



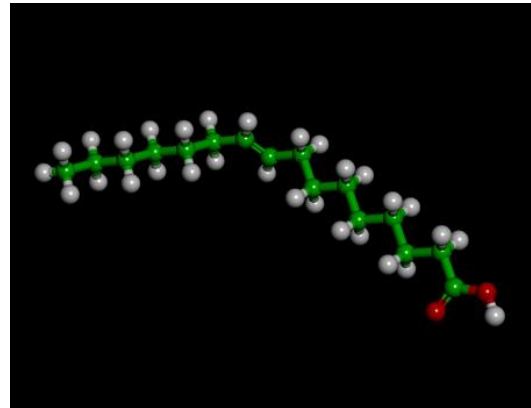
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## Cancer Association of South Africa (CANSA)

### Fact Sheet on Palmitoleic Acid (Omega-7)

#### Introduction

Most people are aware of the following polyunsaturated fatty acids (PUFAS), namely Omega-3, Omega-6, Omega-9 and Omega-12. Most people are also aware of the wide-ranging benefits of Omega-3. There is, however, another category of fatty acid called Omega-7 in which the site of unsaturation is seven carbon atoms from the end of the carbon chain. The two most common omega-7 fatty acids in nature are palmitoleic acid and vaccenic acid. Whereas Omega-3, -6, -9, and -12 are polyunsaturated fatty acids (PUFAS), Omega-7 (Palmitoleic Acid) is a monounsaturated fatty acid (MUFA).



[Picture Credit: Palmitoleic Acid]

Palmitoleic acid (Omega-7) can be abbreviated as 16:1 $\Delta^7$ . Dietary sources of palmitoleic acid include a variety of animal oils, vegetable oils, and marine oils. Macadamia oil (*Macadamia integrifolia*) and sea buckthorn oil (*Hippophaë rhamnoides*) are botanical sources with high concentrations, containing 17% and 19% (minimum) to 29% (maximum) of palmitoleic acid, respectively. Palmitoleic acid has the formula  $\text{CH}_3(\text{CH}_2)_5\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$ . (Wikipedia).

#### Good Sources of Palmitoleic Acid

A good source of Palmitoleic Acid is obtained from the oil of the Macadamia plant (*Macadamia integrifolia*). Macadamias are large, spreading evergreen trees reaching 10 to 15 metres high and almost as wide. Macadamias are considered to be among the finest table nuts in the world. They contain high quantities of oil, and are, therefore, very fattening.



[Picture Credit: Macadamia]

Another excellent source of Palmitoleic Acid is obtained from oil from the seeds of the Sea Buckthorn plant.

[Picture Credit: Sea Buckthorn]

Sea Buckthorn (*Hippophaë rhamnoides*) is an arborescent armed, deciduous shrub or tree sometimes reaching up to 18 metres. Its crown is irregular in shape with spiny, grey branches. The fruit is edible and has a tart, bittersweet taste. Its fruit is rich in Vitamins C, E, K, B<sub>1</sub> and B<sub>2</sub>, as well as niacinamide, pantothenic acid, carotenoids and other substances such as oil, sugar, malic acid, amino acids and pectin.



The plant is considered a general panacea (a solution or remedy for all difficulties or diseases) and extensive use is made of its roots, stems, leaves, flowers, fruits and seed. Oil from the fruit acts as an antioxidant and is traditionally used to treat wounds, frost bite and pathological problems of the alimentary mucous membranes. Serotonin (5-hydroxytryptamine) extracted from sea buckthorn possesses anti-tumour capabilities. (Worldagroforestry; Aspet).

Omega-7 is quoted to be high in *palmitoleic acid* (not present in Omega-3, -6 or -9) which is effective against a range of life-threatening disorders – including cancer. Omega-7, in its natural source (i.e. macadamia nuts and sea buckthorn), is quoted to be a double-edged sword as it also contains high levels of *palmitic acid*. *Palmitic acid is a thick, gooey palm oil*, which in turn raises the risk of certain life-threatening disorders. It is essential when acquiring Omega-7 (palmitoleic acid) to ascertain that it has been ‘purified’ of palmitic acid.

### Palmitoleic Acid (Omega-7) Fights the Factors of Metabolic Syndrome

Metabolic syndrome is a major contributor to the following:

- Elevated glucose and insulin resistance
- Lipid disturbances [causing high triglycerides and low High Density Lipoprotein (HDL)]
- High blood pressure
- Central obesity (“apple shape”) – a well-known contributing factor to the increase in the risk of certain cancers like cancer of the prostate, kidney, breast, ovaries, colon, pancreas, cervix, thyroid and endometrium
- Chronic Inflammation which is also known to increase the risk for certain cancers



(American Cancer Society; American Institute for Cancer Research; MD Anderson Cancer Center; Cancer Research UK; Princeton Longevity Center; WebMD).

If one has metabolic syndrome, it means that one is possibly already along the road to heart disease, diabetes, certain cancers and other life-threatening disorders.

Omega-7 works in five distinct ways to reduce most of metabolic syndrome’s harmful effects on one’s health:

- It reduces insulin resistance and lowers blood glucose
- It suppresses fat production and accumulation
- It normalises abnormal lipid profiles (including raising beneficial HDL-cholesterol)
- It fights obesity
- It powerfully suppresses the inflammation that drives metabolic syndrome

The following table shows how different drugs compare to Omega-7 in fighting metabolic syndrome:

Metabolic Syndrome Parameter	Statins (Lipitor and others)	Fibrates (Lopid and others)	Glitzones (Actos and others)	Sulfonylureas (Glipizide and others)	Palmitoleic Acid (Omega-7)
LDL ('bad' cholesterol)	Reduce	Reduce	Increase	No effect	Reduce
HDL ('good' cholesterol)	Little effect May decrease	Increase	Increase	Decrease	Increase
Blood sugar	May increase	No effect	Reduce	Reduce Increases insulin	Reduce
Insulin Resistance	May worsen	No effect	Reduce	May improve	Reduce
Body weight/ Composition	Increase weight Decrease fat-free mass	Mazy increase weight and fat mass	Decrease fat	Increase	Reduce appetite
Inflammation	May reduce	May reduce	Reduce	No effect	Reduce
Side effects	Muscle pain (myalgia), may increase risk of diabetes	Gallstones, muscle pain	May increase risk of cardiovascular death	Increased risk of cardiovascular death	None known

(Yang, Miyahara & Hatnaka, 2011; Stefan, et al., 2010; Experimental Animal Laboratory, 2008; Green, 2012; Martinez, 2013).

### Palmitoleic Acid (Omega-7) Fights Inflammation

There is a close connection between fat tissue and the chronic, low-grade inflammation that is associated with metabolic syndrome. The connection may be related to an enzyme known as SCD1 (stearoyl-CoA desaturase 1).

When scientists remove SCD1 activity in laboratory animals, their levels of fat tissue inflammation fall sharply, and their ability to respond to insulin (insulin sensitivity) rises. In the laboratory, adding omega-7 to cultures of fat cells triggers these same benefits by suppressing SCD1 activity.

Animal studies show significantly reduced levels of fat-related inflammatory cytokines (signalling molecules) following administration of omega-7. The livers of supplemented animals show significant reductions in the number of activated inflammatory cells, an effect that may help prevent fatty liver disease. Many of these beneficial anti-inflammatory effects may arise from the ability of omega-7 to deactivate the master inflammatory regulation complex called *NF-kappaB*.

There is now human data on how omega-7 can lower inflammation and reduce the resulting cardiovascular risk. In a pilot trial of adults with high levels of *C-reactive protein* (blood

marker for inflammation), supplementation with 210mg a day of *omega-7* resulted in a robust 73% decrease of *C-reactive protein (CRP)*.

Those results were extended in a larger, randomised clinical trial, in which all patients had abnormally high CRP levels (greater than 3 mg/dL). In this study, 30 days of supplementation with 210 mg/day of palmitoleic acid resulted in a significant drop in CRP of 1.9 mg/dL – that is a 43% reduction in a dangerous cardiovascular risk marker. Moreover, by the end of the supplementation period, the average CRP level was reduced from greater than 4 mg/dL to 2.1 mg/dL. The health ramifications of this marked reduction in C-reactive protein are profound, especially in abdominally-obese individuals who often exhibit dangerously elevated levels of this inflammatory indicator (CRP).

(NHLBI/AHA Conference Proceedings; Festa, *et al.*, 2000; Shah, *et al.*, 2008; Liu, *et al.*, 2010; Yand, Miyahara & Hatanaka, 2011; Guo, *et al.*, 2012; Green, 2012; Martinez, 2013).

### **Palmitoleic Acid (Omega-7) Helps Manage Body Weight**

The reason central or abdominal obesity ('apple shape') is a factor in metabolic syndrome is because it has such strong associations with certain cancers and cardiovascular disease risk. This is due, in large part, to the increased inflammation produced by fat tissue.

Omega-7 helps manage this factor of metabolic syndrome because it signals one's body to stop storing fat.

Animals fed diets rich in omega-7 show significant increases in stomach and intestinal hormones that promote the feeling of fullness (satiety). At the same time, such diets produce decreases in hunger-promoting hormones. The combined effect is a significant reduction in food intake.

Several statin drugs, while lowering cholesterol and triglycerides, also produce increases in body and liver fat deposition. Omega-7 does just the opposite. Omega-7 **reduces** the production of fat in the liver. Increases in liver fat can result in non-alcoholic fatty liver disease (NAFLD), which is considered a major manifestation of the metabolic syndrome - which can eventually lead to liver failure and even cancer.

(Elbassuoni, 2013; Festa, *et al.* 2000; Shah, Mehta & Reilly, 2012; Lu, *et al.*, 2012; Yang, Takeo, & Katayama, 2013; Aguirre, *et al.*, 2013; Pappachan, 2013; NHLBI/AHA Conference Proceedings; Burns, *et al.*, 2012).

### **Adverse Effects of Palmitoleic Acid (Omega-7)**

No significant adverse effects have been reported for Omega-7 fatty acids. (Yang & Kallio, 2002; Yang, Kalimo, Marrila, *et al.*, 1999; Farma Nord).

### **Medical Disclaimer**

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## Sources and References

**Aguirre L, Hijona E, Macarulla MT, et al.** 2013. Several statins increase body and liver fat accumulation in a model of metabolic syndrome. *J Physiol Pharmacol.* 2013 Jun;64(3):281-8.

### American Cancer Society

<http://www.cancer.org/acs/groups/cid/documents/webcontent/003047-pdf.pdf>

### American Institute for Cancer Research

<http://www.aicr.org/enews/2012/october-2012/enews-1-in-5-pancreatic-cancers-preventable.html>

### Aspet

<http://jpet.aspetjournals.org/content/327/2/316.full>

**Burns, T.A., Duckett, S.K., Pratt, S.L., & Jenkins, T.C.** 2012. Supplemental palmitoleic (C16:1 cis-9) acid reduces lipogenesis and desaturation in bovine adipocyte cultures. *J Anim Sci.* Oct; 90(10):3433-41.

### Cancer Research UK

<http://www.cancerresearchuk.org/about-cancer/type/pancreatic-cancer/about/pancreatic-cancer-risks-and-causes>

**Elbassuoni, E.** 2013. Better association of waist circumference with insulin resistance and some cardiovascular risk factors than body mass index. *Endocr Regul.* 2013 Jan;47(1):3-14.

**Experimental Animal Laboratory.** 2008. Final report for study on CCO Technologies Oil (CCO-Oil) on the development of atherosclerosis: Department of Cardiovascular Medicine, Cleveland Clinic; 2008.

### Farma Nord

<http://www.pharmanordnutrients.co.uk/showarticle.asp?aid=94&m=az&al=S>

**Festa, A., D'Agostino, R. Jr., Howard, G., Mykkänen, L., Tracy, R.P., & Haffner, S.M.** 2000. Chronic subclinical inflammation as part of the insulin resistance syndrome: the Insulin Resistance Atherosclerosis Study (IRAS). *Circulation.* 2000 Jul 4;102(1):42-7.

**Green, J.A.** 2012. Effect of two levels of Provinal™ (purified Palmitoleic Acid; C16:1n7; Omega 7) on serum lipid and C-reactive protein(CRP) profiles in humans. Tersus Pharmaceuticals, LLC: 2012.

**Guo, X., Li, H., Xu, H., et al.** 2012. Palmitoleate induces hepatic steatosis but suppresses liver inflammatory response in mice. *PLoS One.* 2012;7(6):e39286.

**Lu, X., et al.** 2012. Postprandial inhibition of gastric ghrelin secretion by long-chain fatty acid through GPR120 in isolated gastric ghrelin cells and mice. *Am J Physiol Gastrointest Liver Physiol.* 2012 Aug 1;303(3):G367-76.

### Macadamia

[http://ntbg.org/plants/plant\\_details.php?plantid=7260](http://ntbg.org/plants/plant_details.php?plantid=7260)

**Martinez, L.** 2013. Provinal (R) in the reduction of CRP: A double blinded, randomized, placebo controlled study. *Provinal purified omega 7*. Vol: Tersus Pharmaceuticals; 2013.

### **MD Anderson Cancer Center**

<http://www.mdanderson.org/patient-and-cancer-information/cancer-information/cancer-topics/prevention-and-screening/exercise/flatabs.html>

### **NHLBI/AHA Conference Proceedings**

Available at: <http://circ.ahajournals.org/content/109/3/433.full>.

### **Omega-7**

<http://www.amazon.com/Purified-InnovixLabs-Macadamia-Palmitoleic-Capsules/dp/B00GRAAMLY>

### **Palmitoleic Acid**

[http://www.worldofmolecules.com/foods/palmitoleic\\_acid.htm](http://www.worldofmolecules.com/foods/palmitoleic_acid.htm)

**Pappachan, J.M., Antonio, F.A., Edavalath, M., & Mukherjee, A.** 2013. Non-alcoholic fatty liver disease: a diabetologist's perspective. *Endocrine*. 2013 Nov 28.

### **Princeton Longevity Center**

[http://www.theplc.net/Preventing\\_Prostate\\_Cancer.html](http://www.theplc.net/Preventing_Prostate_Cancer.html)

### **Sea Buckthorn**

<http://newsino.en.hisupplier.com/product-1128444-Hippophae-rhamnoides-Seed-Oil.html>

**Shah A, Mehta N, Reilly MP.** 2008. Adipose inflammation, insulin resistance, and cardiovascular disease. *JPEN J Parenter Enteral Nutr*. 2008 Nov-Dec;32(6):638-44.

**Stefan, N., et al.** 2010. Circulating palmitoleate strongly and independently predicts insulin sensitivity in humans. *Diabetes Care*. 2010 Feb;33(2):405-7.

### **WebMD**

<http://www.webmd.com/ovarian-cancer/ss/slideshow-ovarian-cancer-overview>

### **Wikipedia**

[http://en.wikipedia.org/wiki/Omega-7\\_fatty\\_acid](http://en.wikipedia.org/wiki/Omega-7_fatty_acid)  
[http://en.wikipedia.org/wiki/Palmitoleic\\_acid](http://en.wikipedia.org/wiki/Palmitoleic_acid)

### **Worldagroforestry**

[http://www.worldagroforestry.org/treedb/AFTPDFS/Hippophae\\_rhamnoides.pdf](http://www.worldagroforestry.org/treedb/AFTPDFS/Hippophae_rhamnoides.pdf)

**Yang, Z.H., Miyahara, H, & Hatanaka, A.** 2011. Chronic administration of palmitoleic acid reduces insulin resistance and hepatic lipid accumulation in KK-Ay Mice with genetic type 2 diabetes. *Lipids Health Dis*. 2011;10:120.

**Yang ZH, Takeo J, Katayama M.** 2013. Oral administration of omega-7 palmitoleic acid induces satiety and the release of appetite-related hormones in male rats. *Appetite*. 2013 Jun;65:1-7.

**Yang, B., Kallio, H.** 2002 Composition and physiological effects of sea buckthorn lipids. *Trends in Food Sci Technol*; 13: 160-167

**Yang, B., Kalimo, K.O., Mattila, L.M., et al.** 1999. Effects of dietary supplementation with sea buckthorn seed and pulp oils on atopic dermatitis. *J Nutr Biochem*; 10: 622-630