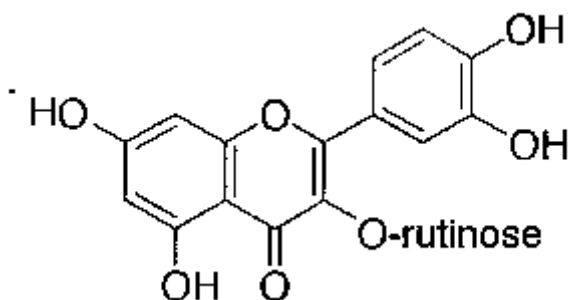


Rutin

DESCRIPTION

The flavonoid rutin is a flavonol glycoside comprised of the flavonol quercetin (see Quercetin) and the disaccharide rutinose. Rutin is found in many plants, especially the buckwheat plant *Fagopyrum esculentum* Moench, the flour of which is used to make pancakes. Other rich dietary sources of rutin include black tea and apple peels.

Rutin is a solid substance, pale yellow in appearance and only slightly soluble in water. It is, however, much more soluble in water than its aglycone quercetin. Rutin's molecular formula is $C_{27}H_{30}O_{16}$, its molecular weight is 610.53 daltons, and its structural formula is:



Rutin

The disaccharide moiety of rutin, rutinose, is comprised of the sugars rhamnose (6-deoxy-L-mannose) and glucose. Many names are used for rutin in the literature. They include rutoside, quercetin-3-rutinoside and sophorin. Also, 3, 3', 4', 5, 7-pentahydroxyflavone-3-rutinoside, 3-rhamnosyl-glucosyl quercetin and 3-[[6-O-(6-deoxy-alpha-L-mannopyranosyl)-beta-D-glucopyranosyl] oxy]-2-(3, 4-dihydroxyphenyl)-5,7-dihydroxy-4H-1-benzopyran-4-one.

ACTIONS AND PHARMACOLOGY

ACTIONS

Rutin may have antioxidant, anti-inflammatory, anticarcinogenic, antithrombotic, cytoprotective and vasoprotective activities.

MECHANISM OF ACTION

Many, if not most, of rutin's possible activities can be accounted for, in part, by rutin's antioxidant activity. Rutin is a phenolic antioxidant and has been demonstrated to scavenge superoxide radicals. Rutin can chelate metal ions, such as ferrous cations. Ferrous cations are involved in the so-called Fenton reaction, which generates reactive

oxygen species. Rutin may also modulate the respiratory burst of neutrophils. The *in vivo* antioxidant activity of rutin is most likely due to its aglycone quercetin, to which it is metabolized following ingestion. Although most studies show rutin to inhibit lipid peroxidation, a few studies do not. Rutin may also help maintain levels of the biological antioxidant reduced glutathione. Importantly, under certain conditions, rutin or its metabolite quercetin may become a pro-oxidant. For example, nitrosation of rutin/quercetin may produce a pro-oxidant molecule that may have mutagenic potential.

PHARMACOKINETICS

The pharmacokinetics of rutin in humans is still under investigation. It appears that only about 17% of an ingested dose is absorbed. Absorption appears to occur mainly from the colon following the removal of the carbohydrate moiety by bacterial enzymes to form quercetin. Quercetin may undergo glucuronidation in the colonocytes. It is unclear to what extent there is absorption of quercetin glycosides. Quercetin and glucuronide conjugates of quercetin are transported to the liver via the portal circulation, where they undergo significant first pass metabolism. Metabolites may include isorhamnetin, kaempferol and tamarixetin. Quercetin itself may undergo glucuronidation and sulfation. Quercetin and its metabolites are distributed from the liver to various tissues in the body. Quercetin is strongly bound to albumin in the plasma.

INDICATIONS AND USAGE

Rutin may be useful in the management of venous edema. It may help strengthen capillaries, protect against some toxins and have anti-inflammatory effects, as well as some anticancer effects. It may also help prevent the oxidation of vitamin C and have some positive lipid effects.

RESEARCH SUMMARY

Some of the earliest research related to rutin found that, in daily doses of 200 to 600 mg, it is useful in treating some with conditions characterized by capillary fragility and attendant easy bruising. There was the suggestion in some of this early work that it might help decrease the incidence of cerebral hemorrhage, though no research was conducted to specifically confirm this. An early placebo-controlled study reported a significant reduction in mid-cycle menstrual bleeding in rutin-supplemented women.

Several placebo-controlled trials have demonstrated that rutin has significant efficacy in diminishing the venous edema that is an early sign of chronic venous disease of the leg.

Rutin's anti-inflammatory potential has been demonstrated in a number of animal studies. In experimentally induced colitis, both pre- and post-induction treatment with rutin conferred significant preventive and healing effects. Rutin was shown to increase colonic glutathione levels, thus reducing oxidative tissue damage in this inflammatory condition. It has also shown cytoprotective effects against ethanol injury in an animal model of ethanol-induced gastric lesions.

Rutin's radical-scavenging and, possibly, its iron-chelating abilities were said, in other animal studies, to significantly protect against asbestos-induced oxidative cellular injury.

Very preliminary animal research has found some evidence that rutin can inhibit some cancerous and pre-cancerous conditions, including chemically induced colonic neoplasia. Results, however, have been mixed. Far more research is required.

Although in most studies rutin has been found to inhibit lipid peroxidation, in one study rutin was not found to block cellular lipid peroxidation. However, according to the researchers, rutin may still potentially play a positive role in helping to prevent atherogenesis by inhibiting the depletion of cellular glutathione and ATP, thus perhaps reducing the cytotoxicity of oxidized LDL-cholesterol.

Finally, there is some evidence suggesting that rutin, taken with vitamin C, may help inhibit the oxidation of vitamin C and thus make it safer and more useful in some conditions. More research is needed to elucidate the relationship between the flavonoids and vitamin C.

CONTRAINDICATIONS, PRECAUTIONS, ADVERSE REACTIONS

CONTRAINDICATIONS

Rutin is contraindicated in those who are hypersensitive to any component of a rutin-containing product.

PRECAUTIONS.

Pregnant women and nursing mothers should avoid using rutin supplements.

There is some suggestion that rutin may undergo nitrosation with, for example, nitrates and nitrites found in some processed meat products to form potentially mutagenic substances. Those who supplement with rutin should avoid using it concomitantly with such products.

ADVERSE REACTIONS.

Rutin is generally well tolerated. Adverse reactions include gastrointestinal ones, such as nausea. There are rare reports of headache and mild tingling of the extremities.

Melilotus

DESCRIPTION

This herbaceous plant possesses sheets trifoliées and small yellow flowers gathered in lengthened clusters.

THE PLANT OF the VENOUS TONUS

This plant was used rightly in traditional medicine as diuretic(diuretic) and anti-spasmodic of the digestive tract.

In fact, the presence of flavonoïdes also confers it anti-inflammatory properties and anti-œdémateuses interesting in problems bound to the veino-lymphatic incapacity. Furthermore, the wealth in coumarine, anticoagulant light and fluidifying of natural origin, allows it to be indicated in the preventive treatment of varicose veins and thrombophlébites.