



Beta-Carotene

AT A GLANCE

Introduction

Beta-carotene is a member of the carotenoid family, which are highly pigmented (red, orange, yellow), fat-soluble compounds naturally present in many fruits, grains, oils, and vegetables.

Among the naturally occurring carotenoids that can be converted to vitamin A in the human body, so-called 'provitamin A carotenoids', beta-carotene is the most abundant and most efficient one found in foods.

Health Functions

A sufficient intake of beta-carotene is important as it functions as

- a safe source of vitamin A, helping the body to reach the vitamin A levels that are essential for normal growth and development, good vision and eye health, a strong immune system, and healthy skin.
- an antioxidant, contributing to protecting the body against the damaging effects of free radicals, which can potentially increase the risk of developing certain diseases, including cardiovascular diseases and cancer.

Disease Risk Reduction

Lung cancer

Studies indicate that increased intake of vegetables and fruits rich in beta-carotene may decrease the risk of lung cancer. It is not clear if these effects can be attributed to beta-carotene alone as the role of other carotenoids or vitamins from vegetables and fruits and associated dietary or life style patterns have not been adequately explored in the studies (see also Principles – The contradictory science of micronutrients).

Heart disease

A number of studies have associated high blood levels of dietary beta-carotene and other carotenoids with a lower risk of developing diseases that involve the heart or blood vessels (e.g., heart attack and atherosclerosis).

Skin health

There is evidence that beta-carotene, alone and in combination with other carotenoids or antioxidant vitamins can protect the skin from sun damage. Oral supplementation of beta-carotene has been used successfully as sun protection in combination with sunscreens in the prevention of sunburn.

Age-related eye disorders

The results of population studies suggest that diets rich in beta-carotene and other carotenoids may help to slow the development of age-related macular degeneration (deterioration of the macula, the part of the retina that is responsible for central vision) and cataracts (clouding in the lens of the eye) causing vision loss if left untreated.

Immune function

In a number of studies, supplementation with beta-carotene and other carotenoids was found to enhance certain immune responses potentially preventing infections.

Other Applications

Please note:

Any dietary or drug treatment with high-dosed micronutrients needs medical supervision.

Age-related eye disorder

A clinical trial found that people with age-related macular degeneration (deterioration of the part of the retina that is responsible for central vision) could slow its progression by taking supplemental beta-carotene, vitamin C, vitamin E, zinc, and copper. Further studies are needed to confirm this beneficial effect.

Sun sensitivity

Studies suggest that high doses of beta-carotene may decrease sensitivity to the sun. People with 'erythropoietic protoporphyria', a rare genetic condition that causes painful sun sensitivity, are often treated with beta-carotene to reduce sun sensitivity.

Intake Recommendations

European and U.S. health authorities have decided that the existing evidence is insufficient to establish intake recommendations for beta-carotene.

Until now, dietary intake of beta-carotene, which can be converted to vitamin A, has been expressed as part of the intake recommendations for vitamin A.

Apart from its 'provitamin A function', data continue to accumulate supporting a role for beta-carotene as important micronutrient in its own right.

However, consumption of foods rich in beta-carotene is being recommended by scientific and government organizations in Europe and the U.S.; the recommended intakes range from 2 to 6 mg beta-carotene per day for adults.

Supply Situation

The estimated average amount of total beta-carotene presently consumed in Europe and the U.S. is below the recommended intake.

Deficiency

In populations that consume low amounts of vitamin A, which is mostly found in animal products such as liver, a sufficient intake of beta-carotene, as provitamin A carotenoid, is essential in preventing vitamin A deficiency.

Above average intake of beta-carotene can improve health (see Health Benefits).

Sources

The best sources of beta-carotene are yellow/orange vegetables (e.g., carrots, sweet potatoes, pumpkins, and winter squash) and fruits (e.g., apricots, cantaloupes, papayas, mangoes, carambolas, nectarines, peaches) and dark green leafy vegetables (e.g., spinach, broccoli, endive, kale, chicory, escarole, watercress and beet leaves).

The proportion of beta-carotene that can be absorbed, transported and utilized by the body once it has been consumed ('bioavailability') is influenced by a number of factors: beta-carotene from dietary supplements is better absorbed than beta-carotene from foods, chopping, mechanical homogenisation and cooking enhances bioavailability of beta-carotene, and the presence of fat in the digestive tract is required for the absorption of beta-carotene.

Safety

High doses of beta-carotene (up to 180 mg/day) used for the treatment of skin disorders have shown no adverse or toxic effects.

Excessive intakes of beta-carotene may cause a yellowish tint of the skin, mainly on the palms of the hands and soles of the feet. The yellow color disappears when carotenoid consumption is reduced or stopped.

Beta-carotene is considered a safe source of vitamin A: while the ingestion of high amounts of preformed vitamin A (retinol) for months or years can be toxic (see Vitamin A / Safety), the body will convert only as much vitamin A from beta-carotene as it needs without a risk of intoxication.

Lung cancer risk

Two clinical studies indicated that long-term high-dose beta-carotene supplementation (20 mg/day and more = 5 to 10 times the recommended dose over several years) in heavy smokers and former asbestos workers increased the risk of lung cancer and death. The reasons for these findings are not yet clear. Other studies did not confirm these observations; it is therefore difficult to interpret the results for these high-risk groups.

However, supplemental beta-carotene in doses of 20 mg/day or more is not recommended for use in current smokers.

Tolerable upper intake level

European and U.S. health authorities have decided that there is insufficient scientific data from human intervention trials to set a precise figure for a tolerable upper intake level of beta-carotene.

Drug interactions

Please note:

Because of the potential for interactions, dietary supplements should not be taken with medication without first talking to an experienced healthcare provider.