



BOTANICAL INFLUENCES ON METABOLIC SYNDROME

Dr Jillian Stansbury



OUTLINE OF PRESENTATION

- **THE DEADLY QUARTET AND EPIDEMIOLOGY**
 - **NUTRIENTS AND THE RISK OF METABOLIC SYNDROME**
 - **HERBAL THERAPIES FOR METABOLIC SYNDROME**
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THE DEADLY QUARTET

THE RISING TIDE OF DIABETES AND METABOLIC SYNDROME

METABOLIC SYNDROME DEFINITION

- ➡ Metabolic syndrome is a particularly pronounced type of insulin resistance, where insulin levels are significantly elevated, as are blood glucose and lipids, and as the condition progresses, high blood pressure ensue.

Metabolic syndrome Special Report *Metabolic syndrome—a new world-wide definition. A Consensus Statement from the International Diabetes Federation* K. G. M. M. Alberti, P. Zimmet and J. Shaw (Released by the International diabetes federation in 2005)

METABOLIC SYNDROME SYNONYMS

- Metabolic Syndrome is associated with a significantly increased risk for heart disease and damage.
- Metabolic Syndrome is also referred to as:
 - Metabolic Cardiovascular Syndrome
 - Metabolic Syndrome of Obesity
 - Insulin Resistance Syndrome

- The International Diabetes Federation has termed the combination of hypertension, high blood sugar, high cholesterol, and obesity as the **"Deadly Quartet."**
- Like diabetes, it appears that genetic predispositions do exist but that diet and lifestyle are also contributory.

METABOLIC SYNDROME AND OTHER PATHOLOGY RISKS

- Metabolic Syndrome may emerge as early as pre-puberty initiating atherosclerosis leading to coronary heart disease and stroke risk.
- Metabolic Syndrome predisposition to heart disease at an early age, certain cancers, Alzheimer's disease, and dementia.

Physical Activity and Cardiovascular Disease Risk Factors in Children and Adolescents

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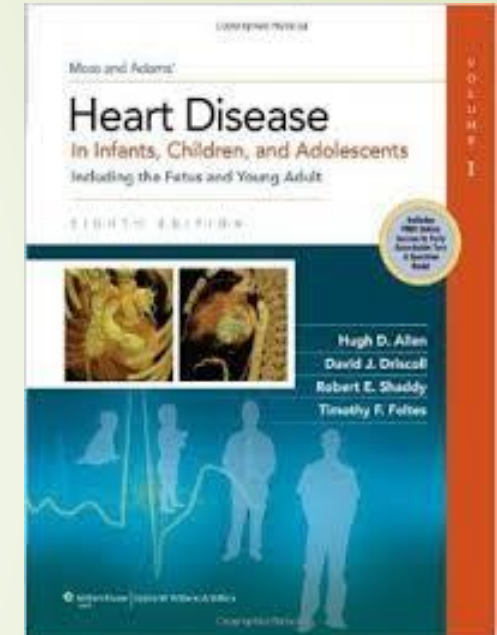
Abstract: Metabolic syndrome (MetS) is the clustering of global metabolic and cardiovascular risk factors. The most frequent MetS risk factors are visceral adiposity, insulin resistance, elevated lipids, and hypertension. These factors are associated with a higher risk of developing CVD in adults and children. A growing body of evidence suggests that the early onset of MetS is associated with a higher risk of CVD in children and adolescents. This review examines the evidence for the association between MetS and CVD in children and adolescents. It also discusses the potential mechanisms underlying this association and the role of physical activity in the prevention and treatment of MetS and CVD in children and adolescents.

Introduction: Metabolic syndrome (MetS) is the clustering of global metabolic and cardiovascular risk factors. The most frequent MetS risk factors are visceral adiposity, insulin resistance, elevated lipids, and hypertension. These factors are associated with a higher risk of developing CVD in adults and children. A growing body of evidence suggests that the early onset of MetS is associated with a higher risk of CVD in children and adolescents. This review examines the evidence for the association between MetS and CVD in children and adolescents. It also discusses the potential mechanisms underlying this association and the role of physical activity in the prevention and treatment of MetS and CVD in children and adolescents.

including visceral adiposity, changes in body fat composition, and insulin resistance, and increased changes in insulin sensitivity. In children, the prevalence of MetS is increasing, and this is associated with a higher risk of CVD in adults. The prevalence of MetS in children is also associated with a higher risk of CVD in adults. This review examines the evidence for the association between MetS and CVD in children and adolescents. It also discusses the potential mechanisms underlying this association and the role of physical activity in the prevention and treatment of MetS and CVD in children and adolescents.

When (2) results showed that "physical inactivity is one of the most important public health problems of the 21st century," it is not surprising that it is also one of the most important risk factors for the development of CVD in children and adolescents. Physical inactivity is associated with a higher risk of CVD in children and adolescents. This review examines the evidence for the association between physical inactivity and CVD in children and adolescents. It also discusses the potential mechanisms underlying this association and the role of physical activity in the prevention and treatment of CVD in children and adolescents.

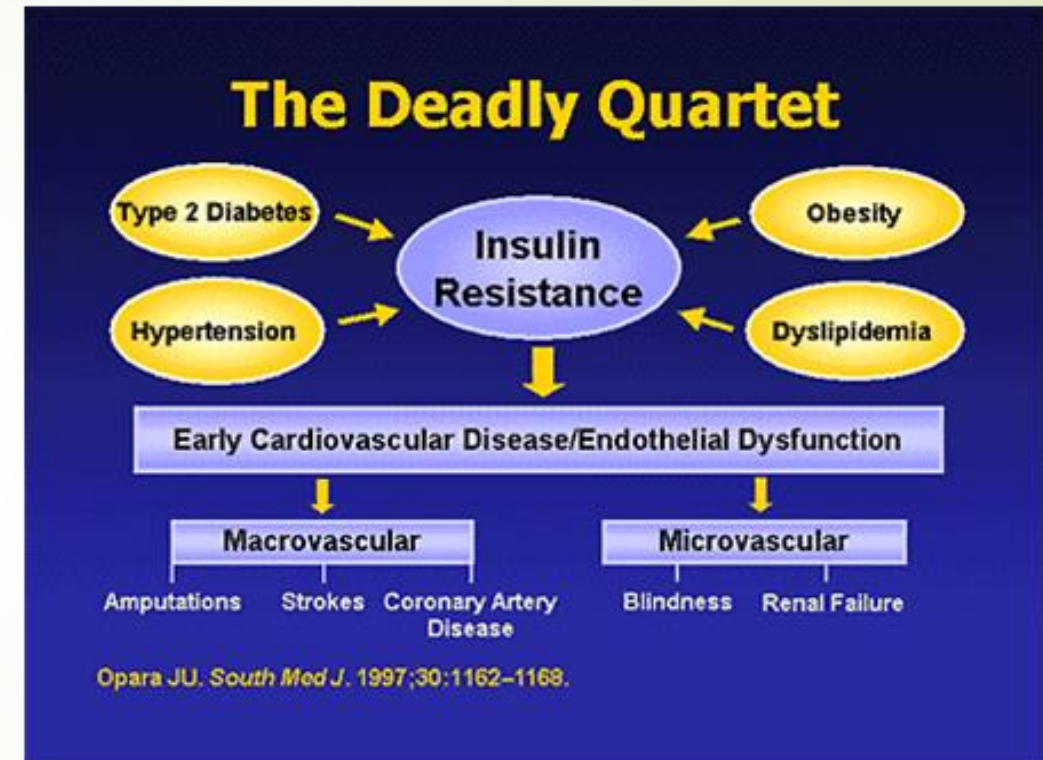
Conclusions: Physical inactivity is one of the most important risk factors for the development of CVD in children and adolescents. This review examines the evidence for the association between physical inactivity and CVD in children and adolescents. It also discusses the potential mechanisms underlying this association and the role of physical activity in the prevention and treatment of CVD in children and adolescents.



Curr Alzheimer Res. 2011 May 23. Metabolic Syndrome, Mild Cognitive Impairment, and Dementia. Panza F, Frisardi V, Seripa D, et al.

THE DEADLY QUARTET

- ➡ High Blood Pressure
- ➡ High Blood Sugar
- ➡ High Cholesterol
- ➡ Obesity



➡ Image from faculty.ksu

DIABETES AND METABOLIC SYNDROME EPIDEMIC

- Metabolic Syndrome and Diabetes are among the significant health challenges of the modern era.
- An article in the *Journal of the American Medical Association* reported that in 1992 22-24% of the United States general population could be diagnosed with Metabolic Syndrome with around 7% of people in their 20s being affected, up through over 40% of people in their 60s being affected.

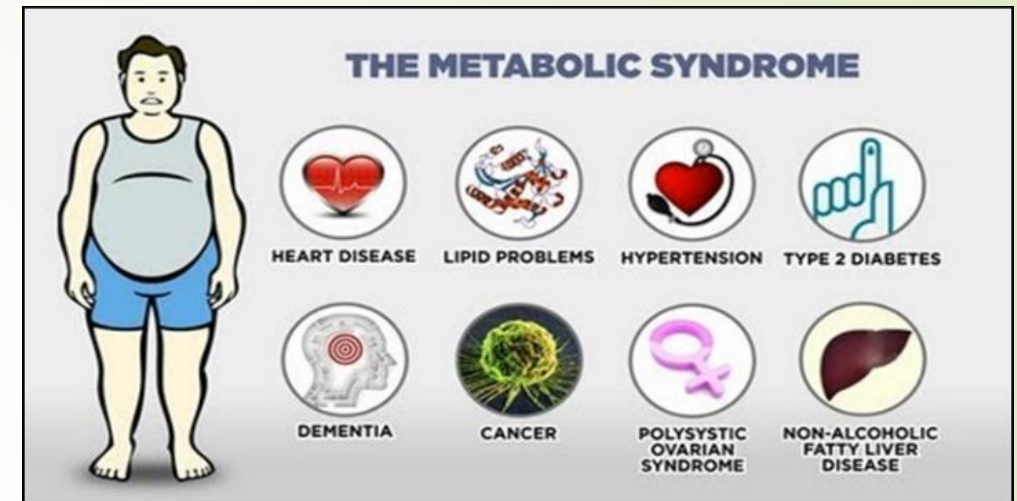


Image from healinghypothyroidism.com

J Clin Endocrinol Metab. 2004 Jun;89(6):2526-39. *Insulin resistance syndrome in children.* Ten S, Maclaren N.

JAMA. 2002 Jan 16;287(3):356-9. *Prevalence of the metabolic syndrome among US adults: findings from the third National Health and Nutrition Examination Survey.* Ford ES, Giles WH, Dietz WH.

METABOLIC SYNDROME DIAGNOSIS AND PREVALENCE

- In the US, men and women are equally affected except in African American and Mexican American populations where women are more affected.
- All in all, this shows that Metabolic Syndrome is extremely prevalent in the US population and increases the older we become.

METABOLIC SYNDROME DIAGNOSTIC CRITERIA

Central Obesity

- * Men – greater than 40 inch waist
- * Women – Greater than 35 inch waist

Fasting TGs – Over 15- mg/dl

HDL Cholesterol

- * Men – less than 40
- * Women – less than 50

Blood Pressure – 130/85 or higher

Fasting Glucose – 110 or higher

Many also calculate BMI – Body Mass Index

METABOLIC SYNDROME AND GENETIC PREDISPOSITION

- There is a strong familial occurrence of Metabolic Syndrome, especially in those from the Indian subcontinent, individuals of African, Hispanic, and American Indian descent.
- The “cause” of Metabolic Syndrome is polygenetic with numerous nutritional and lifestyle contributors.

Lifestyle factors include excessive refined carbohydrate and fat consumption, and lack of exercise.



Image from ijpm.com



METABOLIC SYNDROME ASSOCIATED CONDITIONS

- 
- **Obesity**
 - **Chronic Inflammatory Disorder**
 - **Atherosclerosis**
 - **Fatty Liver**
 - **Blood Clots**
 - **Gout**
 - **Dermatitis**
 - **Ovarian Cysts**
 - **Dementia and Alzheimer's Disease**

SIGNS AND SYMPTOMS OF METABOLIC SYNDROME


- Early and excessive weight gain during childhood, and persistent adult obesity
- Deadly Quartet :
Hypertension, Hyperlipdemia, Insulin Resistance, Hyperglycemia.
- PCOS such as ovarian cysts and infertility.

OTHER ASSOCIATED CONDITIONS:

- Premature puberty
- Allergies
- Male gynecomastia
- Fat accumulation in the liver
- Early and severe development of atherosclerosis



METABOLIC SYNDROME AND INFLAMMATORY DISEASE

- 
- Blood clotting disorders are also associated with Metabolic Syndrome due to general inflammation in the blood and blood cells.
 - Chronic inflammatory disorders such as gout or skin rashes may also occur due to general body-wide increases in inflammatory molecules and processes.
- Chronic inflammation itself is associated with an increased risk of cancer, dementia and numerous chronic inflammatory disorders.
 - Anti-Inflammatory herbs and diets are an important aspect of all protocols for Metabolic Syndrome.

LAB TEST FOR CV DISEASE RISK

Additional labs may be more sensitive measure of assessing the risk heart disease risk than lipid panels alone.

- **Homocysteine**
- **C Reactive Protein** – a measure of vascular inflammation. Normal values are 0.5 to 5.0. Vitamin E may reduce levels when elevated.
- **Fibrinogen** – a measure of inflammation and increased clotting potential. Proteolytic enzymes may reduce elevated levels.

Arch Gynecol Obstet. 2009 Sep 22. High sensitive serum C-reactive protein and its relationship with other cardiovascular risk factors in normoinsulinemic polycystic ovary patients without metabolic syndrome. Verit FF.

Fertil Steril. 2009 Sep 16. Metabolism of triglyceride-rich lipoproteins and lipid transfer to high-density lipoprotein in young obese and normal-weight patients with polycystic ovary syndrome. Rocha MP, Maranhão RC, Seydell TM, et al.

- Those with Met Women are less able to process lipids due to complex metabolic abnormalities, even with normal blood sugar.
- Even moderate lipid elevations can result in severe risks and should be taken very seriously.
- Regular laboratory testing helps assess efficacy of diet, exercise, and medical therapies.

METABOLIC SYNDROME AND DIET

- The typical "Western" diet (i.e. processed carbohydrates and poor quality fried foods) promotes metabolic syndrome.
 - Animal studies show that high fat/high refined carbohydrate diets increase not only blood fats, insulin resistance, but also negatively affect key enzymes involved in cholesterol metabolism.
 - Infant monkeys fed a high fat diet have an increased tendency to become obese.
 - Our diets early in life and even in utero influences affect our metabolism for remainder of our lives.
- **Kidney Int** 2004 Oct 66(4):1503-11
"HMG-CoA reductase, cholesterol 7alpha-hydroxylase, LDL receptor, SR-B1, and ACAT in diet-induced syndrome X." Roberts CK, Liang K, Barnard RJ, Kim CH, Vaziri ND.
 - **Lipids Health Dis.** 2004 Aug 2;3(1):19.
"Increased contractile responses to 5-hydroxytryptamine and Angiotensin II in high fat diet fed rat thoracic aorta." Ghatta S, Ramarao P.
 - **Endocrinology.** 2009 Aug;150(8):3913-20..
Adipose tissue inflammation: developmental ontogeny and consequences of gestational nutrient restriction in offspring. Sharkey D, Symonds ME, Budge H.

HIGH FRUCTOSE AND INSULIN RESISTANCE

- Rats fed a high fructose diet develop insulin resistance and high triglycerides.
- A high intake of concentrated fructose and sweetened fruit juices have been shown to impair glucose tolerance in genetically susceptible individuals, but eating fresh fruit appears free of such consequences.
- Significant damage to the heart and blood vessels occurs when a 10% fructose solution replaces plain water in animal studies.

Foods containing high fructose corn syrup should be banned from the diet.

- **Curr Vasc Pharmacol.** 2004 Oct;2(4):371-7. "Mechanisms of cardiovascular changes in an experimental model of syndrome X and pharmacological intervention on the renin-angiotensin-system." Miatello R, Cruzado M, Risler N.
- **Nutr Metab Cardiovasc Dis.** 2009 Feb;19(2):77-83. Dietary fructose, fruits, fruit juices and glucose tolerance status in Japanese-Brazilians. Sartorelli DS, Franco LJ, Gimeno SG, Ferreira SR, Cardoso MA;



HYPERLIPIDEMIA NATURAL THERAPIES

BOTANICALS FOR IMPROVING BLOOD LIPIDS

DIETARY CHOICES TO HELP LOWER LIPIDS

- Have Hand-outs Ready to Help Patients Eat more Fiber, Fish, Nuts, Veggies.



Top 5 Foods to Lower Cholesterol

Here are the Top 5 foods or food groups that can lower your cholesterol and protect your heart, as suggested by the experts at Mayo Clinic.



- 1 **Oatmeal, oat bran and high-fiber foods**
(5–10 grams/day)



- 2 **Fish and Omega-3 fatty acids**
(2 servings/week)



- 3 **Walnuts, almonds and other nuts**
(1.5 ounces/day)



- 4 **Olive Oil**
(23 grams/day)



- 5 **Foods with added plant sterols or stanols**
(2 grams/day)

Image from cubcast.com

THERAPEUTIC FATS AND OILS TO IMPROVE BLOOD LIPIDS

- Fish oil - ingestion of fish oils and eating fish reduce the risk of heart disease and improve lipoprotein ratios. 5-10 g/day may lower total cholesterol and improve lipid ratios.
- Essential Fatty Acids – The ingestion Alpha linolenic acid and linoleic acid may reduce diastolic blood pressure and increase serum triacylglycerol concentration in hypercholesterolemic subjects.
- Nuts – Walnuts in particular are rich in polyunsaturated fatty acids and may benefit the heart. Some studies have shown walnut oils to have a positive impact on plasma fatty acid and lipoprotein ratios.
- Vegetable Oils – Olive oil, walnut, and Coconut oil may improve lipid levels, while others such as corn oil may challenge healthy lipid ratios in the blood.

Shekelle RB, et al, "Diet, serum cholesterol, and death from coronary heart disease." The Western Electric Study NEJM 1981;304:65

Von Schacky C et al, "The effect of dietary omega-3 fatty acids on coronary atherosclerosis" Ann Intern Med 1999 Apr 6;130(7):554-62

Bemelmans WJ, et al, Am J Clin Nutr 2002 Feb;75(2):221-7

Bemelmans WJ, Muskiet FA, et al, "Association of alpha-linolenic acid and linoleic acid with risk factors for coronary heart disease." Eur J Clin Nutr 2000 Dec;54(12):865-71

Almario RU, et al, "Effects of walnut consumption on plasma fatty acids and lipoproteins in combined hyperlipidemia." Am J Clin Nutr 2001 Jul;74(1):72-9

INGESTION OF FIBER TO IMPROVE BLOOD LIPIDS

- Plant fibers such as oat bran, wheat bran, pectins and vegetable fibers may lower total cholesterol and improve glycemic control.
- Fiber may lower blood lipids by a simple mechanical trapping of some fats within a food bolus, limiting its absorption.

- Fiber optimizes digestive transit time and favors aerobic conditions within the intestines, encouraging the growth of beneficial intestinal microbes, enhancing lipid elimination.



Allium sativum

Garlic

- Garlic improves lipid profiles
- Reduces in blood pressure
- Improves platelet aggregation
- Improves endothelial protection

Garlic lowers cholesterol and triglycerides by inhibiting biosynthesis in the liver, and inhibiting oxidation of LDL.

A dose of 3 cloves, a gram of crude garlic powder, 5 or more Mg of “garlic oil”, 5-10 mg *allicin* show positive results in various clinical trials



Sumiyoshi H, "New pharmacological activities of garlic and its constituents" Nippon Yakurigaku Zasshi 1997 Oct;110 Suppl 1:93P-97P

Allium sativum

Garlic

- Several sulfur containing constituents in garlic bulbs, *allyl propyl disulfide* or *APDS* and *diallyldisulfide oxide* or *allicin*, are believed to contribute many of the medicinal effects.
- Animal models of diabetes show garlic to reduce blood glucose, improve insulin sensitivity, and reduce oxidative stress in animals fed a high fructose diet.

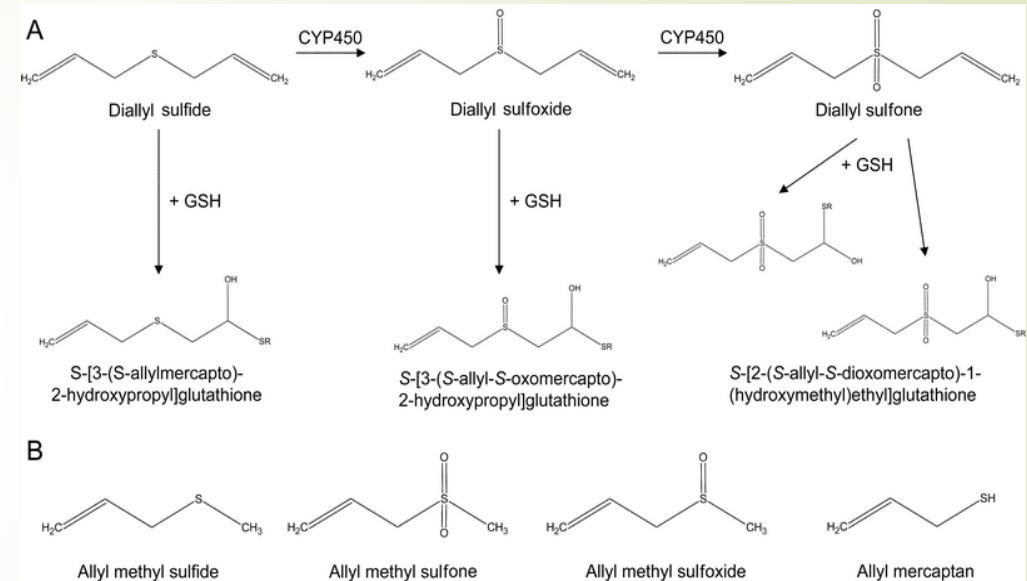


Image from pubs.rsc.org

Nutr Metab (Lond). 2011 Jul 27;8(1):53. *Garlic Improves Insulin Sensitivity and Associated Metabolic Syndromes in Fructose Fed Rats.* Padiya R, Khatua TN, Bagul PK, Kuncha M, Banerjee SK.

Allium sativum

Garlic

Animal studies also suggest that garlic may help protect the heart from the damage that occurs in diabetes.



- **Evid Based Complement Alternat Med.** 2011;2011:950150. *Garlic Oil Alleviates MAPKs- and IL-6-mediated Diabetes-related Cardiac Hypertrophy in STZ-induced DM Rats.* Chang SH, et al
- **Indian J Pharmacol.** 2011 May;43(3):270-4. *Pharmacodynamic interaction study of Allium sativum (garlic) with cilostazol in patients with type II diabetes mellitus.* Mateen AA, et al

GARLIC TO TREAT METABOLIC DISORDERS

- Garlic may reduce the protein glycation and build up in the tissues of AGEs
- Animal studies suggest garlic oil to improve glucose tolerance and ameliorate proteinuria, more so than isolated diallyl disulfide.

Food Chem Toxicol. 2006 Aug;44(8):1377-84. Antidiabetic effect of garlic oil but not diallyl disulfide in rats with streptozotocin-induced diabetes. Liu CT1, Wong PL, Lii CK, Hse H, Sheen LY.

Curr Diabetes Rev. 2012 Mar;8(2):92-108. Natural products as anti-glycation agents: possible therapeutic potential for diabetic complications. Elost A1, Ghous T, Ahmed N.

GARLIC CLINICAL TRIAL ON DIABETIC PATIENTS

- One RCT dosed diabetic patients with either garlic and Metformin or placebo and Metformin to evaluate the effect on serum lipids and glucose.
- Lab values were run at 0, 12 and 24 week.
- Total cholesterol and LDL cholesterol reduced to a greater amount in those taking the garlic, and HDL levels increased, compared to the control.

Pak J Pharm Sci. 2011 Oct;24(4):565-70.
Garlic (Allium sativum) supplementation with standard antidiabetic agent provides better diabetic control in type 2 diabetes patients. Ashraf R1, Khan RA, Ashraf I.



GARLIC AS A MEDICINAL FOOD

- Garlic consumption may slow atherosclerotic plaque formation.
- A pilot study evaluating coronary artery calcification in patients on statin drugs showed adding garlic had incremental benefits compared to statin drugs alone.

J Nutr. 2006 Mar;136(3 Suppl):741S-744S. Aged garlic extract retards progression of coronary artery calcification. Budoff M1.



ONIONS AS A MEDICINAL FOOD

- One RCT evaluated the effects of daily raw red onion consumption compared to a low “liliaceous vegetable diet in women with PCOS.
- Women in the onion group consumed 40-60 grams of raw red onions 2 times per day 8 weeks.
- Body mass index and metabolic parameters (fasting blood sugar, triglycerides, total cholesterol, HDL and LDL were evaluated in the follicular phase of the menstrual cycle at baseline and after 8 weeks.
- Onion consumption significantly decreased total cholesterol



J Obstet Gynaecol Res. 2014 Apr;40(4):1067-76.
Effects of raw red onion consumption on metabolic features in overweight or obese women with polycystic ovary syndrome: a randomized controlled clinical trial. Ebrahimi-Mamaghani M1, et al.

Angelica sinensis

Dong Quai

- Dong Quai is thought to be a “Blood Mover” in TCM.
- *Angelica sinensis* is a vasodilator in part due to *Nicotinic acid* content.
- *Angelica* “moves” the blood via many mechanisms and compound including:
 - *Ferulic acid*
 - *Lugistilide*
 - *Coumarins*

Zhu, David, Dong Quai, Am J Chinese Med



ANGELICA'S ACTIONS

- ▶ These compounds give *Angelica* antihistamine, anticholine, antiserotonin, and platelet anti-aggregation effects.



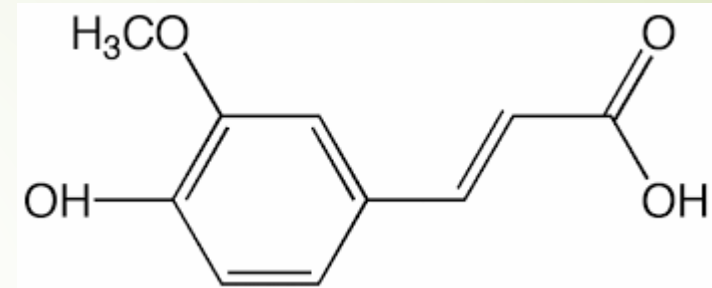
SJ Sjeu, et al, *Analysis and Processing of Chinese Herbal Drugs; VI The Study of Angelica Radix, Planta Medica* , 1987 pg 377-8

- ▶ These compounds also give *Angelica* anti-inflammatory and anti-allergy effects, helping to reduce damage and inflammation to the blood vessels and tissues.

Sung CP, Baker AP, Holden DA et al. *Effects of Angelica polymorpha on reagenic antibody production.* J Natural Products 1982;45:398-406

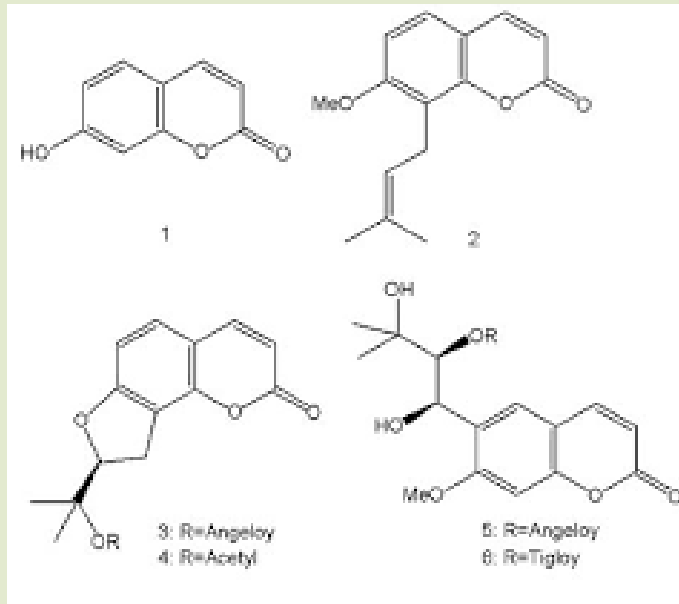
ANGELICA'S FERULIC ACID

- *Ferulic acid* reduces blood cholesterol and triglycerides and improve blood viscosity.
- *Ferulic acid* is antioxidant
- Gamma oryzanol also occurs naturally in plants as esters of ferulic acid.
- Gamma oryzanol metabolizes into *Ferulic acid* in the body
- Rice bran is presently used as a source of gamma oryzanol for therapeutic use.



ANGELICA COUMARINS

► Angelica coumarins inhibit platelet aggregation.



Liu JH, Xu SX, Yao XS, Kobayashi H. "Angelol-type coumarins from *Angelica pubescence* F. biserrata and their inhibitory effect on platelet aggregation." *Phytochemistry* 1995 Jul;39(5):1099-101

A New Coumarin from the Stem of *Angelica dahurica*

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College of Pharmacy and ¹College of Agricultural and Life Science, Kangwon National University, Chuncheon, 200-701, Korea

(Received November 5, 2001)

One new and three known coumarins were isolated from the CHCl_3 soluble fraction of *Angelica dahurica* stem. On the basis of spectral data, the structures of the isolated compounds were determined to be scopoletin, angelol I, angelol H and 6-[(1S), 2(R)-2, 3-dihydroxy-1-methoxy-3-methylbutyl]-7-methoxycoumarin; the latter being isolated for the first time from a plant source.

Key words: *Angelica dahurica*, Umbelliferae, coumarins, 6-[(1S), 2(R)-2, 3-dihydroxy-1-methoxy-3-methylbutyl]-7-methoxycoumarin, NMR

INTRODUCTION

The *Angelica dahurica*(umbelliferae) root has been used Korean traditional medicine as an analgesic (Kim *et al.* 1998). To date, over twenty coumarins have been isolated from this plant (Fujiwara *et al.* 1980; Kim *et al.* 1992; Kwon *et al.* 1997). We were interested in the chemical constituents of *A. dahurica* stem. Repeated column chromatography of the CHCl_3 soluble fraction led to the isolation of four compounds. This paper deals with their isolation and the elucidation of their structure.

MATERIALS AND METHOD

Instruments and reagents

Melting points were determined on a Fisher-Johns melting point apparatus and were uncorrected. Optical rotations were measured with a JASCO DIP-1000 instrument. Nuclear magnetic resonances (^{13}C -NMR and ^1H -NMR spectra taken at 50, 125, 200 and 500MHz) were recorded on a Varian Gemini 200 and Bruker AMX-500 spectrometers using deuterated solvents as the internal standard. The EI/MS (70 eV) and CI/MS (methane) spectra were determined using an Autospec Micromass, UV spectra using a Hitachi U-2000, and IR spectra in a KBr disk using a Bio-Rad FTS-7. TLC work was carried out using plates coated with

silica gel 60 F254 (Merck Co.). All solvents were routinely distilled prior to use. Silica gel column chromatography was performed on Merck silica gel 60 (70-230 mesh and 230-400 mesh). Other reagents were commercial grade without purification.

Plant material

The stem of *A. dahurica* was collected at Mt. Samak, Korea in September 2000 and identified taxonomically with respect to morphology. A voucher specimen of the plant was deposited at the College of Pharmacy, Kangwon National University.

Extraction and isolation

The air-dried stems (1.2 kg) were ground and extracted three times with hot MeOH over a total 4 h period. The resultant extracts were combined and concentrated under reduced pressure to afford 160 g of the residue. This MeOH extract was suspended in 10 volumes of water and then partitioned successively with equal volumes of *n*-hexane, CHCl_3 , and *n*-BuOH, leaving a residual water soluble fraction. Each fraction was evaporated in vacuo to yield the residues of *n*-hexane fraction(fr.), (63 g), CHCl_3 fr., (5.3 g), and *n*-BuOH fr., (12 g).

The CHCl_3 soluble fraction (5.3 g) was column chromatographed on a silica gel (250 g, 70-230 mesh, 15 × 50 cm) using stepwise gradient elution with the solvents benzene-EtOAc (4:1, 2:1, 1:1, v/v) to divide the fraction into four sub-fractions (Fr.1-Fr.4).

Sub-fraction 3 was re-chromatographed on ODS (70 g,

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ANGELICA CLINICAL TRIALS

- A small pilot study investigated the effects of *Angelica* on platelets in UC patients.
- *Angelica* improved thromboxane levels, platelet aggregation, and other measures of platelet reactivity, compared to controls.
- Researchers concluded that *Angelica* significantly inhibit platelet activation, relieved vascular endothelial cell injury, and improved microcirculation.

World J Gastroenterol. 2004 Feb 15;10(4):606-9. *Abnormal function of platelets and role of angelica sinensis in patients with ulcerative colitis.* Dong WG1, Liu SP, Zhu HH, et al.

ANGELICA CLINICAL TRIALS

- ▶ *Angelica* is commonly combined with *Astragalus*, or with *Salvia miltiorrhiza* to treat chronic renal diseases (chronic glomerulonephritis, chronic renal tubulointerstitial disease, hypertensive renal damage).
- ▶ One RCT reported improved renal function from and *Angelica* and *Astragalus* combination in treating advance renal diseases.

Zhongguo Zhong Xi Yi Jie He Za Zhi. 2014 Jul;34(7):780-5. Therapeutic effect of Astragalus and Angelica mixture on the renal function and TCM syndrome factors in treating stage 3 and 4 chronic kidney disease patients. Li S, Yin XX, Su T, Cao C, Li X, Rao XR, Li X.

Hibiscus sabdariffa

- ➔ Hibiscus has been shown to improve lipid profiles in patients with dyslipidemia including total Cholesterol and HDL/LDL levels.

Phytomedicine. 2010 Jun;17(7):500-5. *Effects of Hibiscus sabdariffa extract powder and preventive treatment (diet) on the lipid profiles of patients with metabolic syndrome (MeSy).* Gurrola-Díaz CM1, García-López PM, Sánchez-Enríquez S, et al



Commiphora mukul Guggul

- Guggul is a traditional herb from India used for obesity, inflammation, and sluggish metabolic rate.
- Modern research has shown benefits for lipid metabolism, general metabolic rate, and thyroid function.



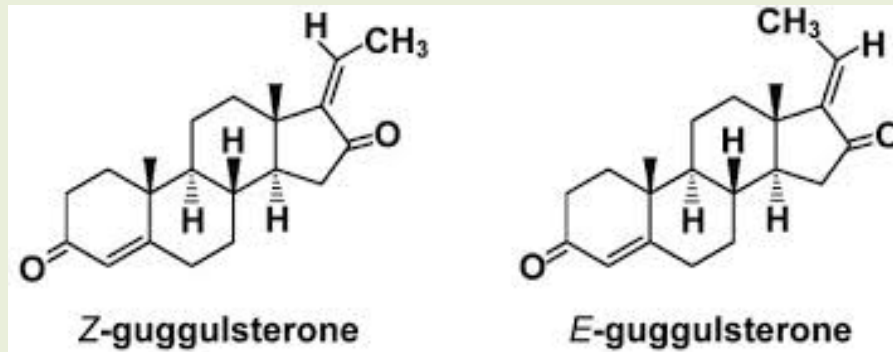
Commiphora mukul Guggul

- Guggul improve blood lipids, including increasing HDL and reducing LDL and VLDL.
- Guggul acts on bile acid receptors promoting hepatic degradation of LDL and may reduce atherosclerotic processes.
- Guggul helps prevent and treat arterial plaques.



COMMIPHORA'S GUGGULSTERONES

- Guggul contains a group of steroidal molecules referred to as guggulsterones.
- Guggulsterones may interfere with lipoprotein synthesis by inhibiting the production of cholesterol in the liver.



- Gupta A, Kapoor K, Nityananda S, "Mechanism of hypolipidemic action of standardized extract", Ind J Pharmacology 1982 14(1):65
- Schauss, A Munson S, "Guggul (Commiphora mukul): Chemistry, Toxicology, and Efficacy of a Hypolipidemic and Hypocholesterolemic Agent" Natural Medicine Journal, Vol 2:5,7-11
- Singh K, Chander R, Kapoor NK, "Guggulsterone, a potent hypolipdemic, prevents oxidation of low density lipoprotein" Phytotherapy Research 1997,11:291-294

COMMIPHORA'S GUGGULSTERONES

Animal studies show guggulsterones to inhibit the development and maturation of fat storing cells, the adipocytes.

Guggulsterones exert direct inhibitory effect on adipocytes by:

- Reducing synthesis of new cells,
- Decreasing fat accumulation in existing cells.
- Increasing apoptotic destruction of fat cells.
- Suppressing adipocyte regulatory proteins.

Food Chem Toxicol. 2009 Oct;47(10):2631-9. *Effects of guggulsterone isolated from Commiphora mukul in high fat diet induced diabetic rats.* Sharma B, Salunke R, Srivastava S, Majumder C, Roy P.

J Med Food. 2009 Aug;12(4):846-53. *Anti-obesity effects of xanthohumol plus guggulsterone in 3T3-L1 adipocytes.* Rayalam S, Yang JY, Della-Fera MA, Park HJ, Ambati S, Baile CA.

GUGGUL CLINICAL TRIALS

Guggulsterones are shown to have the following actions:

- Antagonism of farnesoid x receptor (FXR), a key transcriptional regulator for the maintenance of cholesterol and bile acid homeostasis, contributing to hypolipidemic action.
- Upregulation of the bile salt export pump (BSEP), an efflux transporter responsible for removal of cholesterol metabolites, bile acids from the liver, promoting cholesterol metabolism into bile acids, another hypolipidemic activity.
- Potent inhibition of NF-kappaB activation contributing to the antiinflammatory effect.

Cardiovasc Drug Rev. 2007 Winter;25(4):375-90. *Therapeutic effects of guggul and its constituent guggulsterone: cardiovascular benefits.* Deng R1.

Curcuma longa

Turmeric

- ▶ Turmeric, a relative of ginger and an important ingredient in curry powder, is a powerful antioxidant and anti-inflammatory compound.
- ▶ The yellow pigmented flavonoid *curcumin* is credited with these anti-inflammatory actions, as well as cholesterol-lowering, and liver supportive activities.

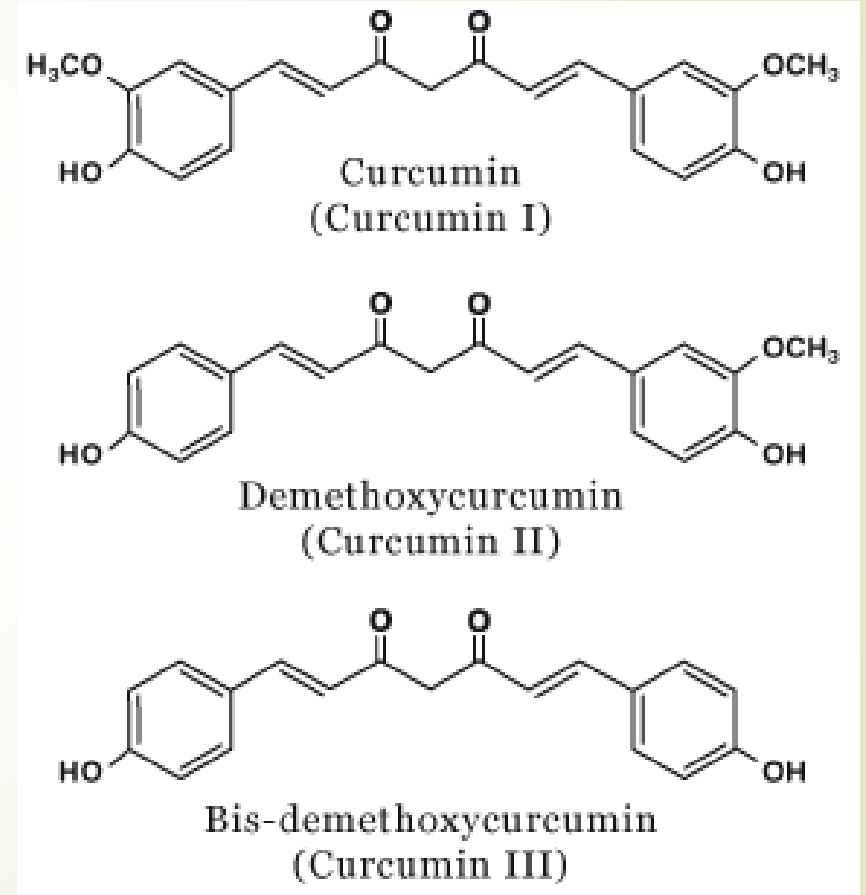


Curcuma longa

Turmeric

Curcumin a flavonoid in Turmeric may improve lipids by several mechanisms:

- Reduces intestinal absorption of cholesterol from the intestines,
- Promotes the transformation of cholesterol into beneficial bile acids
- Promotes, as well as promote biliary excretion of cholesterol.
- Promotes prostaglandin processing enzymes reducing vasoconstrictive and pro-inflammatory thromboxanes
- Promotes synthesis o inflammatory modulating prostacyclins.



Curcuma longa

Turmeric

A review of the last decades' research on Curcumin revealed the following MOA that may benefit diabetics and/or reduce inflammatory burden in obesity and metabolic syndrome:

- Interaction with specific proteins in adipocytes, pancreatic cells, hepatic stellate cells, macrophages, and muscle cells
- Suppression of cellular proteins NF-kB, STAT-3, Wnt/ β -catenin and
- Activates PPAR- γ , Nrf2 cell signaling pathway.
- Downregulation of inflammatory cytokines, resistin and leptin,
- Upregulates adiponectin and associated proteins.

Eur J Nutr. 2011 Apr;50(3):151-61. *New mechanisms and the anti-inflammatory role of curcumin in obesity and obesity-related metabolic diseases.* Shehzad A1, Ha T, Subhan F, Lee YS.

CURCUMA CLINICAL TRIAL ON DIABETIC PATIENTS

- A small study investigated the effects of 6 grams of *Curcuma* on plasma glucose, insulin level, and glycemic index in healthy subjects following GTT.
- The ingestion of 6 g *C. longa* had no significant effect on the glucose response, while postprandial insulin levels were increased.

Nutr J. 2010 Oct 12;9:43. *Effects of Curcuma longa (turmeric) on postprandial plasma glucose and insulin in healthy subjects.* Wickenberg J1, Ingemansson SL, Hlebowicz J.

CURCUMA CLINICAL TRIALS

- A meta-analysis reviewed 6 eligible clinical trials on curcuminoids and reported strong evidence that the flavonoids could significantly reduce circulating levels of C reactive protein.

Phytother Res. 2014 May;28(5):633-42. Are curcuminoids effective C-reactive protein-lowering agents in clinical practice? Evidence from a meta-analysis. Sahebkar A1.

- *Curcuma* has been shown to reduce inflammatory cytokines, particularly interleukins in renal disease patients, reducing inflammation and improving antioxidant capacity.

J Complement Integr Med. 2013 Jul 1;10. The use of an anti-inflammatory supplement in patients with chronic kidney disease. Moreillon JJ1, Bowden RG, Deike E, et al

LEGUMES LOWER LIPIDS

- Soy and other legumes contain Isoflavones known to act as weak estrogen receptor agonists as well as exert mild lipid lowering effects.
- Aim to eat beans at least once a day
- Offer Patients Recipes, including breakfast ideas.

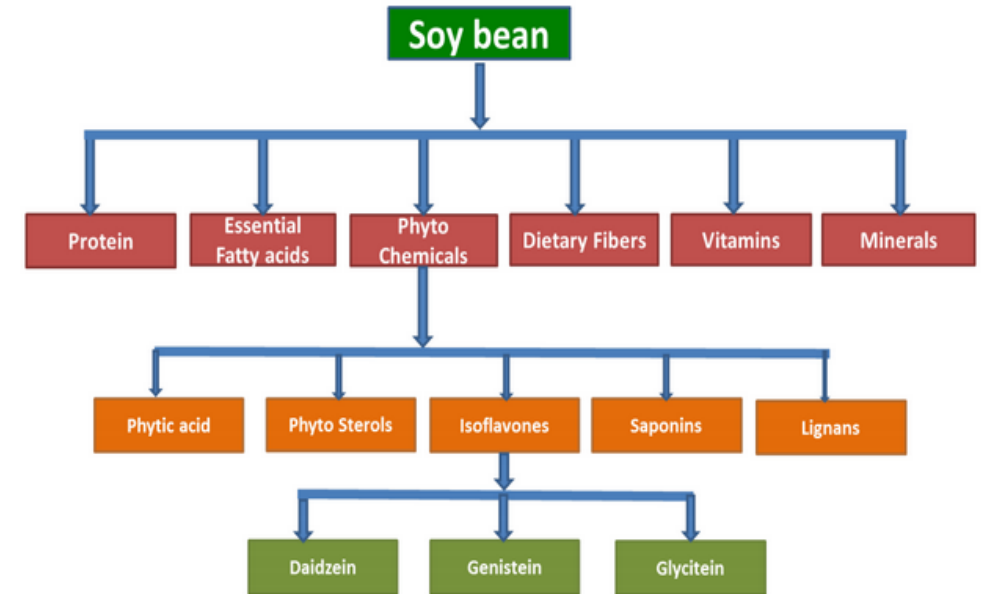


Figure: various phytochemical present in soybean

Image from www.lakshyanatural.com

LEGUME CLINICAL TRIALS

- One RCT investigated the effects of substituting meat for legumes of cardiovascular risk factors in Type 2 diabetics.
- Specific diets were followed for 8 wks, and then subjects were crossed-over to a legume free control diet.
- The Legume-based diet significantly decreased fasting glucose, insulin, TGs, and LDL.

Eur J Clin Nutr. 2014 Oct 29. *Substitution of red meat with legumes in the therapeutic lifestyle change diet based on dietary advice improves cardiometabolic risk factors in overweight type 2 diabetes patients: a cross-over randomized clinical trial.* Hosseinpour-Niazi S1, Mirmiran P2, Hedayati M3, et al

Monascus purpureus

Red Rice Yeast

- *Monascus* is a type of red yeast used in traditional Chinese medicine as early as the Tang Dynasty to promote circulation.
- The traditional preparation fermented rice with this yeast and used the resulting food in the diet.
- Modern investigation has shown *Monascus* to act as a natural HMG-CoA reductase inhibitor.
- HMG-CoA reductase inhibitors deplete CoQ10 so this should be taken in tandem.



CULINARY “BLOOD MOVERS”

- Many common culinary herbs support circulation and reduce the tendency to clot formation.
 - Use as medicines and help patients to work these spices into your daily cooking such that they might have a protective effect against circulatory diseases and risk factors.
-
- Garlic (*Allium sativum*)
 - Onions (*Allium cepa*)
 - Ginger (*Zingiber officinalis*)
 - Cayenne (*Capsicum species*)
 - Cinnamon (*Cinnamomum species*)



Zingiber officinale

Ginger

Ginger has broad anti-inflammatory and immune modulating effects. Ginger can be used in capsules, tinctures, teas, and as a medicinal foods.

Ginger's effect on Lipids include:

- Promoting cholesterol transformation into bile salts
- Promoting biliary excretion of excess cholesterol.
- Improving blood viscosity by reducing platelet aggregation, and
- Reducing inflammatory and oxidative damage to vascular endothelium by reducing thromboxane synthesis and favoring series 2 prostaglandins.



CULINARY BLOOD MOVERS

- Those with metabolic syndrome are at an increased risk of clot formation due to vascular inflammation and hyper-reactivity.
- Botanical agents improve blood viscosity benefitting ischemic disease, poor perfusion, and tendency to clots or thrombi.
- **Garlic, Onions, Ginger, and Cayenne** are all credited with the ability to keep blood fluid and prevent pathologic platelet aggregation



Srivastava, K., 'Effects of aqueous extracts of onion, garlic and ginger on the platelet aggregation and metabolism of arachidonic acid in the blood vascular system: in vitro study, **Prost, Leukotri., Med.**, 1984, 13, pp 227-35.

Bordia, AK et al. 'Effect of garlic oil on fibrinolytic activity in patients with CHD', **Atherosclerosis**, 1977, 28, pp155-9

Baghurst, et al, 'Onions and platelet aggregation, **Lancet**, 1977, i, p 101

LIPOTROPIC AGENTS FOR HYPERLIPIDEMIA

- *Lipotropic* means fat mover and lipotropic agents and refers to agents that assist the liver to move or process lipids.

Traditional categories of herbs that may have a lipotropic effect include:

- Cholagogues
- Alteratives

These herbs make valuable components of an protocol for hyperlipidemia and Metabolic Syndrome

LIPOTROPIC NUTRIENTS

- Choline
- Methionine
- Inositol
- Betaine

Choline deficiency in rats has been shown to impair VLDL synthesis, and since choline is a component of phosphatidylcholine, this is impaired as well. Choline may be synthesized from methionine. Lecithin contains a form of choline.

ALTERATIVES AND CHOLAGOGUES

- *Taraxicum* – Dandelion Roots
- *Arctium* – Burdock
- *Rumex* – Yellow Dock
- *Curcuma* – Turmeric
- *Silybum* – Milk Thistle
- *Cynara* – Blessed Thistle
- *Hydrastis* – Goldenseal
- *Mahonia* – Oregon Grape
- *Chelidonium* – Celendine



Mahonia vulgaris* and *Hydrastis canadensis

Oregon Grape and Goldenseal

- ***Mahonia vulgaris* (formerly *Berberis vulgaris*) and *Hydrastis canadensis* are two alterative and cholagogue herbs**
- **Both of these bitter roots improve digestive and liver function and help process fats and sugars.**
- **Both *Mahonia* and *Hydrastis* contain the isoquinoline alkaloid berberine. Berberine has been shown to improve insulin resistance in human investigations.**



Metabolism. 2010 Feb;59(2):285-92.
Berberine lowers blood glucose in type 2 diabetes mellitus patients through increasing insulin receptor expression. Zhang H et al

Mahonia vulgaris and *Hydrastis canadensis*

Oregon Grape and Goldenseal

- Human clinical trials with insulin resistant diabetics have shown significant reductions in blood glucose, fats, and insulin as evidence of improved insulin response and general metabolism with berberine.
- Researchers in China report berberine to lower blood lipids by numerous complex effects on cellular enzymes, insulin signals inside cells, and other direct effects on adipocytes.



Metabolism. 2008 May;57(5):712-7. Efficacy of berberine in patients with type 2 diabetes mellitus. Yin J, Xing H, Ye J.

Eur J Pharmacol. 2010 Dec 15;649(1-3):390-7. Berberine regulates peroxisome proliferator-activated receptors and positive transcription elongation factor b expression in diabetic adipocytes. Zhou J, Zhou S.

CLINICAL TRIAL ON BERBERINE

- A small RCT evaluated the effect of berberine on insulin sensitivity and secretion in patients with metabolic syndrome.
- Either 500 mg of berberine or placebo were dosed TID ac X 3 months
- Berberine led to remission of metabolic syndrome, a decrease in waist circumference, Systolic BP, triglycerides, total insulin secretion, and improvement in insulin sensitivity.
- **Metab Syndr Relat Disord.** 2013 Oct;11 (5):366-9. *Effect of berberine administration on metabolic syndrome, insulin sensitivity, and insulin secretion.* Pérez-Rubio KG1, González-Ortiz M, Martínez-Abundis E, et al

Silybum marianum

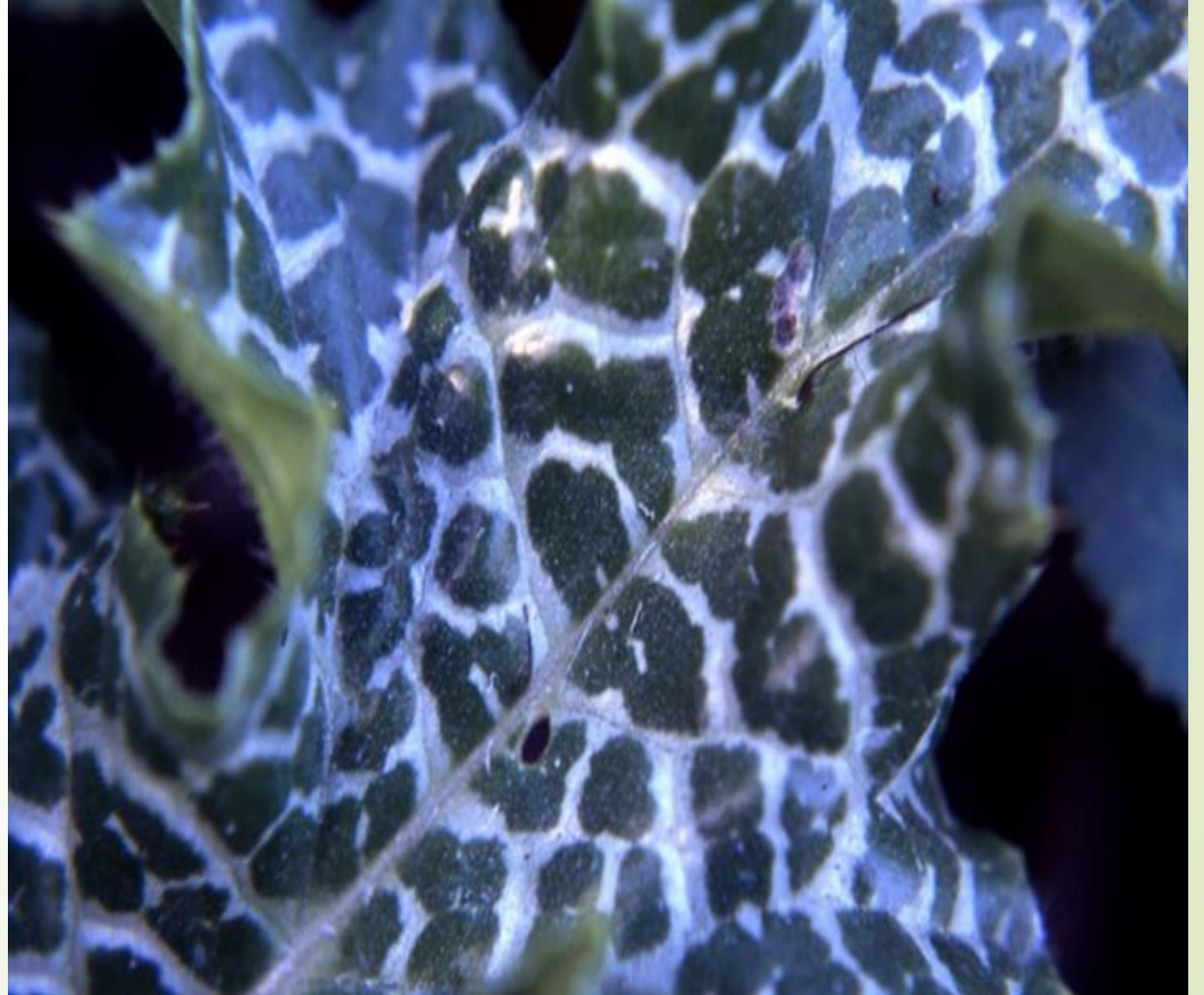
Milk Thistle

- *Silybum marianum*, the Milk Thistle plant reduces hyperlipidemia.
- One placebo controlled double blinded trial used 420 mg of Silymarin, a component of *Silybum* for a duration of 3 months.
- Total Cholesterol and HDL levels were noted to be slightly reduced in those receiving Milk Thistle compared to placebo.



Silybum marianum

Milk Thistle





BOTANICAL THERAPIES FOR HYPERTENSION

**Natural Beta Blockers, Calcium Channel Blockers
and Other Mechanisms**

BOTANICAL THERAPIES FOR HYPERTENSION

- High blood pressure is common in the adult population affecting over 1 in 5 Americans.
- Physical fitness is associated with lower blood pressure.
- Vegetarians generally have less hypertension than non-vegetarians do, and an inadequate consumption of fiber is associated with a greater risk of developing hypertension.

- Murray M, Pizzorna J, Encyclopedia of Natural Medicine, 1990 Prima Pub Rocklin, CA Chapter 48
- Sedgewick AW, Taplin RE, Davidson AH, and Thomas, DW, "*Relationships between physical fitness and risk factors for coronary artery disease in men and women*", Aust N.Z. J Med, 1984, 14, pp 208-14
- Kaplan NM, "Non drug treatment of hypertension" *Annals of Internal Medicine*, 1985, 102, pp 359-73

Allium sativa

Garlic

- Garlic promotes nitric oxide and improves blood viscosity.
- Garlic may improve blood pressure with dosages from 1800mg fresh garlic to 18mg-garlic oil to 900 mg dry garlic powder standardized to 1.3% alliin.
- Some patients may have digestive SA and tolerate “aged” garlic best.

- Ernst E, “Garlic and blood lipids”, **Br Med J**, 1985, 291, pp139
- Rotzch, E, “Postprandial lipidemia under treatment with *Allium sativum*. Controlled double-blind study in healthy volunteers with reduced HDL2-cholesterol levels” **J Arzneim Forsch** 1992 42(10), pp 1223-7

GARLIC CLINICAL TRIALS

- One RCT evaluated the effects of garlic at various dosages on BP in hypertension patients, compare to both atenolol and placebo.
- Garlic reduced BP in both a dose and duration manner compared to placebo, and similar to atenolol at the higher dosage range of 1200 and 1500 mg/day.

Pak J Pharm Sci. 2013 Sep;26(5):859-63. *Effects of Allium sativum (garlic) on systolic and diastolic blood pressure in patients with essential hypertension.* Ashraf R1, Khan RA, Ashraf I, et al.



CRATAEGUS OXYCANTHA, MONOGYNA

Hawthorne Berry

- Hawthorn is in the Rose Family and like rose hips, apples, cherries, plums and other fruits of the same family, bears fruits that are high in flavonoids with many antioxidant and anti-inflammatory effects.
- Proanthocyanidins in Hawthorn berries have been the subject of much research.



Crataegus PCOs

- **Procyanidolic oligomers (PCO) or “pycnogenol”** are small dimers of *epicatechin*, a tannin derivative.
- PCOs are also extracted from grape seeds and pine bark, hazel leaves, and lime flower bracts.
- PCOs are flavonoids that stabilize capillaries when taken at a dosage of 150 to 300 mg per day, and serve to reduce vascular permeability and fragility.

Murray, M, Nutritional influences on Illness, 1994, third line press, Tarzana, CA pp 279



Hawthorn - *Crataegus* PCOs

- *Crataegus* products are standardized to 10-28% PCO content, and/or 1.8% vitexin-4-rhamnoside.
- Hawthorne's PCOs have a positive inotropic action, promote diuresis but do not deplete minerals, and normalize blood pressure.
- Hawthorne enhances myocardial contractility, yet coronary arteries are dilated rather than contracted.

Rewerski VW et al Some pharmacologic properties of oligomeric procyanidin isolated from hawthorne (*Crataegus oxyacantha*) **Arzneim Forsch**, 17:490-1, 1967

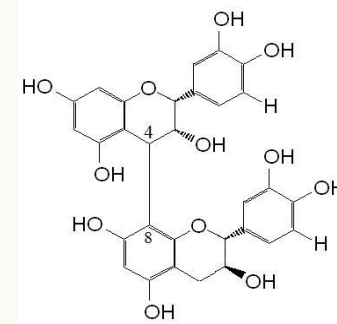


Hawthorn - *Crataegus* PCOs

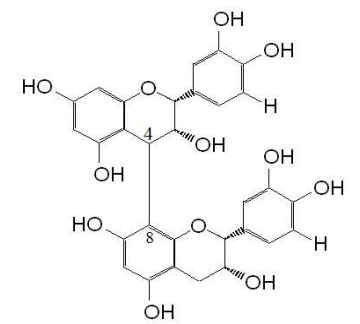
- *Crataegus* PCOs have a stabilizing effect on capillaries serving to reduce vascular permeability and fragility.
- *Crataegus* may be included in formulas for both hyper- and hypotension, elevated cholesterol levels angina pectoris, and atherosclerosis.
- Clinical trials using Hawthorne extracts in-patients with CHF showing significant improvements in symptoms and heart function.

Petkov, V., 'Plants with hypotensive, antiatheromatous and coronary dilating action', *A. J. Chinese Med.*, 1979,7,pp 197-236

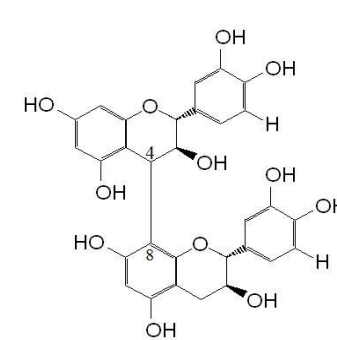
Leuchtgens H, "Crataegus special extract WS 1442 in NYHA II heart failure: A placebo controlled randomized double-blind study," *Fortschr Med* 111 (1993): 352-4



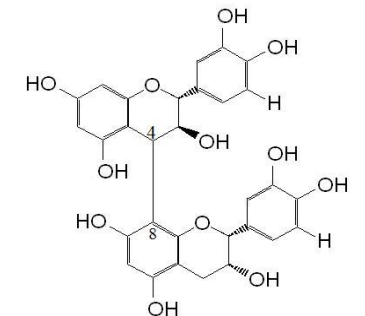
Procyanidin B1:
(epicatechin-(4 β →8)-catechin dimer)



Procyanidin B2:
(epicatechin-(4 β →8)-epicatechin dimer)



Procyanidin B3:
(catechin-(4 α →8)-catechin dimer)



Procyanidin B4:
(catechin-(4 α →8)-epicatechin dimer)

ADDITIONAL PCO MECHANISMS

- Hawthorne PCOs have ACE inhibiting effects.
- Hawthorn is a natural Calcium Channel Blocker due to Phosphodiesterase Inhibition.

Uchida S, Ikari N, Ohtaa H et al, "Inhibitory effects of condensed tannins on angiotensin converting enzyme" Jap **J Pharmacol**, 43:242-5, 1987

METHYL XANTHINES ALSO INHIBIT PHOSPHODIESTERASE

Methyl Xanthines

- Naturally occurring Methyl Xanthine alkaloids are Caffeine, Theophylline and Theobromine
- Mechanism of action:
 - Inhibition of phosphodiesterase (PDE) → increased cAMP → Bronchodilatation, cardiac stimulation, vasodilation
 - Blockade of adenosine receptors → relaxes smooth muscles
 - Release of Ca^{2+} from sarcoplasmic reticulum, especially in skeletal and cardiac muscle (only at higher concentrations)
- E.g: Theophylline, Aminophylline, Choline theophyllinate, Hydroxyethyl theophylline, Doxophylline

Image from slideshare.com

HAWTHORN CLINICAL TRIALS

- One RCT investigated the effects of hawthorn for hypertension in patients with type 2 diabetes taking prescribed drugs.
- No herb-drug interaction was found and minor health complaints were reduced from baseline in both groups.

Br J Gen Pract. 2006 Jun;56(527):437-43. Hypotensive effects of hawthorn for patients with diabetes taking prescription drugs: a randomised controlled trial. Walker AF1, Marakis G, Simpson E, et al.



Gingko biloba

The Maidenhair Tree

- *Gingko* is a traditional medicine for heart Dz, Allergies, Asthma , and Inflammation.
- *Gingko* leaves have vasodilating effects, reducing blood pressure, and enhancing peripheral, coronary, and cerebral perfusion.
- *Gingko* flavonoids are antioxidant, reduce lipid peroxidation, and free radical damage.



Hindmarch, I. and Subhan, Z., 'The psychopharmacological effects of *Gingko biloba* extract in normal healthy volunteers', *Int. J. Clin. Pharmacol. Res.*, 1984, 4, pp. 89-93.

Ginkgo Flavonoids

- *Ginkgo* contains physiologically active flavonoids called heterosides.
- *Ginkgo* products are often standardized to 24% flavonoids also known as *heterosides*.

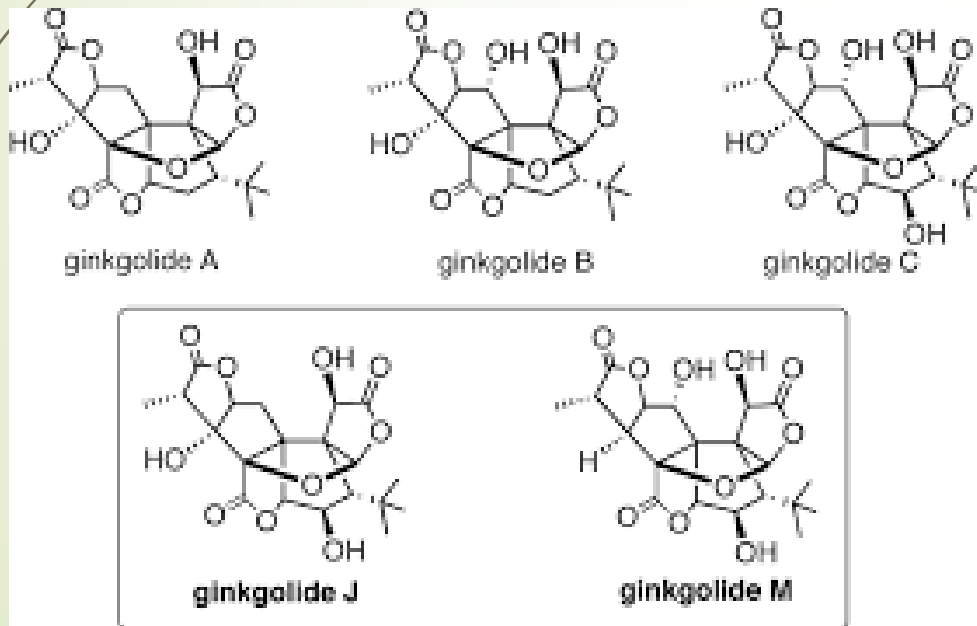


GINGKO FLAVONOIDS INCLUDE:

- Heterosides
- Quercitin
- Kaemferol
- Isorhamnetin
- Proanthocyanindins (Cyanidin, Delphinidin)
- Carotenoids (Zeaxanthin, Lutein)

Ginkgo Terpenes

- Terpene constituents in *Ginkgo* include the *ginkgolides*, a group of bitter *diterpenes* unique to *Ginkgo* and numerous other *sesquiterpenes*.



Ginkgo Clinical Trials

- As early as the 1970s, clinical research reported *Ginkgo* to be useful in cases of arterial insufficiency, intermittent claudication, ischemic heart disease, and other cases of tissue hypoxia.

JAMA, 1975, 231; 1162

Kleijen J, Knipschild P. "Ginkgo biloba" **Lancet** 1992, 340, pp 1136-9



Ginkgo biloba

Ginkgo is a plant helpful for supporting circulation

- to the brain,
- to the extremities,
- to the microcirculatory blood vessels,
- and to the heart muscle itself.

- **Neuroradiology.** 2011 Mar;53(3):185-91. *Effects of Ginkgo biloba on cerebral blood flow assessed by quantitative MR perfusion imaging: a pilot study.* Mashayekh A, Pham DL, Yousem DM, Dizon M, Barker PB, Lin DD
- **Arzneimittelforschung.** 1992 Apr;42(4):428-36. *Ginkgo biloba extract in peripheral arterial diseases. Meta-analysis of controlled clinical studies.* Schneider B.
- **Arzneimittelforschung.** 1990 May;40(5):589-93. *Effect of Ginkgo biloba on fluidity of blood and peripheral microcirculation in volunteers.* Jung F, Mrowietz C, Kiesewetter H, Wenzel E.
- **Phytother Res.** 2008 Jun;22(6):734-9. *Ginkgo biloba extract improves coronary artery circulation in patients with coronary artery disease: contribution of plasma nitric oxide and endothelin-1.* Wu YZ, Li SQ, Zu XG, Du J, Wang FF.
- **Phytomedicine.** 2008 Mar;15(3):164-9. *Ginkgo biloba extract improves coronary blood flow in healthy elderly adults: role of endothelium-dependent vasodilation.* Wu Y, Li S, Cui W, Zu X, Du J, Wang F.

BOTANICAL BETA-BLOCKERS

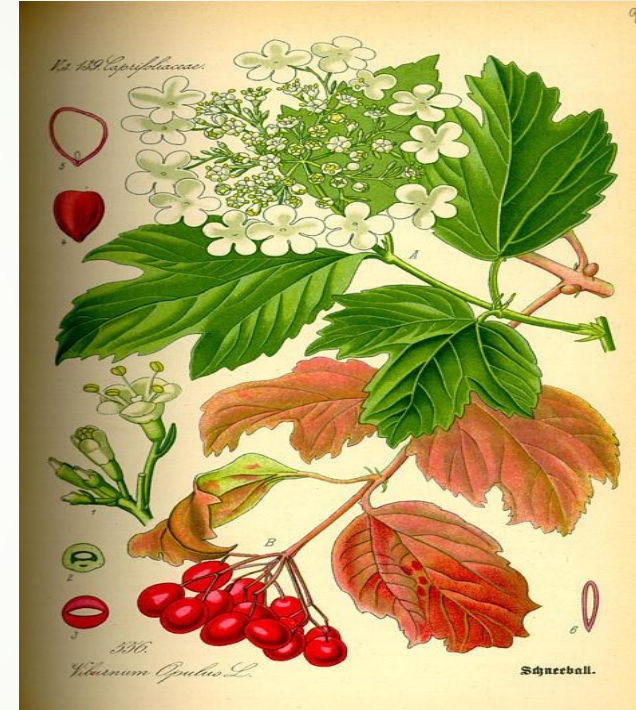
- Beta receptors promote stimulation of the heart, vasculature, and uterus, thus many classic botanical uterine antispasmodics are also vasodilators.
- Botanicals that Antagonize Beta Adrenergic Receptors Include:
 - *Leonurus cardiaca*
 - *Tilia europea*
 - *Viburnum opulus*
 - *Lobelia inflata*



Viburnum opulus

Crampbark

- Crampbark is primarily a B2 antagonist, with action primarily on the uterus.
- Crampbark is also relaxing to the bronchi, intestines, skeletal muscle, and vasculature to a lesser degree.
- The smooth muscle relaxing activity of *Viburnum* provides a hypotensive effect when included in herbal formula.



Nicholson JA, Darby TD, Jarboe, CH
Viopudial, a hypotensive and
smooth muscle antispasmodic from
Viburnum opuluss 36479, Proc Soc
Exp Biol Med 1972;140(2):457-461

Leonurus cardiaca

Motherwort

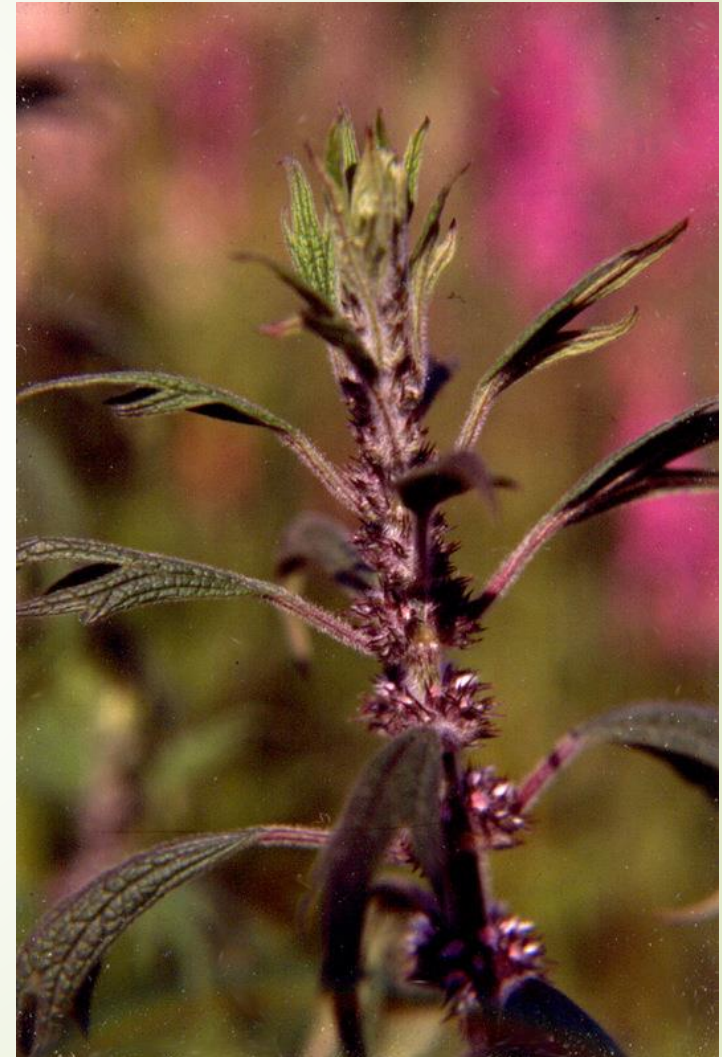
- *Leonurus cardiac* is a Mint Family plant traditionally for nervous heart conditions and digestive disorders, bronchial asthma, climacteric symptoms, and ammenorrhoea, as well as externally in wounds and skin inflammations.
- *Leonurus* has mild negative chronotropic, hypotonic and sedative effects
- *Leonurus cardiaca* has demonstrated many activities that reduce CV risk factors including antioxidant, anticoagulant, and anti-apoptotic effects in vascular cells.

Leonurus cardiaca

Motherwort

- *Leonurus* is a natural beta blocker with an affinity for the uterus and vasculature.
- *Leonurus* has a hypotensive effect.
- In the folkloric literature, *Leonurus* is specific for pelvic pain with concomitant heart palpitations, anxiety attacks, and stress.

Isaev L, Bojadzieva M. *Obtaining Galenic and neogalenic preparations and experiments on the isolation of active substances from Leonurus cardiaca.* Nauchni Tr Visshiya Med Inst Sofiya 1960;37(5):145-52



Leonurus cardiaca

Motherwort

LEONURUS FLAVONOIDS INCLUDE:

- Chlorogenic acid
- Orientin
- Quercetin
- Hyperoside
- Rutin

LEONURUS ALSO CONTAINS:

- Terpenes:
monoterpenes,
diterpenes, triterpenes
- Phenylpropanoids
- Phenolic acids
- Volatile
- Sterols
- Tannins

Leonurus cardiaca

Motherwort

- *Leonurus* injections improve blood viscosity by decreasing platelet aggregation, fibrinogen content, and erythrocyte deformation.

American Journal of Chinese Med.
Vol XVII Nos.1-2 1989, pp65-70.



HJÄRTSTILLA, LEONURUS CARDIACA L.

Leonurus cardiaca

Motherwort

MODERN RESEARCH SHOWS MECHANISMS INVOLVING:

- Down-regulation of TNF- α , IL-1, IL-6, IL-8, KIM-1 expression and by the
- Inhibition of the phosphorylation of I κ B α and p65 translocalization. These results suggest that LEO may **Suppression of NF- κ B activation**
- Inhibition of pro-inflammatory cytokine production

- *L. cardiaca* can significantly reduce phosphorylation activities involved with mitochondrial oxidative respiratory chains generated by free radicals.
- *Leonurus* may offer cardioprotection via this and other mechanisms.

Planta Med. 2014 May;80(7):525-32. The effect of *Leonurus cardiaca* herb extract and some of its flavonoids on mitochondrial oxidative phosphorylation in the heart. Bernatoniene J1, Kopustinskiene DM1, Jakstas et al.

Leonurus cardiaca

Motherwort

- Animal studies suggest protective effects on the renal vasculature.



Fitoterapia. 2014 Sep;97:148-55.
Leonurine ameliorates LPS-induced acute kidney injury via suppressing ROS-mediated NF-κB signaling pathway. Xu D1 et al

- One pilot study evaluated the effects groups. of *Leonurus* on patients with hypertension associated with anxiety and sleep disorder.
- After one month on 1200 mg/day, a significant improvement in the symptoms of anxiety and depression was observed in 32% of patients, a moderate improvement in 48% and a weak effect in 8%; 12% of patients did not respond to therapy.
- Side effects were minimal.

Phytother Res. 2011 Apr;25(4):540-3. *Effect of Leonurus cardiaca oil extract in patients with arterial hypertension accompanied by anxiety and sleep disorders.* Shikov AN1, Pozharitskaya ON, Makarov VG, et al

Leonurus cardiaca

Motherwort

- **Leonurus** may deter endocarditis due to inhibition of bacterial adherence and biofilm formation.

Acta Biochim Pol. 2014;61(2):385-8. *Leonurus cardiaca* L. herb--a derived extract and an ursolic acid as the factors affecting the adhesion capacity of *Staphylococcus aureus* in the context of infective endocarditis. Micota B1, Sadowska B1, Podsędek A2, et al.



Leonurus cardiaca

Motherwort Clinical Trial

- One pilot study evaluated the effects of *Leonurus* on patients with hypertension associated with anxiety and sleep disorder.
- After one month on 1200 mg/day, a significant improvement in the symptoms of anxiety and depression was observed in 32% of patients, a moderate improvement in 48% and a weak effect in 8%; 12% of patients did not respond to therapy.
- Side effects were minimal in all groups.

Phytother Res. 2011 Apr;25(4):540-3. Effect of *Leonurus cardiaca* oil extract in patients with arterial hypertension accompanied by anxiety and sleep disorders. Shikov AN1, Pozharitskaya ON, Makarov VG, et al

Lobelia inflata

- Lobelia is vasorelaxing via B Adrenergic blockade.
- Lobelia is a traditional remedy for cough, asthma, hypertension, angina, and tachycardia.



BOTANICAL CALCIUM CHANNEL BLOCKERS

Botanicals that may affect Calcium Channels on cardiac muscle include:

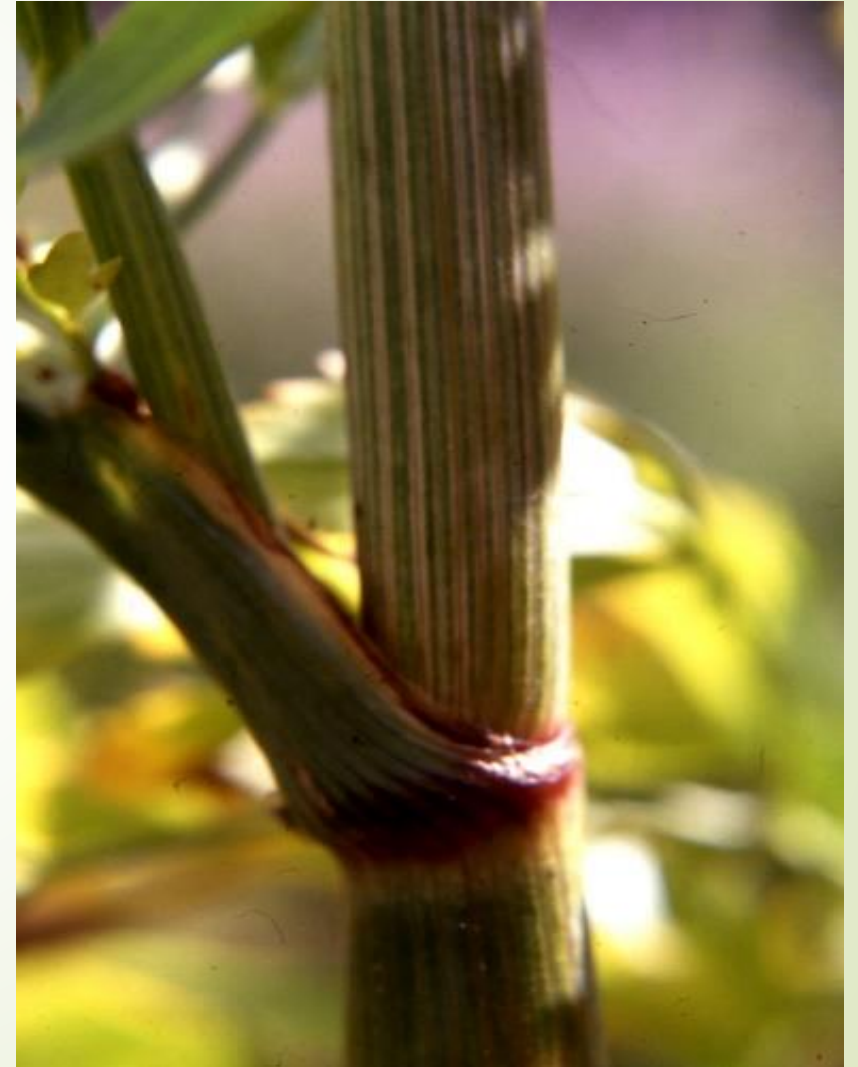
- *Angelica sinensis*
- *Mentha piperita*
- *Crataegus* species
- *Daucus carota* and relatives
- *Tussilago farfara*



BOTANICAL CALCIUM CHANNEL BLOCKERS

- *Angelica* may have calcium channel blocking ability.
- *Angelica* contains *Ferulic acid* which may calm cardiac arrhythmias.
- *Angelica* also contains *nicotinic acid* with vasodilating action.
- *Angelica*'s traditional indications include stagnant circulation, pelvic congestion, and uterine cramps.

Entman ML et al, "The influence of angelica lactones on calcium metabolism of dog cardiac microsomes" **J Clin Anvest** 1969; 48(2):229



Mentha piperita

PEPPERMINT

- Mint is a calcium antagonist to smooth muscle, but less so cardiac muscle.
- Mint may help angina following meals when digestive spasm triggers angina, arrhythmia, and tightness in the chest.
- Peppermint oil was included in the “Glyconda Formula” of 1800s used for angina, arrhythmia, and cardiovascular symptoms accompanied by indigestion, and gastric and intestinal ailments.

Taylor BA et al, Proceedings of the British Pharmacol Soc, April 1985



Tussilago farfara

Coltsfoot

- *Tussilago* or Coltsfoot is also a Ca channel blocker and PAF inhibitor.
- Animal studies have noted *Tussilago* to have calcium channel blocking activity in rat aorta.
- *Tussilago* has been used historically for asthma, chronic cough, hypertension and tightness in the chest.

Hwang SB et al, "L-652,469 a dual receptor antagonist of PAF and Dihydropyridines from *Tussilago farfara*" **Eur J Pharmacol** 1987;141(2):269



BOTANICAL DIURETIC HERBS

- Botanical Diuretics may complement vasodilating, calcium channel blocking, and ACE inhibiting herbs.
- Botanical Diuretic do not deplete K, Mg or other minerals as pharmaceutical diuretics do.



Botanical Diuretics Include:

- *Equisetum* (Horsetail)
- *Medicago* (Alfalfa)
- *Taraxicum* (Dandelion)
- *Urtica* (Nettles)
- *Petroselinum* (Parsley)
- *Apium* (Celery Seeds)

OTHER BOTANICAL AGENTS FOR HYPERTENSION

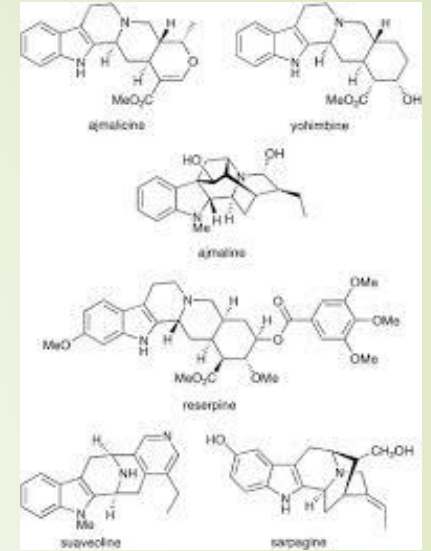
- Other botanical agents that improve hypertension include sedative muscle relaxing herbs.
- Sedative herbs are palliative and useful to include in formulas for hypertension, but may not slow pathology or protect the vasculature the way flavonoids and metabolic correctives agents can.

Herbal Sedatives and Vasorelaxers Include:

- *Rauwolfia serpentina*
- *Viscum*
- *Tilia europea*,
- *Valerian officinalis stichensis*
- *Passiflora incarnata*

Rauwolfia serpentina

Indian Snake Root



- Native to India, *Rauwolfia* has been used as a traditional Ayurvedic medicine for many ailments, including anxiety, headaches, snakebites, and as a general sedative for over 1000 years.
- The whole plant extract 1:4 may be dosed at ml at a time, increasing to building to two and three times a day if necessary. Do not exceed 5-6 mg of whole extract/ day.
- *Rauwolfia* has potential side affects of muscle weakness, fatigue, impotence, and depression, so this is not a first choice therapy.



Rauwolfia serpentina

Indian Snake Root

Rauwolfia's Actions Include:

- Decreases myocardial excitability,
- Inhibition of AV conduction, and
- Extension of the refractory period of the heart rhythm.

- Although *Rauwolfia* will reduce blood pressure, its effects are more pronounced on the CNS, than the peripheral nervous system through activity at the diencephalon.
- The alkaloid *reserpine* decreases the release and accumulation of noradrenaline.
- Another alkaloid, *ajamaline* is thought to be antiarrhythmic.
- *Rauwolfia* blocks adrenergic activity.

Viscum album

Mistletoe

- *Viscum* is a strong hypotensive with toxic potential.
- *Viscum* is specifically indicated for the hypertensive patient who has a weak feeble pulse, dyspnea, and restlessness.
- *Viscum* is also indicated for sudden rushes of blood to the head causing frequent headaches with flushed face, and tearing intense pain.
- *Viscum* is also indicated for CHF where there is enlargement of the heart.



Viscum album

Mistletoe

- *Viscum* contains a choline derivative similar to acetylcholine with a vasodilating properties via parasympathetic mechanisms.
- *Viscum* also contains a vasodilating nitrates that promote vascular relaxation as endogenous Nitric oxide itself does.
- Endogenous and exogenous nitrates stimulate cGMP promoting vascular smooth muscle relaxation.
- Nitrates such as amylnitrate and Nitroglycerine have been used for anginal pain since the late 1800s





OTHER HERBS TO SUPPORT THE VASCULATURE

FLAVONOIDS, PHYTOSTEROLS AND TONICS

PHYTOSTEROLS AND OTHER NATURAL THERAPIES FOR CARDIOVASCULAR HEALTH

- Phytosterols inhibit intestinal cholesterol absorption.
- Plant sterols attenuate gene expression reducing cholesterol uptake and lowering the cholesterol esterification.
- Phytosterols have potent antioxidant effects reducing oxidative stress in the body.
- Consumption of phytosterols in oils, nuts, and plants are associated with healthier blood lipids and inflammatory markers.

Supplement Facts

Serving Size: 1 Capsule
Servings Per Container: 120

	Amount Per Serving	% Daily Value
Phytosterol Complex (standardized to 95% total plant sterols (890 mg))	937 mg	*
Beta Sitosterol	375 - 543 mg	*
Campesterol	187 - 281 mg	*
Stigmasterol	131 - 206 mg	*
Brassicasterol	0 - 56 mg	*
Sitosterol	0 - 47 mg	*

* Daily Value not established.

Food	Serving Size	Phytosterol Content
Sesame seeds	1 oz	113 mg
Wheat Germ	¼ cup	99 mg
Canola oil	1 Tbsp	92 mg
Edamame	1 cup	90 mg
Split peas (dried)	¼ cup	66 mg
Brussels Sprouts	1 cup	68 mg
Almonds	1 oz	56 mg
Peanut butter	2 Tbsp	47 mg
Pistachios	1 oz	79 mg
Avocado	¼ fruit	32 mg

Chart from quickanddirtytips.com

BETA SITOSTEROL

- Beta sitosterol is a common phytosterols
- Certain protein kinases help regulate metabolism of intracellular lipids and glucose.
- Beta-sitosterol has been shown to regulate these kinases.
- Beta-sitosterol increases glucose uptake and reduces intracellular triglycerides and cholesterol.

Cholesterol, Phytosterol, and Tocopherol Content of Food Products and Animal Tissues

WILLY LANGE, Chemical Division, The Procter and Gamble Company, Cincinnati, Ohio

[EDITOR'S NOTE: This paper is essentially a tabulation of about 700 reported values from 100 sources, arranged under various headings. It is offered as a help to technologists, dietitians, nutritionists, and physicians who need information on the cholesterol and vitamin E content of foods, animal tissues, and other materials.]

NUTRITIONISTS, physicians, and food technologists have become increasingly interested in the quantities of sterols, particularly cholesterol, and of tocopherols present in various natural materials. Nutritional and clinical interest in cholesterol stems from the belief that the cholesterol content of the diet has an influence on the health and well-being of man. The tocopherols are of interest because of their vitamin activities (vitamin E) and of their behavior as antioxidants for fats in foods. Since the pertinent information is widely scattered, an attempt has been made to select the more important data on sterol and tocopherol content of foods and related materials and to tabulate same for convenient consultation. The resulting tables are presented below.

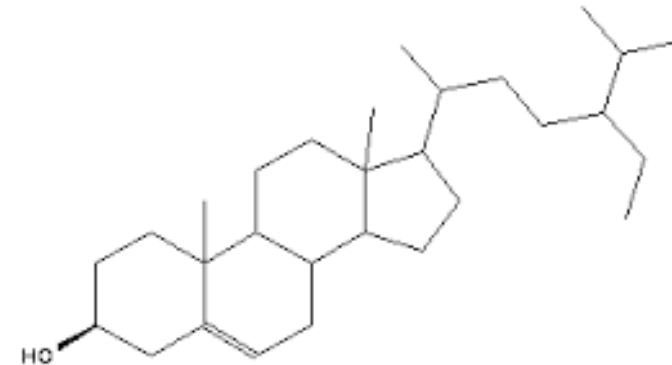
ture of cholesterol completely prevent absorption (82). After simultaneous feeding of cholesterol and phytosterols, only cholesterol can be isolated from the lymph duct and no trace of phytosterols is found. Since absorbed cholesterol together with the bulk of the absorbed fat is transferred from the intestine into the organism mainly through the lymph and can be readily recovered from it, the experiment has been considered as proof that the phytosterols are treated by the intestine as an inert substance and are not absorbed (8). This rejection of phytosterols by the animal organism is the main reason why nutritional and medical interest centers around cholesterol (64b).

In sterol analyses, color tests and precipitation reactions are not specific for any individual sterol. The total quantity of sterols present in a sample may readily be established and also the question answered whether the material is cholesterol or phytosterol while the separation and determination of individual phytosterols from their natural mixtures requires a considerable amount of work.

in to liberate any sterol may be determined colation of the Liebermann-Schoenheimer-Sperry ion as the digitonide (64a, 64b) or be precipitated as insoluble according to Bömer (14b), a sterol and phytosterols studies of the crystal forms and determinations of their also applicable to cholesterol admixture of phytosterols which some cholesterol has using a method described is based on the sparing bromide in a mixture of acid; however the bromide sterol, precipitates under the re to the difficulty of separating components, literature of phytosterols are limited. yosterols have a potential is for the preparation of ds and sex hormones will nsive analytical studies. otal cholesterol content of in mg./100 g. of moist material unless otherwise stated. Although physiologically of less interest, the sterol (phytosterol) content of vegetable materials is also given for comparative purposes in Table VI to VIII.

Tocopherols

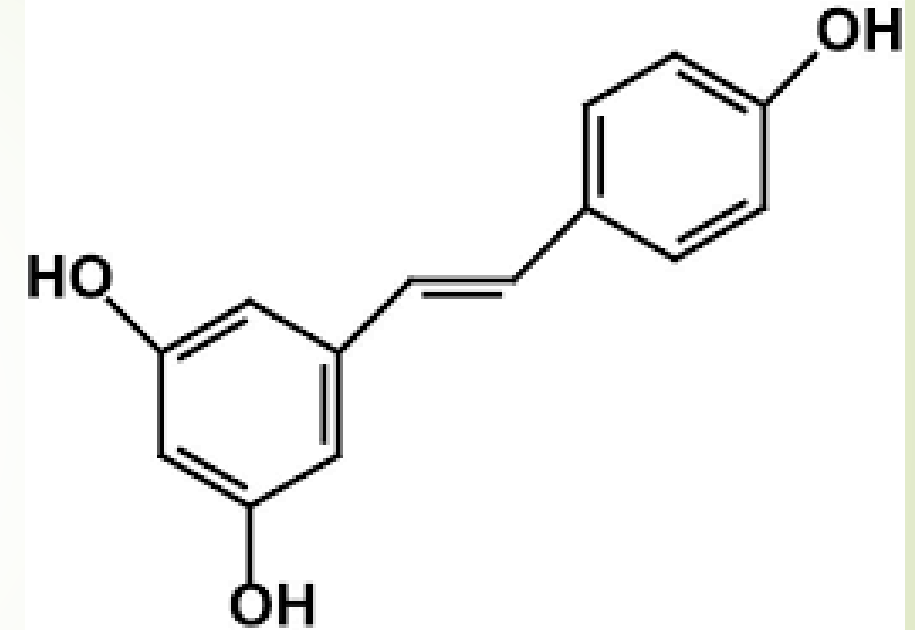
The four naturally occurring tocopherols (α , β , γ , and δ) are similar in chemical and physical properties and in nature occur in mixtures of varying proportions. While the colorimetric determination of total tocopherol content often may be carried out without too much difficulty, the quantitative estimation of each individual component is tedious (7), and



subcutaneous tissue of a dog are not esterified or modified by the organism and are treated like an inert, foreign material while cholesterol is readily esterified. Rabbits absorb cholesterol fed with the diet and deposit it in their organs while phytosterols are practically completely recovered from the feces and no deposition in the organs is observed. Experiments show that the phytosterols isolated from the feces are identical with those fed to the animal and have not been subjected to any modification during their passage through the intestinal tract (81). The selectivity of the intestinal walls in the absorption of sterols is remarkable; slight changes in the struc-

RESVERATROL

- Resveratrol, a naturally occurring polyphenol with numerous health benefits including anti-oxidant, anti-inflammatory, anti-aging, cardioprotective and neuroprotective activities.
- Resveratrol has antioxidant and apoptotic action.



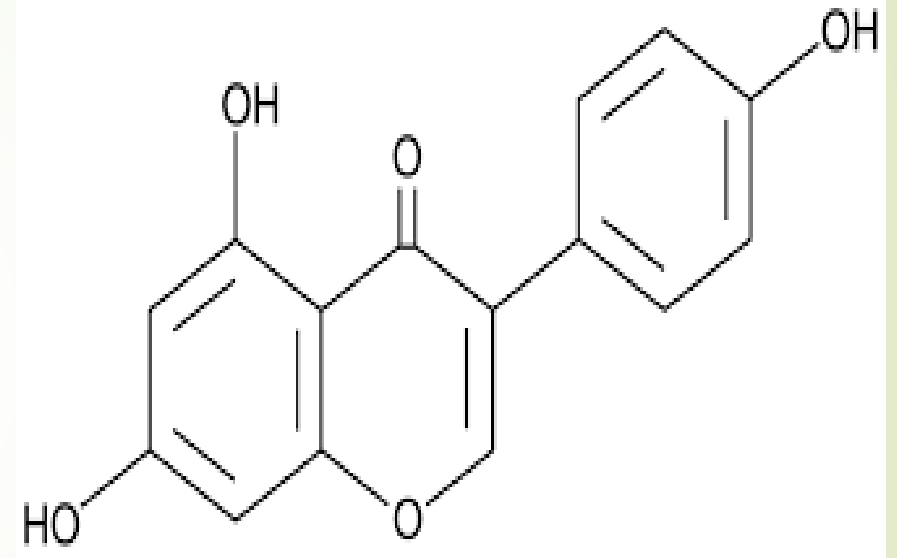
Spine (Phila Pa 1976). 2008 Nov 15;33(24):2586-95. The action of resveratrol, a phytoestrogen found in grapes, on the intervertebral disc. Li X, Phillips FM, An HS, Ellman M, Thonar EJ, Wu W, Park D, Im HJ.

STEROLS IN NUTS

- Almonds, Sesame seeds, Walnuts, Peanuts and other nuts are high in phytosterols.
- Including nuts and nut oils in the diet has been shown to lower total cholesterol and improve lipid profiles.
- Epidemiologic studies show that those with the highest nut consumption displayed intake reduced risk of CHD incidence based on lipid profiles.
- Nuts are rich in Phytosterols and anti-inflammatory sterols such as resveratrol.
- Proanthocyanidins are found in almonds, cashews, hazelnuts, pecans, pistachios, peanuts, and walnuts, with concentrations varying from 9-494 mg/100 g.
- An inverse relationship has been shown between nut consumption and cardiovascular disease.

PHYTOESTROGENS AND VASCULAR HEALTH

- Phytoestrogens act as specific ER modulators and improve the actions of estrogen in the aging blood vessels.
- Genistein, the most common phytoestrogen, reduces vascular inflammation and exerts a positive effects on endothelial cells
- Isoflavones activate Nitric Oxide synthesis in endothelial cells and protect against cell damage.



GENISTEIN

Menopause. 2009 May-Jun;16(3):539-44. *Effect of isoflavone extracts from Glycine max on human endothelial cell damage and on nitric oxide production.* Paulo M, Salvador MM, dos Anjos Neto Filho M, Montes MB, Franceschini SA, Toloí MR.

GENISTEIN

- Genistein inhibits angiotensin-converting enzyme offering a hypotensive effect.

Eur J Pharmacol. 2009 Apr 1;607(1-3):173-7.
Isoflavone genistein inhibits the angiotensin-converting enzyme and alters the vascular responses to angiotensin I and bradykinin.
Montenegro MF, Pessa LR, Tanus-Santos JE.



Image from algaecal.com

Glycyrrhiza glabra

LICORICE

- Licorice is a medicinal plant used for thousands of years.
- Its most common side effect is hypokalemic hypertension, which is secondary to a block of 11beta-hydroxysteroid dehydrogenase type 2 at the level of the kidney, leading to an enhanced mineralocorticoid effect of cortisol.
- This effect is due to glycyrrhetinic acid, which is the main constituent of the root, but other components are also present, including isoflavans, which have estrogen-like activity, and are thus involved in the modulation of bone metabolism.



LICORICE AND HYPERTENSION

- Abnormal cortisol metabolism plays a role in the pathogenesis of hypertension.
- 11beta-hydroxysteroid dehydrogenase (11beta-HSD) isozymes catalyze interconversion of cortisol and cortisone, playing an important role in the regulation of the effects of cortisol.
- Activity of 11beta-HSD type 2, converting active cortisol in inactive cortisone, is crucial in preventing access of cortisol to the renal mineralocorticoid receptors (MRs).
- Decreased activity of this isozyme in the kidney, either congenitally in Apparent Mineralocorticoid Excess syndrome or acquired following licorice consumption, allows cortisol access to the MRs, resulting in hypokalemic hypertension.

BIOFLAVINOIDS CONTAINING BOTANICALS

- For all Vascular Issues, use high bioflavonoid containing herbs and foods.
- Bioflavonoids have antioxidant and anti-inflammatory actions and support integrity of the blood vessels themselves.
- The *carotenoids*, the *procyanadin oligomers*, the *anthocyanosides*, *rutin*, *querticin*, and *hesperitin* are all common in brightly colored fruits, veggies, and herbs.



Vaccinium myrtillis

Blueberry, Bilberry

- Blueberry leaves and fruit have long been a folk remedy for diabetes.
- Animal studies shown blueberries to reduce blood glucose and enhance insulin sensitivity in type 2 diabetic mice.
- Blueberries promote the intracellular "second messenger" cyclic AMP and associated protein kinases.



J Nutr. 2010 Mar;140(3):527-33. Dietary anthocyanin-rich bilberry extract ameliorates hyperglycemia and insulin sensitivity via activation of AMP-activated protein kinase in diabetic mice. Takikawa M, Inoue S, Horio F, Tsuda T.

Vaccinium myrtillis

Blueberry, Bilberry

- Human studies on *Vaccinium*'s glucose regulation are sparse, but one study on overweight and obese women with Metabolic Syndrome reported the consumption of blueberries to have a slight but statistically significant effect of total weight and waist circumference compared to other berries and isolated chemical concentrates from berries.

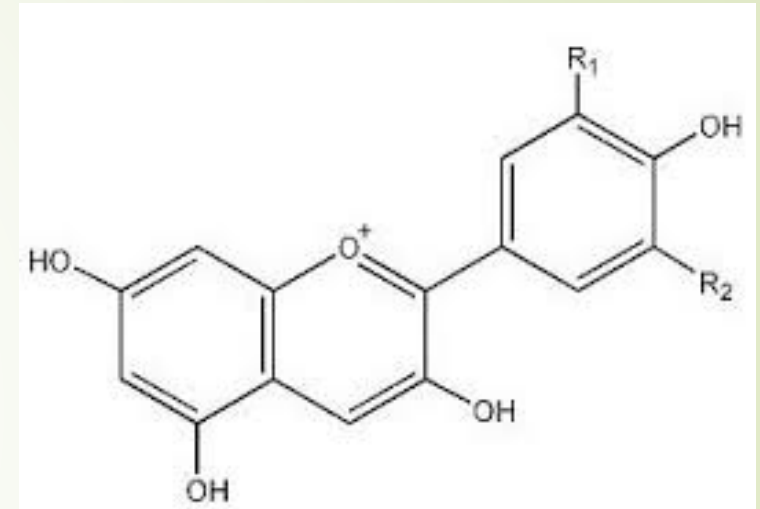


Eur J Clin Nutr. 2011 Mar;65(3):394-401. Different berries and berry fractions have various but slightly positive effects on the associated variables of metabolic diseases on overweight and obese women. Lehtonen HM, Suomela JP, Tahvonen R, Yang B, Venojärvi M, Viikari J, Kallio H.

Vaccinium myrtillis

Blueberry, Bilberry

- Anthocyanins (also called anthocyanosides) are a group of bluish-purple pigmented flavonoids found in *Vaccinium* species that have a protective effect on capillaries and blood vessel walls.
- Anthocyanins are powerful antioxidants and reduce the inflammatory damage to blood vessels inflicted by the many inflammatory and abnormal metabolic processes seen with diabetes, high cholesterol, and Metabolic Syndrome.



Study Org Chem 23:293-301, 1986 Boniface R et al.
Pharmacological properties of myrtillus anthocyanosides:
Correlation with results of treatment of diabetic microangiopathy.

Vaccinium myrtillis

Blueberry, Bilberry

- Blueberries enhance circulation and are both a preventative and therapy for diabetic retinopathy, peripheral neuropathy, and circulatory insufficiency.
- Many commercial products exist, often standardized to deliver 160 mg anthocyanins per day.
- Eating whole blueberries is highly recommended for diabetics and those with Metabolic Syndrome.





HERBS TO IMPROVE METABOLIC FUNCTION

**BOTANICAL AGENTS THAT IMPROVE
CARBOHYDRATE AND LIPID METABOLISM**

BOTANICAL ACTIONS THAT SUPPORT BASIC METABOLISM

Botanical Agents may improve basic metabolic function via:

- Thyroid Support (*Guggul*, *Fucus*)
- Insulin Reception (*Opuntia*, *Stevia*)
- Liver Support (Cholagogues, Alternatives)



Opuntia

Prickly Pear Cactus

- **Opuntia** optimizes basic metabolism
- **Opuntia** normalizes blood glucose and cholesterol in animal models of diabetes.
- **Opuntia** juice lowers elevated blood sugar.
- **Opuntia** normalized carbohydrate metabolism in diabetic animals.



- **Cardiovasc Hematol Agents Med Chem.** 2008 Oct;6(4):237-52. *Medicinal agents in the metabolic syndrome.* Baños G, Pérez-Torres I, El Hafidi M.
- **Endocr Metab Immune Disord Drug Targets.** 2008 Jun;8(2):78-81. *Efficacy of dietary supplementation with botanicals on carbohydrate metabolism in humans.* Cefalu WT, Ye J, Wang ZQ.
- **Nutr Res.** 2011 Jun;31(6):479-87. *Opuntia humifusa stems lower blood glucose and cholesterol levels in streptozotocin-induced diabetic rats.* Hahm SW, Park J, Son YS.
- **Proc West Pharmacol Soc.** 2003;46:139-42. *Hypoglycemic activity of two polysaccharides isolated from Opuntia ficus-indica and O. streptacantha.* Alarcon-Aguilar FJ, Valdes-Arzate A, Xolalpa-Molina S, Banderas-Dorantes T, Jimenez-Estrada M, Hernandez-Galicia E, Roman-Ramos R.
- **Arch Invest Med (Mex).** 1979;10(4):223-30. *Hypoglycemic effect of Opuntia cactus.* Ibañez-Camacho R, Roman-Ramos R.

Stevia redbudiana

Stevia or Sweet Leaf

- *Stevia*, a sweet tasting herb from the South American Andes, improves insulin resistance.
- The sweet stevosides have no calories and a glycemic index of zero.
- *Stevia* is naturally high in chromium, a mineral that supports insulin signal transduction.
- Animals suggest *Stevia* may improve insulin output from the pancreas for Type I diabetes, as well as improve insulin resistance in Type II diabetes.



Int J Food Sci Nutr. 2010 Feb;61(1):1-10. *Stevia (Stevia rebaudiana) a bio-sweetener: a review.* Goyal SK, Samsher, Goyal RK.

Horm Metab Res. 2005 Oct;37(10):610-6. *Increase of insulin sensitivity by stevioside in fructose-rich chow-fed rats.* Chang JC, Wu MC, Liu IM, Cheng JT.

J Pharm Bioallied Sci. 2011 Apr;3(2):242-8. *Antidiabetic activity of medium-polar extract from the leaves of Stevia rebaudiana Bert. (Bertoni) on alloxan-induced diabetic rats.* Misra H, Soni M, Silawat N, Mehta D, Mehta BK, Jain DC.

Hibiscus sabdariffa

Hibiscus, Flor de Jamaica



Image from otramedicina.imujer.com



Lepidium meyenii

Maca

- Maca contains linoleic and linolenic essential fatty acids and is noted to improve blood fats when included in animal feed.
- Animal studies shown Maca to reduce high blood pressure.
- Maca may enhance kidney clearance of Na, K, and Cl in a manner that helps reduce blood pressure.
- *Lepidium* may also improve blood flow in the heart.



Prostaglandins Leukot Essent Fatty Acids. 2008 Feb;78(2):123-30. Bio-availability and metabolism of n-3 fatty acid rich garden cress (*Lepidium sativum*) seed oil in albino rats. Diwakar BT, Dutta PK, Lokesh BR, Naidu KA

J Ethnopharmacol. 2005 Aug 22;100(1-2):193-7. Antihypertensive effect of *Lepidium sativum* L. in spontaneously hypertensive rats. Maghrani M, Zeggwagh NA, Michel JB, Eddouks M.

Zhong Yao Cai. 1998 May;21(5):243-5. Effect of aqueous extract of *Lepidium apetalum* on dog's left ventricular function. Wu X, Yang Y, Huang D.

Lepidium meyenii

Maca

- Maca improves metabolic syndrome when induced in rats are fed a high sucrose diet, abolishing the tendency to cholesterol and glucose elevations.
- General hypoglycemic effects have also been reported.
- Maca may increase the urinary excretion of glucose.
- Maca is available as a flour-like powder that may also be stirred into juices, milks, and fruit purees to enhance the medicinal value of the daily diet.

- **Food Chem Toxicol.** 2008 Mar;46(3):1006-13. Maca (*Lepidium meyenii*) and yacon (*Smallanthus sonchifolius*) in combination with silymarin as food supplements: in vivo safety assessment. Valentová K, Stejskal D, Bartek J, Dvorácková S, Kren V, Ulrichová J, Simánek V.
- **Plant Foods Hum Nutr.** 2007 Jun;62(2):59-63. The influence of maca (*Lepidium meyenii*) on antioxidant status, lipid and glucose metabolism in rat. Vecera R, Orolin J, Skottová N, Kazdová L, Oliyarnik O, Ulrichová J, Simánek V.
- **J Ethnopharmacol.** 2005 Feb 28;97(2):391-5. Study of the hypoglycaemic activity of *Lepidium sativum* L. aqueous extract in normal and diabetic rats. Eddouks M, Maghrani M, Zeggwagh NA, Michel JB.
- **Phytother Res.** 2008 Jan;22(1):1-5. Effect of *Lepidium sativum* L. on renal glucose reabsorption and urinary TGF-beta 1 levels in diabetic rats. Eddouks M, Maghrani M.

THE LEGUME FAMILY

All Types of Beans and Legume Family Herbs

- Legumes offer many health benefits for blood sugar, obesity, and metabolic syndrome.
- Legumes in the diet and medicinal herbs in the legume family are beneficial for insulin resistance, hormonal balance, and lowering blood sugar and cholesterol.
- Legumes contain fiber, choline, magnesium, lecithin, saponins and other beneficial compounds which have been investigated together and individually.



Nutr Metab Cardiovasc Dis. 2011 Jul 15. Obesity and metabolic syndrome: Potential benefit from specific nutritional components. Abete I, Goyenechea E, Zulet MA, Martínez JA

DIETARY LEGUMES

- The legume family of plants may be eaten in the form of hummus, bean soup, a side of lentils or a soy smoothie, garbanzo flour substituted for wheat flour, etc.
- Legume family herbs may be consumed as herbal teas, tinctures, or in encapsulated products.



PINNITOL AND D-CHIRO-INOSITOL

- Legumes contain *Pinnitol* and the *D-Chiro-Inositol*, both known to support insulin reception.
- *Pinnitol* from soy has been shown to support HDL ("good") cholesterol and promote antioxidant enzymes in the liver.
- *Pinnitol* and *D-Chiro-Inositol* improve insulin resistance by improving signal transduction.

Food	Mg Inositol per 100g food	Gm needed to obtain 1200 mg inositol	DCI/Pinitol
Buckwheat farinetta	1371	88	DCI
Soya lecithin	2100	57	DCI
Chickpeas	760	158	DCI
Brown rice	700	171	U/K
Wheat germ	690	174	U/K
Lentils	410	293	U/K
Barley	390	308	U/K
Veal/liver	340	353	U/K
Oats	320	375	U/K
Torula Yeast	270	444	U/K
Beef	260	462	U/K
Alfalfa	240	500	U/K
Oranges	210	571	DCI
Peanuts	210	571	U/K
Molasses	180	667	U/K
Whole Wheat	170	706	U/K
Peas	160	750	U/K
Grapefruit	150	800	U/K
Strawberries	95	1263	U/K
Cauliflower	92	1304	U/K
Mung beans	N/K		DCI
Pumpkin	N/K		DCI
Pumpkin Seeds	N/K		DCI
Pidgeon pea	N/K		U/K
adzuki beans	N/K		U/K
Carob	N/K		P

Chart from pcosinfo.wordpress.com

Mol Nutr Food Res. 2009 Jun;53(6):751-9.
Metabolic response of soy pinitol on lipid-lowering, antioxidant and hepatoprotective action in hamsters fed-high fat and high cholesterol diet. Choi MS, et al

LEGUME FAMILY HERBS

Many Herbaceous Legume Family Plants may also improve insulin reception and signal transduction including:

- *Pueraria mirifica, lobata* Kudzu
- *Astragalus membranaceus* Milk Vetch
- *Medicago sativa* Alfalfa
- *Glycyrrhiza glabra* Licorice
- *Trigonella foenum-graecum* Fenugreek





QUESTIONS