

**CONTINUING NUTRITIONAL SUPPLEMENTS SERIES:
FLAVANONE GLYCOSIDE – HESPERIDIN**

Jagdish Kakadiya*, Nehal Shah

**Department of Pharmacology, Dharmaj degree Pharmacy College,
Petlad-Khambhat road, Dharmaj,
Dist: Anand, Gujarat, India.**



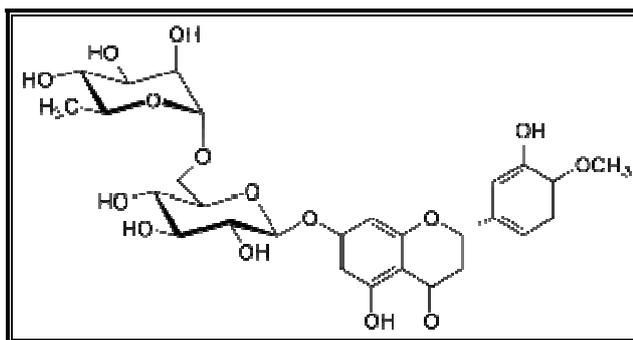
ADDRESS FOR CORRESPONDENCE

Mr. Jagdish L. Kakadiya
Dharmaj degree pharmacy college,
Amrapali Township, Petlad-Khambhat road,
Dharmaj, Dist: Anand-388430,
Gujarat, India.

jagdishkakadiya@yahoo.co.in

DESCRIPTION

Hesperidin is a Flavonoid found in citrus fruits. Hesperidin is the predominant flavonoid in lemons and oranges. The peel and membranous parts of these fruits have the highest hesperidin concentrations. Therefore, orange juice containing pulp is richer in the flavonoids and hesperidin than that without pulp. Sweet oranges (*Citrus sinensis*) and tangelos are the richest dietary sources of hesperidin. Hesperidin is classified as a Citrus bioflavonoid. Hesperidin is a polyphenolic compound classified as a bioflavonoid that is widely distributed in the plant kingdom. Bioflavonoids are often found together with vitamin C in fruits. Hesperidin is found in citrus rinds as a non-bitter tasting flavonoid glycoside, along with rutoside, sinensetin, nobiletin, tangeretin, citrin and bitter flavonoids, neohesperidin and naringin; polymethoxylated flavones, numerous hydroxycinnamates and at least 44 different flavones. Popular flavonoid products standardized for hesperidin content often also contain the flavonoid, diosmin. The product, Daflon 500 mg, is a micronized purified flavonoid fraction, containing 90% w/w diosmin and 10% w/w of flavonoids expressed as hesperidin, used clinically in the treatment of chronic venous insufficiency and hemorrhoidal disease. Hesperidin, in combination with a flavone glycoside called diosmin, is used in Europe for the treatment of venous insufficiency and hemorrhoids. Hesperidin, (s)-7-(((6-o-(6-deoxy-alpha-l-mannopyranosyl)-beta-d-glucopyranosyl)oxy)-2,3-dihydro-5-hydroxy-2-(3-hydroxy-4-methoxyphenyl)-4h-1-benzopyran-4-one has the following structural formula:



Hesperidin is a flavanone glycoside (flavonoid) ($C_{28}H_{34}O_{15}$) found abundantly in citrus fruits. Its aglycone form is called hesperetin. Its name is derived from the Hesperides nymphs of Greek mythology. Hesperidin is believed to play a role in plant defense. It acts as an antioxidant according to in vitro studies (1). In human nutrition it contributes to the integrity of the blood vessels.

Various preliminary studies reveal novel pharmaceutical properties. Hesperidin reduced cholesterol (2) and blood pressure (3) in rats. In a mouse study large doses of the glucoside hesperidin decreased bone density loss (4). Another animal study showed protective effects against sepsis (5). Hesperidin has anti-inflammatory effects (6, 7). Hesperidin is also a sedative, possibly acting through opioid or adenosine receptors (8, 9). Some in vitro results applied only to the aglucone form. Hesperidin also showed the ability to penetrate the blood brain barrier in an in vitro model (10).

MECHANISM OF ACTION:

Hesperetin reduces or inhibits the activity of acyl-coenzyme A: cholesterol acyltransferase genes (ACAT1 and ACAT2) and it reduces microsomal triglyceride transfer protein (MTP) activity. Hesperetin also seems to upregulate the LDL receptor. This leads to the reduced assembly and secretion of apoB-containing lipoproteins and enhanced reuptake of those lipoproteins, thereby lowering cholesterol levels.

BENEFITS OF HESPEREDIN:

In Europe, hesperidin and a flavonne glycoside diosmin is used to treat venous insufficiency and hemorrhoids. Hesperidin, rutin, and others are thought to be helpful in reducing capillary permeability. It may also have anti-inflammatory effects as well. These are known as Vitamin P. Hesperidin may also treat vascular disorders in humans, treat cancer, and some autoimmune diseases. It might also be an anti-allergen and anti-inflammatory agent. This is based on experiments with animals. Hesperidin, along with other bioflavanoids, can improve capillarie health and connective tissues. Due to this, it has been stated that it can help with bruising, varicose veins, and fragile capillaries. Other benefits of Hesperedin include an ability to help and get rid of hay fever and other similar allergies.

Hesperidin is an important nutrient that works together with Vitamin C to maintain the health of collagen. Sagging and wrinkling of the skin is due to the result of a breakdown of collagen. To get the best benefits from Hesperedin, and to use this nutrient the best way, you need take the nutrient synergistically with Vitamin C, otherwise your pretty much wasting your time taking this nutrient.

TIPS ON CHOOSING A HESPERIDIN SUPPLEMENT

1. Obtain your product from pharmaceutical GMP compliant manufacturers. Such places comply with the strictest regulatory standards for the manufacture of nutritional

supplements. This is an issue consumers need to take seriously because dietary supplements are unregulated in the U.S., and many products have been shown to contain contaminants or do not even contain what is stated on the label.

2. Be sure that you choose a product that does not contain any fillers or additives (examples include: sugar, starch, gluten, silica) or any artificial colors or flavors of any kind.
3. Hesperidin works synergistically with Vitamin C, as mentioned above, to maintain the health of collagen, and the health enzyme Bromelain (derived from pineapples) which enhances its absorption, giving you the best possible benefits of hesperidin. Because of this fact, all 3 nutrients should be taken together for the best health results and for maximum efficacy. Also, we believe it is best to take the nutrient with other prominent bioflavonoids, quercetin and rutin.

USES

Hesperidin is a Citrus Bioflavonoid and bioflavonoids are a natural substance found abundantly in citrus fruits, as well as plants, fruits, vegetables, nuts, bark and buckwheat. Hesperidin helps to protect capillaries, prevent bruising and intensify the effect of vitamin C in the body. In fact, bioflavonoids are essential for total vitamin C effectiveness. Citrus Bioflavonoids provide natural antiviral, anti-inflammatory and antiallergy properties. In addition, certain bioflavonoids are beneficial for fighting infections, free radical damage, viruses and common colds. The bioflavonoid Quercetin is typically available in capsule form as a supplement by itself. Rutin, commonly used in vitamin C supplements to boost its effectiveness, is derived from the buckwheat plant and provides a non-acidic source of vitamin C. Hesperidin can improve the health of capillaries and connective tissues. Because of this, it has been indicated to help with bruising, varicose veins and fragile capillaries. Daily use of Citrus Bioflavonoids can be helpful to those suffering from spider veins, arthritis, hemorrhage, phlebitis, high cholesterol levels, herpes, cataracts, general inflammation, bleeding gums, blood clots, scurvy, hemorrhoids, edema and hypertension. Anyone taking bioflavonoids is encouraged to also supplement their diet with up to 2,500 mgs. of vitamin C to significantly increase their effectiveness in healing actions.

Hesperidin has antioxidant, anti-inflammatory, hypolipidemic, vasoprotective and anticarcinogenic and cholesterol lowering actions. Hesperidin can inhibit following enzymes: phospholipase A2, lipoxygenase, HMG-CoA reductase and cyclo-oxygenase. Hesperidin

improves the health of capillaries by reducing the capillary permeability. Hesperidin is used to reduce hay fever and other allergic conditions by inhibiting the release of histamine from mast cells. The possible anti-cancer activity of hesperidin could be explained by the inhibition of polyamine synthesis. A study 'Hesperidin, a citrus flavonoids, inhibits bone loss and decreases serum and hepatic lipids in ovariectomized mice showed that hesperidin added to the diet not only lowered serum and hepatic cholesterol, but also inhibited bone loss by decreasing osteoclast number in ovariectomized mice. The molecular mechanism of the inhibitory effect of hesperidin on bone resorption is not clear.

Overall, Hesperidin is tremendously effective as a treatment for varicose veins as well as swelling sensations, hemorrhoids, cramps, pain, and capillary bruising. As a natural citrus bioflavonoid, Hesperidin contains a potent blend of anti-inflammatory, antioxidant, anti-allergenic, and antiviral properties which make it quite versatile. When it comes to diminishing the appearance of varicose veins, the qualities of Hesperidin really shine when combined with other varicose vein fighting ingredients like Diosmin and other natural supplements.

HESPERIDIN FOR VARICOSE VEINS

When it comes to varicose veins, Hesperidin has proven to be most effective because it acts as an anti-inflammatory agent which also diminishes the permeability of capillaries. Hesperidin has its greatest utility as a treatment for varicose veins when it is combined with other bioflavonoids such as Diosmin along with other natural varicose vein fighters.

DRUG INDICATIONS

Hesperidin and other bioflavonoids tend to reduce blood platelet stickiness in a beneficial way and therefore may reduce the dosage required for blood thinners.

CONTRAINDICATIONS

Bioflavonoids, including hesperidin, tend to reduce blood platelet stickiness and therefore individuals taking blood thinners should consult with their physician prior to commencing supplementation. Pregnant and lactating women should notify their doctor prior to taking hesperidin supplements, or should get their flavonoids from natural food sources for maximum safety.

SIDE EFFECTS

No signs of toxicity have been observed with the normal intake of hesperidin, nobiletin or other citrus flavonoids. Some Allergic reaction: Itching or hives, swelling in your face or hand, swelling or tingling in your mouth or throat, chest tightness, trouble breathing, or rash.

REFERENCES

1. Hirata A, Murakami Y, Shoji M, Kadoma Y, Fujisawa S. "Kinetics of radical-scavenging activity of hesperetin and hesperidin and their inhibitory activity on COX-2 expression". *Anticancer Res.* 2005; 25 (5): 3367–74.
2. Monforte MT, Trovato A, Kirjavainen S, Forestieri AM, Galati EM, Lo Curto RB. "Biological effects of hesperidin, a Citrus flavonoid: hypolipidemic activity on experimental hypercholesterolemia in rat". *Farmaco* 2005; 50 (9): 595–9.
3. Ohtsuki K, Abe A, Mitsuzumi H, et al. "Glucosyl hesperidin improves serum cholesterol composition and inhibits hypertrophy in vasculature". *J. Nutr. Sci. Vitaminol.* 2003; 49 (6): 447–50.
4. Chiba H, Uehara M, Wu J, et al. "Hesperidin, a citrus flavonoid, inhibits bone loss and decreases serum and hepatic lipids in ovariectomized mice". *J. Nutr.* 2003; 133 (6): 1892–7.
5. Kawaguchi K, Kikuchi S, Hasunuma R, Maruyama H, Yoshikawa T, Kumazawa Y. "A citrus flavonoid hesperidin suppresses infection-induced endotoxin shock in mice". *Biol. Pharm. Bull.* 2004; 27 (5): 679–83.
6. Emim JA, Oliveira AB, Lapa AJ. "Pharmacological evaluation of the anti-inflammatory activity of a citrus bioflavonoid, hesperidin, and the isoflavonoids, dauricin and claussequinone, in rats and mice". *J. Pharm. Pharmacol* 1994; 46 (2): 118–22.
7. Galati EM, Monforte MT, Kirjavainen S, Forestieri AM, Trovato A, Tripodo MM. "Biological effects of hesperidin, a citrus flavonoid: antiinflammatory and analgesic activity". *Farmaco* 1994; 40 (11): 709–12.
8. Loscalzo LM, Wasowski C, Paladini AC, Marder M. "Opioid receptors are involved in the sedative and antinociceptive effects of hesperidin as well as in its potentiation with benzodiazepines". *Eur. J. Pharmacol* 2008; 580 (3): 306–13.
9. Guzmán-Gutiérrez SL, Navarrete A. "Pharmacological exploration of the sedative mechanism of hesperidin identified as the active principle of *Citrus sinensis* flowers". *Planta Med* 2009; 75 (4): 295–301.
10. Youdim KA, Dobbie MS, Kuhnle G, Proteggente AR, Abbott NJ, Rice-Evans C. "Interaction between flavonoids and the blood-brain barrier: in vitro studies". *J. Neurochem* 2003; 85 (1): 180–92.