PROVINOLS™

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PROVINOLS™

Technical data & Specifications

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PROVINOLS™ was developed in partnership with INRA (Institut National de Recherche Agronomique) in Montpellier-France and the Société Française de Distilleries, a French wine producing company, specialised in the production of wine based products.

PROVINOLS™ is composed of polyphenols collected from red wine produced in the Languedoc-Roussillon regions in the south-east of France, which has been specifically selected for its quality and antioxidant content.

Description

A fine or granulated powder directly obtained from selected red wine.
The product is a natural and efficient source of the antioxidant polyphenols contained in red wine and which properties are known as “The French Paradox”.

Active ingredients

Total polyphenols: min. 70% (Absorb. 280, eq. Catechin)

Family	Identified polyphenols	Value (%)
Oligomers	Proanthocyanidole B1	1.40
	Proanthocyanidole B2	0.87
	Proanthocyanidole B3	0.31
	Proanthocyanidole B4	0.91
Monomers	Catechin	1.51
	Epicatechin	1.76
	B2-3 O gallate	0.54
	Epicatechin 3-O gallate	0.10
Phenolic acids	Cafeoil tartric acid	0.54
	p-coumaric acid	0.18
	Gallic acid	0.08
Stilbens	Resveratrol	0.17

Analytical method: HPLC

Nutritional facts

Protein (Kejdhal : N x 6.25)	8.81 %
Fat	0.17 %
Carbohydrate (Dubois)	15.14 %
Ashes	4.71 %

Recommended daily dosage (red wine polyphenols) : 100 - 300 mg/day
based on advice of the French Paradox : 1 to 3 glasses of red wine per day.

Specifications

Characteristics	Standards
Appearance	fine powder
Colour	dark red to purple
Odour	tannic, characteristic
Taste	astringent
Composition	min. 70 % total polyphenols of red wine
Water solubility (pH 3)	min. 1 %
Alcohol solubility (15 %)	min. 4 %
Residual alcohols	≤ 0.02%
Loss on drying	max. 8 %
Heavy metals	< 20 ppm
Pesticides	according to EP 3
Microbial Count : - Total germs	max 1000/g
- Enterobacteria	max 100/g
- Escherichia coli	absence
- Salmonella	absence
- Pseudomonas aeruginosa	absence
- Staphylococcus aureus	absence
- Yeast & Mould	max 100/g

Packaging and storage

Packaging	25 kg double wall polyethylene-lined cartons
Selflife	2 years
Storage	in a cool, dry and dark place

Uses

- In drinks (alcoholic and alcohol free),
- In dairy products and desserts
- In dietary supplement bars
- In capsules, tablets, sachets

PROVINOLS™

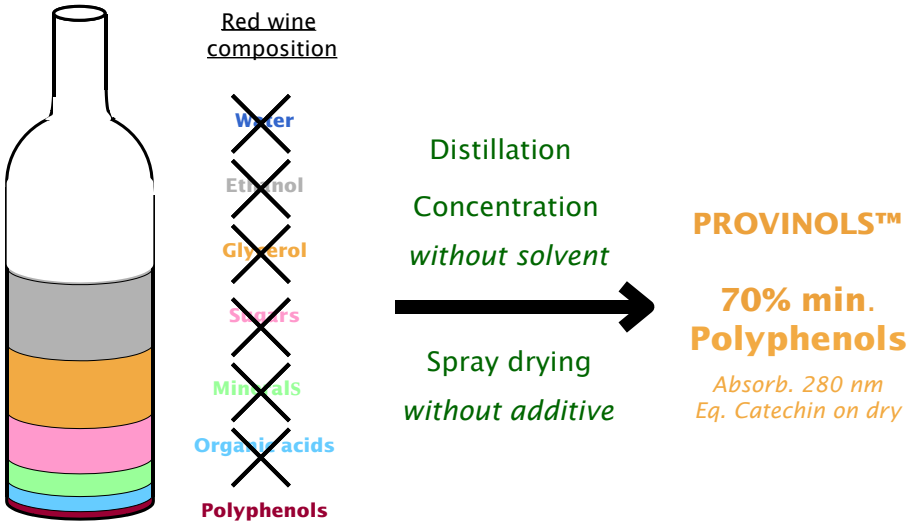
Manufacturing process & Analysis

- Manufacturing process
- Polyphenols distribution
- HPLC analysis

Manufacturing process

The raw material used to manufacture PROVINOLS™ is red wine from Languedoc-Roussillon regions.
The substances which are eliminated during the process are mainly : ethanol, reducing sugars, part of mineral salts, organic acids like tartric acid and malic acid.

PROVINOLS™ is obtained without any solvent or any carriers.



1.100 litres of red wine permit to produce 1 kg of PROVINOLS™.

Polyphenols distribution

Comparative study between wine used to manufactured PROVINOLS™ and pseudo wine prepared with 0.13% PROVINOLS™ in an hydroalcoholic solution at 12% v/v.

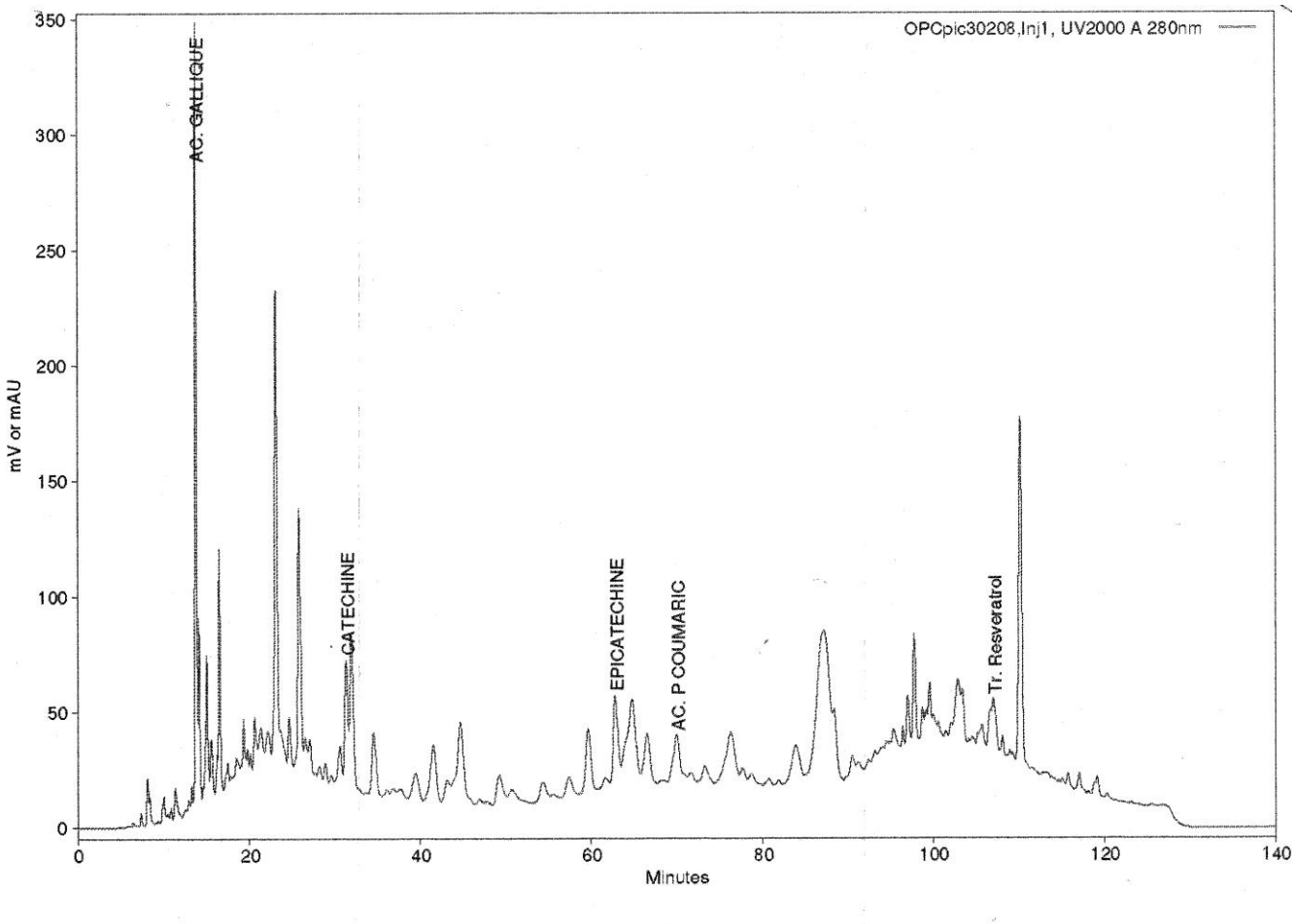
Polyphenolic families	Wine Quantities (mg/l)	PROVINOLS™ Quantities (mg/l)	Yield (%)
Phenolic acids	242	196	81
Anthocyanes	246	245	100
Flavonols	32	21	66
Flavanols	910	909	100

100 mg of PROVINOLS™ correspond to 1 glass of red wine.

HPLC analysis

Analysis		Results (mg/100g of powder)
Oligomers	Proanthocyanidole B1	1399
	Proanthocyanidole B2	869
	Proanthocyanidole B3	310
	Proanthocyanidole B4	916
Monomers	Catechin	1513
	Epicatechin	1759
	B2-3 O gallate	538
	Epicatechin 3O gallate	103
Other phenolic compounds	Chlorogenic acid	544
	p-coumaric acid	179
	Gallic acid	81
	Resveratrol	171
Polymers	-	17106
Other phenolic acids	-	12798

Analysed by NUTRINOV Lab. (Rennes, France) - 12/09/2000



PROVINOLS™

Physical characteristics

Description

Aspect	fine or granulated powder
Colour	dark red to purple
Odour	tannic
Taste	astringent

Particle size

Fine powder	D50 = 21 µm D90 = 55 µm D100 = 125 µm
Granulated powder	D50 = 37 µm D90 = 80 µm D100 = 250 µm

Solubility

Solubility (water, 20°C, pH 3-4)	> 1 %
Solubility (ethanol 15 %)	> 4 %

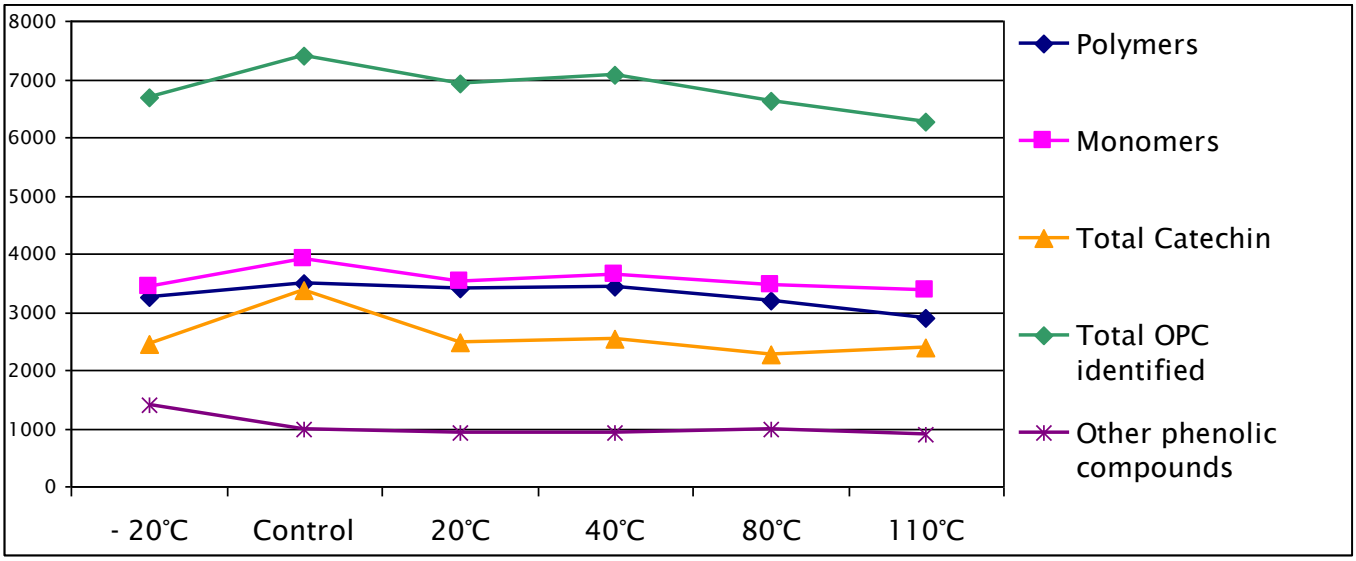
Thermal stability

Thermal stability of PROVINOLS™ was studied directly on the powder.
At hot temperatures : 20°C, 40°C, 80°C and 110°C during 10 minutes.
At cold temperature : -20°C during 2 days.

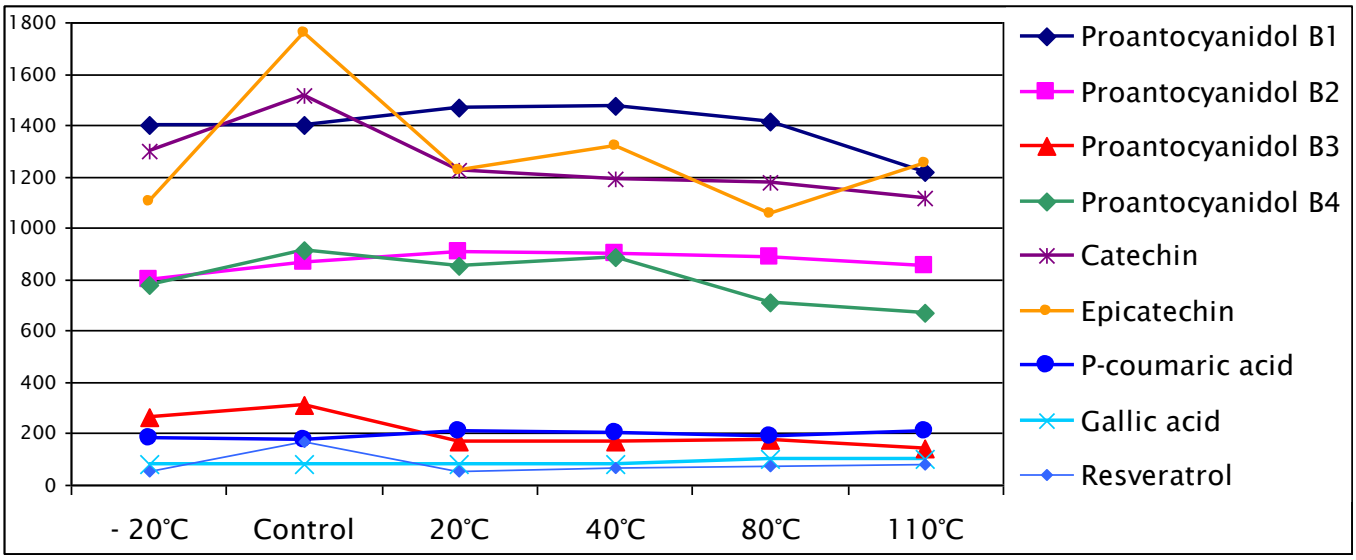
Then HPLC analysis of polyphenols were down.

The results are as follow :

Polyphenols	- 20°C	Control	20°C	40°C	80°C	110°C
Polymers	3245	3494	3403	3435	3190	2884
Monomers	3438	3913	3526	3629	3448	3387
Total Catechin	2456	3375	2473	2534	2260	2399
Total OPC identified	6689	7407	6919	7064	6638	6272
Other phenolic compounds	863	975	930	928	974	885



Polyphenols	- 20°C	Control	20°C	40°C	80°C	110°C
Proantocyanidol B1	1402	1399	1471	1475	1414	1219
Proantocyanidol B2	800	869	910	902	889	854
Proantocyanidol B3	267	310	173	170	178	140
Proantocyanidol B4	776	916	850	888	709	671
Catechin	1297	1513	1224	1193	1181	1117
Epicatechin	1100	1759	1227	1320	1054	1249
P-coumaric acid	186	179	210	202	190	211
Gallic acid	80	81	82	84	102	101
Resveratrol	57	171	53	68	75	79



PROVINOLS™

Radical scavenging effect

- Test principle
- Results

Free radicals are activated chemical species produced in vivo under normal or pathological, biological conditions. Various external aggressions (chemical, mechanical, UV, stress, pollution, alcohol consumption, smoking ...) also increase their formation, thus causing cells a great deal of harm.

Within the cell, free radicals can induce peroxidation of the polyunsaturated fatty acids of the phospholipid membranes, the formation of cytotoxic peroxides, the oxidation of proteins and a denaturing of DNA. All these phenomena very frequently contribute to cell death.

If the enzyme or chemical detoxification systems naturally present in the body are overwhelmed (defence capacities may vary from individual to individual), the cells require help in defending themselves via topically applied radical scavenging active ingredients.

Because of its radical scavenging action, PROVINOLS™ protects the cells against the harmful effects caused by free radicals when aggression occurs.

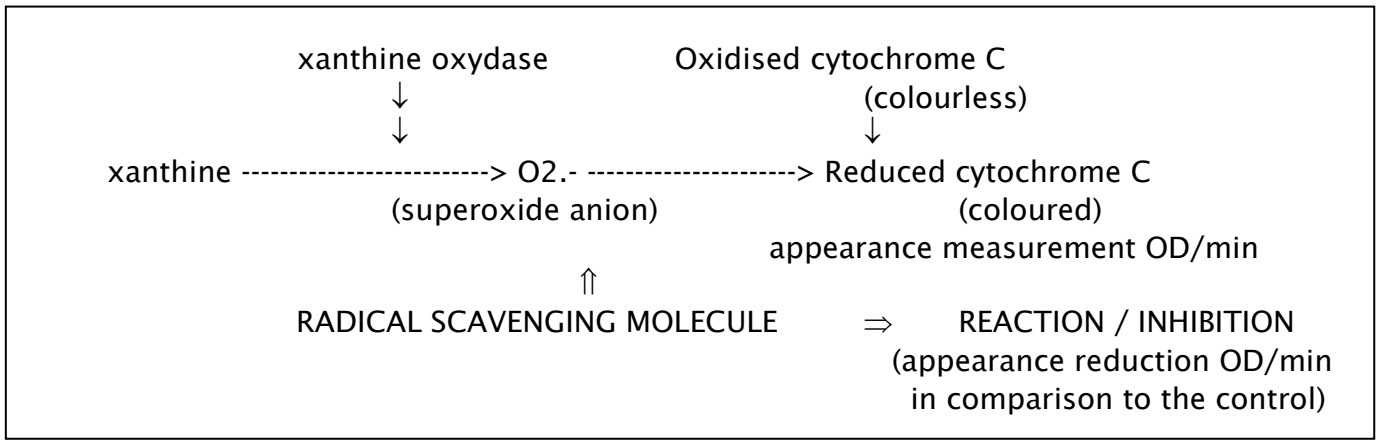
Test principle

This in vitro test assesses the radical scavenging properties of PROVINOLS™ with the superoxide anion.

The radical scavenging activity of PROVINOLS™ was compared with that of vitamin C, a reference radical scavenger.

Determination of the radical scavenging effect is based on the inhibition or the decrease in the speed of cytochrome C reduction, by adding to the reactive medium a molecule to be studied.

The superoxide anion is generated by the action of xanthine oxydase on xanthine. It leads in the absence of a molecule able to capture it, to the reduction of the cytochrome C. The appearance of reduced cytochrome C is monitored using a spectrophotometer at 550 nm in the presence (test) and absence (control) of radical scavenging molecules.



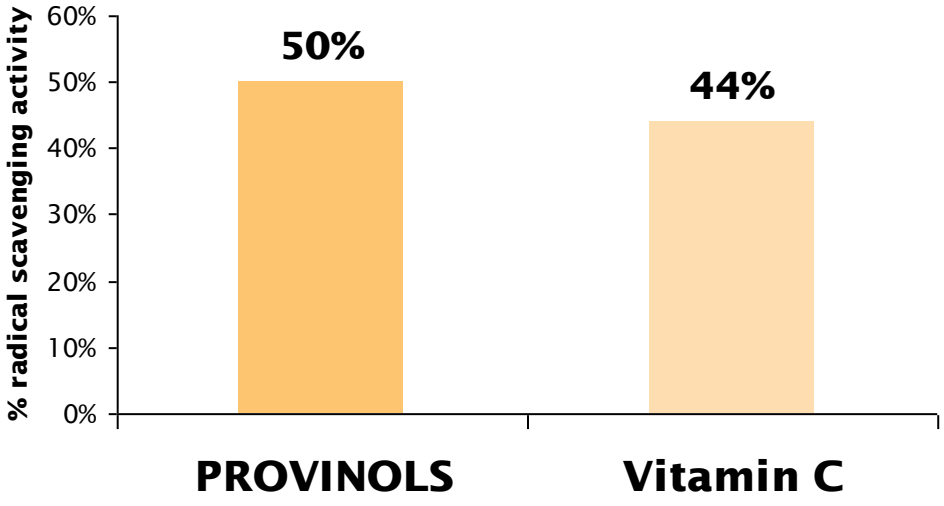
The reaction is carried out in a spectrophotometer set at 25°C equipped with a sample passer. This procedure is carried out and observed at least three times. The average and the standard deviation are calculated for the three values obtained.

An inhibition percentage for the speed of appearance of the coloured product (corresponding to the quantity of free superoxide anion) shall therefore be calculated for each active ingredient tested. This calculation shall be carried out on the basis of the speed of appearance of the coloured product in the control (active free).

The percentage of inhibition of the appearance of the coloured product by the active ingredient therefore corresponds to the percentage of inhibition of the superoxide anion (= radical scavenging activity).

Results

At a very low content (0.0015% of active matter), both PROVINOLS™ and Vitamin C (a reference product in this item) have a very good radical scavenging efficacy.



However, the efficiency of PROVINOLS™ is a little bit better than that of vitamin C, and its incorporation in a formula is much easier (more stable than vitamin C).

The use of PROVINOLS™ is then particularly recommended in all product where a radical scavenging effect is requested.

PROVINOLS™

Wine polyphenols and CVD

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Introduction

Plant polyphenols contain a multitude of compounds and are one of the most important and widely distributed groups of compounds in plants. They are present in many foods including fruits, vegetables, dried fruits and drinks. Wine is one of the drinks which contains large quantifies of polyphenols (approximately 1 to 2 g/l in red wine and 0.5 g/l in white wine).

Cardiovascular diseases are responsible for approximately 50% of deaths in developed countries. The major process giving rise to these cardiovascular diseases is atherosclerosis, which is often associated with poorly balanced nutrition. These observations have attracted the attention of many researchers into the quality of food and its importance in human health. Many epidemiological studies have identified correlations between consumption of foods which are rich in polyphenols and a reduced incidence of cardiovascular diseases (Hertog et al., 1995).

Plant polyphenols have a very diverse pharmacological spectrum of activity, which may explain their protective actions against cardiovascular diseases. This review examines in particular, published results on the beneficial effects of polyphenols contained in red wine. Polyphenols obtained from wine (MTE) have protective properties against oxidation of circulating lipids, particularly "low density lipoproteins or (LDL)". Polyphenols also reduce platelet aggregation and therefore increase blood fluidity. The anti-oxidant and platelet anti-aggregant activity of the polyphenols may interfere with the atherogenic process and/or thrombotic processes associated with atherosclerosis and may explain the beneficial properties of these compounds. It has recently been reported that the WPE, and in particular PROVINOLS™, are vasodilators, which have actions on the vascular endothelium by releasing a potent vasodilating compound, nitrogen monoxide (NO) (Andriambeloson et al., 1999). This property of the polyphenols is believed to be important both in cardiovascular diseases associated with endothelial failure and in myocardial ischaemia.

Platelet anti-aggregant activity

Arterial thromboses is the major complication of atherosclerosis and may lead to myocardial infarction. Blood platelets play a major role in the development of arterial thromboses. Inhibitors of platelet aggregation are also effective in the treatment and prevention of arterial thromboses.
In vitro studies performed on isolated platelets have shown that WPE inhibit platelet aggregation. The triggering signal for platelet aggregation is an increase in calcium ion content within the platelets. It has been reported that by acting on different targets, WPE inhibit the increase in intracellular calcium. Although many in vitro studies have shown that WPE have platelet anti-aggregant activity, very few studies in vivo in animals or clinical studies in human beings have been reported. Demrow et al. (1995) reported that administration of red wine to dogs inhibited platelet aggregation and thrombus formation, although this effect was not seen with white wine. Consumption of red wine for 2 to 4 months in rats also inhibited platelet aggregation (Ruf, 1995). More detailed studies in animals and human beings are needed, however, to evaluate any in vivo anti-thrombotic activity of the WPE.

Anti-oxidant activity

The formation of atherosclerotic plaques is, also associated with oxidation and accumulation of LDL in sub-endothelial cells, resulting in a reduction in the diameter of blood vessels. LDL are proteins which transport cholesterol and other lipids in the circulation towards target cells. During their transport, lipids may be oxidised by oxygen radicals. Oxidised LDL accumulates in sub-endothelial macrophages and alters cell cholesterol metabolism. Oxidised LDL also prevents the removal of cholesterol and, in addition, causes platelet aggregation.
Red wine contains many polyphenol compounds which have anti-oxidant properties and can bind oxygen free radicals. Through this mechanism they inhibit oxidation of LDL (Serafini et al., 1994). Frankel et al. (1995) reported that polyphenols from wine prevented the formation of conjugated dienes formed after oxidation of human LDL catalysed by copper ions. Fuhrman et al (1995) showed in a clinical trial that administration of red wine to healthy individuals reduced LDL oxidation due to an artificial free radical producer or when induced by copper. Carbonnau et al (1997) showed that administration of WPE for 15 days to healthy subjects increased plasma resistance to LDL oxidation.

Vasodilating properties of the WPE and in particular of PROVINOLS™

The blood vessel consists of 3 layers: the endothelium, which lines the internal wall of the blood vessel and is the layer in contact with circulating blood, smooth muscle cells which have contractile properties and which constitute the middle part of the vessel, and the adventitia, which is the outside part of the vessel. The vascular endothelium plays an important role in the regulation of blood flow and vascular tone. It secretes various vasodilating factors including NO, prostanoid derivatives and the hyperpolarising factor derived from the epithelium (Furchgott and Vanhoutte, 1989). Release of these various substances results in vascular relaxation, through a mechanism which is dependent on the endothelium, on different vascular beds in several species. In many diseases, such as hypertension, diabetes and atherosclerosis, the ability of the blood vessels to produce vasodilating factors from the vascular endothelium is reduced. One of the mechanisms which may be involved in this poor endothelial function is a reduction in NO release. The effects on vasomotility of the WPE and PROVINOLS™, in particular, have been studied in detail using different pharmacological approaches in the blood vessels and in the cells which make up the blood vessels, particularly endothelial cells (Andriantsitohaina et al., 1999). The WPE and PROVINOLS™ have been shown to produce vascular relaxation which depends on the presence of

endothelial cells lining the internal wall of the blood vessels. This effect is due to the production of a potent vasodilating compound, NO, by endothelial cells (Andriambeloson et al., 1997, 1999). Production of NO by the endothelium which plays a part in the vascular relaxation produced by WPE and PROVINOLS™, involves complex mechanisms which do not appear to require secondary messengers, but occur through an increase in calcium ion content in the endothelial cell. This requires the presence of extracellular calcium (Andriambeloson et al., 1989). Studies on cultured endothelial cells have shown that wine polyphenols may induce a rise in the calcium ion content in these cells. This rise is responsible for production of NO by endothelial cells, leading to vascular relaxation (Andriambeloson et al., 1997).

Studies to isolate and identify compounds responsible for the vascular effects of the WPE have shown that the class of oligomeric condensed tannins and the anthrocyans appear to contain compounds which promote the vasorelaxing activity of wine extract, which is dependent on the presence of the endothelium (Andriambeloson et al., J Nutri, 1998).

NO has many roles: it plays a fundamental role in physiological regulation of blood vessel contraction, it protects against platelet aggregation and finally it inhibits proliferation of vascular cells, which may close off the blood vessel lumen. All of the biological properties of NO described above may contribute to the protective effects of the WPE and PROVINOLS™ in cardiovascular disorders.

Conclusion

Findings from epidemiological studies suggest that foods which are rich in polyphenols may have beneficial effects on human health. Resistance to certain cardiovascular diseases which is seen in certain population groups, particularly in the Mediterranean Basin, has been attributed to high consumption of fruits and vegetables and moderate intake of red wine.

Some polyphenols present in red wine may therefore be of therapeutic benefit in the future. The plant polyphenols may be able to improve blood fluidity and reduce the formation of atheromatous plaques, allowing improved supply of oxygen and nutrients to different organs as a result of their anti-oxidant, platelet anti-aggregant and vasodilating properties. The plant polyphenols may therefore represent a new class of medicinal products against cardiovascular diseases which remain, at present, a major public health problem.

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PROVINOLS™

Effects of PROVINOLS™ on vasomotricity

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Introduction

Epidemiological studies have established a link between the consumption of plant polyphenols and a low incidence of coronary artery disease (Hertog et al., 1995), and red wine has a high polyphenol content.

Some polyphenols - and particularly those present in red wine - can act as vasculo- or cardio-protective substances due to their anti-oxidant and free radical-scavenging properties. They protect "low-density lipoproteins" (or LDL) against oxidation (Frankel et al., 1993). Polyphenols also reduce platelet aggregation and consequently appear to increase blood fluidity (Renaud and Logeril, 1992; Osman et al., 1998). Finally, polyphenols are also capable of inhibiting the proliferation of vascular smooth muscle cells (Iijima et al., 2000) in addition to their numerous other properties, particularly in the immune cells (for review Middleton et al., 2000). Hence, thanks to these properties, polyphenols may interfere with the atherogenesis process and/or the thrombotic phenomena associated with atherosclerosis, which could explain the beneficial effects of these substances. In addition to their platelet anti-aggregant and anti-oxidant effects, grape seed extracts and wine extracts are capable of acting directly on blood vessel function, inducing an endothelium-dependent relaxation that involves the nitric oxide (NO) pathway (Fitzpatrick et al., 1993).

Our group has been interested in the vascular effects of wine - and, in particular, PROVINOLS™ - for several years and has clearly demonstrated that wine extract induces vessel relaxation due to a mechanism independent of their free radical-scavenging and anti-oxidant properties. In addition, wine extract directly stimulates the production of NO in the blood vessels, as we have been able to demonstrate by electronic paramagnetic resonance (Andriambeloson et al., 1997). This is due to the direct action of polyphenols on the endothelial cells, stimulating the release of NO and other endothelial relaxing factors, such as the hyperpolarising factor. Moreover, studies on the effects of defined commercially-available polyphenols and polyphenol fractions extracted from

wine have demonstrated that oligomeric condensed tannins and anthocyanins contain active molecules that, in addition to inducing endothelium-dependent relaxation (Andriambeloson et al., 1998), also lead to inhibition of the inactivation of cyclic guanosine monophosphate (cyclic GMP) by the cyclic nucleotide phosphodiesterases (PDE) that can be activated by the calcium-calmodulin complex (PDE1) and also by the phosphodiesterase stimulated by cyclic GMP (PDE2) (Klaiber et al., 2001). Delphinidin was the only defined substance in this anthocyanin class that presented the same pharmacological profiles as wine extract.

As for NO, this activates cyclic GMP in the majority of cases and thus has many different roles: it plays a fundamental role in the regulation of vessel contraction, it protects against platelet aggregation, adhesion and leukocyte migration and it inhibits the proliferation of vascular cells following endothelial damage. It can also induce the expression of numerous genes (Kim et al., 1997; Marschall et al., 2000). Finally, it is capable of inducing or inhibiting apoptosis or «programmed cell death» in vascular cells. All these effects could explain the protective role of wine extract - and, in particular, PROVINOLS™ - in vascular diseases and, especially, in coronary artery diseases, in addition to their anti-oxidant effects.

Study project

This project is intended to obtain information relative to the mechanisms of producing endothelial factors - in particular NO - induced by PROVINOLS™ in endothelial cells *in situ* in the vessel (rat aorta) and in culture. In addition, the consequences of acute and chronic treatment with PROVINOLS™ on vasomotricity were analysed *in vivo*. Finally, the protective role of PROVINOLS™ against the effects of hypertension triggered by NO-blocking at cardiac and vascular level was also considered. These studies were carried out in order to provide us with a better understanding of the potential beneficial effects of PROVINOLS™ on cardiovascular problems, which are still a major public health concern today.

Analysis of the intracellular mechanisms governing the production of NO or other relaxing factors in the endothelial cells, in the vessel or in culture

The production by wine extract of the endothelial NO involved in vascular relaxation entails a mechanism that requires the presence of extracellular Ca^{2+}. The associated mechanism does not involve the activation of known secondary messengers, such as those produced by PLC or phospholipase A_2, nor G proteins (Andriambeloson et al., 1999).

We studied the intracellular mechanisms governing the elevation in intracellular calcium ($[Ca^{2+}]_i$) levels and the production of NO in the endothelial cells of bovine aorta in culture in response to polyphenols. To do this, we selected two polyphenol wine extracts with a similar composition - PROVINOLS™ and a standardised polyphenol extract (Cabernet-Sauvignon) supplied by the INRA in Montpellier. In the cultured bovine aorta endothelial cells, the three substances are all capable of inducing an elevation in $[Ca^{2+}]_i$ levels and the production of NO. However, the molecular mechanisms involved in the elevation in $[Ca^{2+}]_i$ levels produced by the three substances are different.

For PROVINOLS™, this mechanism triggers an increase in $[[Ca^{2+}]_i$ levels that is dependent on the influx of Ca^{2+}. The elevation in $[Ca^{2+}]_i$ levels entails the participation of intracellular Ca2+ reserves that can be released by agents producing inositol-triphosphate, such as bradykinin, or agents acting on the Ca^{2+}-ATPase pump of the sarcoplasmic reticulum, such as thapsigargin. In addition, PROVINOLS™ induces an elevation in $[Ca^{2+}]_i$ levels by independently activating the C-

type phospholipases pathway and that of tyrosine kinases. The mechanisms involved entail the activation of G proteins sensitive to pertussis toxin and those sensitive to cholera toxin.

In view of the results obtained, several conclusions can be drawn. First of all, PROVINOLS™ stimulates an elevation in Ca^{2+} levels and the production of endothelial factors, acting on multiple molecular targets. Secondly, the mechanisms underlying the elevation in $[Ca^{2+}]_i$ levels in response to PROVINOLS™ and to the INRA wine extract are different, although both are capable of producing NO.

Effects of acute and chronic administration of PROVINOLS™ on vasomotricity *in vivo*

The results demonstrated that intra-jugular administration (0.001 to 2 mg/kg) of PROVINOLS™ in anaesthetised rats led to a moderate fall in blood pressure without any change in heart rate. The effect obtained reaches a maximum with the administration of 1 mg/kg and the blood pressure is reduced by 50 mmHg.

Consequently, PROVINOLS™ is hypotensive when it is administered acutely in anaesthetised rats.

The oral administration (20 mg/kg, once daily) of PROVINOLS™ for one week reduces blood pressure in normotensive rats without affecting heart rate. The haemodynamic effects are associated with an increase in endothelium-dependent relaxation of the rat aorta, an induction of gene expression in the vascular wall (inducible NO-synthase and inducible cyclo-oxygenase) and the concomitant release of extra-endothelial NO and endothelial thromboxane, the function of which is to preserve the contractile response of vessels to vascontrictive agonists. Even more importantly, the improvement in endothelial function obtained following treatment with PROVINOLS™ is thought to involve reactive oxygen species insofar as free radical-scavengers inhibit this improvement (Diebolt et al., 2001).

All these results suggest that the polyphenols in PROVINOLS™ are absorbed *in vivo* and that, under these experimental conditions, polyphenols are present in the blood stream at concentrations that can influence blood pressure, cardiac and vascular functions. The consequences of this are modifications in the release of vaso-active factors and in gene expression in the vascular wall.

Protective role of PROVINOLS™ on the effects of hypertension produced by NO blocking at cardiac and vascular level

Treating rats with PROVINOLS™ (40 mg/kg/d) partially prevents the elevation in blood pressure induced by treatment with L-NAME (40 mg/kg/d). In addition, treatment with PROVINOLS™ reverses the reduction in NO-synthase activity, the reduction in endothelial NO-dependent relaxation and the increase in contractile response induced by treatment with L-NAME in rat aorta. The same treatment with PROVINOLS™ prevents the reduction in NO-synthase activity in the heart and cardiac remodelling - in particular, myocardial fibrosis. However, treatment with PROVINOLS™ does not correct ventricular hypertrophy linked to NO-deficient hypertension. All these effects could lead to a hypothesis of a protective role of PROVINOLS™ in cardiovascular diseases, particularly in the event of hypertension, being put forward. Nitric oxide appears to be one of the protective substances involved in the effects of PROVINOLS™.

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PROVINOLS™

Oxygen Radical Absorbance Capacity
ORAC value

Introduction

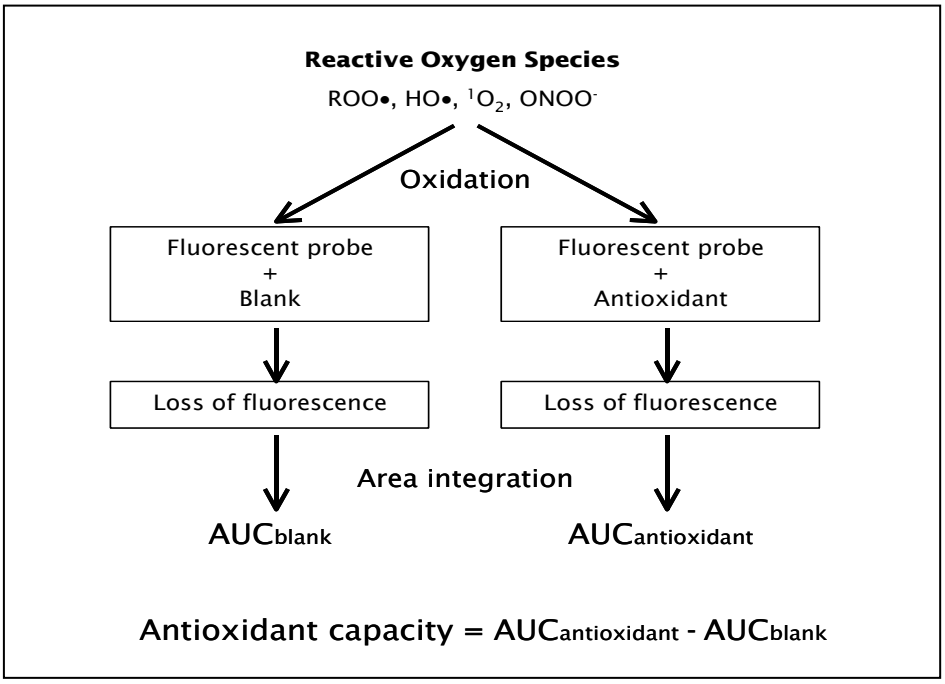
This analysis measures the ability of the sample to protect against attack by free radicals, or to act as an antioxidant. It was originally developed by Dr G.CAO of the National institute of Aging in 1992. In 1995, Dr CAO jointed Dr R.PRIOR's group at Jean Mayer USDA Human Nutrition Research Centre on Aging, where Drs CAO and PRIOR were instrumental in semi-automating the ORAC assay. Since then, the ORAC assay has been extensively utilized in the field of antioxidant and oxidative stress.

Principle of the test

ORAC assay is an *inhibition method* that means it measures the inhibition of free radical action which is composed by 2 parameters : - inhibition time
- inhibition degree

Most of the methods to determine the antioxidant activity (TEAC, TOSC, FRAP) use either the inhibition time at fixed degree of inhibition or the extent inhibition at fixed time as the basis for quantifying the results.

The ORAC assay is based on the measurement of the destruction of a fluorescent probe, a protein having fluorescent properties when is under a specific light ray. Under free radicals voluntarily introduced in the reactional area, the protein is destroyed and loose its fluorescence.
When a free radical scavenger, as the antioxidant sample, is introduced in the area, free radicals are scavenged and the fluorescence persists. The change of fluorescence intensity is an index of the degree of free radical damage. in the presence of antioxidant, the inhibition of free radical damage by antioxidant, which is reflected in the protection against the change of probe fluorescence in the ORAC assay, is a measure of its antioxidant capacity against free radical.
The uniqueness of the ORAC assay is that the reaction is driven to completion and the quantitation is achieved using "area under the curve (AUC). In particular, the AUC technique allows ORAC to combine both inhibitions into a single quantity.
The standard method of analysis uses a free radical source that produces the peroxyl radical, which is the most common type of free radicals in the body. The standard of comparison is Trolox (6-hydroxy-2,5,7,6-tetramethylchroman-2-carboxylic acid), a water soluble analogue of vitamin E.



The ORAC unit is expressed as micromole standard (Trolox Equivalent ou TE) per gram or litre.

The ORAC procedure provides a measure of **"total antioxidant capacity"** and covers all the antioxidant in foods.

ORAC value

PROVINOLS™ = 12,000 µmol TE/g*

** Analysed by Brunswick Laboratories (MA, USA) and Laréal Laboratory (France) following the ORAC-hydro FL method used for water soluble products.*

It is show that to have significant impact on plasma and tissues antioxidant capacity, intake of polyphenols may be between 3,000 and 5,000 ORAC units (µmol TE) per day. Consumption of fruits and vegetables brings around 1,400 µmol TE per day (PRIOR, 1999). Then it is necessary to have a polyphenols supplementation in order to reach 3,000 ORAC units and more (McBRIDE, 1999).
PROVINOLS™ daily dosage, which is 100 to 300 mg per day, should correspond to an ORAC value between 1,200 to 3,600 units per day.

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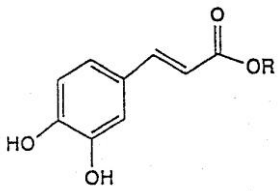
PROVINOLS™

Polyphenols presentation

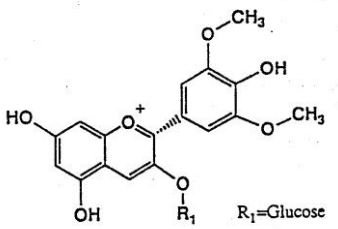
Introduction

Polyphenols are molecules constituted by a phenolic cycle. They are exclusively present in fruits and vegetables. Polyphenols are known as powerful antioxidants.
Red wine is a product that concentrate the largest number of different polyphenols from several families.

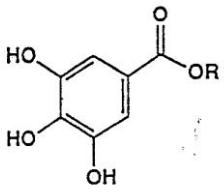
Structure of red wine polyphenols



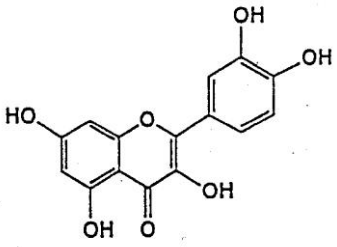
Caffeic acid, an hydroxyciannimic acid



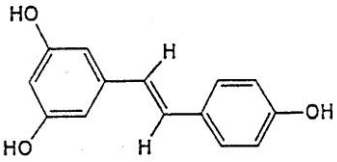
Malvidine-3-glucoside, an anthocyanidol



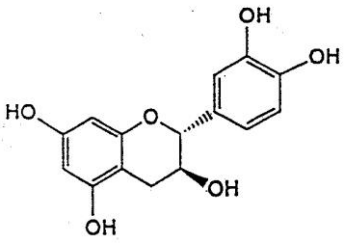
Gallic acid, a benzoic acid



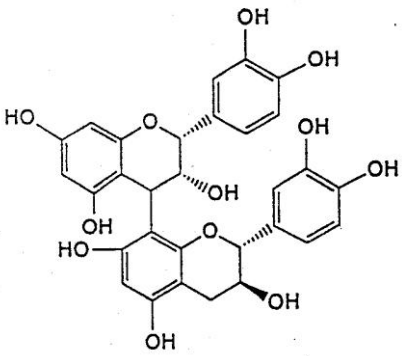
Quercetin, a flavonol



Trans-resveratrol, a stilben



Catechin, a flavanol



B1 dimmer procyanidin, a catechin oligomer

The large family of polyphenols

PHENOLIC ACIDS		
Hydroxybenzoic acids	vanillic acid	cherry, plum
	gallic acid	red wine
	salicylic acid	grape, aromatic herbs
Hydroxycinnamic acids	caffeic acid	aromatic herbs, fruits, red wine
	fenulic acid	citrus fruits, white grape
	p-coumaric acid	citrus fruits, pineapple, raspberry, red wine
	chlorogenic acid	coffee, red wine
STILBENS		
	resveratrol	red wine, peanut, blackberry
	viniferin	
LIGNANS		
	secoisolariceresinol	linseeds, pumpkin seeds, cereals
	matairesinol	
FLAVONOIDS		
Anthocyans	pelagonidin	cherry, strawberry, raspberry
	cyanidin	apple, black grape
	delphinidin	black grape, red wine
Flavonols	kaempferol	leek, chicory, cabbage
	quercetin	onion, apple, red wine
	myricetin	broad bean
Flavones	apigenin	parsley, celery
	luteolin	red pepper
Flavanones	naringenin	grapefruit
	hesperetin	orange
Isoflavones	genistein	soya, black beans
	daidzein	soya, black beans
	glycitein	soya, black beans
Flavan-3-ols	catechin	cherry, peach, grape, red wine
	epicatechin	cherry, blackberry, grape, red wine, green tea
	gallocatechin	cherry, red currant, green tea
	epigallocatechin	cherry, red currant, green tea
Proanthocyanidins	dimer (procyanidin)	strawberry, apple, barley, sorghum
	trimer	cherry, apple
	polymer	apple, peach, banana, grape, red wine
Mix tannins	catechin gallate	green tea
	epicatechin gallate	green tea, red wine
	gallocatechin gallate	green tea
	epigallocatechin gallate	green tea

PROVINOLS™

References

- General references
- Publications on PROVINOLS™ studies

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