

health

Super Vitamin E

Tocotrienol: For the battle against breast cancer and skin cancer

By Dr Daniel Yap, Deputy Head of Tocotrienol Research & Development, DAVOS Lifescience

breast cancer is the most common cancer in women, accounting for 16% of all female cancers worldwide. In 2008, breast cancer was responsible for the deaths of over 550,000 women globally. The World Health Organisation (WHO) predicts that this figure will rise to as many as 790,000 deaths in 2030. Fortunately, recent research on tocotrienol, a natural substance found in palm oil, is suggesting that it could play an important role in reducing the risk and impact of breast cancer, as well as having benefits in other serious diseases.

Tocotrienol – a 'super vitamin E'

There are two different forms of vitamin E, tocopherol and tocotrienol. Both act as a fat-soluble antioxidant, neutralising damaging free radicals that are formed in the body. By far the most widely used form of vitamin E is tocopherol, which is the common ingredient in standard vitamin E supplements and is known to be important in maintaining fertility.

The less well known tocotrienol occurs in certain plants such as barley and rice, but the richest source is undoubtedly the oil palm, *Elaeis guineensis*. Over the last decade, tocotrienol has been quietly building a reputation in its own right as a 'super-vitamin E'. There is considerable evidence confirming that tocotrienol has superior antioxidant properties compared with standard vitamin E supplements. It also has other health benefits, such as lowering cholesterol and maintaining a

healthy heart and cardiovascular system.

Tocotrienol also has the ability to reduce inflammation. To varying degrees, most diseases are closely linked to inflammation, which can have damaging long-term effects if it persists. Chronic inflammation has a greater significance in serious diseases such as cancer. Eating an 'anti-inflammatory diet' rich in antioxidants could help reduce chronic inflammation and therefore lower the risk of developing a wide range of serious diseases. With its powerful antioxidant properties and anti-inflammatory activity, tocotrienol would make an ideal addition to any such diet.

Moreover, tocotrienol has recently caught the attention of the scientific and medical community due to a growing library of research and encouraging clinical trial results. These indicate that it could help to reduce the risk and impact of cancers such as prostate, pancreatic and breast cancer.

Tocotrienol to reduce risk and impact of breast cancer

Preliminary laboratory research demonstrated that tocotrienol prevents the growth of breast cancer cells. Further studies indicated that the gamma-tocotrienol subtype has the

most powerful activity against these cells.

These findings led to a ground-breaking study being conducted by a research partnership between scientists at the University of Hong Kong, the Australian Prostate Cancer Research Centre in Brisbane and Davos Life Science in Singapore.

This cancer cell-line study confirmed that gamma-tocotrienol has powerful cancer-killing properties. The substance targets cancer cells by inhibiting the key cancer-promoting protein, NF-kappa B, which is also an important factor in controlling immune and inflammatory responses. Inhibition of NF-kappa B triggers a process known as apoptosis (or cell suicide), which causes the cancer cells to self-destruct. Crucially, gamma-tocotrienol selectively attacks breast cancer cells and has no adverse effects on the functioning of normal healthy cells.

Another significant finding was that gamma-tocotrienol suppresses the invasive ability of breast cancer cells to spread to other parts of the body. Furthermore, the natural product makes breast cancer cells more sensitive to the cancer-killing effects of docetaxel, a chemotherapy drug commonly used to treat breast cancer.



Melanoma and other skin cancers

In addition to its positive effects on breast cancer, research has demonstrated that tocotrienol may help to prevent and treat other cancers, in particular skin cancer. Overexposure to ultraviolet (UV) radiation as well as environmental pollution, smoke and stress generates an excessive number of free radicals in the skin, which increase the risk of skin cancer. In 2008, an estimated 73,000 deaths worldwide were caused by melanoma and other skin cancers. The WHO expects this figure to rise to as many as 99,000 deaths in 2030.

There is evidence to support the use of dermatological formulations of tocotrienol for protecting the skin against free radicals produced by overexposure to UV rays from the sun, which may help prevent skin cancers. The substance readily penetrates the outermost skin layer (the stratum corneum) and is retained within the skin tissue after topical application.

After penetrating to the deepest layers of the skin, tocotrienol disrupts cancer formation at the cellular level. As with breast cancer, the gamma-tocotrienol subtype was found to have the most powerful cancer-killing effects against melanoma cells. Its effects were again due to inhibition of NF-kappa B, inducing cell suicide.



As seen with breast cancer cells, gamma-tocotrienol also suppresses the invasive ability of melanoma cells to spread to other parts of the body, and makes melanoma cells more sensitive to the anticancer effects of two commonly used chemotherapeutic agents, docetaxel and dacarbazine.

Future directions for tocotrienol

Findings from studies into the use of gamma-tocotrienol in breast and skin cancer point the way for clinical trials to be conducted to fully realise this natural product's potential in these diseases. The antioxidative and anti-inflammatory properties of gamma-tocotrienol are effective at killing cancer cells and preventing them from spreading elsewhere in the body, while at the same time not affecting the functioning of healthy cells. Moreover, due to its low toxicity, in combination with lower doses of chemotherapy agents it could help to minimise the debilitating side effects experienced by

patients receiving chemotherapy.

Tocotrienol also has potential health benefits in other cancers, including prostate and pancreatic cancer. A clinical trial is currently underway at the Moffitt Cancer Center in the US, to evaluate the potential of the delta-tocotrienol subtype in treating patients with pancreatic cancer. It is hoped that this will be the first of many clinical trials involving tocotrienol.

Interest in this natural product is clearly increasing amongst research scientists and healthcare professionals and, as the body of evidence supporting its health benefits continues to grow, it is only a matter of time until tocotrienol will appear on supplement labels in pharmacies.

Dr Daniel Yap is the Deputy Head of Tocotrienol Research & Development at Davos Life Science, a company that focuses on the production and also of tocotrienol for use in supplements, functional food, personal care and pharmaceutical formulations. For further information visit www.davoslife.com.