

ANTIOXIDANTS

Nutrients with antioxidant activity include vitamin A, vitamin C, vitamin E and selenium. All are essential nutrients, not only on account of their antioxidant activity in the cells and tissues, but also for a whole host of other effects on immune function, the blood, the nervous system and the musculoskeletal system. The totality of evidence from epidemiological studies, animal trials and various studies in humans for these essential nutrients suggests that they have many health benefits and that inadequate intake can increase the risk of poor health. Moreover, a significant number of British people have diets lacking in these essential nutrients. A supplement containing the recommended daily amount of these, and all essential vitamins and minerals, will ensure that a person's intake does not fall below recommended levels

Commenting on the subject of Antioxidants, The Health Supplements Information Service notes: "Nutrients with antioxidant activity, including vitamin A, C, E and selenium are essential for human health. Vitamin A is essential for the health of the eyes and mucus membranes, such as the respiratory tract. Vitamin C is essential for the health of all connective tissue, such as the bones, joints, blood vessels and gums. Vitamin E is essential for the health of the nervous system and selenium participates in many biochemical reactions throughout the body as a result of its involvement in key enzymes."

"Each one of these nutrients has proven antioxidant activity in the tissues, which means that they reduce the adverse effects of reactive oxygen and reactive nitrogen species on biochemical functions in the body's tissues. In this antioxidant role, these nutrients have a wide variety of protective roles in the body all of which help to maintain health. Vitamin E protects the lipid (fat) component of cell membranes from damage. Vitamin C protects the DNA in human sperm from oxidative damage, and the eye tissue from damage caused by ultraviolet light."

So why are vitamins E and C essential for health?

Both vitamin E and C have a number of essential functions in the body. Vitamin E is a fat-soluble vitamin whose main role is as an antioxidant. It protects body cells from toxic compounds, heavy metals, such as lead and cadmium, and also from the effects of drugs, radiation and free radical damage. It works in fats and oils which makes it complementary to vitamin C which fights free radicals dissolved in water. Free radicals can harm cells, tissues and organs.

As an antioxidant, vitamin E helps to protect the fats in low density lipoproteins (LDLs).¹ Lipoproteins are substances that transport fat and protein through the bloodstream. LDLs specifically transport cholesterol in the blood. If oxidised, LDLs deposit cholesterol in the blood vessels so causing build up of fat and damage to blood vessels. If LDLs are not oxidised, this helps to maintain the health of the blood vessels.

Vitamin E makes an important contribution to the health of the heart, blood and blood vessels.²³ It helps to maintain the blood at an appropriate consistency – not too sticky – by an action on platelets which are one type of blood cell. Vitamin E also helps in the formation of red blood cells. All of these effects help to maintain appropriate blood flow in the circulation.

Vitamin E has several functions not directly related to its antioxidant activity.⁴ Thus it has an effect on the activity of substances such as proteins and enzymes that work in immune and inflammatory cells.⁵ This action helps to maintain the health of the body's immune and inflammatory systems.

Vitamin E also helps to regulate the activity of some of the substances in the body that send signals between cells. This is another function of vitamin E that helps to maintain the health of the body's cells.

¹ Mustacich DJ, Bruno RS, Traber MG. Vitamin E. [Vitam Horm](#). 2007;76:1-21

² Traber MG. Vitamin E. In: Shils ME, Shike M, Ross AC, Caballero B, Cousins RJ, eds. *Modern Nutrition in Health and Disease*. Philadelphia: Lippincott Williams & Wilkins; 2006:396-411

³ Ball GFM. Vitamin E. In: *Vitamins. Their Role in the Human Body*. Blackwell Publishing, 2004;234-255.

⁴ Zingg JM, Azzi A. Non antioxidant activities of vitamin E. [Curr Med Chem](#). 2004;11(9):1113-33.

⁵ Traber MG. Vitamin E regulatory mechanisms. *Annu Rev Nutr*. 2007;27:347-362

Low and marginal intakes of vitamin E are not uncommon in the British population. There is no Reference Nutrient Intake in the UK for vitamin E but the EU Recommended Daily Amount is 10mg daily. In the National Diet and Nutrition Survey (NDNS) in British adults aged 19-64 years, 47% of men overall and 67% of women overall had a vitamin E intake below 10mg daily. In the 19-24 year olds, these figures increased to 60% of men and 76% of women.⁶

Vitamin C is a water-soluble vitamin. Like vitamin E, it is an effective antioxidant. Vitamin C can protect essential substances in the body such as proteins, lipids, carbohydrates and DNA and RNA from damage by free radicals. Vitamin C works in tandem with vitamin E and is able to regenerate vitamin E when vitamin E is used as an antioxidant.⁷

Vitamin C is also required for the synthesis of collagen, an important structural component of blood vessels, tendons, ligaments, and bone. Vitamin C plays an important role in the regulation of various neurotransmitters, including norepinephrine and acetylcholine which are critical for brain function. Vitamin C is also required for the synthesis of [carnitine](#), a substance essential for the transport of fat to the body's cells for conversion to energy. Vitamin C is also involved in the metabolism of cholesterol to [bile acids](#) and protects LDL cholesterol against damage. The vitamin is also important for the absorption of iron from plant foods (cereals, nuts, fruits, vegetables, pulses).

Evidence suggests that vitamin C plays an important role in the human immune system by protecting various types of cells, such as phagocytes, lymphocytes and neutrophils, within the immune system.⁸

As is the case for vitamin E, low intakes of vitamin C are quite common in the British population. In the NDNS in British adults, vitamin C intakes were below the Reference Nutrient Intake in 21 per cent of men and women. This increased to 25 per cent in the 19-24 year old group.⁹ In people over the age of 65, vitamin C

⁶ The National Diet and Nutrition Survey: adults aged 19 to 64 years. Volume 3. Vitamin and mineral intake and urinary analysis. London: Stationery Office, 2003

⁷ Ball GFM. Vitamin C, In Vitamins: their role in the human body. Oxford: Blackwell Publishing, 2004, pp393-415.

⁸ Ball GFM. Vitamin C, In Vitamins: their role in the human body. Oxford: Blackwell Publishing, 2004, pp393-415.

⁹ The National Diet and Nutrition Survey: adults aged 19 to 64 years. Volume 3. Vitamin and mineral intake and urinary analysis. London: Stationery Office, 2003

intakes were below the RNI in 28 per cent of free living men and 36 per cent of free living women.¹⁰

It can be seen that significant dietary gaps do exist for vitamins E and C. Supplements can help to make up dietary gaps caused by poor diets, which are a problem for significant numbers of people in this country - young and old.

In summary

Antioxidant vitamins are essential for health and UK national dietary surveys have shown that some people have poor intakes. Antioxidant vitamins, like any other vitamins were never intended for the prevention of chronic disease and mortality. They are not magic bullets. They are intended for health maintenance on the basis of their various physiological roles in the body and in the case of the antioxidant vitamins, this does, in appropriate amounts, include a protective antioxidant effect in the body's tissues.

What we need now is yet further research, looking at the role of antioxidant vitamins in different groups of people at different stages of life and throughout life, and possibly also in different mixtures and amounts.

Antioxidants we know are essential for health and that many people in the UK do not have an adequate intake according to recommended daily amounts. A vitamin supplement taken in recommended amounts can be beneficial for health, especially for those people whose intakes are poor. “

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1. Bjelakovic G, Nikolova D, Gluud LL, Simonetti RG, Gluud C. Antioxidant supplements for prevention of mortality in healthy participants and patients with various diseases. *Cochrane Database of Systematic Reviews* 2008, Issue 2. Art. No.: CD007176. DOI: 10.1002/14651858.CD007176.
2. [Bjelakovic G](#), [Nikolova D](#), [Gluud LL](#), [Simonetti RG](#), [Gluud C](#). Mortality in randomized trials of antioxidant supplements for primary and secondary prevention: systematic review and meta-analysis. *JAMA*. 2007 Feb 28;297(8):842-57.

¹⁰ Finch S, Doyle W, Lowe C, Bates C, Prentice A, Smithers G, et al. The National Diet and Nutrition Survey: people aged 65 years and over. Vol 1: Report of the Diet and Nutrition Survey. London: The Stationery Office. 1998

