

Resveratrol

Introduction

As a phytoalexin, resveratrol belongs to the polyphenol group and is produced in response to injury or when a plant is under attack by pathogens, such as bacteria or fungi. In 1940, resveratrol was discovered in the white hellebore roots, and later in the roots of *Polygonum cuspidatum*, called Ko-jo-kon in Japanese, used in traditional Chinese and Japanese medicine. Resveratrol has been studied for its potential therapeutic use, with little evidence of anti-disease effects or health benefits in humans. Researchers believe they act like antioxidants, protecting the body against damage that can increase your risk for cancer and heart disease. Companies have tried to capitalize on its benefits by marketing resveratrol supplements. A plant known as *Polygonum cuspidatum* is the source of most of the resveratrol extracts sold in the U.S. Red wine extracts or grape extracts are also sources of resveratrol supplements.

Polyphenols

There is a class of phytochemicals called polyphenols. Polyphenols are chemical compounds found in plants. Polyphenols are among the most abundant antioxidants in our diet, present in quantities ten times greater than vitamin C and 100 times greater than vitamin E or carotenoids: Polyphenols are found in fruits, vegetables, and plant-derived drinks such as red wine, coffee, and fruit juices. As well as chocolate, cereal, and legumes, they are found in nuts. It has long been established that polyphenols, obtained either through diet or supplementation, boost health. There are several types of polyphenols according to their molecular compositions. Each molecule contains a phenol molecule. Polyphenols are further classified as flavonoids and nonflavonoids. One of the most nutritionally important classes of polyphenols, flavonoids are aromatic and include many pigments. Flavonoids are more abundant in colorful fruits and vegetables. Anthocyanins are the most abundant flavonoids in grapes. Blue, purple, and red fruits and vegetables get their color from these powerful antioxidants. Catechin and quercetin are the most studied flavonoids. Catechins are concentrated in green tea. Quercetin is found in red wine, apples, broccoli, grapes, and tea, and is sometimes paired with resveratrol in supplements.

Chemistry

Howitz identified resveratrol as a small-molecule SIRT1 activator in 2003. SIRT1, like all sirtuins, is deacetylated by nicotinamide adenine dinucleotide (NAD⁺). The dependence of SIRT1 on NAD⁺ strongly links its activity to cellular energy levels. It plays a role in the regulation of lipid and glucose homeostasis and is induced by both calorie restriction and exercise. SIRT1 is closely related to cellular energy levels and energy homeostasis, making it an interesting molecular target for treatment of metabolic disorders like obesity. It's not surprising that resveratrol, which has been identified as a SIRT1 activator, is said to exert similar effects to calorie restriction. However, there is debate whether resveratrol activates SIRT1 directly or rather via activation of AMP-activated protein kinase (AMPK). AMPK and SIRT1 both play a crucial role in energy homeostasis and their activity is closely interrelated.

Therefore, it is difficult to determine whether resveratrol activates SIRT1 or AMPK or both, either directly or indirectly. According to Park et al., resveratrol's metabolic effects may result from competitive inhibition of cAMP-degrading phosphodiesterase, which leads to elevated cAMP levels. Consequently, through a cascade of effects, this could lead to activation of AMPK, followed by an increase in NAD⁺ and finally an increase in SIRT1 activity. Unfortunately, the exact mechanism has not yet been determined. Despite its mechanism of action, resveratrol is a promising candidate for treating and preventing metabolic diseases through mimicking calorie restriction-like effects.

Sources of Resveratrol

There are more than 70 plant species that naturally contain and produce resveratrol, such as red grapes, peanuts, some berries, dark chocolate, and Japanese knotweed. *Polygonum cuspidatum*, a plant used in traditional Chinese and Japanese medicine, is the most abundant natural source of resveratrol. Even within the same food, levels of resveratrol vary between seasons and batches. Smaller amounts of resveratrol can also be found in nuts like peanuts and pistachios.

The following foods contain high levels of resveratrol:

- Red Grapes

This antioxidant can be found in unfermented grapes. It is actually contained in the skin of red grapes, along with minerals like manganese and potassium, as well as vitamins like K, C, and B1.

- Red wine

In the early 1990s, epidemiologists were surprised to observe that the French, who eat a high-fat diet, had the lowest incidence of cardiovascular disease in Europe during. Because French people traditionally drink wine with meals, one plausible explanation for the French paradox can be explained by the high levels of resveratrol in red wine. As a result of the discovery of the French paradox, extensive studies were conducted to determine which compounds of red wine have the greatest health-promoting properties. A large body of scientific research has established the health benefits of red wine. Drinking one or two glasses of red wine a day is considered safe for most adults.

- Red grape juice

Other sources of resveratrol may also be available to people who do not drink red wine, such as grape juice. These studies involve laboratory animals given megadoses of resveratrol, far more than we can get from sipping a glass of red wine, however pleasant that might be.

- Dark Chocolate

Dark chocolate contains resveratrol as well as other antioxidants and minerals, such as iron, copper, and manganese. According to the Cleveland Clinic, some research has linked moderate chocolate consumption with a lower risk of cardiovascular disease, stroke and diabetes. However, chocolate can be high in calories, saturated fat and sugar, and eating too much of it can result in weight gain, which in turn can cause health problems.

- Blueberries:

Blueberries don't have quite as much resveratrol as grapes, but according to Harvard Health Publishing, they are still a great source of resveratrol, antioxidants, dietary fiber, vitamins C and K, and manganese. According to a classic August 2003 study in the *Journal of Agricultural and Food Chemistry*, the amount of resveratrol in blueberries will vary based on their type and origin - for instance, while high bush blueberries from Michigan contained resveratrol, those from British Columbia did not.

Get some nuts!

- peanuts

As well as containing resveratrol, peanuts are an excellent source of vitamin E and fiber, as well as having relatively high amounts of copper, folic acid, magnesium, manganese, niacin, phosphorus, thiamin, and zinc. Furthermore, they are high in plant protein and primarily contain monounsaturated and polyunsaturated fats. Although peanuts aren't technically nuts (they are legumes), they offer some of the same health benefits as tree nuts, which, when eaten frequently in small quantities, can significantly reduce the risk of heart disease by more than half.

- Pistachios

The other resveratrol rich food aside from peanuts is pistachio. actually There is more resveratrol in pistachios than peanuts, Unlike peanuts which have dozens of published tests, only a couple exist for pistachios. Based on the most detailed analysis, resveratrol and quercetin contained 0.11 mg and 0.20 mg per 100 g serving, respectively. To be clear, quercetin foods do not activate SIRT1. Adding it to the list of pistachio health benefits makes them even more appealing. Pistachios have several anti-aging properties.

- Peanut Butter:

There is also some resveratrol in peanut butter (up to .13 mg per cup). Peanut butter is a great source of niacin and manganese. Technically a legume, these "nuts" are rarely considered superfoods, yet they have a moderate ORAC value that's higher than cashews, macadamias, and other nuts and seeds. Resveratrol provides some of that antioxidant value.

- Red currants

One of the best sources of resveratrol is red currants, which contain 1.57 mg per 100 g of resveratrol, about 30% less than most wines.

These are some other sources of resveratrol: [strawberries](#), [jackfruit skin](#), [cranberries](#), [lingonberries](#) and [mulberries](#).

Benefits of Resveratrol

The anti-aging and disease-fighting properties of resveratrol have gained considerable attention. Today, scientific research shows that resveratrol can prevent a number of chronic and degenerative diseases, including heart disease, cancer, and even slow the aging process, making it a potent antioxidant. Recent research has even demonstrated that resveratrol can increase blood flow to the brain. Resveratrol may also have the potential to help us live longer, making it a prominent subject in aging and longevity research. Resveratrol has been shown to mimic the health benefits of calorie restriction, the only proven method of extending lifespan. Research has long indicated that substances in red wine may be beneficial to health.

During the 1990s, experts began focusing on resveratrol, an antioxidant compound found in red wine. Since then, animal and laboratory studies have shown that resveratrol has antiviral, anti-inflammatory, and anti-cancer properties. They're thought to act like antioxidants, protecting the body against damage that can put you at higher risk for things like cancer and heart disease. Inflammation plays an important role in the pathogenesis of a wide variety of diseases including cardiovascular disease, cancer, diabetes, Alzheimer's disease, and autoimmune disease. Agents that can suppress inflammation thus have a potential in mitigating the symptoms of the disease. Resveratrol exhibits antioxidant and anti-inflammatory properties and may be useful for treating certain diseases.

Studies have shown that resveratrol reduced 5-FU's toxicity, enhanced its antitumor effects

on murine hepatoma, and antagonized its toxicity significantly. Based on the results of this study, it appears that resveratrol modulates the therapeutic effects of 5-FU, which may prove useful in the treatment of cancer. The resveratrol component of the compound appears to protect the normal cells from chemotherapeutic agents, while enhancing the toxicity against tumor cells. Olas et al. demonstrated that resveratrol protects hematopoietic cells against chemotherapy-induced toxicity. Using platinum compounds, the researchers found that resveratrol protected blood from changes in platelet thiols. The use of cisplatin is particularly useful in the treatment of epithelial malignancies, but it comes with several toxic effects, including hematology toxicity. Selenium-cisplatin conjugate $\text{ONH(3)(2)Pt(SeO(3))}$; Se-Pt) is not toxic to blood platelets. The reduction of platelets' protein thiols was observed to be caused by platinum compounds. The combination of 25 g/ml of resveratrol and platinum compounds decreased platelet thiols (after 30 minutes), particularly those in the acid-soluble fraction. Despite experts recognizing its potential, there isn't enough evidence to confirm its effectiveness. People have not been adequately studied on the effects of resveratrol supplements. We can't be certain what benefits and risks they may have. In addition, resveratrol might not be more important than other natural substances found in wine.

Conclusion

Resveratrol is now recognized as a phytoalexin that is naturally produced by a variety of plants such as grapes, pistachios, peanuts, blueberries, chocolate, etc., as a defense mechanism against stress, injury, ultraviolet radiation, and fungus. Several studies have shown that resveratrol has tremendous potential for treating various diseases, but only clinical trials can determine its true effectiveness. Resveratrol has traditionally been used for treatment of stomachaches, hepatitis, arthritis, urinary tract infections, fungal diseases, and skin inflammation, but its main biological function is cardioprotection.

Also Resveratrol may be useful in treating the following diseases:

- Diabetes: Diabetes can result from insulin resistance. resveratrol helps prevent insulin resistance, a condition in which the body becomes less sensitive to insulin, a hormone that lowers blood sugar. The resveratrol gene is believed to be activated by resveratrol. The gene is thought to protect the body from the effects of aging and the diseases of obesity.
- Heart disease: Resveratrol reduces inflammation, lowers bad cholesterol, and makes it more difficult for blood clots to form, which can cause heart attacks.
- Cancer: Resveratrol might be able to prevent cancer cells from spreading.
- Alzheimer's disease: Resveratrol may protect nerve cells from damage and fight the plaque buildup that can lead to the disease.

In addition to its cardioprotective effects, resveratrol is anti-carcinogenic, antiviral, neuroprotective, anti-inflammatory, and antioxidant. One of the most promising compounds in anti-inflammatory drug formulation is resveratrol-like derivatives. Nevertheless, its attractiveness, as well as their bioavailability and activity must be improved.

In vitro and in vivo evidence suggests that resveratrol may be a promising therapeutic agent, however clinical trials must confirm this. The question of whether resveratrol should be consumed in a purified form or as a part of the plant is important.

