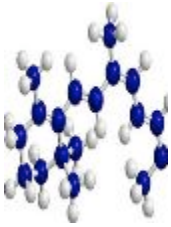
Vitamin A (retinol)



While some complementary and alternative techniques have been studied scientifically, high-quality data regarding safety, effectiveness, and mechanism of action are limited or controversial for most therapies. Whenever possible, it is recommended that practitioners be licensed by a recognized professional organization that adheres to clearly published standards. In addition, before starting a new technique or engaging a practitioner, it is recommended that patients speak with their primary healthcare provider(s). Potential benefits, risks (including financial costs), and alternatives should be carefully considered. The below monograph is designed to provide historical background and an overview of clinically-oriented research, and neither advocates for or against the use of a particular therapy.

Related Terms:

- 3,7-dimethyl-9-(2,6,6, trimethyl-1-cyclohexen-1-yl)-2,4,6,8-natetraen-1-ol, 3-dehydroretinol, antixerophthalmic vitamin, Aquasol A®, axerophtholum, beta-carotene oleovitamin A, Palmitate-A®, retinaldehyde (RAL), retinyl acetate, retinyl N-formyl aspartamate, retinyl palmitate, Solatene®, vitamin A, vitamin A1, vitamin A USP, vitaminum A.

BACKGROUND

- Vitamin A is a fat-soluble vitamin that is derived from two sources: preformed retinoids and provitamin carotenoids. Retinoids, such as retinal and retinoic acid, are found in animal sources like liver, kidney, eggs, and dairy produce. Carotenoids like beta-carotene (which has the highest vitamin A activity) are found in plants such as dark or yellow vegetables and carrots.
- Natural retinoids are present in all living organisms, either as preformed vitamin A or as carotenoids, and are required for a vast number of biological processes like vision and cellular growth. A major biologic function of vitamin A (as the metabolite retinal) is in the visual cycle. Research also suggests that vitamin A may reduce the mortality rate from measles, prevent some types of cancer, aid in growth and development, and improve immune function.
- Recommended daily allowance (RDA) levels for vitamin A oral intake have been established by the U.S. Institute for Medicine of the National Academy of Sciences to prevent deficiencies in vitamin A. At recommended doses, vitamin A is generally considered non-toxic. Excess dosing may lead to acute or chronic toxicity.
- Vitamin A deficiency is rare in industrialized nations but remains a concern in developing countries, particularly in areas where malnutrition is common. Prolonged deficiency can lead to xerophthalmia (dry eye) and ultimately to night blindness or total blindness, as well as to skin disorders, infections (such as measles), diarrhea, and respiratory disorders.

SCIENTIFIC EVIDENCE

Uses *These uses have been tested in humans or animals. Safety and effectiveness have not always been proven. Some of these conditions are potentially serious, and should be evaluated by a qualified healthcare provider.*	**Grade***

Acne Derivatives of vitamin A, retinoids, are used to treat skin disorders such as acne. Topical and oral prescription medications, such as tretinoin (Avita®, Renova®, Retina-A®, Retin-A Micro®) and isotretinoin (Accutane®), are available for treatment. Isotretinoin may cause severe side effects and should be used only for severe resistant acne. Isotretinoin must not be used in women who are pregnant, plan to become pregnant, or have a chance of being pregnant due to a risk of severe birth defects. These medications should be prescribed and coordinated by a qualified licensed healthcare professional. Vitamin A supplements should not be used simultaneously due to a risk of increased toxicity.	**A**
Acute promyelocytic leukemia (treatment, All-trans retinoic acid) The prescription drug All-*Trans*-Retinoic Acid (ATRA, Vesanoid®) is a vitamin A derivative that is an established treatment for acute promyelocytic leukemia and improves median survival in this disease. Treatment should be under strict medical supervision. Vitamin A supplements should not be used simultaneously with ATRA due to a risk of increased toxicity.	**A**
Eye disorders (Bitot's spot) Vitamin A deficiency can lead to Bitot's spot, or the buildup of keratin debris in the conjunctiva. Bitot's spot is a sign of xerophthalmia, and may be treated with vitamin A supplementation.	**A**
Measles (supportive agent) Vitamin A should be administered to children diagnosed with measles in areas where vitamin A deficiency may be present. Measles is a viral disease that can lead to serious complications such as diarrhea, pneumonia, and encephalitis. Supplementation with vitamin A in children with measles has been shown to be beneficial, by decreasing the length and impact of the disease. Side effects such as diarrhea, pneumonia, and death have been reduced with the use of vitamin A. Management of measles should be under strict medical supervision.	**A**
Vitamin A deficiency Vitamin A deficiency may occur after chronic lack of adequate amounts of vitamin A or beta-carotene. Vitamin A is necessary for vision, and an early sign of vitamin A deficiency is keratomalacia (night blindness). Prolonged deficiency may lead to xerophthalmia (dry eye) and Bitot's spot, or the buildup of keratin debris in the conjunctiva. Eventually, blindness can occur due to damage to the retina and cornea. Vitamin A is necessary for healthy growth and development, and recommended daily amounts (RDA) should be assured, particularly in children.	**A**

Xerophthalmia (dry eye) Oral vitamin A is the treatment of choice for xerophthalmia, due to prolonged vitamin A deficiency, and should be given immediately once the disorder is established.	**A**
Malaria (supportive agent) Limited research suggests that vitamin A may reduce fever, morbidity, and parasite blood levels in patients with malaria (*Plasmodium falciparum* infection). However, there is a lack of evidence suggesting that vitamin A is equivalent or superior to well-established drug therapies used for the prevention or treatment of malaria. Patients with malaria or living/traveling in endemic areas should speak with a physician about appropriate measures.	**B**
Retinitis pigmentosa Retinitis pigmentosa is a genetic disorder that affects night vision. Early symptoms include night blindness and progressive loss of vision over time. Based on recent findings, vitamin A in the palmitate form has been recommended in patients with retinitis pigmentosa.	**B**
Antioxidant The benefits to humans of potential antioxidant activity are not clear.	**C**
Breast cancer Research results are not clear as to whether vitamin A is beneficial in the treatment or prevention of breast cancer. Patients receiving chemotherapy or radiation therapy for cancer should speak with their doctor(s) before taking antioxidants such as vitamin A during treatment, due to possible interference.	**C**
Cataract prevention Vitamin A has been suggested to prevent cataract formation. Carotenoids such as beta-carotene, lutein, and zeaxanthin may decrease the risk of severe cataracts. There is not sufficient evidence to form a clear conclusion at this time.	**C**
Diarrhea Vitamin A may reduce the severity and duration of diarrheal episodes in malnourished children but not in well-nourished children. Since diarrhea is a major cause of morbidity and mortality in developing countries, vitamin A supplementation may be considered in undernourished children with diarrhea.	**C**

HIV Infection The role of vitamin A in the prevention, transmission, or treatment of HIV is controversial and not well established. A clear conclusion cannot be formed based on the available scientific research.	C
Immune function Vitamin A deficiency may compromise immunity, but there is no clear evidence that additional vitamin A supplementation is beneficial for immune function in patients who are not vitamin A deficient.	C
Infant mortality There is a limited amount of research in this area, with mixed results. Some evidence suggests possible decreases in infant mortality with vitamin A supplementation, while other research reports no benefits. A clear conclusion cannot be formed based on the available scientific research.	C
Iron deficiency anemia Vitamin A supplementation in combination with iron may have beneficial effects in patients with iron deficiency anemia, including children and pregnant women. It is not clear that there are benefits in individuals who are not vitamin A deficient. This area remains controversial, and further evidence is necessary before a clear conclusion can be drawn.	C
Pancreatic cancer Vitamin A supplementation has not been shown to improve response to gemcitabine in pancreatic cancer. It is unclear whether vitamin A may provide any benefits in patients with pancreatic cancer. More research is needed in this area.	C
Parasite infection (Acaris reinfection) After deworming, children supplemented with vitamin A may be less prone to *Ascaris* parasite reinfection. These benefits may be less in children with stunted growth.	C
Photoreactive keratectomy Photoreactive keratectomy is a type of laser eye surgery used to correct nearsightedness. High-dose vitamin A supplementation in addition to vitamin E has been suggested to help improve ocular healing after surgery and to improve visual acuity, although additional evidence is necessary before a definitive conclusion can be reached.	C

Pneumonia (children) One study found no effect of a moderate dose of vitamin A supplementation on the duration of uncomplicated pneumonia in underweight or normal-weight children aged younger than five years. However, a beneficial effect was seen in children with high basal serum retinol concentrations.	C
Pregnancy-related complications Maternal vitamin A deficiency is common in developing countries. Beta-carotene may reduce pregnancy-related complications and mortality in such individuals. However, excess intake of vitamin A has been reported to increase the risks of some birth defects. Vitamin A supplementation above the RDA is therefore not recommended in pregnancy.	C
Skin aging (improving aging skin appearance) Some studies suggest that topical vitamin A may improve the appearance and integrity of aged skin.	C
Skin cancer prevention It is not clear if vitamin A or beta-carotene, taken by mouth or used on the skin with sunscreen, is beneficial in the prevention or treatment of skin cancers or wrinkles.	C
Stomach cancer (prevention) Vitamin supplementation has been proposed to reduce the rate of stomach cancer. However, there is some evidence suggesting that vitamin A does not reduce the rates of gastric cancer or pre-cancerous gastric lesions. More research is needed to examine whether vitamin A has any effects on stomach cancer.	C
Tumors (polyp prevention) Alpha-carotene and vitamin A may protect against recurrence of polyps and adenoma in nonsmokers and nondrinkers or be indicative of compliance or another healthy lifestyle factor that reduces risk. Further research is needed before a conclusion can be drawn	C
Viral infection (Norovirus (NoV) infection) Vitamin A supplementation has been suggested to help prevent NoV infection in	C

Vitamin A supplementation has been suggested to help prevent NoV infection in children and reduce the symptoms associated with NoV infections.	
Weight loss Daily vitamin A with calcium has been suggested for weight loss, and in one study an average loss of two pounds was reported after two years of supplementation in young women.	**C**
Wound healing In preliminary study, retinol palmitate significantly reduced rectal symptoms of radiation proctopathy, perhaps because of wound-healing effects. Further research is needed to confirm these results.	**C**
Chemotherapy adverse effects Vitamin A supplementation does not appear to improve chemotherapy-related side effects including nausea, vomiting, diarrhea, or mouth sores.	**D**
Lung cancer Vitamin A has been studied as a possible treatment for lung cancer without evidence of benefits. Available evidence suggests that high-dose Vitamin A and beta-carotene may actually increase the risk of adverse effects, especially among alcohol users and smokers.	**D**
Key to grades: **A: Strong scientific evidence for this use; **B**: Good scientific evidence for this use; **C**: Unclear scientific evidence for this use; **D**: Fair scientific evidence against this use (it may not work); **F**: Strong scientific evidence against this use (it likely does not work).*	

TRADITION/THEORY

The below uses are based on tradition, scientific theories, or limited research. They often have not been thoroughly tested in humans, and safety and effectiveness have not always been proven. Some of these conditions are potentially serious, and should be evaluated by a qualified healthcare provider. There may be other proposed uses that are not listed below.

- Aging, allergic rhinitis, anemia, asthma, bronchopulmonary dysplasia in premature infants, burns, candidiasis, chemical sensitivities (pollutant protection), conjunctivitis, Crohn's disease, cystic fibrosis, deafness, deficiency (protein), diabetes, eczema, fibrocystic breast disease, glaucoma, headache (persistent), heart disease, herpes (cold sores), hyperthyroidism, increasing sperm count, infant eye / brain development, infections, kidney stones, leukoplakia, Lichen planus pigmentosus, liver disease, menorrhagia (heavy menstruation), metabolic disorders (Hurler syndrome), neurodegenerative diseases, nutritional supplement, pancreatitis, periodontal disease, pityriasis rubra pilaris, premenstrual syndrome, psoriasis,

respiratory disorders, rhinitis, sebaceous cysts, sinusitis, skin disorders (ichthyosis, Darier's disease), sleep (regulation), sunburn, tinnitus, ulcers (stress ulcers in severely ill hospitalized patients), urinary tract infections, vaginal atrophy, vaginitis, vision enhancement (nearsightedness, blurred vision), warts.

DOSING

The below doses are based on scientific research, publications, traditional use, or expert opinion. Many herbs and supplements have not been thoroughly tested, and safety and effectiveness may not be proven. Brands may be made differently, with variable ingredients, even within the same brand. The below doses may not apply to all products. You should read product labels, and discuss doses with a qualified healthcare provider before starting therapy.

Sources of Vitamin A

- Vitamin A is found in dairy products, fish, darkly colored fruits and vegetables. Consumption of five servings of fruits and vegetables per day supplies 5-6 milligrams per day of provitamin A carotenoids, which provides about 50-65% of the adult RDA for vitamin A.

Adults (over 18 years old)

- Vitamin A is included in most multivitamins, often in 5,000 IU doses as softgels, capsules, tablets, or liquid. U.S. Recommended Daily Allowance (RDA) for adults have been established by the U.S. Institute of Medicine of the National Academy of Sciences. Recommendations are: 900 micrograms per day (3,000 IU) for men and 700 micrograms per day (2,300 IU) for women. For pregnant women 19 years and older, 770 micrograms per day (2,600 IU) is recommended. For lactating women 19 years and older, 1,300 micrograms per day (4,300 IU) is recommended.
- For vitamin A deficiency not involving xerophthalmia, 100,000 IU orally or intramuscularly administered daily for three days, followed by 50,000 IU per day for two weeks has been used. A maintenance dose of 10,000 to 20,000 IU per day for two months has been recommended.
- Supporting care following chemotherapy may include weekly injections of 100,000 IU vitamin A. Patients receiving vitamin A should be observed carefully for liver toxicity.
- Injections should always be performed by a licensed healthcare provider.

Children (under 18 years old)

- Recommended Dietary Allowances (RDA) have been established by the U.S. Institute of Medicine of the National Academy of Sciences. Recommendations are: for children 1-3 years-old, 300 micrograms per day (1,000 IU); for children 4-8 years-old, 400 micrograms per day (1,300 IU); and for children 9-13 years-old, 600 micrograms per day (2,000 IU). For pregnant women between 14-18 years-old, 750 micrograms per day (2,500 IU) is recommended; for lactating women between 14-18 years-old, 1,200 micrograms per day (4,000 IU) is recommended.
- The World Health Organization (WHO) has established dosage guidelines for children between 6-11 months old to receive 100,000 IU of vitamin A. This increases to 200,000 IU every six months from 12 to 59 months of age.

SAFETY

The U.S. Food and Drug Administration does not strictly regulate herbs and supplements. There is no guarantee of strength, purity or safety of products, and effects may vary. You should always read product labels. If you have a medical condition, or are taking other drugs, herbs, or supplements, you should speak with a qualified healthcare provider before starting a new therapy. Consult a healthcare provider immediately if you experience side effects.

Allergies

- Avoid in individuals with a known hypersensitivity/allergy to vitamin A.

Side Effects and Warnings

- Vitamin A toxicity, or hypervitaminosis A, is rare in the general population. Vitamin A toxicity can occur with excessive amounts of vitamin A taken over short or long periods of time. Consequently, toxicity can be acute or chronic. An infant with acute toxicity can develop a bulging fontalle (the soft spot on the head) and symptoms similar to a brain tumor. Adults experience less specific symptoms such as headache, dizziness, fatigue, malaise, blurry vision, bone pain and swelling, nausea, and/or vomiting. Acute vitamin A toxicity may also lead to increased intracranial pressure, pruritus or itching, and bone problems. Severe toxicity can lead to eye damage, high levels of calcium, and liver damage. Persons with liver disease and high alcohol intake may be at risk for hepatotoxicity from vitamin A supplementation. Smokers who consume alcohol and beta-carotene may be at an increased risk for lung cancer or cardiovascular disease.
- Vitamin A toxicity may lead to intrahepatic cholestasis, a condition where bile cannot flow from the liver into the intestines. Treatment with ursodeoxycholic acid has been shown to greatly improve the symptoms of cholestasis.

Pregnancy and Breastfeeding

- Vitamin A should only be used within the recommended dietary allowance, because vitamin A excess, as well as deficiency, has been associated with birth defects. Excessive doses of vitamin A have been associated with central nervous system malformations.
- Vitamin A is excreted in human breast milk. Benefits or dangers to nursing infants are not clearly established.

INTERACTIONS

Most herbs and supplements have not been thoroughly tested for interactions with other herbs, supplements, drugs, or foods. The interactions listed below are based on reports in scientific publications, laboratory experiments, or traditional use. You should always read product labels. If you have a medical condition, or are taking other drugs, herbs, or supplements, you should speak with a qualified healthcare provider before starting a new therapy.

Interactions with Drugs

- Vitamin A supplements should not be taken simultaneously with acitretin (Soriatane®), anticoagulants (blood thinners) such as warfarin (Coumadin®), bexarotene (Targentin®), All-*Trans*-Retinoic Acid (ATRA, Vesanoid®), etretinate (Tegison®), isotretinoin (Accutane®, Amnesteen®), or tretinoin (Vesabiod®, Avita®, Renova®, Retin-A®, Retin-A® Micro, Altinac®) due to increased risk of vitamin A toxicity.
- Cholestyramine (Questran®) and colestipol (Colestid®) may decrease the effectiveness of vitamin A by reducing absorption of this fat-soluble vitamin. Neomycin may interfere with the absorption of vitamin A, although this interaction has not been found to be clinically significant. Oral contraceptives (birth control pills) increase plasma vitamin A levels.
- Vitamin A may reduce seroconversion rates to the measles virus/vaccine, rendering the

vaccine less effective. Other vaccines may be enhanced by vitamin A, including the *Haemophilus influenzae* type b vaccine and the diphtheria vaccine. Other vaccines have been demonstrated to be unaffected by vitamin A supplementation. These include the oral polio vaccine (OPV), tetanus toxoid, pertussis, and hepatitis B vaccines. Vitamin A may also alter the immune response to the Bacille Calmette-Guérin (BCG) vaccine, but this interaction is unclear.

- Mineral oil has been reported to reduce absorption of all fat-soluble vitamins. With occasional use, the effect on vitamin A levels does not appear to be significant. Alcohol, particularly chronic use, may induce vitamin A deficiency.
- Orlistat (obesity drug) decreases the absorption of fat-soluble vitamins, although studies suggest that vitamin A is not affected as much by orlistat as other fat-soluble vitamins. Nonetheless, the manufacturer of orlistat recommends that all patients take a multivitamin supplement containing all the fat-soluble vitamins (including vitamins A, D, E, and K unless otherwise contraindicated), separating the dosing time by at least two hours from orlistat.
- Patients who take tetracyclines, specifically minocycline (Minocin®), plus vitamin A are at a risk for developing benign intracranial hypertension (pseudotumor cerebri), which can occur with tetracyclines and vitamin A intoxication. Therefore, high doses of vitamin A should be avoided in people taking chromic tetracyclines. Other examples of tetracyclines include demeclocycline (Declomycin®) and tetracycline (Achromycin®).
- Increased toxicity with concurrent use of vitamin A and chemotherapy may occur.

Interactions with Herbs and Dietary Supplements

- Carob may increase risk of vitamin A toxicity.
- Vitamin A may improve anemia in people who are deficient in iron and vitamin A. There is likely no benefit in people who are not vitamin A deficient.
- Zinc deficiency may alter vitamin A status, although the mechanism is unclear.

AUTHOR INFORMATION

- This information is based on a systematic review of scientific literature edited and peer-reviewed by contributors to the Natural Standard Research Collaboration (www.naturalstandard.com).

REFERENCES

Natural Standard developed the above evidence-based information based on a thorough systematic review of the available scientific articles. For comprehensive information about alternative and complementary therapies on the professional level, go to www.naturalstandard.com. Selected references are listed below.

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