Vitamin A and Bone Health

National Institutes of Health
Osteoporosis and Related Bone Diseases ~ National Resource Center

2 AMS Circle
Bethesda, MD
20892-3676

Tel: (800) 624-BONE or
(202) 223-0344
Fax: (202) 293-2356
TTY: (202) 466-4315

Internet: www.niams.nih.gov/bone
E-mail: NIAMSBONEINFO@mail.nih.gov

The NIH Osteoporosis and Related Bone Diseases ~ National Resource Center is supported by the National Institute of Arthritis and Musculoskeletal and Skin Diseases with contributions from: National Institute on Aging, *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, National Institute of Dental and Craniofacial Research, National Institute of Diabetes and Digestive and Kidney Diseases, NIH Office of Research on Women's Health, DHHS Office on Women's Health.

The National Institutes of Health (NIH) is a component of the U.S. Department of Health and Human Services.

Vitamin A is essential for good health. It promotes growth, the immune system, reproduction, and vision. However, recent research suggests that too much vitamin A, particularly in the form of retinol, may be bad for your bones. This fact sheet explains where we get vitamin A, how much of this important vitamin we need, how it can build up in the body to excessive levels, and how you can assess your own vitamin A intake.

What Is Vitamin A?

Vitamin A is a family of compounds that play an important role in vision, bone growth, reproduction, cell division, and cell differentiation. We get vitamin A from a variety of sources. Two of the most common are retinol and beta-carotene.

Retinol is sometimes called “true” vitamin A because it is nearly ready for the body to use. Retinol is found in such animal foods as liver, eggs, and fatty fish. It can also be found in many fortified foods, such as breakfast cereals, and in dietary supplements.

Beta-carotene is a precursor for vitamin A. The body needs to convert it to retinol or vitamin A for use. Beta-carotene is found naturally in plant foods, mostly orange and dark green ones such as carrots, sweet potatoes, mangos, and kale.

The body stores both retinol and beta-carotene in the liver, drawing on this store whenever more vitamin A is needed.

How Much Vitamin A Do I Need?

The Institute of Medicine developed the Recommended Dietary Allowance (RDA) for vitamin A (retinol). The recommended intakes are listed in International Units (IU) in the table, below:

Recommended Dietary Allowance (RDA) for Vitamin A in International Units (IU)

Age (Years)	Children	Men	Women	Pregnancy	Lactation
1-3	1,000 IU				
4-8	1,333 IU				
9-13	2,000 IU				
14-18		3,000 IU	2,330 IU	2,500 IU	4,000 IU
19+		3,000 IU	2,330 IU	2,565 IU	4,335 IU

Source: Institute of Medicine, 2001.

The body can convert beta-carotene into vitamin A to help meet these requirements. While there is no RDA for beta-carotene, the National Institutes of Health (NIH) Office of Dietary Supplements recommends eating five or more servings of fruits and vegetables per day, including dark green and leafy vegetables and deep yellow/orange fruits to get appropriate amounts of beta-carotene.

How Does Vitamin A Affect My Bones?

Vitamin A is a family of fat-soluble compounds that play an important role in vision, bone growth, reproduction, cell division, and cell differentiation. Vitamin A is important for healthy bones. However, *too much* vitamin A has been linked to bone loss and an increase in the risk of hip fracture. Scientists believe that excessive amounts of vitamin A trigger an increase in osteoclasts, the cells that break down bone. They also believe that too much vitamin A may interfere with vitamin D, which plays an important role in preserving bone.

Retinol is the form of vitamin A that causes concern. In addition to getting retinol from their diets, some people may be using synthetic retinoid preparations that are chemically similar to vitamin A to treat acne, psoriasis, and other skin conditions. These preparations have been shown to have the same negative impact on bone health as dietary retinol. Use of these medications in children and teens has also been linked to delays in growth.

Beta-carotene, on the other hand, is largely considered to be safe and has not been linked to adverse effects in bone or elsewhere in the body.

How Can I Make Sure I Get the Right Amount of Vitamin A?

Most Americans are getting adequate amounts of vitamin A. The National Center for Health Statistics estimates that, on average, U.S. men and women get about 6,064 IU and 5,256 IU of vitamin A respectively each day, which is more than twice the RDA.

The Institute of Medicine cautions against daily intakes of retinol above 10,000 IU.

The chart below identifies some common food sources of retinol. Most of the reported cases of vitamin A toxicity have been blamed on the use of supplements. Healthy individuals who eat a balanced diet generally do not need a vitamin A supplement.

Food Sources of Retinol	International Units (IU) of Vitamin A
Liver, beef, cooked 3 oz	30,325
Liver, chicken, cooked, 3 oz	13,920
Egg substitute, fortified, 1/4 cup	1,355
Fat-free milk, fortified with Vitamin A, 1 cup	500
Cheese pizza, 1/8 of a 12 in diameter pie	380
Milk, whole, 3.25% fat, 1 cup	305
Cheddar cheese, 1 oz	300
Whole egg, 1 medium	280

Source: NIH Office of Dietary Supplements

Plant sources of beta-carotene are not as well absorbed as the animal sources of vitamin A listed in the chart, but they are still an important source of this vitamin. Dark orange and green vegetables and fruit, including carrots, sweet potatoes, spinach, cantaloupe, and kale are excellent sources of beta-carotene. Due to concerns about the negative effects of too much retinol, some people prefer to eat more foods rich in beta-carotene to satisfy their need for vitamin A.

Are Some People At Special Risk of Getting Too Much Vitamin A?

The National Health and Nutrition Examination Survey (NHANES III) found high levels of retinol in 5 to 10 percent of the survey participants. These increased levels were more common in men over the age of 30 and women over the age of 50.

Older people who regularly take dietary supplements containing vitamin A may be at higher risk of getting too much vitamin A.

Studies suggest that taking dietary supplements is a common practice among many seniors. However, the routine use of vitamin A supplements, as well as fortified foods, in older men and women is increasingly being questioned. Older adults are at significant risk for osteoporosis and related fractures, and their serum (blood) levels of retinol increase with age. As a result, fortified foods and supplements containing vitamin A in the form of beta-carotene may be a better choice for bone health in this population.

The supplement label provides information about how much vitamin A is provided, in both International Units and as a percentage of the RDA. The list of ingredients will contain information about which forms of vitamin A are included. Other names for retinol include retinyl, palmitate, and retinyl acetate.

Where Can I Find More Information?

For additional information on bone health, visit the National Resource Center Web site at www.niams.nih.gov/bone or call 1-800-624-2663.

For additional information on vitamin A, visit the NIH Office of Dietary Supplements Web site at http://dietary-supplements.info.nih.gov or call 301-435-2920.

Revised October 2005

For Your Information

For updates and for any questions about any medications you are taking, please contact the U.S. Food and Drug Administration at 1-888-INFO-FDA (1-888-463-6332, a toll-free call) or visit their Web site at www.fda.gov.