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Is Moderate Daily Consumption of Red Wine a Good Solution?

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Abstract

Resveratrol is a natural polyphenol that is present in the human diet and has many potential therapeutic properties. It is produced by certain plants, including several dietary sources such as grapes, apples, raspberries, blueberries, plums, peanuts and products derived therefrom (e.g. wine).

Resveratrol has received attention for its health benefits. This compound and its glucoside, the transpolydatin piceid, have garnered interest worldwide for their beneficial effects on cardiovascular, pulmonology, inflammatory, neurodegenerative, metabolic, and age-related diseases.

Although seed wine, in moderation, has long been considered heart-healthy, several studies have concluded that it is not possible to absorb the recommended therapeutic doses of resveratrol through moderate consumption or dietary sources. The relatively low amounts of resveratrol in wine following moderate consumption, however, might be insufficient to mitigate biological damage, such as that due to oxidative stress. Several groups have also highlighted the importance of viticulture and the winemaking process to enhancing resveratrol concentrations in wine to increase its health benefits.

Keywords: *Resveratrol; Red Wine; Antioxidants*

Resveratrol (3,5,49-trihydroxystilbene) is a polyphenolic molecule that is found in the skins of red fruits, such as grapes, and is a compound in red wine extract with a range of biological activities [1].

The major dietary sources of resveratrol include grapes, wine, apples, peanuts, tea and soy [2,3]. *Vitis vinifera* (grape), *Arachis hypogea* (peanut), *Theobroma cacao* (cacao), plants producing berries (*Vaccinium myrtillus*, *Ribes nigrum, Rubus idaeus*, etc.), tea (*Polygonum japonicum*, formerly known as *Polygonum cruspdatum*) are sources rich in resveratrol [4].

Originally this herbaceous plant was endemic to East Asia, Japan, China, and Korea. Today, the Japanese knotweed is also found in many countries throughout Europe and is defined as one of the worst invasive plant species [5].

Resveratrol was first isolated in 1939 from the roots of the white hellebore (*Veratrum grandiflorum*) and received its name from the fact that it is a derivative of the benzene-1,3-diol resorcinol and isolated from the Veratrum species. Several studies have demonstrated that phenolic compounds have radical scavenger and antioxidant properties [6,7].

Oxidative stress is an increase in free radical production and a decrease in the production of antioxidant molecules. Free radicals are waste products found in thin cells in the mitochondria, where oxygen is used in metabolic processes to produce energy. Not all oxygen is used approximately 5% of it gives rise to selected free radicals [8].

Other free radicals come from outside and can enter the body through the digestive system, skin, lung, against which an organism has a specific system to defend itself.

Free radicals can exist independently, containing an unpaired electron in an atomic orbital, rendering them unstable and highly reactive oxygen species (ROS) [9].

The most significant ROS are reported in table 1. They are derived from essential metabolic processes in the human body or external sources (Table 2). ROS damage biological molecules such as DNA, proteins carbohydrates and lipids [10].

Hydroxyl radical
Superoxide anion radical
Hydrogen peroxide
Oxygen singlet
Hypochlorite
Nitric oxide radicals
Peroxy nitrite radical

Table 1*: Principal ROS.*

Mitochondria
Xanthine oxidase
Peroxisomes
Inflammation
Exercise
Phagocytosis
Cigarette Smoke
Environmental pollutions
Ischemia/reperfusion injury
Radiations
Ozone
Industrial solvent

Table 2: *Internally generated sources of free radicals.*

The imbalance between oxidants and antioxidants, in favor of the former, potentially leading to damage, forms the core of the definition of 'oxidative stress', as this author has discussed before and after the 1985 book that devoted was to the term itself [11-13].

Antioxidant dietary supplements appear to reduce the risk of cardiovascular, metabolic, neurodegenerative diseases and respiratory diseases and cancer [14], because oxidative stress is a common pathophysiological mechanism of these diseases.

Oxidative stress due to airway inflammation is increased in chronic obstructive pulmonary disease (COPD) and idiophatic pulmonary fibrosis (IPF) and might account for the progressive deterioration in the structure and function of the respiratory tract in these diseases. Antioxidant defences of the respiratory tract can become overwhelmed by the oxidant burden in COPD and possibly restored with antioxidant therapy [15].

An antioxidant is a molecule that is stable enough to donate an electron to a rampaging free radical and neutralize it, thus reducing its capacity to damage. Antioxidants act as radical scavenger, hydrogen donor, electron donors, peroxide decomposers, singlet oxygen quenchers, enzyme inhibitors, synergists, and metal-chelating agents. Enzymatic and nonenzymatic antioxidants exist in the intracellular and extracellular environment to detoxify ROS [16,17].

Table 3 shows the principle types of antioxidants. The potential benefits of drinking red wine with meals have been partly ascribed to its high content of polyphenols such as resveratrol. Resveratrol has anti-inflammatory and antioxidant properties. It prevents oxidation of scavenging ROS and the peroxidation of lipids and other macromolecules [18-20].

Enzymatic	Non Enzymatic	Others
Superoxide dismutate	Ascorbic acid	Indian Medicinal plants and plants
Catalase	Glutathione	Beverages (283 products were included, from coffee and tea to beer, wine and lemonades)
Glutathione systems	Melatonin	Cereals, grains and grain products, legumes
	Tocopherols and tocotrienols (Vitamin E)	Fruit and fruit juices, Fish
	Uric acid	Berries and berry products

Table 3: *Antioxidants agents.*

Area	Daily Dose Range	Comments
Cancer	0.07-5 gr	Positive effects on markers of cellular proliferation, migration and apoptosis
Fatty Liver	0.3-3 gr	Reduction of hepatic enzymes
Diabetes	0.01-3 gr	Improvement of insulin sensitivity
Cognitive function	0.075-2 gr	General improvement of cognitive function
Cardiovascular diseases	0.5-200 mg	Reduction of LDL - cholesterol
Respiratory diseases	> 300 mg	Inhibition of release of the neutrophil chemotactic factor. This could lead to inhibition of neutrophilia and decreased levels of inflammatory cytokines in the airways

Table 4: *Resveratrol's effects in humans in various diseases.*

French epidemiologists have observed a lower mortality incidence of coronary heart disease in France despite its high levels of dietary saturated fat and cigarette smoking [21]. It was later assumed that moderate consumption of red wine over a long period of time can protect against coronary heart disease and might be the cause of this paradoxical finding [6]. Moreover, resveratrol was postulated to modulate signaling pathways that limit the spread of cancer cells, protect nerve cells from damage, prevent diabetes and acts as an antiaging agent that improves age-related problems [22-26].

Table 4 listed the effects of resveratrol in humans in various diseases. It reduces neutrophilia and proinflammatory cytokine levels in lung tissue in a rodent model of acute lipopolysaccharide-induced airway inflammation [27]. Further, *in vitro* treatment with resveratrol inhibits the release of inflammatory cytokines from bronchoalveolar lavage fluid macrophages and human bronchial smooth muscle cells from COPD patients [28-30]. Many studies have implicated oxidative stress, in skeletal and respiratory muscle dysfunction and loss of skeletal muscle mass in patients with COPD, especially those with emphysema and muscle wasting [31,32].

Preclinical animal studies have suggested beneficial effects for resveratrol in the treatment of COPD phenotype, characterized by the high prevalence of emphysema and muscle-wasting cardiovascular diseases [33,34], but only at a high dose of resveratrol (300 mg/day).

The results of the studies are not unique because on the variability in dosage (8 - 3000 mg/day) and duration (2 weeks to 6 months) between studies and the low bioavailability of resveratrol [35]. This compound is located primarily in the skins and seeds of grape berries; thus, winemaking practices, that influence the extraction of resveratrol from the skins and seeds into wine influence its concentration in the final product [36].

Although most of the benefits that are ascribed to this substance have been scientifically confirmed, the high dosages that are required to obtain these "protective" effects have limited the enthusiasm for red wine. Even if there is no single indication in this regard, to reach the levels of resveratrol intake that are proposed by various studies, harmful quantities of wine (several liters per day) would be necessary.

Although exploiting the antioxidant properties of resveratrol through the consumption of wine has no scientific value, it is fair to ask whether moderate consumption of this drink has positive effects on human health. In this regard, it is not possible to give a definitive answer because, starting from the assumption that alcohol is an oncogenetic substance, there are some studies (though not all) have confirmed the health benefits of wine.

Regarding wine consumption, reasonable low-risk intake limits have been set - typically 24 - 30g of alcohol per day for men and 12 - 15g per day for women, equal to 1 - 2 glasses of wine (150 - 300 ml). Finally, wine, regardless of its resveratrol content, has, above all, cultural and convivial significance. Its health implications, on the contrary, still awaiting confirmation [37].

Conclusion

We conclude to oppose antioxidant insults lifestyle interventions including smoking cessation, physical activity and nutritional and dietary modulation are needed.

There is evidence for resveratrol as an antioxidant. Wine is the main source of dietary resveratrol although the average intake is on the order of several mg/day, which is insufficient to support healthy biological actions. Therefore, additional studies are needed to confirm this relationship and examine means of increasing its concentration, also through the winemaking processes.

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