



VITAMIN A - AN OVERVIEW

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Abstract: *Vitamin A is one of four fat-soluble vitamins necessary for good health. It serves an important role as an antioxidant by helping to prevent free radicals from causing cellular damage. Adequate levels are important for good eyesight, and poor night vision may be one of the first symptoms of a deficiency. It is also necessary for proper function of the immune, skeletal, respiratory, reproductive, and integumentary (skin) systems.*

Introduction:

Vitamin A is a generic descriptor of retinoids that exhibit qualitatively the activity of alltrans-retinol compounds. Retinol signifies Vitamin A alcohol and is found in foods of animal origin only. Some carotenoids, which are found in plants, bacteria, algae and fungi, can be converted into retinol and are called provitamin A. The carotenoid with the highest vitamin A activity is beta carotene. Beta carotene yields two molecules of retinol. Retinol is esterified in the mucosal cell with palmitic acid. Retinyl palmitate is stored in the liver. Being fat soluble, retinol mobilized from the liver must be bound in serum to retinol binding protein (RBP), which is synthesized in the liver. Retinol binding protein also protects retinol from oxidation and releases it to specific receptor sites on the surface of the target cell. It has been suggested that RBP synthesis may be affected in zinc deficiency.

• Preparations

➤ Natural sources

There are two basic forms of vitamin A. Retinoids, the active types, are contained in animal sources, including meat, whole milk, and eggs. Liver is particularly rich in vitamin A, since it is one of the storage sites for excess. Precursor forms of the vitamin (carotenoids) are found in orange and leafy green produce such as sweet potatoes, carrots, collard greens, spinach, winter squash, kale, and turnip greens. Very fresh foods have the highest

levels, followed by frozen foods. Typically, canned produce has little vitamin A. Preparing vegetables by steaming, baking, or grilling helps them to release the carotenes they contain. Alpha and **beta carotene**, as well as some of the other lesser-known carotenoids, can be converted to vitamin A in the small intestine. This is done by the body on an as-needed basis, so there is no risk of overdose as there is with the active form.

➤ General Use –

- An adequate level of vitamin A unquestionably contributes to good health. It is essential for the proper function of the retina, where it can act to prevent **night blindness**.
- As well as lower the odds of getting age-related **macular degeneration** (AMD), which is the most common cause of blindness in the elderly.
- There is also evidence that good levels of vitamin A in the form of **carotenoids** may decrease the risk of certain cancers, heart attacks, and strokes.
- The immune system is also strengthened.
- It is unclear, however, if supplemental forms of vitamin A have the same benefit as consuming the nutrient in natural foods in the case of a person without deficiency. Taking high levels of vitamin A in any supplemental form is not advisable without the counsel of a healthcare professional.

➤ **Supplemental sources**

Supplements may contain either the active or precursor forms of vitamin A. The active form may be more desirable for those who may have some difficulty in converting the carotenoids into the active vitamin. This is more often true in those over age 55 or who have a condition that impairs the absorption of fat. There is a water-soluble form of the vitamin, retinyl palmitate, which may be better utilized in the latter case. Carotenes are also available either as oil-based or natural water-based formulas. Be sure to store both away from light and heat, which will destroy them.

➤ **Units**

There are several units that can express the amount of vitamin A activity in a product. Many supplements are still labeled with the old International Unit (IU), although the more current and most accurate unit is the Retinol Equivalent (RE). The new measurement distinguishes between the differences in absorption of retinol and beta carotene. One RE is equal to one microgram (MICROg) of retinol, or six MICROg of beta carotene.

➤ **Dose limits**

Adults should take no more than 25,000 IU (5,000 RE) per day of vitamin A in its active form, except in the case of women who are pregnant or may become pregnant. The latter group should not exceed 10,000 IU (2,000 RE) per day in order to avoid potential toxic effects to the fetus. The best way to get vitamins is in the natural food form, as the complexities are not always either known or reproducible in a supplement. A diet rich in foods containing carotenoids is optimal, but in the event of nutritional deficiencies, supplements may be needed. Mixed carotenoids are preferable to either large doses of vitamin A or pure beta carotene supplements to avoid toxicity and maximize healthful benefits. Some of the minor carotenoids appear to have beneficial effects that are still being explored. A good mixture will contain alpha and beta carotene, as well as **lycopene** and xanthophylls. Eating foods high in many carotenoids may confer some

benefits—such as a lower risk of **cancer**, heart attacks, and strokes—which a supplement may not.

➤ **Deficiency**

Levels of vitamin A low enough to cause symptomatic deficiency are uncommon in people of normal health in industrialized nations. Symptoms of deficiency may include, but are not limited to, loss of appetite, poor immune function causing frequent **infections** (especially respiratory), **hair loss, rashes**, dry skin and eyes, visual difficulties including night blindness, poor growth, and **fatigue**. Generally symptoms are not manifested unless the deficiency has existed for a period of months. Deficiencies are more likely in people who are malnourished, including alcoholics, the chronically ill, and those with impaired fat absorption. Another group at increased risk of vitamin A deficiency are persons with type 1 diabetes whose disorder is poorly controlled. People with normal health and nutritional status have a considerable vitamin A reserve.

In countries where nutritional status tends to be poor and deficiency is more common, vitamin A has been found to reduce the mortality rate of children suffering from a number of different viral infections.

Experts in plant genetics have been working on a strain of rice that contains beta carotene, hoping to help people in developing countries avoid the risk of vitamin A deficiency. Known as Golden Rice, the new strain is being sent to research institutes in developing countries for further study.

➤ **Risk factors for deficiency**

Taking the RDA level of a nutrient will prevent a deficiency in most people, but under certain circumstances, an individual may require higher doses of vitamin A. Those who consume alcoholic beverages may be more prone to vitamin A deficiency. People taking some medications, including birth control pills, methotrexate, cholestyramine, colestipol, and drugs that act to sequester bile will also need larger amounts. Those who are malnourished, chronically ill, or recovering from surgery or other injuries may also benefit from

a higher than average dose. Patients undergoing treatments for cancer, including radiation and chemotherapy, typically have compromised immune systems that may be boosted by judicious supplementation with vitamin A. Other conditions that may impair vitamin A balance include chronic **diarrhea**, cystic fibrosis, and kidney or liver disease. Diabetics are often deficient in vitamin A, but may also be more susceptible to toxicity. Any supplementation for these conditions should be discussed with a healthcare provider. Supplements are best taken in the form of carotenoids to avoid any potential for toxicity. There is not an established RDA for beta carotene.

Recommendations for how much to take vary between 6 and 30 mg a day, but the middle range—around 15 mg—is a reasonable average.

➤ **Precautions**

Overdose can occur when taking mega doses of the active form of this vitamin. Amounts above what is being utilized by the body accumulate in the liver and fatty tissues. Symptoms may include dry lips and skin, bone and joint **pain**, liver and spleen enlargement, diarrhea, **vomiting**, headaches, blurry or double vision, confusion, irritability, fatigue, and bulging fontanel (soft spot on the head) in infants; these are most often reversible, but a doctor should be contacted if a known overdose occurs. Very high levels of vitamin A may also create deficiencies of vitamins C, E, and K. Symptoms will generally appear within six hours following an acute overdose, and take a few weeks to resolve after ceasing the

supplement. Children are more sensitive to high levels of vitamin A than adults are, so instructions on products designed for children should be followed with particular care. Vitamin supplements should always be kept out of reach of children.

It is especially important to avoid overdoses in **pregnancy**, as it may cause miscarriage or fetal malformations. Using supplements that provide carotenoids will avoid the potential of overdose. Those with kidney disease are also at higher risk for toxicity due to either vitamin A or beta carotene, and should not take these supplements without professional healthcare advice.

There is some evidence that taking beta carotene supplements puts smokers at a higher risk of lung cancers. The CARET (Beta Carotene and Retinol Efficacy Trial) study is one that demonstrated this effect. Clarification through more study is needed, as evidence also exists showing that beta carotene, along with other **antioxidants**, can be a factor in cancer prevention. For example, a team of American researchers has recently reviewed evidence that vitamin A protects against **bladder cancer**, and a group in Germany is testing an aerosol form of vitamin A to prevent **lung cancer**. Some of the lesser-known carotenoids may be key factors in the relationship between vitamin intake and cancer. Whole sources of vitamin A are better obtained from foods than from

Supplements. Smokers should consult with a healthcare provider before taking supplemental beta carotene.

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