

Supplement Sampler

Vitamin A and Beta Carotene

Vitamin A is a fat-soluble vitamin important for vision, bone growth, reproduction, immune function, iron absorption, and cell growth and proliferation. Beta-carotene is a carotenoid that the body can convert into vitamin A. Study results for the two have been mixed.

Best Indications ***Be aware of potential harm of high doses***

For vitamin A

- Vitamin A deficiency (imagine that!)
- Acne
- Acute promyelocytic leukemia (is sold as the drug Vesanoid)
- Xerophthalmia (dry eye)
- Cataracts (nuclear)
- Postpartum diarrhea prevention in malnourished women
- Night blindness in malnourished pregnant women; zinc probably enhances positive effects

For beta-carotene

- COPD. Less risk of COPD in those with higher dietary intake (Supplements don't seem to help.) ([Am J Respir Crit Care Med 1997;156:1447-52](#)).
- Osteoarthritis. May slow osteoarthritis progression ([Arthritis Rheum 1996;39:648-56](#)).
- Improves physical performance and muscle strength in the elderly ([Am J Clin Nutr 2004;79:289-94](#)).
- Ovarian Cancer. Diet rich in carotenoids may decrease risk of ovarian cancer in postmenopausal women ([Int J Cancer 2001;94:128-34](#)).

Mechanism of Action

Vitamin A is comprised of a family of 20 carbon molecules that differ in terms of chemical groups at the 15th carbon, including retinyl ester, retinal, retinol, and retinoic acid. All-trans retinol, the most potent form, is the form usually found in the diet. Vitamin A is stored in the liver, and serum levels are closely modulated. It is also stored in the retina, kidneys, lungs, adrenals, and in intraperitoneal fat. Vitamin A is needed to create retinal pigments. In vitro it induces tumor suppressor genes. It is needed for iron absorption from the gut.

Beta-carotene is converted to retinal. Rate of conversion decreases as intake of beta-carotene increases, so high doses don't lead to vitamin A toxicity. Synthetic beta-carotene is usually in the trans-form, whereas natural forms tend to have cis- configurations. The implications of this are not known.

Best Studies

Positive:

- Nuclear cataract risk decreased with dietary vitamin A intake in a large population-based study ([Ophthalmology 2000;107\(3\):450-6](#)).



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- Diets rich in beta-carotene may reduce breast cancer risk in premenopausal women (especially with a family history or high alcohol intake) (*Nutr Res* 2001;21(6):797-809)
- AMD. Age-related macular degeneration can be slowed in people with advanced disease. 15 mg beta-carotene was given along with 500 mg vitamin C and 400 IU vitamin E, and zinc 80 mg (*Arch Ophthalmol* 2003;121:1621-4).
- 30 mg bid of beta carotene produced sustained remissions of oral leukoplakia in a RCT of 50 people (*Arch Otolaryngol Head Neck Surg* 1999;125:1305-10).

Negative:

- Beta-carotene at 20-50 mg a day does not affect cancer incidence for uterine, cervical, thyroid, bladder, skin, brain, or blood ("*Beta-Carotene*," on www.naturaldatabase.com. Accessed 1/20/09).
- In people who smoke, beta-carotene can increase lung cancer by 18-28% and cardiovascular mortality by 12-26% ("*Beta-Carotene*," on www.naturaldatabase.com. Accessed 1/20/09).
- Long-term intake of high-retinol diet may lead to osteoporotic hip fractures, according to one large study (*JAMA* 2002; 287:102-4).

Dosage

The upper tolerable intake level of vitamin A is 10,000 international units (IU) daily in adults. Up to age three, the dose should be <2,000 IU/day. Ages 4-8: <3,000 IU/day. Ages 9-13: <5,700 IU/day. Ages 14-18: <9,300 IU/day

The recommended daily allowance is 2300 IU in women and 3000 in men. In 9-13 year olds, it is 1800 IU. In children ages 4-8, it is 1200 IU, and in 1-3 year olds, it is 900 IU. In pregnant women over 19 years of age, 2600 IU is suggested, and 4300 IU/day is recommended for breastfeeding mothers. It is thought to be safe in pregnancy under 10,000 IU/day; over this level, it can cause fetal malformations.

1 microgram is equal to 3.33 IU.

A standard dose for beta-carotene is 25 mg per day.

Side Effects

One study indicated that taking vitamin A alone or in combination with other antioxidants might be associated with higher all-cause mortality (*JAMA* 2007;297:842-57). Hypervitaminosis is dependent on total cumulative dosing, rather than on the dose taken each day. Hepatotoxicity can occur when the dose is greater than 50,000 IU/day, and liver function tests can rise with daily intake of 25,000 IU. High doses have been linked to pneumonia and diarrhea in kids, and vitamin A can suppress bone production and antagonize vitamin D's ability to keep calcium levels normal.

Doses over 50,000 IU cause vomiting, headache, vertigo, blurry vision, coordination problems, and increased cerebrospinal fluid pressure. Chronic use at high levels can lead to fatigue, lethargy, irritability, low-grade temperatures, excessive sweating, abdominal pain, and skin peeling, as well as dry skin and lips. Population studies indicate a link between vitamin A and gastric cancers.

Too much beta-carotene can turn a person yellow (carotenodermia). Some studies have indicated that men supplementing beta-carotene had a higher risk of prostate cancer and overall mortality. None of these negative findings have been linked to higher dietary intake of beta-carotene.



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Cost

Inexpensive; found in most multivitamins.

Comments

Vitamin A is mainly found as retinol in animal-derived products (eggs, meat, butter, and especially liver). One-third to one-half of dietary vitamin A is made in the body from carotenoids (including beta-carotene) which come from green and yellow vegetables, carrots, fruits, grains, and oils. Eating 5-6 servings of fruits and vegetables a day provides half to two-thirds of the adult RDA. Serum retinol levels increase with age and may be linked to decreasing bone density. A normal level is less than 1.05 micromol/liter. You can order a vitamin A level through most hospital labs to check for high or low levels.

The World Health Organization, American Cancer Society, and American Heart association recommend obtaining beta-carotene through a diet high in fruits and grains, rather than via supplementation.

Clinical Bottom Line

People who eat a lot of low fat dairy products and fruits and veggies probably don't need to take extra vitamin A. It is best to eat a diet high in beta-carotenoids, as opposed to supplementing with the ones that are manufactured. Moderation is a good rule of thumb for both of these compounds. Smokers should probably avoid supplemental beta-carotene.

Brought to you by Adam Rindfleisch, MD, Mphil, and your colleagues in the University of Wisconsin-Madison Department of Family Medicine, Integrative Medicine Program.

Date created: January 2009