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The Secret Miracle of Olive Oil

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Abstract:
Olive oil is a key component of the Mediterranean Diet (MD), being the main source of vegetable fat, especially monounsaturated fatty acids (MUFA). As Mediterranean unique food stuff, olive oil has become a legendary culinary oil with very difficult-to-match health benefits. Anyone coming from the Mediterranean region of the world would tell you about the health benefits, as well as the wonderful flavor, of a good dose of olive oil on salads, pasta, fish and almost anything else. Fortunately, it is available throughout the year to satisfy taste buds and promote good health. In the last decade, many epidemiological studies confirmed the protective role of olive oil against several chronic diseases. Polyphenols and monounsaturated fatty acids may play a mysterious role in olive oil benefits and curability. They possess high potential anti-inflammatory effects, enhance cardiorespiratory health, can promote a healthy digestive system and healthy bone remodeling, maintain a good glycemic response, may prevent cancer, and can enhance beauty.
**Keywords:** Olive Oil, MD (Mediterranean Diet), polyphenols, MUFA (mono unsaturated fatty acid)

**Introduction**

For centuries, olive oil has been recognized for its nutritional properties and has been associated with human health benefits, being considered by ancient Greeks as an "elixir of youth and health (Buckkland & Gonzalez, 2015)."
Olive oil is a functional food, which has a high level of monounsaturated fatty acid and contains multiple minor components with biological properties (Covas et al., 2006). Between 30-40% of the calorie intake of the Mediterranean diet comes from fats; however, more than half of these calories come from olive oil (Singh et al., 2002). In the Mediterranean cuisines, olive oil is used instead of saturated fats in many cooking processes. Oleic acid (MUFA) is the main fatty acid in all types of olive oil that comprises about 78-85% of the triglycerides in olive oil (Najafi et al., 2015). Oleic acids are considered the healthiest dietary fatty acid. The replacement of saturated fats with unsaturated fats will result in several health benefits (Covas et al., 2006). One of the most important minor chemical substances that give the oil its health properties is the phenolic compound commonly referred to as polyphenols. These compounds exist mainly in extra virgin and virgin oil (Tuck & Hayball, 2002; Bravo, 1998). They are a complex mixture of compounds that include 3,4-dihydroxyphenylethanol (hydroxytyrosol), 4-hydroxyphenylethanol (tyrosol), 4-hydroxyphenylacetic acid, protocatechuic acid, syringic acid, vanillic acid, caffeic acid and p-coumaric acid, among others (Tuck & Hayball, 2002).

Most of the polyphenols in this list have been shown to function both as antioxidants and as anti-inflammatory nutrients in the body. The huge number and variety of polyphenols in olive oil might explain the unique health benefits of this culinary oil (Bravo, 1998).

The list below shows some of the key polyphenols found in olive oil, arranged according to their chemical category:

- Oleocanthal
- Simple Phenols
- tyrosol
- hydroxytyrosol

- Terpenes
  - oleuropein
  - ligstroside

- Flavones
  - apigenin
  - luteolin

- Hydroxycinnamic acids
  - caffeic acid
  - cinnamic acid
  - ferulic acid
  - coumaric acid

- Anthocyanidins
  - cyanidins
  - peonidins

- Flavonols
  - quercetin
  - kaempferol

- Flavonoid glycosides
  - rutin

- Lignans
  - pinoresinol

- Hydroxybenzoic acids
  - vanillic acid
  - syringic acid (Vernaglione, 2008).
Health Benefits of Olive Oil

Anti-Inflammatory Role of Olive Oil

Inflammation is the body’s natural protective response to illness, stress, and infection; however, some illnesses and diseases cause the body’s immune system to malfunction leading to chronic inflammation. When inflammation is activated continuously for a long time, it can result in progressive oxidation stress in the body. A growing body of research supports that chronic inflammation is the root cause of major illnesses such as neurological disorders (including Parkinson’s and Alzheimer’s disease), obesity, metabolic syndrome, cardiovascular disease, diabetes, arthritis and cancer (Wahle et al., 2004). As a result of this understanding, professionals in the medical community are embracing anti-inflammatory diets as a key ingredient to promote health and delay the onset of age-related illnesses. The MD in general and olives and olive oil in particular have numerous anti-inflammatory properties (Tuck & Hayball, 2002). Increased olive oil consumption has been linked with a decreased risk of developing rheumatoid arthritis, an autoimmune disease characterized by inflammation and pain, particularly in the joints (Wahle et al., 2004). Berbert et al. (2004) revealed that rheumatoid arthritis patients who supplemented their diets with olive oil and fish oil experienced greater improvement in clinical measurements of the disease than those who used fish oil supplementation alone. This study suggests that olive oil could help in preventing rheumatoid arthritis and may restore mobility and function in those already affected by the disease. One reason that olive oil helps in preventing inflammation might be attributed to the effect of the phenolic compound on gene expression involved in inflammatory response (Camargo et al., 2010). Bitt et al. (2009) reported that olive oil
contains cyclooxygenase inhibitor (oleocanthal) with potential anti-inflammatory and analgesic properties similar to the non-steroidal anti-inflammatory drug ibuprofen that reduces the risks of some cancers and platelet aggregation. Moreover, Oleocanthal may offer special protection against Alzheimer’s disease. A laboratory study found that oleocanthal beneficially alters the structure of neurotoxic proteins believed to contribute to the debilitating effects of Alzheimer's disease (Bitt et al., 2009).

**Cardiovascular Health and Olive Oil**

to reducing low-density lipoprotein (LDL) cholesterol (or bad cholesterol) and increasing high-density lipoprotein (HDL) cholesterol (or good cholesterol), olive oil improves many additional risk factors for cardiovascular disease, including blood pressure, glucose metabolism and antithrombotic profile (Guasch-Ferré et al., 2014). Moreover, endothelial function, inflammation and oxidative stress are positively changed. Olive oil keeps the heart young. LDL oxidation plays a critical role in the development of atherosclerosis and coronary heart disease. While many studies have compared the effects of diets rich in MUFA on LDL oxidation and its protective role, there are other mechanisms at work (Covas et al., 2006; Singh et al., 2002; Wahle et al., 2004; Chowdhury et al., 2014; Covas et al., 2006). Polyphenol compounds in olive oil show powerful antioxidant properties against LDL oxidation (fito et al., 2000). The results of the EUROLIVE study provide additional evidence of the many antioxidant properties of phenolic compounds. The EUROLIVE study was a large, crossover, multicenter clinical trial performed on 200 people from 5 countries in Europe. Subjects who consumed high phenolic
olive oil had decreased LDL/HDL cholesterol ratios and LDL oxidation (Covas et al., 2006). There is a reduced incidence of hypertension in populations that eat MD--a result which emphasizes that MD, especially olive oil intake, is inversely related to the elevation of systolic and diastolic blood pressure. Olive oil’s antihypertensive properties have been confirmed in several studies. One study found that patients with high blood pressure who ate a diet rich in olive oil were able to reduce their dose of blood pressure medication (Ferrara et al., 2000). Further data on olive oil’s impact on CVD comes from a study on stroke prevention, where Samieri et al. (2011) reported that the daily consumption of olive oil has reduced the incidence of stroke among those with high risk.

**Gastrointestinal Tract Health and Olive Oil**

Because more than 70% of the body’s immune system is located in the intestines, digestive health plays a critical role in maintaining general health and wellness as well as preventing chronic disease. For centuries, olives and olive oil have been used to treat several digestive disorders. Olive oil facilitates overall digestion and absorption of nutrients; most notably, fat-soluble vitamins. Researchers estimate that 55-66% of polyphenols from olive oil are absorbed after ingestion, primarily in the small intestine (Vissers et al., 2002). In addition to anti-inflammatory properties, antibacterial and antimicrobial activities of olive oil also offer positive effects on gut health (Medina et al., 2006). Researchers have also found that olive oil compounds exerted a significant antibacterial activity against several strains of *Helicobacter pylori* that is associated with peptic ulcers and gastric cancer, including 3 that are resistant against antibiotic medication (Romero et al., 2007).
Bone Strength and Olive Oil

The intake of olive oil has been reported long ago to be related to the prevention of osteoporosis. Fernández-Real *et al.* (2012) revealed that consumption of MD enriched with virgin olive oil for 2 years is associated with increased serum osteocalcin and P1NP concentrations suggesting protective effects on bone. However the real and obvious relationship between bone strength and olive oil consumption is not consistence. Moreover, postmenopausal women usually suffer from a decrease in the production of estrogen, which may weaken bone structures leading to osteoporosis. With the help of other MD components, olive oil may help in reducing the risk of postmenopausal osteoporosis (Kitchin & Morgan, 2007).

Type 2 Diabetes and Olive Oil

Several dietary interventions for the treatment of Diabetes Mellitus (DM) have been explored during the last few decades. Given the fact that diabetic patients are at high risk of cardiovascular disease, the cardio-protective low-fat diet has been traditionally used as part of the disease’s management (Shariatpanahi *et al.*, 2014; Schröder, 2007). A Mediterranean-style dietary pattern is recommended as an effective alternative to a low-fat, high-carbohydrate eating pattern for Type 2 Diabetes Mellitus (T2DM) patients due to emerging evidence of its beneficial effect on glycemic control and CVD risk factors. Indeed, several epidemiological and interventional studies have demonstrated a beneficial effect of the MD on T2DM patients’ glycemic control, cardiovascular risk, as well as liver and sexual function (Schröder, 2007). Olive oil has been well documented to have positive effects on blood
glucose level, glycemic control and insulin sensitivity among diabetic patients (Al Jamal & Ibrahim, 2011).

**Anti-Cancer Benefits of Olive Oil**

Cancer has been one of the main deadliest diseases worldwide, for which scientists have found no solution yet. Some scientists hypothesize that this disease is a result of a degeneration of the own body when it is exposed to potential tumorigenic substances like tobacco, pollution, alcohol or diet. Among these factors, unhealthy diet is more likely to affect personal cancer risk (Phillips, 1975). Research shows that about one-third of all cancer deaths are related to dietary factors and lack of physical activity in adulthood (Ames et al., 1995; Parkin et al., 2011).

Cancer develops when cells in a part of the body begin to grow out of control. The majority of cancers in humans are induced by carcinogenic factors present in our environment including our food. Interestingly, there is increased evidence that monounsaturated oils are associated with a lower risk of some cancers, which agrees mainly with the composition of olive oil and the potential role of its monounsaturated fatty acids (MUFA) and the minor compounds (polyphenols) as protective against reactive oxygen species (ROS) (Albertini et al., 2011). Moreover, minor compounds in the extra virgin olive oil (phenolic) like hydroxytyrosol and tocopherol are potent antioxidants and radical scavengers of fatty acid peroxidation that minimize the amount of ROS generated in the body, and in the case of monounsaturated fatty acids (MUFA) the DNA damage can be reduced by a lower lipid peroxidation of MUFA that are less likely oxidized than other PUFA rich oils. Therefore, the level of ROS is lower when dietary PUFA are replaced by MUFA, which results in a decrease in
the level of exocyclic DNA adducts (Albertini et al., 2011). Oleocanthal, one of the phenolic in the olive oil, plays a role in rupturing part of the cancerous cells, which leads to release of some enzymes that causes cancer cell death, without harming healthy cells. In this way, oleocanthal causes cancer cells to break down and die very quickly (within 30 minutes), instead of the 16 to 24 hours it takes for programmed cell death, known as apoptosis (Hale & Crosswhite, 2015). Studies in Mediterranean countries revealed an inverse relation between consumption of olive oil and cancer of the breast, Colon (Hashim et al., 2008), Prostate (Lozano et al., 2010), bladder & stomach (Buiatti et al., 1989), urinary tract (Staskus et al., 1991), and lung and endometrial (Dirsch et al., 2003). However, there is no association in single studies with olive oil and cancer of pharynx, ovarian, pancreas, and esophagus (López et al., 2004). Several epidemiological studies suggest that extra virgin olive oil may offer better protection for some types of cancer than other olive oil sorts, which in turn reveals the important role of olive oil phytochemicals, especially the phenolic compounds (Gill et al., 2005).

**Olive Oil Enhances Beauty**

One of the best beauty secrets is olive oil. In addition to being a natural, hypoallergenic way to moisturize skin, extra virgin olive oil has the added advantage of providing strong antioxidants, including vitamin E, as well as vitamin K, which has a good role in repairing and renewing damaged skin cells that have been overexposed to sun, air pollution, and other modern-day environmental hazards – like cigarette smoking and fast food (Quiles et al., 2002). These olive oil-rich nutrients have the natural ability to stimulate cells and return skin to a firmer, smoother, and healthier state. In
general, olive oil can enhance beauty and it has great benefits for skin care, hair care, skin moisturizing, exfoliation, body scrub and skin polishing, nail and cuticle care. It is also an ideal eye makeup remover, and it has anti-aging properties (Quiles et al., 2002; Worwood, 2012).

Conclusion
The myriad protective benefits of consuming olive oil as part of a healthy diet are well documented by several scientific studies. In conclusion, all the reviewed articles clarify the specific role of olive oil as a miracle food due to its health benefits when consumed regularly.
As part of the Mediterranean diet, olive oil has shown to endorse more benefits to those provided by other vegetable oils such as increasing HDL cholesterol, reducing oxidative stress, decreasing inflammation, improving vascular endothelial function, controlling glucose level among type2 diabetics, and decreasing blood pressure.
Current studies are focusing on the improving or protective role of olive oil in treating some common diseases like Alzheimer, Parkinson's disease, cardiovascular disease, gastritis (H. pylori), osteoporosis, cancers, and eczema.
Mechanisms by which olive oil can exert its beneficial effects are mainly attributed to the antioxidant potential, nutrigenomic effect, and modulating the expression of atherosclerosis-related genes towards a protective mode thanks to the phenols in olive oil.
References


