other constituents include catechins, triterpenoids, aromatic carboxylic acids, amino and purine derivatives, and various other compounds. The flavonoid content of the crude drug is approximately 1% for the leaves and flowers but only about 0.1% for the berries. The content of oligomeric procyanidins in the leaves and flowers is believed to be about 1-3%.

• Hawthorn and Heart Failure

Heart failure is the result of an extended process in which injury to the heart caused by the presence of specific diseases that damage the cardiac and circulatory system results in failure of the left and right ventricles. The heart gradually loses the ability to provide adequate blood flow, and thus oxygen, to the rest of the body. Symptoms of chronic heart failure include swelling, most often in the legs and ankles, and difficulty breathing. Any kind of heart disease can result in heart failure, but the two most common causes of heart failure are coronary artery disease and high blood pressure.

Studies have shown that hawthorn may provide support for heart ailments including chronic heart failure. A meta-analysis of 8 studies comprising 323 patients with heart failure who were

treated over an average of 4 to 8 weeks with extracts from hawthorn leaves and flowers standardized to 18.75% oligomeric procyanidins or 2.2% flavonoids was conducted. The hawthorn extracts were effective over a daily dose range of 160 mg to 900 mg. Patients saw a decrease in clinical symptoms and an improvement in overall well being.⁶

Measuring the Severity of Heart Failure

In accordance with a recommendation of the New York Health Association (NYHA), the severity of heart failure is divided according to the symptoms as a function of the patient's normal physical activities into stage I (no limitation of exercise capacity), II (mild limitation, symptoms only on exercise), III (severe limitation, symptoms even on mild exercise), and IV (symptoms even at rest). The 1994 Commission E monograph on hawthorn leaves and flowers states that the extract is indicated for "declining cardiac performance consistent with stage II failure according to the NYHA."⁷

A double-blind study conducted on 136 patients with NYHA II heart failure saw a change in the difference in the pressure rate product (systolic blood pressure X heart rate/100) between rest and 50 W exercise on a bicycle ergometer. The reduction of pressure rate product under resting conditions is evidence for economization of cardiac work. Patients received either 160 mg of hawthorn flower extract (18.75% procyanidins) or placebo for 8 weeks. During the hawthorn treatment the pressure rate product decreased whereas the placebo treatment led to a slight increase. Since the pressure rate product correlates with myocardial oxygen consumption, these findings suggest greater efficiency of cardiac work and an increase in exercise tolerance in patients consuming the hawthorn flower extract.⁸

• Pharmacological Effects of Hawthorn

Decreasing the Onset and Further Progression of Atherosclerosis

When arteries are healthy, they have strong, flexible walls and a smooth inside lining that allow them to transport blood freely to all parts of the body. But the inner lining of an artery can become laden with fatty substances such as cholesterol, calcium, and other material. This buildup is called atherosclerosis, which eventually leads to a decrease in flow to the heart muscle resulting in heart failure as well as other coronary heart disease. Procyanidins from hawthorn extracts help reduce cholesterol levels and decrease the size of atherosclerotic plaques.⁹ This action may be the result of hawthorn's ability to increase the integrity of the collagen matrix of the vessel walls, making them stronger, which may help prevent the development and further progression of atherosclerotic plaque.

Lowering Blood Pressure

Hypertension appears to aggravate the atherosclerotic process, possibly by weakening the artery walls that are already stiffened and narrowed by plaque. The heart struggles to pump blood and, consequently, blood pressure continues to increase. This increase forces the left ventricle of the heart to increase effort in pumping blood through the system and in time, left ventricular

hypertrophy results and eventually chronic heart failure can develop.⁴ Several studies have confirmed a moderate reduction in blood pressure due to hawthorn extract, which might contribute to reducing the load on the failing heart. One study conducted on 20 patients with heart failure (NYHA II) saw a reduction in the resting systolic and diastolic blood pressure from 136.5/87.5 to 134.0/83.5 mm Hg during treatment with 160 mg/day of hawthorn extract standardized to 18.75% procyanidins for 4 weeks.⁵

Increasing Ejection Fraction

Hypertension is one of the causes leading to a reduced ejection fraction. Ejection fraction is the percentage of blood leaving the heart during each beat; the higher the ejection fraction, the better the heart's ability to pump oxygen-rich blood throughout the body. Controlling blood pressure and increasing the ejection fraction would therefore be beneficial. Weikland et al carried out a detailed study on the action of hawthorn extract standardized to 18.75% procyanidins on left ventricular ejection fraction (LVEF). Seven NYHA II-III heart failure patients with LVEF reduction of 55% were given 240 mg of hawthorn extract daily for 4 weeks. On average, LVEF increased from 29.8% to 40.5%.⁵

Reducing Angina Attacks

Angina begins to appear whenever the load on the heart becomes too great in relation to the coronary blood flow, which is caused by the lack of oxygen as a result of CVD. Angina can occur suddenly when stimulated by emotional stress, eating, exposure to cold, or some combination of these factors. The beneficial effects of hawthorn in the treatment of angina are due to improvement in the blood and oxygen supply of the heart, resulting from dilation of the coronary vessels, as well as improvement of the metabolic processes in the heart.¹⁰

• Dosage and Safety

Most clinical studies use 100-250 mg hawthorn flower extract, standardized to contain 1.8% flavonoids and 20% procyanidins. Long term oral studies and *in vitro* tests have shown no evidence of risks or any other contraindications with the use of hawthorn extract.^{7,11}

HORSE CHESTNUT

Horse chestnut, *Aesculus hippocastanum*, was introduced into northern Europe from the Near East in the 16th century and remains very popular as a therapeutic agent in middle Europe today. Horse chestnut seeds have a long folk history of use in the treatment of varicose veins and hemorrhoids and may be effective in venous insufficiency.⁷

The main active constituents of horse chestnut are a complex mixture of triterpenoid saponin glycosides, designated aescin (or escin). Flavonoids, including quercetin, rutin, and kaempferol, are also present in the seeds.¹²

• Horse Chestnut and Diseases of the Veins

There is evidence that horse chestnut extracts may exert beneficial effects that help nourish and protect the veins through-

out the body. One of the most common diseases of the veins is chronic venous insufficiency, a syndrome resulting from the lack of circulation in the deep veins or perforating veins in the lower extremities.⁷ This condition is common in patients who are immobilized for periods of time, have stasis of blood due to varicosities or congestive heart failure, are pregnant, have trauma to the legs, or have an increased number of red blood cells and various types of malignant diseases.¹ This condition can lead to painful inflammation, edema, and varicose veins and can eventually lead to a blood clot of the deep vein, which can then break off and be carried to a distant part of the circulation, where it lodges in another blood vessel and can lead to serious cardiovascular problems, such as heart attack and stroke.¹³

Horse chestnut may reduce capillary permeability and associated edema and may improve circulation in the veins, possibly preventing or delaying further damage.

• Pharmacological Effects of Horse Chestnut

Increasing Capillary Integrity and Reducing Edema

Capillaries become excessively permeable when any factor, like a blood clot or lysosomal enzymes, destroys the integrity of the capillary wall. Increased permeability facilitates the passage of electrolytes, proteins, and water through the venous walls, thereby producing edema.¹² Lohr et al conducted a study on 74 patients with chronic venous insufficiencies who were prone to lower extremity edema. Leg volumes were measured before and after the provocation of edema. The provocative increase in leg volume fell from 32 mL to 27 mL in the group treated with horse chestnut but rose from 27 mL to 31 mL in the placebo-treated group.⁷

According to Bisler et al, horse chestnut has an inhibitory effect on edema formation via a decrease in transcapillary filtration and thus improves edema-related symptoms in venous disease of the legs. Twenty-two patients with proven chronic venous insufficiency were given a horse chestnut seed extract (600 mg/day providing 50 mg aescin) or a placebo. Three hours after administration, the capillary filtration coefficient actually decreased in the patients given horse chestnut seed extract and increased in patients given the placebo.⁷ Aescin is believed to be able to exert antiinflammatory properties as well as decrease capillary permeability by reducing the number and size of the small pores of the capillary wall, thus restricting water from leaving the capillaries.¹⁴ In addition to aescin, rutin is commonly used to help decrease capillary fragility and restore normal permeability.^{15,16}

Prevention of Destructive Enzymes

Edema prevents adequate diffusion of nutritional materials from the capillaries to the muscle and skin cells so that the muscle becomes painful and weak, leading to varicose veins and hemorrhoids, which elevate levels of destructive lysosomal enzymes that increase the permeability of the capillary wall. Aescins have the ability to reduce lysosomal enzyme activity as much as 30%, apparently by stabilizing the cholesterol containing membranes

of the lysosomes and limiting release of the actual enzymes.¹² In a study conducted by Kreysel et al, high levels of beta glucuronidase, N-acetylglucosaminidase, and arylsulphate were found in 15 patients with varicose veins. After 12 days of treatment with 900 mg/day of horse chestnut extract (150 mg aescin), the enzymes were reduced by 29.1%.¹⁷

Venotonic Activity

Investigators have also demonstrated that aescin has venotonic activity. A venotonic is a substance that improves venous tone by increasing the contractile potential of the elastic fibers in the vein wall. Relaxation of the venous wall contributes greatly to the development of varicose veins and can lead to an imbalance between these factors and not enough oxygen and nutrients being delivered to the necessary organs. In a study conducted on guinea pigs, flavonoids, including rutin, extracted from horse chestnut increased the contractile force of the venous wall.¹⁶ This venotonic activity may be the key factor in the positive effects of horse chestnut in the treatment of varicose veins.^{18,19}

• **Horse Chestnut Seed Extract Compared to Compression Stockings**

The most common therapy for treating the symptoms of chronic venous insufficiency is the use of compression stockings. Extracts of horse chestnut seed standardized for aescin appear to be as effective as compression stockings without the high cost and nuisance. A randomized, partially blinded, placebo-controlled trial, involving 204 patients with chronic venous insufficiency, was conducted to compare the efficacy of compression stockings and oral horse chestnut seed extract in the treatment of grade II chronic venous insufficiency. Patients were assigned to one of three treatment groups: compression stocking therapy, horse chestnut seed extract, or placebo. Lower leg volume of the more severely affected limb decreased on average by 43.8 mL with horse chestnut seed extract and 46.7 mL with compression therapy. It increased by 9.8 mL in the placebo group. The authors concluded that the horse chestnut seed extract and the compression stockings were found to be equivalent, with horse chestnut offering a hassle-free alternative.¹⁹

• **Dosage and Safety**

A typical dosage of horse chestnut is 600 to 700 mg/day standardized to 16% to 21% aescins. There are no known contraindications to the use of horse chestnut extract, although isolated instances of itching, nausea, and stomach discomfort have been reported as side effects.^{7,12}

ADDITIONAL CARDIOVASCULAR PROTECTION FROM AYURVEDIC HERBS

While hawthorn and horse chestnut are well known for their positive effects on the cardiovascular system, additional herbs have been traditionally used for centuries for their cardioprotective effects and for the treatment of various CVD. Many Ayurvedic herbs have been researched for a particular level of standardization of active constituents. However, in multi-herb formulas, these

levels may vary due to the synergistic effect of multiple herbs. The Ayurvedic tradition offers recommendations for the health and revitalization of the heart and vascular system. Specific recommendations for vascular health are offered by the Ayurvedic physician within the framework of a comprehensive program of general balancing, rejuvenation, and preventive care designed for each individual according to their body type and lifestyle.

ARJUNA BARK

Arjuna bark, *Terminalia arjuna*, comes from a tropical woody tree indigenous to India. Arjuna is often used traditionally as a general heart tonic and to ameliorate or prevent chest pain. Over 1,200 years ago, Ayurvedic physicians recommended the use of different preparations of arjuna bark for different types of heart disease. The biological active constituents isolated from arjuna bark include triterpene glycosides (arjunine, arjunetin, arjunosides-I, II, III, IV), a flavone (arjunolone), and tannins.^{20,21}

• **Pharmacological Effects of Arjuna Bark**

Lipid Lowering Effects

Studies show that arjuna bark plays an important role in managing heart disease through its lipid lowering action and hypocholesterolemic effects. These effects help to prevent heart disease that is directly related to disorders in lipid metabolism, hyperlipidemia, and atherosclerosis. In a study conducted by Ram et al, hyperlipidemia was induced in rabbits by administering cholesterol (400 mg/kg body weight). It was observed that chronic feeding of arjuna bark powder at 100 mg/kg or 500 mg/kg body weight for 60 days following cholesterol administration reduced total cholesterol by 72% and 76%, respectively, as compared to 42% in groups fed cholesterol alone. Arjuna bark caused lowering in lipids followed by an increase in high density lipoprotein (HDL) cholesterol as compared with the groups treated with the control diet only.²²

Beneficial Effects on Blood Pressure and Ejection Fraction

Arjuna bark has been shown to have beneficial effects other than lowering cholesterol. A double-blind, placebo-controlled study was performed with arjuna bark extract on 12 patients with chronic congestive heart failure. Each patient received arjuna bark extract (500 mg capsule) at 8-hour intervals for a 2-week period. Arjuna bark administration resulted in many beneficial effects such as a decrease in blood pressure and an increase in ejection fraction.²³

• **Dosage and Safety**

Studies show that arjuna bark is safe and induces long lasting improvement in symptoms and signs related to heart failure and other heart conditions. A significant effective daily dosage is 1500 mg crude extract.²³

GUGUL RESIN

Gugul resin is derived from the mukul myrrh tree, *Commiphora mukul*, a small thorny tree native to Arabia and India. The tree exudes a yellowish gum resin, referred to as "gugulu." This resin is used traditionally by Ayurvedic practitioners for rheumatoid

arthritis and lipid disorders.²⁴

The main active components of gugal resin are two gugalipid compounds. Several clinical studies have confirmed that these gugalsterones have the ability to lower both cholesterol and triglyceride levels and ameliorate conditions associated with the heart and vascular system.^{24,25}

• Pharmacological Effects of Gugal Resin

Cholesterol and Triglyceride-Lowering Effects

Numerous studies in humans and animals have shown that gum gugal (both crude and purified alcohol extract)^{30,31} is effective in lowering total serum cholesterol and plasma triglycerides, and also greatly reduces LDL cholesterol by increasing the uptake of LDL cholesterol from the blood by the liver while at the same time increasing HDL cholesterol. The mechanism of gugalipid's cholesterol lowering action is the herb's ability to increase the liver's metabolism of LDL cholesterol.²⁴ In a placebo-controlled study, 205 patients received 500 mg of gugalipid standardized to 5% gugalsterones 3 times daily or placebo. A significant lowering of serum cholesterol (23.6%) and serum triglycerides (22.6%) was observed in 70%-80% of the patients on the gugalipid, whereas the levels were not significantly changed in the placebo group.²⁵

• Dosage and Safety

For medicinal purposes, 1,500 mg of gugalipid standardized to 2%-5% gugalsterones is regarded as the most beneficial in terms of safety and effectiveness.^{24,25,26}

COLEUS ROOT

Coleus root, *Coleus forskohlii*, is a small, perennial member of the mint family. It grows in the mountains of India, Nepal, Sri Lanka, and Thailand, where it has a long history of use for the treatment of CVD. The radially spread rootstock is the portion of the plant used for medicinal purposes. The primary chemical of interest contained in coleus root is forskolin, which has hypotensive and spasmolytic actions.

• Pharmacological Effects of Coleus Root

Antagonizing the Action of Platelet-Activating Factor

PAF (platelet-activating factor), a phospholipid, plays a central role in many inflammatory and allergic processes, including increasing vascular permeability and smooth muscle contraction, and reducing coronary blood flow. Forskolin has been shown to antagonize the action of PAF by interfering with the binding of PAF to receptor sites on cells. *In vitro* studies show a 30%-40% decrease in PAF binding after treatment of platelets with forskolin prior to PAF binding.²⁷

• Dosage and Safety

The recommended dosage should be based on the level of forskolin. The daily recommended dosage is 50 mg/day of coleus root extract standardized to contain 18% forskolin daily.²⁸ Animal studies on forskolin indicate an extremely low toxicity.

Coleus root preparations should be used with caution by patients on prescription medications, especially antiasthmatics and anti-hypertensives, because forskolin could possibly potentiate the effects of these drugs.²⁸

INULA

Inula racemosa is a plant of the *Compositae* family and grows in hilly regions of India. Many sesquiterpenes, lactones, and alantolactone have been isolated and characterized from the root of this plant.³¹ In the Ayurvedic system of medicine, the root has been described as a medicine for cough, dyspnea, chest pain, and to protect the heart. The root powder has also been reported to have hypoglycemic and hypocholesterolemic activity.^{7,29} Research indicates that inula may help to reduce chest pain (heart pain, angina) and protect the heart.

• Pharmacological Effects of Inula

Hypolipidemic Effects

In a study conducted by Bajpai et al, 15 patients with hyperlipidemia were given 1,000 mg/day of inula in powdered form. At the end of 4 weeks the results showed a significant reduction in free fatty acids, triglycerides, serum cholesterol, and total serum lipids.²⁹

• Dosage and Safety

Studies show that 1,000 mg of inula root per day, standardized to contain 2% alantolactones, is a safe and effective dose.

BUTCHER'S BROOM

Butcher's broom, *Ruscus aculeatus*, has a long history of use in treating venous disorders such as hemorrhoids and varicose veins. The active ingredients in butcher's broom are ruscogenins.¹²

• Pharmacological Effects of Butcher's Broom

Ruscogenins have demonstrated a wide range of pharmacological actions, including antiinflammatory and vasoconstrictor effects.¹⁰ In Europe, butcher's broom extracts are used extensively, both internally and externally, to treat varicose veins and hemorrhoids.

• Dosage and Safety

The typical dose of butcher's broom used in Europe is 300 mg/day of crude extract. Although toxicity has not been reported, much additional work must be carried out before the efficacy of butcher's broom can be established with certainty.^{10,12}

The chemical properties of these herbs help to enrich the diet with support for cardiovascular function in both healthy and compromised individuals. People with a family history of CVD and high cholesterol would benefit greatly by incorporating these herbs into their diet. Along with a healthy diet, relaxation, and exercise, these herbs can offer outstanding heart and vein support.

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