

# Drawing Health from Vitamin

# E

Vitamin E is living up to its promise as a vital component for nutrition and disease prevention in humans



**D**ietary oils and fats have long been recognised as a macronutrient with a primary function to provide a concentrated source of energy for human metabolic processes.

While being cautious of over-consuming fats, we should recognise that these account for more than twice the energy density (9 calories/g) of proteins or carbohydrates (4 calories/g).

Apart from making foods palatable, fats are required for the carriage of the fat-soluble Vitamins A, D, E and K in our body.

Triglycerides, which are basically fatty acids bound to a glycerol molecule, make up 96-99% of the dietary fats consumed. The remainder, termed 'unsaponifiable matter', includes fat-soluble minor components that serve a functional purpose in the oil or fat.

In crude edible oils these components are

divided into two groups. The first comprises non-nutritional, largely pro-oxidant odiferous components and free fatty acids that must be removed through refining to produce the typically bland golden oil preferred by consumers.

The second group consists of the important and nutritionally functional group, which includes tocopherols and tocotrienols (collectively termed Vitamin E), carotenes (pro-Vitamin A components), phytosterols, squalene and co-enzyme Q.

Refining crude oils either reduces the content of these components or removes them, as in the case of carotenes. However, the use of technology has helped recover Vitamin E, carotenes and phytosterols from waste products of the edible oil industry.

#### Role of Vitamin E

Vitamin E functions as a chain-breaking antioxidant and prevents the

accumulation of lipid peroxidation products. Daily dietary sources appear adequate to avoid any deficiency syndromes, which are rarely seen in any case.

However, consumption of Vitamin E in larger doses than that available from our diet has been recommended to prevent the onset and progression of degenerative diseases including cancer and cardiovascular disease.

In nature, Vitamin E occurs in eight isomeric forms, the four tocopherol and four tocotrienol isomers (*see table*). Of these, alpha-tocopherol is the most abundant.

Most natural Vitamin E preparations bought over the counter are of this isomeric form, mainly extracted from the refining scum (waste) of soybean oil refining. If the source is corn oil, substantial amounts of beta-tocopherol are also present.

Tocotrienols are a curiosity of nature and occur in appreciable quantities in only palm oil and rice bran oil. Wheat germ and barley germ oils are less important sources.

Tocotrienols differ structurally from tocopherols and this appears to influence the physiological effects.

### Health-giving properties

Over the past three decades Vitamin E has been looked upon as an important health-giving minor nutrient that protects against degenerative diseases.

The hypothesis is that oxidised low-density lipoprotein enhances cardiovascular disease (CVD), and the belief that Vitamin E potentially protects against oxidation is gaining credence.

Vitamin E does inhibit oxidation processes and protect against atherosclerosis. However, the evidence from large-scale population (epidemiological) studies is conflicting.

Only one of four studies demonstrated that Vitamin E protects against CVD. Therefore, there is insufficient evidence to recommend the consumption of Vitamin E as a dietary supplement to prevent heart disease in general populations.

In the case of diabetes, the data strongly suggested increased oxidative stress and that the Vitamin E may have a role as a chain-breaking antioxidant. The overall evidence for cancer prevention is weaker than that for protection against CVD.

Tocopherol and Tocotrienol Content of Oils and Fats (ppm)									
	Tocopherols				Tocotrienols				
	$\alpha$ -T	$\beta$ -T	$\gamma$ -T	$\delta$ -T	$\alpha$ -T3	$\beta$ -T3	$\gamma$ -T3	$\delta$ -T3	T-T3
Corn oil	112	50	602	18	--	--	--	--	782
Soybean oil	101	--	593	264	--	--	--	--	958
Rice Bran oil	124	40	50	--	184	21	570	--	989
Palm oil	152	--	--	--	205	--	439	94	890
Barley oil	144	30	73	60	402	14	180	60	965
Sunflower seed oil	387	--	174	240	--	--	--	--	801
Olive oil	51	--	--	--	--	--	--	--	51
Coconut oil	5	--	--	6	5	1	19	--	36
Lards	12	--	7	--	7	--	--	--	26

Understanding of the effects of tocotrienols is just emerging, based on their recent availability from palm oil and rice bran oil processing. The primary advantage of tocotrienols is that they are natural food components with no adverse effects.

They have far superior chain-breaking antioxidants than tocopherols. They lower blood cholesterol through a mechanism akin to the family of 'statin' drugs used to control high blood cholesterol levels. Tocotrienols regulate a key liver enzyme that is involved in the synthesis of cholesterol.

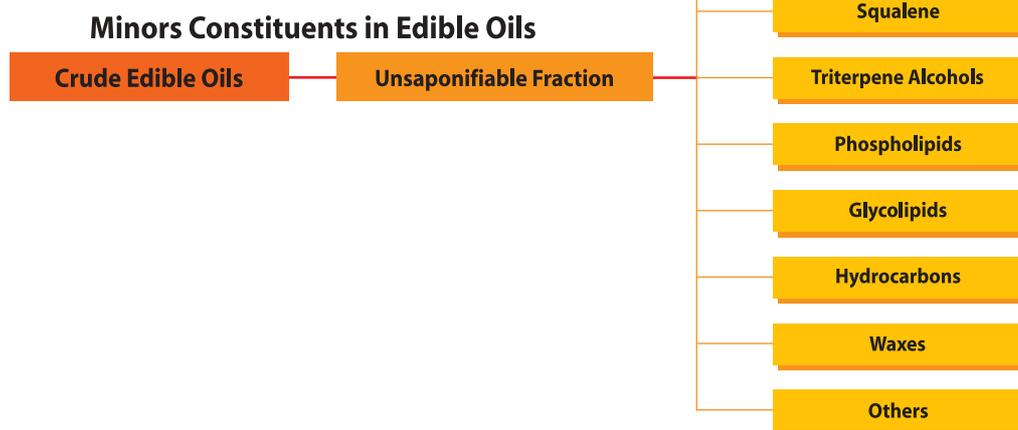
In a controlled human clinical trial, patients suffering from carotid arterial stenosis who were given palm tocotrienol supplements showed several degrees of improvement, compared to those receiving Vitamin E (alpha-tocopherol) supplements.

Atherosclerosis is often mediated by oxidative damage of low-density

lipoproteins. Tocotrienols showed greater protection in this area than tocopherols, based on evidence from several animal studies.

Interesting developments have been recorded for tocotrienols in cancer studies. In human breast cancer cell culture studies, palm tocotrienols appear to inhibit the growth of cancer cells. These perform even more effectively in combination with the drug tomaxifen, used to treat breast cancer.

*More information on carotenes and phytosterols will follow in the next issue.*



### Asian 'mega trend' on health foods



Consumer behaviour across Asia is changing to reveal the face of health conscious shoppers.

A recent survey of about 40,000 households in various countries has shown that, year on year spending on health foods has grown significantly to become the 'Number One mega trend'.

The Taiwanese led the pack, allocating 50% of their household spending for purchase of such products as fruit and vegetables, RTD tea, vitamins, cereals, yoghurt products and liquid milk.

About 90% of households in Vietnam – more than in any other country surveyed – expressed a willingness to pay more for health foods and drinks.

Asia also fared better than the West in the comparison of those overweight or obese, although this position may be negated by increased spending on snack foods in countries like Vietnam, Malaysia and Thailand.

Source: AP Foodtechnology.com

### Quick detector of deadly bacteria



US scientists at the Department of Agriculture have developed a 'flow cytometer' that can handle up to 100 samples at a time in detecting bacteria and obtain more precise results as well.

*Listeria monocytogenes* and *Candida albicans* bacteria can be identified with accuracy within a day, compared to about three days previously.

*Listeria* is a hardy pathogen that resists freezing, drying and heat processes and has been responsible for numerous and sometimes fatal outbreaks of food poisoning. The yeast *Candida* can be lethal to people with weakened immune systems.

The machine uses molecules called 'probes' to find and bind corresponding pieces of species-specific DNA. A fluorescent marker tells the cytometer which DNA sequence was detected, with the identity of the species displayed as colour-coded bar graphs.

The test can be used to check for yeasts that cause food and beverage spoilage. It could also speed up the search for yeasts adept at fermenting cornstarch

into ethanol or those used for the control of fruit-storage rots.

Foods typically associated with *Listeria monocytogenes* contamination include ready-to-eat products made with red meat, poultry meat and fish, including frankfurters, *pâté*, smoked salmon and fermented raw meat sausages.

It could also affect dairy products like soft cheeses, such as brie, camembert and roulade, semi-soft farmhouse cheeses and unpasteurised milk. Prepared salads, such as coleslaw, also support the growth of the pathogen.

The innovation could therefore prove especially useful in hazard analysis and critical control point programmes at food-processing plants.

Source: FOOD USA Navigator.com

### Calorie quality check for long life

New research by scientists at the University College London (UCL) has revealed that fruit flies can live longer without reducing calories but by eating proportionally less yeast.

The finding is expected to assist in dietary programmes to prevent obesity.

Figures released in March show that more than 200 million adults across the EU may be overweight or obese. The region's number of overweight children is rising by 400,000 a year, according to International Obesity Task Force data.

The UCL study on the impact of reducing yeast suggests that protein or fat plays a greater role than sugar in the longevity of *Drosophila* flies.

During the study, dietary restriction involved diluting the nutrients in the fly's standard lab diet of yeast and sugar to a level known to maximise life span.

Since both yeast (which contributes protein and fat) and sugar (carbohydrates) provide the same calories per gram, the authors could adjust nutrient composition without affecting the calorie count, allowing them to separate the effects of calories and nutrients.

Reducing both nutrients increased the lifespan, but yeast had a much greater effect – reducing yeast from 'control' to 'dietary restriction' levels increased median lifespan by over 60%.

However, those switched from the standard restriction diet to the sugar-restricted diet began to die at the same rate as flies on the control diet.

*Source: NUTRA Ingredients.com*

## Role of genes in busting cholesterol



Some people have to be careful about their diets, while others have much more freedom in

dietary choices. Everything depends on their genes, based on a limited study done on 28 pairs of identical twins in the US.

Researchers found that, even if one twin exercised regularly and the other was a couch potato, both had a very similar cholesterol response when put on a high fat diet.

The findings published in the *American Journal of Clinical Nutrition* in July shows the importance of genes in fat metabolism.

Scientists from the Lawrence Berkeley National Laboratory and the Children's Hospital Oakland Research Institute in California gave the twins either a high-fat diet (40% of the calories from fat) or a low-fat diet (only 20%) for six weeks. The pairs switched diets for another six weeks. Blood cholesterol levels were tested after each period.

The researchers found a 0.7 correlation in responses to the change in diet, which is described as a very strong similarity in the way each pair of twins responded.

(A correlation of zero would mean that their responses had no relation to each other, while a correlation of 1.0 would mean that their responses were identical.)

The correlations showed that the twins had very similar changes in LDL cholesterol because they had the same genes.

Some twins had one or more genes that made them very sensitive to the amount of fat in their diets. Other pairs had genes that made

them insensitive to dietary fat, no matter how much they exercised.

*Source: NUTRA Ingredients.com*

## Acrylamide reduction in fried foods



The global food processing industry has been on alert for acrylamide since 2002, when Swedish regulators reported unexpectedly high levels of this potential carcinogen in fried foods. It was found to cause cancer in laboratory rats.

Acrylamide was suspected to form as a result of reaction between specific amino acids and sugars present in carbohydrate-rich foods, like potatoes, when cooked at high temperatures.

More than 200 research projects were then carried out worldwide, with the findings co-ordinated by national governments, the EU and the United Nations.

Tests have confirmed that when the amino acid is heated at temperatures above 100°C (212°F), it reacts with sugar to create acrylamide.

This knowledge has enabled action by European food manufacturers and checks have revealed a 30-40% drop in acrylamide in fried products.

Recent research at the US Texas A&M University has confirmed the findings, indicating that reducing the cooking temperature would be an “easy and effective way” to reduce acrylamide.

The study successfully varied cooking times, pressure and temperatures to see if acrylamide levels could be decreased in potato crisps.

Because potato varieties have varying levels of reducing sugars, different types were tested. Storage at lower storage temperatures were found to increase the level of reducing sugars.

The type of cooking oil had no effect on acrylamide levels. But with the lower cooking temperatures, less oil (28% against 40%) was retained on a ‘wet basis’ in the end product than at normal cooking temperatures.

*Source: FOOD USA Navigator.com*

### EU food platform pushes R&D

The European Technology Platform (ETP) on Food for Life is holding out funding to lure food makers and ingredients suppliers in the €800 billion food and drink sector into undertaking research and development (R&D).

At their Barcelona Summit, EU leaders had agreed on a 3% (of GDP spent on R&D) objective to assist the region’s push to become “a knowledge powerhouse” by 2010.

In 2002, overall R&D expenditure accounted for 1.93%

of GDP in the EU25 - an increase of 0.11% since 1998.

Europe’s agro-food industry utilises more than 70% of the EU’s agricultural raw materials and employs over four million people. It also supports some 280,000 companies, of which 99% are small- and medium-scale enterprises.

R&D opportunities will be driven by consumer demand for quality, convenience, diversity and health; as well as expectations of safety, ethics and sustainable food production.

The push for innovation will deliver new consumer products and help the sector to improve its competitive edge in order to sustain growth.

*Source: CEE-Food Industry.com*

### Food makers fall short in TFA labelling

The Florida Agriculture and Consumer Services commission has found that only one out of 33 food products tested was accurately labelled for trans fatty acid (TFA) content.

If this goes on, food makers could face legal action from January next year, when mandatory labelling requirement will be enforced by the US Food and Drugs Administration.

Offenders could be fined a maximum of \$5,000 and face a consumer backlash that would diminish their brand value.

The commission stressed that accurate food labels are critical for

millions of overweight consumers, those who have diabetes or are on restricted diets that require careful monitoring of the amount of fats, carbohydrates or calories consumed.

TFA are formed when liquid oils are made into solid fats like shortening and hard margarine, a process that increases the shelf life and flavour stability of foods. But the substance has been found to contribute to elevated cholesterol levels and can lead to coronary artery disease.

Many manufacturers are already listing the information, especially those that have eliminated TFA in their products.

According to New York-based AC Nielsen, US sales of products already labelled ‘no trans fat’ increased 12% to \$6.4 billion for the 52 weeks ended Oct 2, 2004, compared with the previous 52-week period.

*Source: FOOD USA Navigator.com*

### Of doctors and diet-based cures



Many health conditions can be alleviated through diet, often without creating secondary health risks associated with taking drugs.

Instead, the medical profession opts for prescription and distribution of high-power drugs, not the least because these are heavily promoted by pharmaceutical companies.

In a survey last year by the University of Washington, Seattle, 66.5% of doctors said they wanted more information on weight management, while others said they wanted to know about diet for the prevention of disease.

The challenge lies in getting this information to them. The American Dietetic Association recently introduced a continuing education programme through its journal.

This, however, found few takers among doctors who have heavy work loads or scant resources to look up information on their own.

In the absence of informed doctors, patients are left to identify a dietary solution even though most not qualified to sift through and use scientific research as the basis for a sensible course of action.

Advocates believe that dietary advice for health issues should be dished out as a matter of course in every doctor's office.

And if efforts pay off in the US, there may be federal funds for training health professionals in the diagnosis, treatment and prevention of obesity and eating disorders.

Source: *NUTRA Ingredients USA.com*

### 'Anti-ageing' bread in Spain



Olive oil is strongly associated with the benefits of the Mediterranean diet, including longevity and low rates of cardiovascular disease.

Now, a bread containing a concentrated component of olive oil – named *Hytolive 2* – has been launched in Spain as an anti-ageing food.

The ingredient has been added to *Nostrum* brand bread, made with a mixture of heart healthy cereals, such as oat, wheat and barley.

*Hytolive 2* is a 45% concentration of natural hydroxytyrosol, obtained by a patented technology that isolates it from olives at up to 99% purity.

Genosa R&D, which makes the concentrate, claims that hydroxytyrosol is a valuable antioxidant extracted from olives.

Source: *NUTRA Ingredients.com*

### Codex standards for vitamins and minerals

Global standards for vitamin and mineral supplements were adopted by Codex Alimentarius on July 4 after being in discussion for more than 10 years.

These recognise vitamin and mineral supplements as a food category.

One provision will exert influence on the health supplement industry – the basis for setting permitted levels of vitamins and minerals.

Last year the drafting committee agreed that maximum levels should be based on risk assessment.



Currently, a number of countries base the levels on recommended dietary intake (RDA), which result in much lower levels than those based on risk assessment.

The guidelines will apply only in those jurisdictions where the defined products are regulated. Aspects of packaging, labelling and sources of vitamins and minerals are also covered.

More than 60 countries including China, India, Taiwan and Mexico, are now looking at introducing or amending regulations for vitamin and mineral supplements.

Codex, established by the United Nations in 1961, establishes guidelines to harmonise trade in food. Although not binding, the standards have an influence on less liberal markets and those without a regulatory framework.

Source: *NUTRA Ingredients.com*