Beta-carotene *(pro-vitamin A) Trans-beta-carotene*

Common Indications:

- Immune function
- Vitamin A deficiency
- Cardiovascular disease
- Photoprotection

General Comments:

Beta-carotene belongs to a group of plant compounds called carotenoids. Carotenoids are the pigments that provide the yellow, orange and red coloration in fruits and vegetables. Beta-carotene, which is also known as pro-vitamin A, consists of two molecules of vitamin A linked together which is split by enzymes in the epithelial lining of the intestinal tract whenever the body needs it. Beta-carotene is the most abundant carotenoid in human foods and is generally thought to be the most important carotenoid for humans.

Benefits & Mechanism of Action:

IMMUNE FUNCTION

The mechanism is not well understood; however, beta-carotene reduces oxidative damage to cell membranes and receptors. Studies have shown that supplementation with beta-carotene 15 mg/day reduces IgE and respiratory rater. An increased dose of 30 mg/day increases the TNF-α levels as well as protect against UV-induced photosuppression. When the dose is further increased to 60 mg/day, there was a significant increase in lymphocyte counts[1].

VITAMIN A DEFIENCY

The primary cause for a beta-carotene deficiency is not eating enough fruits and vegetables. Supplementation has been found to reduce loose stools and night blindness. Low dietary intake is associated with a weaker immune system and therefore supplementation is associated with a reduced infection-related mortality. The incidence of some cancer including breast, non-melanoma and melanoma, is increased as well as the likelihood of RA, age-related macular degeneration and metabolic syndrome. Some medications may also contribute to a deficiency including cholestyramine, colchicine, colestipol, mineral oil, neomycin, PPIs, and orlistat[1,9].

CARDIOVASCULAR DISEASE

Being an antioxidant, beta-carotene will inhibit the oxidation processes of LDL in the arteries hopefully preventing future ASCVD as well as preserving endothelial function[12]. One study found

that low beta-carotene levels have an increased risk of CVD, and individuals in the lowest tertile have a two-fold increased risk of sudden cardiac death and three-fold increased risk of CHF[10,11].

PHOTOPROTECTION

Beta-carotene isn't capable of protecting an individual alone but when used combined with other carotenoids, they can work by one of two functions: 1) remove excess energy as heat or 2) scavenge reactive oxygen species and suppress lipid peroxidation. They can absorb UV light preventing cellular target damage. When supplies in the skin are at optimal levels, it is associated with better UV defense. Several weeks of supplementation is required for protective effects to appear because of the turnover time of skin. The photoprotection offered by beta-carotene is less than topical sunscreens, however, when combined the effect is enhanced[1,13].

Functions:

- Antioxidant
- Source of vitamin A to help maintain eyesight, skin, membranes and immune function.
- Source of vitamin A to help in the development and maintenance of teeth and bones.
- May help protect against various cancers, including esophageal, pancreatic and breast cancer as well as lung cancer in nonsmokers[5,6,7,8].

Dose:

- Adults and teenagers: 6-15mg of beta-carotene per day (the equivalent of 10,000 to 25,000 units of vitamin A activity).
- Children: 3-6 mg of beta-carotene per day (the equivalent of 5,000 to 10,000 units of vitamin A activity).

Standardization:

Until recently, vitamin A activity in foods was expressed as international units (IU). The unit retinol activity equivalent (RAE) is used for Dietary Reference Intakes (DRIs). 1 RAE = 3.33 IU vitamin A activity from retinol.

Cautions & Side Effects:

- Beta-carotene is not known to be teratogenic[2].
- Beta-carotene is stored in fat. Excessive doses may lead to yellowing of the palms, hands or soles of feet, or to a lesser extent the face called carotenodermia[1].
- Supplementing with beta-carotene has been associated with an increased risk of lung in people who smoke or who have been exposed to asbestos when on long-term therapy. One study of 18,314 men and women with a history of cigarette smoking and/or asbestos were found to have a 28% higher incidence of lung cancer and a 17% higher mortality rate compared to placebo[4,5].

Food Sources:

Carrots	Cantaloupe	Broccoli	Green leafy vegetables
Sweet potatoes	Squash	Apricots	Peaches
Green, yellow & red peppers	Gac fruit	Crude palm oil (~10x more than carrots)	

References:

GENERAL ROLE & IMMUNE FUNCTION

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