

METABOLIC syndrome comprises of dyslipidemia (elevated triglyceride and low HDL 'good' cholesterol levels), high blood pressure (hypertension), obesity and insulin resistance. This rapidly growing disease is known to increase the risk of heart disease and diabetes by up to five-fold.

Results from population studies have shown that the

global prevalence of metabolic syndrome among people over 60 years of age ranges between 20 to 45 percent depending on geographical regions. The highest incidence is found in the US and in developed European and Asian nations.

Globally, metabolic syndrome succeeds to elicit a high level of concern and interest, as indicated by no less than 3.3 million hits on

Google in addition to more than 33,000 scientific papers published on this complex disease.

TRIGLYCERIDES & CHOLESTEROL

Triglycerides and cholesterol comprise the majority of blood lipids. Both lipids are produced by the liver with a small proportion obtained from the diet.

Blood lipids help carry out bodily functions and are essential in maintaining cellular health and hormonal balance. Poorly controlled blood lipid levels can lead to medical conditions closely linked to metabolic syndrome.

Being insoluble in blood, triglycerides and cholesterol require lipoproteins such as LDL and HDL to serve as carriers that will transport them to other parts of the body.

Certain carriers such as small and dense LDL (sd-LDL) are more prone to oxidation, a chemical reaction that initiates the chain of events leading to fatty plaque formation (atherosclerosis). As a result, high levels of sd-LDL in the blood magnify the risk of developing heart disease.

Triglycerides are often overlooked when assessing the risk of metabolic diseases. At greater than 200 mg/dl, triglycerides independently increase the risk of heart disease and stroke.

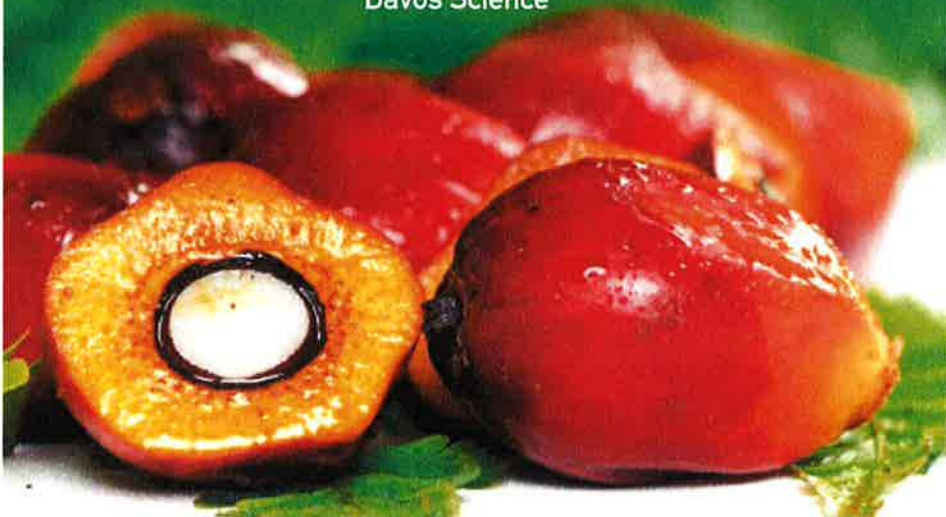
In addition to jeopardising metabolic health, triglyceride levels when uncontrolled can lead to the swelling of the pancreas, the organ which helps maintain blood sugar levels. Moreover, high triglyceride levels may also disrupt liver health and worsen diabetes-related complications.

Two types of cholesterol are of clinical importance when considering metabolic health: LDL 'bad' cholesterol and HDL 'good' cholesterol. Sustainably high levels of LDL-cholesterol

Palm Tocotrienols:

Action against Metabolic Syndrome

Metabolic syndrome is a rapidly growing disease known to increase the risk of heart disease and diabetes by up to five-fold. By **Vanessa Lacuesta** and **Daniel Yap**, Davos Science



hasten atherosclerosis, hence laying down the framework for cardiovascular disease, blood clots and strokes.

THE RISING STAR OF VITAMIN E

Natural vitamin E has long been used in dietary supplements mainly due to its superior anti-oxidation properties. There are two main families of natural vitamin E, namely tocotrienols and tocopherols. Each of which has four isomeric forms: alpha, beta, gamma, and delta.

Tocopherols are abundant in temperate oil seeds like soy, corn and rapeseed, while tocotrienols are found mainly in tropical oil seeds, such as palm fruits and rice bran.

Tocotrienols' unique chemical profile coupled with the growing pool of scientific evidence on their effective lipid lowering properties defines tocotrienols as the vitamin E of choice when addressing metabolic syndrome.

LIPID BALANCE

The suppression of high serum lipids by tocotrienols were demonstrated by metabolic research institutes. Qureshi first demonstrated the effective cholesterol-suppressive action of tocotrienols in humans with elevated cholesterol levels.

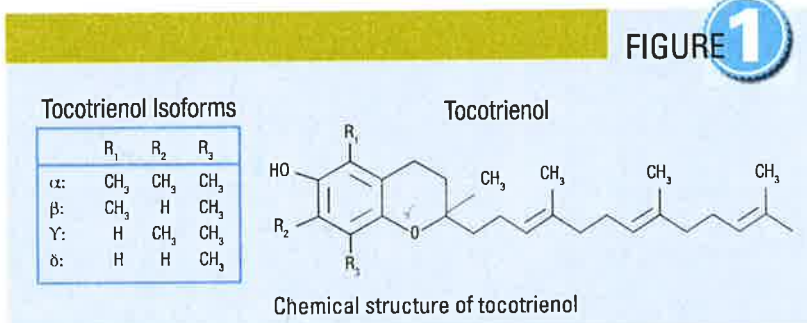
In the study, subjects given tocotrienols at 200 mg per day showed a 13 percent reduction in their serum cholesterol levels after

four weeks of supplementation. Similarly, tocotrienols taken at a lower dose of 100 mg per day were shown to lower total blood cholesterol and LDL-cholesterol by 20 and 25 percent respectively in humans.

Compared to tocopherol, tocotrienols display unique cholesterol-lowering properties. In a randomised study of patients with mildly elevated cholesterol levels, tocotrienols significantly reduce total blood cholesterol and LDL-cholesterol as compared to 500mg per day of tocopherols.

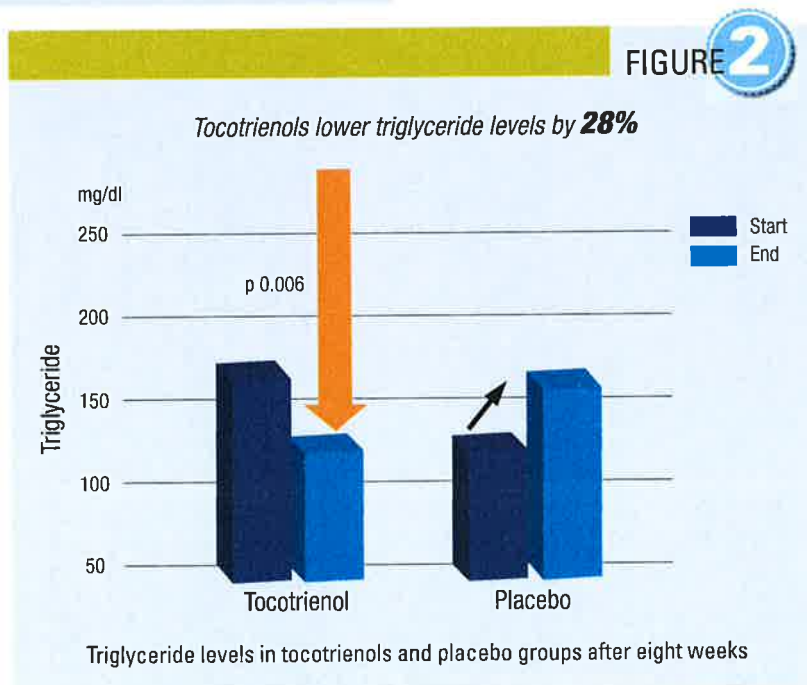
The lipid-lowering effects of tocotrienols are not limited to cholesterol alone. In a double-blind, placebo-controlled study conducted in Japan, subjects in the tocotrienol group supplemented with 120 mg per day of tocotrienols, showed reduction in their triglyceride levels by 28 percent from baseline.

Interestingly, while triglyceride levels decreased in these patients, triglyceride levels of subjects in the placebo group were noted to have increased (refer to figure 2).



For a long time, tocotrienols have hidden behind the shadows of the more popular tocopherols. Subsequent research highlights the distinct biochemical properties and emerging potential health benefits of tocotrienols. In addition, evidence has demonstrated that tocotrienols possess 60 times more superior anti-oxidant activity than tocopherols.

Recently, tocotrienols have gained the scientific community's attention for its potential in lowering triglycerides, cholesterol and sd-LDL levels. Promoting lipid balance by addressing lipid abnormalities is important in curbing the steady rise in metabolic syndrome worldwide.



Moreover, there was a decrease in the levels of triglyceride carriers and sd-LDL in the blood samples of patients taking tocotrienols.

With regards to their triglyceride-lowering effects, researchers have demonstrated that the ability of tocotrienols to decrease triglyceride levels, stems from their ability to inhibit proteins that regulate the production of blood lipids in the body.

While individual triglycerides and cholesterol levels are the established metabolic parameters, taking the proportion of HDL to LDL cholesterol (HDL/LDL ratio) in the blood is a recognised predictor of heart and metabolic disease risk. In a study conducted in humans with elevated cholesterol levels, tocotrienols increased HDL to LDL ratio by 53 percent, suggesting that the nutrient can help achieve healthy blood lipid levels.

Moreover, clinical studies also explored tocotrienols' role in enhancing the effects of lipid-lowering medications. Qureshi showed that the combination of tocotrienols and cholesterol-lowering medication, lovastatin, reduces lipid parameters by 20 to 25 percent in patients with elevated cholesterol levels.

ANTI-METABOLIC BENEFITS

In addition to its lipid-lowering properties, scientific evidence has shown that tocotrienols inhibit atherosclerosis. In a human clinical study conducted in 50 patients with narrowed neck blood vessels, tocotrienols reversed narrowing in 40 percent of these patients, compared to only eight percent in the placebo group.

In another study, tocotrienols reduced blood clot formation within blood vessels suggesting



Tocopherols are abundant in temperate oil seeds like soy, corn and rapeseed.

a potential role in attenuating the risk of stroke. To reinforce its role in promoting healthy blood vessels, a human clinical trial conducted by researchers in Malaysia demonstrated that the nutrient improved the ability of blood vessels to adapt to changes in blood pressure levels (blood vessel compliance, when given at 50 to 200mg per day for two months).

Insulin resistance heralds the beginning of diabetes, a debilitating consequence of metabolic syndrome. Insulin is a chemical that helps regulate



Benjamin Enwicker, Idaho, US

Metabolic syndrome comprises of dyslipidemia, hypertension, obesity and insulin resistance.

blood sugar levels in the body. When the body becomes resistant to the action of insulin, blood sugar levels remain elevated even in the presence of high insulin activity.

Tocotrienols are shown to help reduce blood sugar levels in human and animal studies. One study demonstrated that tocotrienols-fortified diet enhances insulin sensitivity suggesting its potential in addressing diabetes and its complications.

NATURALLY SAFE

Tocotrienols have long gained the recognition for their role as super anti-oxidants. The natural palm tocotrienols are proven to be safe, non-irritant and non-mutagenic.

In 2010, the US Food and Drug Administration (FDA) granted palm derived tocotrienols the Generally Recognized As Safe (GRAS) status. The nutrient is available as oils, powders, emulsions, suitable for direct incorporation into food and beverage formulations.

OUTLOOK FOR TOCOTRIENOLS

Metabolic syndrome is one of the most common health concerns of our time. By 2030, the number of obese individuals suffering from metabolic syndrome approaches one billion worldwide.

By following a healthy diet, exercising and giving the body proper supplemental nutrition, the incidence of this syndrome can be substantially reduced. Palm tocotrienols, through their broad spectrum lipid lowering properties, may be used together with lifestyle modifications to stamp out metabolic syndrome.

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