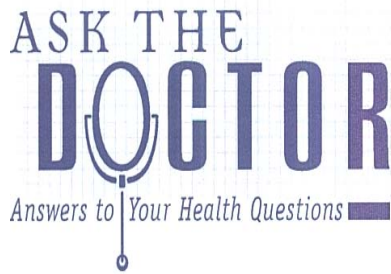




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PCO SOURCES: GRAPE SEED VS. PINE BARK A review and comparison



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One of the most beneficial groups of plant flavonoids are the proanthocyanidins. These flavonoids exert many health promoting effects. The most potent proanthocyanidins are those bound to other proanthocyanidins. When two proanthocyanidin molecules are linked together it is referred to as a "dimer" for three it is a "trimer," for four it is a "tetramer." Collectively, mixtures of proanthocyanidin dimers, trimers, tetramers, and larger molecules are referred to as proanthocyanidolic oligomers or

PCO for short.

Although PCOs exist in many plants as well as red wine, commercially available sources of PCO include extracts from grape seeds and the bark of the maritime (Landes) pine. This article shall review these benefits of PCO as well as answer the question "Which is better, PCO from grape seeds or pine bark?"

The history of PCO

In 1534, French explorer Jacques Cartier was leading an expedition up the Saint Lawrence river. Trapped by ice, Cartier and his crew were forced to survive on a ration of salted meat and biscuits. Cartier's crew began to exhibit signs and symptoms of scurvy—a severe deficiency of vitamin C. At the time, the cause of scurvy was unknown. Fortunately for Cartier and the surviving members of his crew, they came across a Native American who told them to make a tea from the bark and needles of pine trees. As a result, Cartier and his men survived.

More than 400 years later, Professor Jacques Masquelier of the University of Bordeaux, France, read the book Cartier wrote detailing his expedition. Intrigued by Cartier's story, Masquelier and others concluded that pine bark must contain some vitamin C as well as being a good source of bioflavonoids which can exert vitamin C-like



effects.

Masquelier termed the active components of the pine bark "pycnogenols." This term was used to describe an entire complex of proanthocyanidin complexes found in a variety of plants including pine bark, grape seed, lemon tree bark, peanuts, cranberries, and citrus peels. The term "pycnogenols" is now considered obsolete in the scientific community to describe

these compounds giving way to the terms proanthocyanidins, oligomeric proanthocyanidin complexes (OPCs), and/or procyanidolic oligomers (PCO). In the United States, the term Pycnogenol, is a registered trademark of Horphag Ltd. of Switzerland and refers to the PCO extracted from the bark of the French maritime pine.

Masquelier patented the method of extracting PCO from pine bark in France in 1951 and from grape seeds in 1970. The PCO extract from grape seeds emerged as the preferred source based on extensive research between 1951 and 1971, as well as intensive research from 1972 to 1978. The clinical research in the 1970s was conducted to gain the approval as a medicinal agent by the French equivalent of the FDA. Detailed analytical, toxicity, pharmacological, and clinical studies were performed on the PCO derived from grape seeds.

Both PCO from grape seeds and

pine bark have been marketed in France for decades. Sales for the grape seed extract are far greater than those for the pine bark. Due to aggressive advertising and misinformation, in the United States the pine bark extract outsells the grape seed extract considerably.

Beneficial effects of PCO

The most celebrated effects of PCO in the United States are its potent antioxidant and free radical scavenging effects. Antioxidants and free radical scavengers prevent against free radical or "oxidative" damage. Free radical damage has been linked to the aging process and virtually every chronic degenerative disease including heart disease, arthritis, and cancer. Fats and cholesterol are particularly susceptible to free radical damage. When damaged, fats and cholesterol form toxic derivatives known as lipid peroxides and cholesterol epoxides, respectively. The antioxidant and free radical scavenging effects of PCO were discovered by Masquelier in 1986.

While the therapeutic potential of PCO is quite broad due to its antioxidant activity, PCOs are used in Europe primarily in the treatment of venous and capillary disorders including venous insufficiency, varicose veins, capillary fragility, and vascular disorders of the retina. A recent study has shed more light on the exact mechanisms underlying these clinical applications of PCO.

The study featured two primary goals: to determine the free radical scavenging activity of PCO

to determine the inhibitory effects of PCO on xanthine oxidase (the primary generator of oxygen derived free radicals) and the lysosomal enzyme system which governs the release of enzymes that can damage the connective tissue framework which acts as a protective sheath surrounding capillary walls.

The results of some very sophisticated tests provide a detailed explanation on the vascular protective action of PCO and provide a strong rationale for their use in vascular disease. In these studies, PCO

demonstrated an ability to :

- Trap hydroxyl free radicals.
- Trap lipid peroxides and free radicals.
- Markedly delay the onset of lipid peroxidation.
- Chelate to free iron molecules, thereby preventing iron-induced lipid peroxidation.
- Inhibit production of free radicals by non-competitively inhibiting xanthine oxidase.
- Inhibit the damaging effects of the enzymes (e.g. hyaluronidase, elastase, collagenase, etc.) which can degrade connective tissue structures.

Regarding the antioxidant actions of PCO, the activity of PCO is much greater than that of vitamin C and vitamin E. From a cellular perspective, one of the most advantageous features of PCO free radical scavenging activity is that because of its chemical structure it is incorporated within cell membranes. This physical characteristic along with its ability to protect against both water and fat-soluble free radicals provides incredible protection to the cells against free radical damage.

The researchers concluded their discussion with the following comment: "These findings, together [with] those of other investigators, provide a strong rationale for using these compounds in the therapeutic managements of microvascular disorders,"

Uses of PCO extracts

Again, the primary use of PCO is in the treatment of venous and capillary disorders including venous insufficiency, varicose veins, capillary fragility, and vascular disorders of the retina. Good clinical studies have shown positive results in the treatment of these conditions.

Based on the relatively recent demonstration of potent antioxidant activity, the list of clinical uses of PCO extracts will surely increase. Perhaps the most significant use will eventually be in the prevention

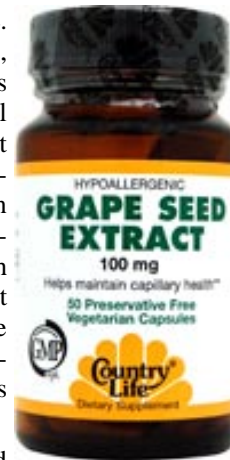
of atherosclerosis (hardening of the arteries characterized by the appearance of cholesterol deposits) and its complications (heart disease and strokes).

There are now numerous studies demonstrating that the level of antioxidants may be a more significant factor in determining the risk of developing heart disease than cholesterol levels. Antioxidants prevent the oxidation of cholesterol and its carrier proteins as well as prevent the initial damage to the artery which ultimately leads to the process of atherosclerosis (hardening of the arteries).

Large-scale studies with vitamin E, vitamin C, and beta carotene have shown these antioxidants are capable of significantly reducing the risk of dying of a heart attack or a stroke. For example, in one study of 87,245 nurses, it was discovered that nurses who took 100 IU of vitamin E daily for more than two years had a 41 percent lower risk of heart disease compared to nonusers of vitamin E supplements. In another study, 39,910 male healthcare professionals produced similar results: a 37 percent lower risk of heart disease with the intake of more than 30 IU of supplemental vitamin E daily.

Since PCO has a greater antioxidant effect compared to vitamins C and E, it is only natural to assume it could offer greater protective effects. There is support for this contention. For example, several studies have shown the protective effects of red wine against heart disease and stroke

The active components in the wine are proanthocyanidins. Also, results from a recent study in 805 men beginning in 1985 demonstrated an inverse correlation between flavonoid intake and death from a heart attack. That is to say, when flavonoid intake was high the risk of having a heart attack was quite low. Conversely, if flavonoid intake was low, the risk of a heart attack was quite high.



In addition to preventing damage to cholesterol and the lining of the artery. PCO extracts have actually been shown to lower blood cholesterol levels and shrink the size of the cholesterol deposit in the artery in animal studies. Presumably, PCO extracts may exert similar benefits in humans. PCO extracts, although in a supplement form, will eventually be thought of as a necessary food in the prevention and treatment of atherosclerosis.

Grape seed vs. pine bark

Grape seed and pine bark extracts of PCO are well-defined chemically. Both are excellent sources of proanthocyanidins. Grape seed extracts are available which contain a total of 92 percent or 95 percent PCO, while the pine bark extracts can vary from 80 percent to 85 percent. Although both sources can be used interchangeably for several valid reasons PCO extracted from grape seeds have emerged as the preferred source.

First of all, the overwhelming majority of the published clinical and experimental studies over the past twenty years have been performed on the grape seed extract not the extract of pine bark. Only the PCO extracted from grape seed is approved for medicinal use in France.

Regarding the free radical scavenging activities of PCO, studies by Professor Masquelier and others have demonstrated that the grape seed extract is substantially more potent and effective compared to the extract of pine bark. The reason? Only the grape seed extract contains the gallic esters of proanthocyanidins (in particular: proanthocyanidin B2-3'-O-gallate). These compounds are the most active free radical scavenging PCO. They are not present in the pine bark extract, but they are found in the PCO extract from the grape seed.

And finally, it is far more economical to extract PCO from grape seeds than it is from pine bark. As a result, the grape seed extract provides



greater value at a lower price.

PCO bound to phosphatidylcholine

The most beneficial PCO products may be those which utilize a special process to bind one part of the grape seed PCO extract with two parts of phosphatidylcholine. This process is referred to as the "phytosome process." The result is a completely new molecule composed of a central molecule of PCO encased by two phosphatidylcholine molecules. The PCO-phosphatidylcholine complex offers significant advantages over unbound PCO.

The major advantage is improved absorption from the gastrointestinal tract. The phosphatidylcholine molecules envelop the PCO molecule in a way that results not only in improved absorption, but also protects the PCO molecules from being degraded by digestion and gut bacteria. Absorption studies on unbound PCO indicate that only about 28 percent of an orally administered dose is retained in the body after 24 hours. The majority (72 percent) of what is given is excreted in the feces (45 percent), urine (19 percent), or exhaled as carbon dioxide (6 percent). By binding the PCO to phosphatidylcholine, more PCO is absorbed—and you're getting more "bang for the buck."

Another advantage of the PCO-phosphatidylcholine complex is improved utilization and incorporation into biological membranes. More PCOs are delivered to body tissue. Once delivered to the tissue, the bound PCO exert much greater antioxidant effects compared to unbound PCO.

One 50 mg capsule of phosphatidylcholine-bound PCO, in terms of absorption only, is equivalent to about 50 mg of unbound PCO whether they are derived from grape seed or pine bark. However, in terms of biological activity, based on studies with other phytosome products, it is estimated that one 50 mg capsule of PCO-phytosome may be as effective as 150 mg of unbound PCO.

Practical recommendations

Regardless of the source, PCO extracts can be used to support good health. As a preventive measure and as antioxidant support, a daily dose of 50 mg of either the grape seed or pine bark extract is suitable. When greater support offered from PCO is desired, the daily dosage should be increased to 150 to 300 mg. For PCO bound to phosphatidylcholine, the dosage for general support is 30 mg; for other purposes, 130 mg.

PCO extracts are without side effects.