ESSENT AL VI AMINS

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If forgiveness is medicine for the soul, then gratitude is vitamins

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Vitamins refer to any of a group of organic compounds which are essential for normal growth and nutrition and are required in small quantities in the diet.

WATER SOLUBLE VITAMINS

A vitamin that can dissolve in water. Water-soluble vitamins are carried to the body's tissues but are not stored in the body. They are found in plant and animal foods or dietary supplements and must be taken in daily.

- Vitamin C
- B vitamins
 - * Biotin (vitamin B7)
 - * Folic acid (folate, vitamin B9)
 - * Niacin (vitamin B3)
 - * Pantothenic acid (vitamin B5)
 - * Riboflavin (vitamin B2)
 - * Thiamin (vitamin B1)
 - * Vitamin B6
 - * Vitamin B12

FAT SOLUBLE VITAMINS

A vitamin that can dissolve in fats and oils. Fat-soluble vitamins are absorbed along with fats in the diet and can be stored in the body's fatty tissue. They come from plant and animal foods or dietary supplements.

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K

Vitamin A is a fat-soluble vitamin that is naturally present in many foods. Vitamin A is important for normal vision, the immune system, and reproduction. Vitamin A also helps the heart, lungs, kidneys, and other organs work properly.

There are two different types of vitamin A. The first type, preformed vitamin A, is found in meat, poultry, fish, and dairy products. The second type, provitamin A, is found in fruits, vegetables, and other plant-based products. The most common type of provitamin A in foods and dietary supplements is beta-carotene.

The amount of vitamin A you need depends on your age and sex. Average daily recommended amounts are listed below in micrograms (mcg) of retinol activity equivalents (RAE).

AGE	RECOMMENDED AMOUNT
Birth to 6 months	400 mcg RAE
Infants 7–12 months	500 mcg RAE
Children 1–3 years	300 mcg RAE
Children 4–8 years	400 mcg RAE
Children 9–13 years	600 mcg RAE
Teen boys 14–18 years	900 mcg RAE
Teen girls 14–18 years	700 mcg RAE
Adult men	900 mcg RAE
Adult women	700 mcg RAE
Pregnant teens	750 mcg RAE
Pregnant women	770 mcg RAE
Breastfeeding teens	1,200 mcg RAE
Breastfeeding women	1,300 mcg RAE

SOURCES OF VITAMIN A

Vitamin A is found naturally in many foods and is added to some foods, such as milk and cereal. You can get recommended amounts of vitamin A by eating a variety of foods, including the following:

- Beef liver and other organ meats (but these foods are also high in cholesterol, so limit the amount you eat).
- Some types of fish, such as salmon.
- Green leafy vegetables and other green, orange, and yellow vegetables, such as broccoli, carrots, and squash.
- Fruits, including cantaloupe, apricots, and mangos.



• Fortified breakfast cereals.

DIETARY SUPPLIMENTS

Vitamin A is available in dietary supplements, usually in the form of retinyl acetate or retinyl palmitate (preformed vitamin A), <u>beta-carotene (provitamin A)</u>, or a combination of preformed and provitamin A. Most multivitamin-mineral supplements contain vitamin A. Dietary supplements that contain only vitamin A are also available.

DEFFICIENCY

The most common symptom of vitamin A deficiency in young children and pregnant women is an eye condition called xerophthalmia. <u>Xerophthalmia</u> is the inability to see in low light, and it can lead to blindness if it isn't treated.

SOME EFFECTS ON FOLLOWING DISEASES

<u>CANCER</u>

People who eat a lot of foods containing beta-carotene might have a lower risk of certain kinds of cancer, such as lung cancer or prostate cancer. But studies to date have not shown that vitamin A or beta-carotene supplements can help prevent cancer or lower the chances of dying from this disease. In fact, studies show that smokers who take high doses of beta-carotene supplements have an increased risk of lung cancer.

Age-Related Macular Degeneration

Age-related macular degeneration (AMD), or the loss of central vision as people age, is one of the most common causes of vision loss in older people. Among people with AMD who are at high risk of developing advanced AMD, a supplement containing antioxidants, zinc, and copper with or without beta-carotene has shown promise for slowing down the rate of vision loss.

MEASLES

When children with vitamin A deficiency get measles, the disease tends to be more severe. In these children, taking supplements with high doses of vitamin A can shorten the fever and diarrhea caused by measles. These supplements can also lower the risk of death in children with measles.



EFFECTS OF HIGHER INTAKE OF VITAMIN A

Yes, high intakes of some forms of vitamin A can be harmful. Getting too much preformed vitamin A (usually from supplements or certain medicines) can cause dizziness, <u>nausea</u>, headaches, coma, and even death. High intakes of preformed vitamin A in pregnant women can also cause birth defects in their babies. Women who might be pregnant should not take high doses of vitamin A supplements. Consuming high amounts of beta-carotene or other forms of provitamin A can turn the skin yellow-orange, but this condition is harmless. High intakes of beta-carotene do not cause birth defects or the other more serious effects caused by getting too much preformed vitamin A

The daily upper limits for preformed vitamin A are listed below. These levels do not apply to people who are taking vitamin A for medical reasons under the care of a doctor. Upper limits for beta-carotene and other forms of provitamin A have not been established.

STRUCTURE AND MOLECULAR FORMULA OF VITAMIN A





IUPAC ID: (2e,4e,6e,8e)-3,7-dimethyl-9-(2,6,6trimethylcyclo-hex-1-enyl)nona-2,4,6,8tetraen-1-ol

video: https://www.youtube.com/watch?v=AKR1g4aHNb4

EFFECTS AND STRUCTURE

VITAMIN B COMPLEX

B vitamins are a class of water-soluble vitamins that play important roles in cell metabolism. The B-complex vitamins act primarily as coenzymes; that is, they are substances that enhance or are necessary for the action of enzymes. Without coenzymes, enzymes cannot function in the body.

Though these vitamins share similar names, they are chemically distinct compounds that often coexist in the same foods. In general, dietary supplements containing all eight are referred to as a vitamin B complex.

Water-soluble vitamins are carried through the bloodstream. Whatever the body does not use is eliminated in urine. Vitamins cannot be synthesized or produced by the human body, thus, our diet must contain vitamins.

VITAMIN	COMMON NAME
B1	Thiamine
B2	Riboflavin
B3	Niacin
B5	Panthothenic Acid
B6	Pyridoxin
B7	Biotin
В9	Folate
B12	Cobalamin

VITAMIN B1 (THIAMINE)

Thiamine (also called vitamin B1) helps turn the food you eat into the energy you need. Thiamine is important for the growth, development, and function of the cells in your body.

The amount of thiamine you need depends on your age and sex. Average daily recommended amounts are listed below in milligrams

AGE	RECOMMENDED AMOUNT
Birth to 6 months	0.2 mg
Infants 7–12 months	0.3 mg
Children 1–3 years	0.5 mg
Children 4–8 years	0.6 mg
Children 9–13 years	0.9 mg
Teen boys 14–18 years	1.2 mg
Teen girls 14–18 years	1.0 mg
Adult men	1.2 mg
Adult women	1.1 mg
Pregnant teens	1.4 mg
Pregnant women	1.4 mg
Breastfeeding teens	1.4 mg
Breastfeeding women	1.4 mg

SOURCES OF VITAMIN B1

You can get recommended amounts of thiamine by eating a variety of foods, including,

- Whole grains and fortified bread, cere al, pasta, and rice
- Meat (especially pork) and fish
- Legumes (such as black beans and soybeans), seeds, and nuts



VITAMIN B1 (THIAMINE)

DEFICIENCY OF THIAMINE

Thiamine deficiency can cause loss of weight and appetite, confusion, memory loss, muscle weakness, and heart problems. Severe thiamine deficiency leads to a disease called <u>beriberi</u>.

Thiamine deficiency is rare in this country. However, certain groups of people are more likely than others to have trouble getting enough thiamine:

- People with alcohol dependence
- Older individuals
- People with <u>HIV/AIDS</u>
- People with diabetes
- People who have had <u>bariatric surgery</u>

SOME EFFECTS ON FOLLOWING DISEASES

DIABETIES

People with diabetes often have low levels of thiamin in their blood. Scientists are studying whether thiamin supplements can improve blood sugar levels and glucose tolerance in people. They are also studying whether benfotiamine supplements can help with nerve damage caused by diabetes.



HEART FAILURE

Many people with heart failure have low levels of thiamin. Scientists are studying whether thiamin supplements might help people. DEFICIENCY AND EFFECTS

VITAMIN B1 (THIAMINE)

ALZHEIMER'S DISEASE

Scientists are studying the possibility that thiamin deficiency could affect the dementia of Alzheimer's disease. Whether thiamin supplements may help mental function in people with Alzheimer's disease needs further study.



STRUCTURE AND MOLECULAR FORMULA OF VITAMIN B1 (THIAMINE)



VITAMIN B2 (RIBOFLAVIN)

Riboflavin (also called vitamin B2) is important for the growth, development, and function of the cells in your body. It also helps turn the food you eat into the energy you need.

Average daily recommended amounts are listed below in milligrams (mg).

AGE	RECOMMENDED AMOUNT
Birth to 6 months	0.3 mg
Infants 7–12 months	0.4 mg
Children 1–3 years	0.5 mg
Children 4–8 years	0.6 mg
Children 9–13 years	0.9 mg
Teen boys 14–18 years	1.3 mg
Teen girls 14–18 years	1.0 mg
Adult men	1.3 mg
Adult women	1.1 mg
Pregnant teens	1.4 mg
Pregnant women	1.4 mg
Breastfeeding teens	1.6 mg
Breastfeeding women	1.6 mg

SOURCES OF VITAMIN B2

Riboflavin is found naturally in some foods and is added to many fortified foods. You can get recommended amounts of riboflavin by eating a variety of foods, including the following:

- Eggs, organ meats (such as kidneys and liver), lean meats, and low-fat milk
- Green vegetables (such as asparagus, broccoli, and spinach)
- Fortified cereals, bread, and grain products

RIBOFLAVIN AND SOURCE

VITAMIN B2 (RIBOFLAVIN)

DEFICIENCY OF RIBOFLAVIN

You can develop riboflavin deficiency if you don't get enough riboflavin in the foods you eat, or if you have certain diseases or hormone disorders.

Riboflavin deficiency can cause skin disorders, sores at the cor-

ners of your mouth, swollen and cracked lips, hair loss, sore throat, liver disorders, and problems with your reproductive and nervous systems.

Severe, long-term riboflavin deficiency causes a shortage of red blood cells (<u>anemia</u>),

which makes you feel weak and tired. It also causes clouding of the lens in your eyes (<u>cataracts</u>), which affects your vision.

CAUSES FOR DEFICIENCY

Certain groups of people are more likely than others to have trouble getting enough riboflavin:

- Athletes who are vegetarians (especially strict vegetarians who avoid dairy foods and eggs)
- Pregnant women and breastfeeding women and their babies
- People who do not eat dairy foods
- People with a genetic disorder that causes riboflavin deficiency (such as <u>infantile Brown-Vialetto-Van Laere syndrome</u>)
 DEFICIENCY AND CAUSES





SUPPLIMENTS OF RIBOFLAVIN

MIGRAIN HEADACHE

Some studies show that riboflavin supplements might help prevent migraine headaches, but other studies do not. Riboflavin supplements usually have very few side effects, so some medical experts recommend trying riboflavin, under the guidance of a healthcare provider, for preventing migraines.

STRUCTURE OF VITAMIN B2 (RIBOFLAVIN)



IUPAC ID: 7,8-Dimethyl-10-[(2S,3S,4R)-2,3,4,5-tetra--hy droxypentyl]benzo[g]pteridine-2,4-dione

video: https://www.youtube.com/watch?v=QSsygm8_kgk

STRUCTURE

VITAMIN B3 (NIACIN)

Niacin (also called vitamin B3) helps turn the food you eat into the energy you need. Niacin is important for the development and function of the cells in your body. The amount of niacin you need depends on your age and sex. Average daily recommended amounts are listed below in milligrams (mg) of niacin equivalents (NE) (except for infants in their first 6 months).

The mg NE measure is used because your body can also make niacin from tryptophan, an amino acid in proteins. For example, when you eat turkey, which is high in tryptophan, some of this amino acid is converted to niacin in your liver. Using mg NE accounts for both the niacin you consume and the niacin your body makes from tryptophan. Infants in their first six months do not make much niacin from <u>tryptophan</u>.

AGE	RECOMMENDED AMOUNT
Birth to 6 months	2 mg
Infants 7–12 months	4 mg NE
Children 1–3 years	6 mg NE
Children 4–8 years	8 mg NE
Children 9–13 years	12 mg NE
Teen boys 14–18 years	16 mg NE
Teen girls 14–18 years	14 mg NE
Adult men	16 mg NE
Adult women	14 mg NE
Pregnant teens	18 mg NE
Pregnant women	18 mg NE
Breastfeeding teens	17 mg NE
Breastfeeding women	17 mg NE

VITAMIN B3 (NIACIN)

SOURCES OF NIACIN

Niacin is found naturally in many foods, and is added to some foods. You can get recommended amounts of niacin by eating a variety of foods, including the following:

- Animal foods, such as poultry, beef, pork, and fish
- Some types of nuts, legumes, and grains
- Enriched and fortified foods, such as many breads and cereals

DEFICIENCY SYMPTOMS

You can develop niacin deficiency if you don't get enough niacin or tryptophan from the foods you eat. Severe niacin deficiency leads to a disease called pellagra. Pellagra, which is uncommon in developed countries, can have these effects:

• Rough skin that turns red or brown in the sun

- A bright red tongue
- Vomiting, constipation, or diarrhea
- Depression
- Headaches
- Extreme tiredness
- Aggressive, paranoid, or suicidal behavior
- Hallucinations, apathy, loss of memory

In its final stages, pellagra leads to loss of appetite followed by death.

Diarrhea



SOME EFFECTS ON FOLLOWING DISEASES

CARDIOVASCULAR DISEASE

Scientists have studied the use of large doses of niacin in the form of nicotinic acid to help reduce the risk of heart attack and stroke in people with atherosclerosis. They found that prescription-strength nicotinic acid (more than 100 times the recommended dietary allowance) can lower blood levels of LDL (bad) cholesterol, raise levels of HDL (good) cholesterol, and lower levels of triglycerides. But these favorable effects on blood lipids (fats) don't affect the risk of having a cardiovascular event, such as heart attack, sudden cardiac death, or stroke. In addition, experts do not recommend high

doses of nicotinic acid for people taking a statin medication.

Your healthcare provider should approve and supervise any use of very high doses of nicotinic acid (in the thousands of milligrams) to treat <u>atherosclerosis</u>.



SOME EFFECTS OF NIACIN

The niacin that food naturally contains is safe. However, dietary supplements with 30 mg or more of nicotinic acid can make the skin on your face, arms, and chest turn red and burn, tingle, and itch. These symptoms can also lead to headaches, rashes, and dizziness.

VITAMIN B3 (NIACIN)

If you take nicotinic acid as a medication in doses of 1,000 or more mg/day, it can cause more severe side effects. These include:

- Low blood pressure (which can increase the risk of falls)
- Extreme tiredness
- High blood sugar levels
- <u>Nausea</u>, heartburn, and abdominal pain
- Blurred or impaired vision and <u>fluid buildup</u> in the eyes

Long-term treatment, especially with extended-release forms of nicotinic acid, can cause liver problems, including hepatitis and liver failure.

STRUCTURE OF VITAMIN B3 (NIACIN)



IUPAC ID: pyridine-3-carboxylic acid

video: https://www.youtube.com/watch?v=vWiizkGt9jA

EFFECTS AND STRUCTURE

Pantothenic acid (also called vitamin B5) helps turn the food you eat into the energy you need. It's important for many functions in the body, especially making and breaking down fats.

The amount of pantothenic acid you need depends on your age and sex. Average daily recommended amounts are listed below in milligrams (mg): Life Stage Recommended Amount

AGE	RECOMMENDED AMOUNT
Birth to 6 months	1.7 mg
Infants 7–12 months	1.8 mg
Children 1–3 years	2 mg
Children 4–8 years	3 mg
Children 9–13 years	4 mg
Teen boys 14–18 years	5 mg
Teen girls 14–18 years	5 mg
Adult men	5 mg
Adult women	5 mg
Pregnant teens	6 mg
Pregnant women	6 mg
Breastfeeding teens	7 mg
Breastfeeding women	7 mg

SOURCES OF PANTOTHENIC ACID

Pantothenic acid is naturally present in almost all foods. It is also added to some foods, including cereals and beverages (such as energy drinks). You can get recommended amounts of pantothenic acid by eating a variety of foods, including the following:

• Beef, poultry, seafood, and organ meats

VITAMIN B5 (Pantothenic acid)

- Eggs and milk
- Vegetables such as mushrooms (especially shiitakes), avocados, potatoes, and broccoli
- Whole grains, such as whole wheat, brown rice, and oats
- Peanuts, sunflower seeds, and chickpeas.



SHIITAKES

DEFICIENCY SYMPTOMS

Severe deficiency can cause numbness and burning of the hands and feet, headache, extreme tiredness, irritability, restlessness, sleeping problems, stomach pain, <u>heartburn</u>, <u>diarrhea</u>, nausea, vomiting, and loss of appetite.



SOME EFFECTS ON FOLLOWING DISEASES

High cholesterol and triglyceride levels. The form of pantothenic acid called pantethine is being studied to see if it helps lower total cholesterol, low-density lipoprotein (LDL or "bad") cholesterol, and triglyceride levels. It's also being studied to see if it raises levels of high-density lipoprotein (HDL or "good") cholesterol. The results of these studies so far are promising, but more research is needed to understand the effects of pantethine dietary supplements taken alone or combined with a heart-healthy diet.



Pantothenic acid is safe, even at high doses. However, taking very high doses of pantothenic acid supplements (such as 10,000 mg per day) can cause an upset stomach and diarrhea.

STRUCTURE OF VITAMIN B5 (PANTOTHENIC ACID)



IUPAC ID: 3-[(2,4-dihydroxy-3,3-dimethylbutanoyl) amino]propanoic acid

video: https://www.youtube.com/watch?v=YBdaG3gLum8

Vitamin B6 is a vitamin that is naturally present in many foods. The body needs vitamin B6 for more than 100 enzyme reactions involved in metabolism. Vitamin B6 is also involved in brain development during pregnancy and infancy as well as immune function.

The amount of vitamin B6 you need depends on your age. Average daily recommended amounts are listed below in milligrams (mg).

AGE	RECOMMENDED AMOUNT
Birth to 6 months	0.1 mg
Infants 7–12 months	0.3 mg
Children 1–3 years	0.5 mg
Children 4–8 years	0.6 mg
Children 9–13 years	1.0 mg
Teen boys 14–18 years	1.3 mg
Teen girls 14–18 years	1.2 mg
Adult men	1.3 mg
Adult women	1.3 mg
Pregnant teens	1.9 mg
Pregnant women	1.9 mg
Breastfeeding teens	2.0 mg
Breastfeeding women	2.0 mg

SOURCES OF VITAMIN B6

Vitamin B6 is found naturally in many foods and is added to other foods. You can get recommended amounts of vitamin B6 by eating a variety of foods, including the following:

- Poultry, fish, and organ meats, all rich in vitamin B6.
- Potatoes and other starchy vegetables, Fruit (other than citrus)

DEFICIENCY SYMPROMS

People who don't get enough vitamin B6 can have a range of symptoms, including anemia, itchy rashes, scaly skin on the lips, cracks at the corners of the mouth, and a <u>swollen tongue</u>. Other symptoms of very low vitamin B6 levels include depression, confusion, and a weak im-



mune system. Infants who do not get enough vitamin B6 can become irritable or develop extremely sensitive hearing or seizures.

EFFECTS ON FOLLOWING DISEASES

CARDIOVASCULAR DISEASE

Some scientists had thought that certain B vitamins (such as folic acid, vitamin B12, and vitamin B6) might reduce cardiovascular disease risk by lowering levels of homocysteine, an amino acid in the blood. Although vitamin B supplements do lower blood homocysteine, research shows that they do not actually reduce the risk or severity of heart disease or stroke.

CANCER

People with low levels of vitamin B6 in the blood might have a higher risk of certain kinds of cancer, such as colorectal cancer. But studies to date have not shown that vitamin B6 supplements can help prevent cancer or lower the chances of dying from this disease.

COGNITIVE FUNCTION

Some research indicates that elderly people who have higher blood levels of vitamin B6 have better memory. However, taking vitamin B6 supplements (alone or combined with vitamin B12 and/or folic acid) does not seem to improve cognitive function or mood in healthy people or in people with dementia.

PREMENSTRUAL SYNDROME

Scientists aren't yet certain about the potential benefits of taking vitamin B6 for premenstrual syndrome (PMS). But some studies show that vitamin B6 supplements could reduce PMS symptoms, including moodiness, irritability, forgetfulness, bloating, and anxiety.

NAUSEA AND VOMITING IN PREGNANCY

At least half of all women experience nausea, vomiting, or both in the first few months of pregnancy. Based on the results of several studies, the American Congress of Obstetricians and Gynecologists (ACOG) recommends taking vitamin B6 supplements under a doctor's care for nausea and vomiting during pregnancy.

EXCESS OF VITAMIN B6

People almost never get too much vitamin B6 from food. But taking high levels of vitamin B6 from supplements for a year or longer can cause severe nerve damage, leading people to lose control of their bodily movements.

The symptoms usually stop when they stop taking the supplements. Other symptoms of too much vitamin B6 include painful, unsightly skin patches, extreme sensitivity to sunlight, nausea, and heartburn.



STRUCTURE OF VITAMNIN B6



IUPAC ID: 4,5-Bis(hydroxymethyl)-2-methylpyri-din--3-ol

video: <u>https://www.youtube.com/watch?v=562MxjFIGuc</u>

STRUCTURE

Biotin is a B-vitamin found in many foods. Biotin helps turn the carbohydrates, fats, and proteins in the food you eat into the energy you need.

The amount of biotin you need each day depends on your age. Average daily recommended amounts are listed below in micrograms (mcg).

AGE	RECOMMENDED AMOUNT
Birth to 6 months	5 mcg
Infants 7–12 months	6 mcg
Children 1–3 years	8 mcg
Children 4–8 years	12 mcg
Children 9–13 years	20 mcg
Teen boys 14–18 years	25 mcg
Teen girls 14–18 years	25 mcg
Adult men	30 mcg
Adult women	30 mcg
Pregnant teens	30 mcg
Pregnant women	30 mcg
Breastfeeding teens	35 mcg
Breastfeeding women	35 mcg

SOURCES OF VITAMIN B7

Many foods contain some biotin. You can get recommended amounts of biotin by eating a variety of foods, including the following:

• Meat, fish, eggs, and organ meats (such as liver)

VITAMIN B7 (BIOTIN)

- Seeds and nuts
- Certain vegetables (such as sweet potatoe, spinach and broccoli)

DEFICIENCY SYMPTOMS



Biotin deficiency can cause thinning hair and loss of body hair; a rash around the eyes, nose, mouth, and anal area; <u>pinkeye</u>; high lev-

els of acid in the blood and urine; seizures; skin infection; <u>brittle nails</u>; and nervous system disorders. Symptoms of biotin deficiency in infants include weak muscle tone, sluggishness, and delayed development.



SOME EFFECTS ON FOLLOWING DISEASES

HAIR, NAIL, AND SKIN HEALTH

Dietary supplements that contain biotin are often promoted to improve the health of your hair, skin, and nails, but there is little scientific evidence to support these claims. In a few small studies, some people with thin and brittle nails who took high doses of biotin had harder nails. Doctors have also reported that in a few cases, high doses of biotin have improved a rare hair disorder in children and skin rash in infants. More research is needed before biotin supplements can be recommended for any of these conditions.



EXCESSOF BIOTIN

Biotin has not been shown to cause any harm. However, supplements that contain biotin above recommended amounts may cause false results in some lab tests, including those that measure levels of certain hormones, like thyroid hormone.

STRUCTURE OF VITAMIN B7 (BIOTIN)



IUPAC ID: 5-[(3aS,4S,6aR)-2-oxohexahydro-1H-thieno--[3,4-d]imidazol-4-yl]pentanoic acid

video: <u>https://www.youtube.com/watch?v=ozLuotyOvH8</u>

EFFECTS AND STRUCTURE

Folate is a B-vitamin that is naturally present in many foods. Your body needs folate to make DNA and other genetic material. Your body also needs folate for your cells to divide. A form of folate, called folic acid, is used in fortified foods and most dietary supplements.

The amount of folate you need depends on your age. Average daily recommended amounts are listed below in micrograms (mcg) of dietary folate equivalents (DFEs).

AGE	RECOMMENDED AMOUNT
Birth to 6 months	65 mcg DFE
Infants 7–12 months	80 mcg DFE
Children 1–3 years	150 mcg DFE
Children 4–8 years	200 mcg DFE
Children 9–13 years	300 mcg DFE
Teen boys 14–18 years	400 mcg DFE
Teen girls 14–18 years	400 mcg DFE
Adult men	400 mcg DFE
Adult women	400 mcg DFE
Pregnant teens	600 mcg DFE
Pregnant women	600 mcg DFE
Breastfeeding teens	500 mcg DFE
Breastfeeding women	500 mcg DFE

The measure of mcg DFE is used because your body absorbs more folic acid from fortified foods and dietary supplements than folate found naturally in foods. Compared to folate found naturally in foods, you actually need less folic acid to get recommended amounts.

SOURCE OF FOLATE

Folate is naturally present in many foods, and folic acid is added to some foods. You can get recommended amounts by eating a variety of foods, including the following.

Folate is naturally present in:

- Beef liver
- Vegetables (especially asparagus, brus sels sprouts, and dark green leafy vege tables such as spinach and mustard greens)



- Fruits and fruit juices (especially or anges and orange juice)
- Nuts, beans, and peas (such as peanuts, black-eyed peas, and kid ney beans)

Folic acid is added to the following foods:

- Enriched bread, flour, cornmeal, pasta, and rice
- Fortified breakfast cereals
- Fortified corn masa flour (used to make corn tortillas)



DEFICIENCY SYMPTOMS

Getting too little folate can result in <u>megaloblastic anemia</u>, a blood disorder that causes weakness, fatigue, trouble concentrating, irritability, headache, heart palpitations, and shortness of breath. Folate deficiency can also cause open sores on the tongue and inside the mouth as well as changes in the color of the skin, hair, or fingernails.

Women who don't get enough folate are at risk of having babies with neural tube defects, such as <u>spina bifida</u>. Folate deficiency can also increase the likelihood of having a premature or low birth weight baby.

SOME EFFECTS ON FOLLOWING DISEASES

NEURAL TUBE DEFECTS

Taking folic acid before becoming pregnant and during early pregnancy helps prevent neural tube defects in babies. Neural tube defects are major birth defects in a baby's brain (anencephaly) or spine (spina bifida). But about half of all pregnancies are unplanned. Therefore, all women and teen girls who could become pregnant should consume 400 mcg of



folic acid daily from supplements, fortified foods, or both, in addition to the folate they get from following a healthy eating pattern.

DEPRESSION

People with low blood levels of folate might be more likely to have depression. In addition, they might not respond as well to antidepressant treatment as people with normal folate levels.

DEMENTIA, COGNITIVE FUNCTION, ALZHEIMER'S DISEASE

Folic acid supplements, with or without other B-vitamins, do not seem to improve cognitive function or prevent dementia or Alzheimer's disease. But more research on these topics is needed.

....... 10 Types of Dementia Alzheimer's Disease Vascular Dementio Wernicke-Korsakoff Syndrome Dementia With Lewy Bodies Normal Pressure (DLB) Hydrocephalus Parkinson's Creutzfeldt-Disease Jakob Disease Dementia Frontotemporal Mixed Dementia Dementia (FTD) Huntington's Disease

AUSTISM SPECTRUM DISORDER (ASD)

ASD affects communication and behavior, usually beginning by age 2. People with ASD have limited interests, repetitive behaviors, and difficulty communicating and interacting with others. Some studies have shown that taking recommended amounts of folic acid before and during early pregnancy may help reduce the risk of ASD in the child. However, because the study results are inconclusive, more research is needed to understand the potential role of folic acid in lowering the risk of ASD.

EXCESS OF FOLATE

Folate that is naturally present in food is not harmful. However, you should not consume folate in supplements or fortified foods in amounts above the upper limit, unless recommended by a healthcare provider.

EFFECTS

Taking large amounts of folate supplements might hide a vitamin B12 deficiency because these supplements can correct the anemia that the vitamin B12 deficiency causes, but not the nerve damage that the vitamin B12 deficiency also causes. The vitamin B12 deficiency can lead to permanent damage of the brain, spinal cord, and nerves. Large doses of folate supplements might also worsen the symptoms of vitamin B12 deficiency.

High doses of folic acid might increase the risk of <u>colorectal</u> <u>cancer</u> and possibly other cancers in some people. High doses can also lead to more folic acid in the body than it can use, but whether these increased folic acid levels are harmful is not completely clear.

STRUCTURE OF VITAMIN B9 (FOLATE)



IUPAC ID: (2S)-2-[(4-{[(2-amino-4-hydroxypteridin-6-yl)methyl]amino}phenyl)formamido]pentanedioic acid

video: https://www.youtube.com/watch?v=ADKz3pdf_5Q

STRUCTURE

Vitamin B12 is a nutrient that helps keep the body's nerve and blood cells healthy and helps make DNA, the genetic material in all cells. Vitamin B12 also helps prevent a type of anemia called megaloblastic anemia that makes people tired and weak.

Two steps are required for the body to absorb vitamin B12 from food. First, hydrochloric acid in the stomach separates vitamin B12 from the protein to which vitamin B12 is attached in food. After this, vitamin B12 combines with a protein made by the stomach called intrinsic factor and is absorbed by the body. Some people have pernicious anemia, a condition in which they cannot make intrinsic factor. As a result, they have trouble absorbing vitamin B12 from all foods and dietary supplements.

AGE	RECOMMENDED AMOUNT
Birth to 6 months	0.4 mcg
Infants 7–12 months	0.5 mcg
Children 1–3 years	0.9 mcg
Children 4–8 years	1.2 mcg
Children 9–13 years	1.8 mcg
Teen boys 14-18 years	2.4 mcg
Teen girls 14–18 years	2.4 mcg
Adult men	2.4 mcg
Adult women	2.4 mcg
Pregnant teens	2.6 mcg
Pregnant women	2.6 mcg
Breastfeeding teens	2.8 mcg
Breastfeeding women	2.8 mcg

SOURCES OF VITAMIN B12

Vitamin B12 is found naturally in a wide variety of animal foods and is added to some fortified foods. Plant foods have no vitamin B12 unless they are fortified. You can get recommended amounts of vitamin B12 by eating a variety of foods including the following:

- Beef liver and clams, which are the best sources of vitamin B12.
- Fish, meat, poultry, eggs, milk, and other dairy products, which also contain vitamin B12.
- Some breakfast cereals, nutritional yeasts and other food products that are fortified with vitamin B12. To find



out if vitamin B12 has been added to a food product, check the product labels.

DEFICIENCY SYMPTOMS

Vitamin B12 deficiency causes tiredness, weakness, constipation, loss of appetite, weight loss, and megaloblastic anemia. Nerve problems, such as numbness and tingling in the hands and feet, can also occur. Other symptoms of vitamin B12 deficiency include problems with balance, depression, confusion, dementia, poor memory, and soreness of the mouth or tongue. Vitamin B12 deficiency can damage the nervous system even in people who don't have anemia, so it is important to treat a deficiency as soon as possible.

In infants, signs of a vitamin B12 deficiency include failure to thrive, problems with movement, delays in reaching the <u>typical devel-opmental milestones</u>, and megaloblastic anemia.

Large amounts of folic acid can hide a vitamin B12 deficiency by correcting <u>megaloblastic anemia</u>, a hallmark of vitamin B12 deficiency. But folic acid does not correct the progressive damage to the nervous system that vitamin B12 deficiency also causes. For this reason, healthy adults should not get more than 1,000 mcg of folic acid a day.

SOME EFFECTS ON FOLLOWING DISEASES

HEART DISEASE

Vitamin B12 supplements (along with folic acid and vitamin B6) do not reduce the risk of getting <u>cardiovascular disease</u>. Scientists had thought that these vitamins might be helpful because they reduce blood levels of <u>homocysteine</u>, a



compound linked to an increased risk of having a heart attack or stroke.

DEMENTIA

As they get older, some people develop dementia. These people often have high levels of <u>ho-</u> <u>mocysteine</u> in the blood. Vitamin B12 (with folic acid and vitamin B6) can



lower homocysteine levels, but scientists don't know yet whether these vitamins actually help prevent or treat dementia.

Energy and athletic performance

Advertisements often promote vitamin B12 supplements as a way to increase energy or endurance. Except in people with a vitamin B12 deficiency, no evidence shows that vitamin



B12 supplements increase energy or improve athletic performance.

STRUCTURE OF VITMIN B12



IUPAC ID: cobalt(3+);[(2R,3S,4R,5S)-5-(5,6-dimethylben zimidazol-1-yl)-4-hydroxy-2-(hydroxymeth yl)oxolan-3-yl] [(2R)-1-[3-[(1R,2R,3R,5Z,7S,10Z, 12S,13S,15Z,17S,18S,19R)-2,13,18-tris(2-a mino-2-oxoethyl)-7,12,17-tris(3-amino-3-oxopro pyl)-3,5,8,8,13,15,18,19-octamethyl-2,7,12,17tetrahydro-1H-corrin-24-id-3-yl]propanoylami no]propan-2-yl] phosphate;cyanide

video: https://www.youtube.com/watch?v=Z8WmHK_QDtw

Vitamin C, also known as ascorbic acid, is a water-soluble nutrient found in some foods. In the body, it acts as an antioxidant, helping to protect cells from the damage caused by free radicals. Free radicals are compounds formed when our bodies convert the food we eat into energy. People are also exposed to free radicals in the environment from cigarette smoke, air pollution, and ultraviolet light from the sun.

The body also needs vitamin C to make collagen, a protein required to help wounds heal. In addition, vitamin C improves the absorption of iron from plant-based foods and helps the immune system work properly to protect the body from disease.

AGE	RECOMMENDED AMOUNT
Birth to 6 months	40 mg
Infants 7–12 months	50 mg
Children 1–3 years	15 mg
Children 4–8 years	25 mg
Children 9–13 years	45 mg
Teen boys 14–18 years	75 mg
Teen girls 14–18 years	65 mg
Adult men	90 mg
Adult women	75 mg
Pregnant teens	80 mg
Pregnant women	85 mg
Breastfeeding teens	115 mg
Breastfeeding women	120 mg

SOURCES OF VITAMIN C

Fruits and vegetables are the best sources of vitamin C. You can get recommended amounts of vitamin C by eating a variety of foods including the following:

- <u>Citrus fruits</u> (such as oranges and grapefruit) and their juices, as well as red and green pepper and kiwifruit, which have a lot of vitamin C.
- Other fruits and vegetables such as broccoli, strawberries, cantaloupe, baked potatoes, and tomatoes—which also have vitamin C.



• Some foods and beverages that are fortified with vitamin C. To find out if vitamin C has been added to a food product, check the product labels.

The vitamin C content of food may be reduced by prolonged storage and by cooking. Steaming or microwaving may lessen cooking losses. Fortunately, many of the best food sources of vitamin C, such as fruits and vegetables, are usually eaten raw.



DEFICIENCY SYMPTOMS

People who get little or no vitamin C (below about 10 mg per day) for many weeks can get <u>scurvy</u>. Scurvy causes fatigue, inflammation of the gums, small red or purple spots on the skin, joint pain, poor wound healing, and corkscrew hairs. Additional



signs of scurvy include depression as well as swollen, bleeding gums and loosening or loss of teeth. People with scurvy can also develop anemia. Scurvy is fatal if it is not treated.

SOME EFFECTS ON FOLLOWING DISEASES

CANCER

People with high intakes of vitamin C from fruits and vegetables might have a lower risk of getting many types of cancer, such as lung, breast, and <u>colon cancer</u>. However, taking vitamin C supplements, with or without other antioxidants, doesn't seem to protect people from getting cancer.

CARDIOVASCULAR DISEASE

People who eat lots of fruits and vegetables seem to have a lower risk of cardiovascular disease. Researchers believe that the antioxidant content of these foods might be partly responsible for this association because oxidative damage is a major cause of cardiovascular disease.

However, scientists aren't sure whether vitamin C itself, either from food or supplements, helps protect people from cardiovascular disease. It is also not clear whether vitamin C helps prevent cardiovascular disease from getting worse in people who already have it.

<u>Age-related macular degeneration</u> (AMD) and <u>cataracts</u>

AMD and cataracts are two of the leading causes of vision loss in older people. Researchers do not believe that vitamin C and other antioxidants affect the risk



of getting AMD. However, research suggests that vitamin C combined with other nutrients might help slow AMD progression.

THE COMMON COLD

Although vitamin C has long been a popular remedy for the common cold, research shows that for most people, vitamin C supplements do not reduce the risk of getting the common cold. However, people who take vitamin C supplements



regularly might have slightly shorter colds or somewhat milder symptoms when they do have a cold. Using vitamin C supplements after cold symptoms start does not appear to be helpful.



EXCESS OF VITAMIN C

Taking too much vitamin C can cause <u>diarrhea</u>, <u>nausea</u>, and <u>stomach cramps</u>. In people with a condition called hemochromatosis, which causes the body to store too much iron, high doses of vitamin C could worsen iron overload and damage body tissues.

STRUCTURE OF VITAMIN C



IUPAC ID: (5R)-[(1S)-1,2-Dihydroxyethyl]-3,4-dihy--droxyfuran-2(5H)-one

video: <u>https://www.youtube.com/watch?v=vcLzhCPuAmw</u>

Vitamin D is a nutrient found in some foods that is needed for health and to maintain strong bones. It does so by helping the body absorb calcium (one of bone's main building blocks) from food and supplements. People who get too little vitamin D may develop soft, thin, and brittle bones, a condition known as rickets in children and osteomalacia in adults.

Vitamin D is important to the body in many other ways as well. Muscles need it to move, for example, nerves need it to carry messages between the brain and every body part, and the immune system needs vitamin D to fight off invading bacteria and viruses. Together with calcium, vitamin D also helps protect older adults from osteoporosis. Vitamin D is found in cells throughout the body.

AGE	RECOMMENDED AMOUNT
Birth to 6 months	10 mcg (400 IU)
Infants 7–12 months	10 mcg (400 IU)
Children 1–3 years	15 mcg (600 IU)
Children 4–8 years	15 mcg (600 IU)
Children 9–13 years	15 mcg (600 IU)
Teen boys 14–18 years	15 mcg (600 IU)
Teen girls 14–18 years	15 mcg (600 IU)
Adult men	15 mcg (600 IU)
Adult women	15 mcg (600 IU)
Pregnant teens	15 mcg (600 IU)
Pregnant women	15 mcg (600 IU)
Breastfeeding teens	15 mcg (600 IU)
Breastfeeding women	15 mcg (600 IU)



SOURCES OF VITAMIN D

Very few foods naturally have vitamin D. Fortified foods provide most of the vitamin D

- Fatty fish such as salmon, tuna, and mackerel are among the best sources.
- Beef liver, cheese, and egg yolks provide small amounts.



vitamin D. In some mushrooms that are newly available in

stores, the vitamin D content is being boosted by exposing these mushrooms to ultravio let light.

Mushrooms provide some

 Vitamin D is added to many breakfast cereals and to some brands of orange juice, yogurt, <u>margarine</u>, and soy beverages.



VITAMIN D FROM SUN

The body makes vitamin D when skin is directly exposed to the sun, and most people meet at least some of their vitamin D needs this way. Skin exposed to sunshine indoors through a window will not produce vitamin D. Cloudy days, shade, and having dark-colored skin also cut down on the amount of vitamin D the skin makes.

However, despite the importance of the sun to vitamin D synthesis, it is prudent to limit exposure of skin to sunlight in order to lower the risk for skin cancer. When out in the sun for more than a few minutes, wear protective clothing and apply sunscreen with an <u>SPF (sun protection factor)</u> of 8 or more. <u>Tanning beds</u> also cause the skin to make vitamin D, but pose similar risks for skin cancer.

People who avoid the sun or who cover their bodies with sunscreen or clothing should include good sources of vitamin D in their diets or take a supplement. Recommended intakes of vitamin D are set on the assumption of little sun exposure.

DEFICIENCY SYMPTOMS

People can become deficient in vitamin D because they don't consume enough or absorb enough from food, their exposure to sunlight is limited, or their kidneys cannot convert vitamin D to its active form in the body. In children, vitamin D deficiency causes <u>rickets</u>, a condition in which the bones become soft and bend.



It's a rare disease but still occurs, especially among African American infants and children. In adults, vitamin D deficiency leads to <u>osteomalacia</u>, causing bone pain and muscle weakness.

SOME EFFECTS ON FOLLOWING DISEASES

BONE DISORDERS

As they get older, millions of people (mostly women, but men too) develop, or are at risk of, <u>os-</u> <u>teoporosis</u>, condition in which bones become fragile and may fracture if one falls. It is one consequence of not getting enough calcium and vitamin D over the long term. Supplements of both



vitamin D3 (at 700–800 IU/day) and calcium (500–1,200 mg/day) have been shown to reduce the risk of bone loss and fractures in elderly people aged 62–85 years. Men and women should talk with their healthcare providers about their needs for vitamin D (and calcium) as part of an overall plan to prevent or treat osteoporosis.

<u>CANCER</u>

Some studies suggest that vitamin D may protect against colon cancer and perhaps even cancers of the <u>prostate</u> and <u>breast cancer</u>. But higher levels of vitamin D in the blood have also been linked to higher rates of <u>pancreatic cancer</u>. At this time, it's too



early to say whether low vitamin D status increases cancer risk and whether higher levels protect or even increase risk in some people.

EXCESS OF VITAMIN D

Yes, when amounts in the blood become too high. Signs of toxicity include nausea, vomiting, poor appetite, constipation, weakness, and weight loss. And by raising blood levels of calcium, too much vitamin D can cause confusion, disorientation, and problems with heart rhythm. Excess vitamin D can also damage the kidneys.

STRUCTURE



IUPAC ID: (3β,5Z,7E,22E)-9,10-secoergosta5,7, 10(19),22-tetraen-3-ol







IUPAC ID: (1S,3Z)-3-[(2E)-2-[(1R,3aS,7aR)-1-[(1R,4S)-4-ethyl-1,5-dimethylhexyl]-7amethyl-2,3,3a,5,6,7-hexahydro-1H-inden-4-ylidene]ethylidene]-4-methylene-1-cy clohexanol

video: <u>https://www.youtube.com/watch?v=yf8uYzgMsEw</u> (ONLY VITAMIN D3 AND D4)

video: https://www.youtube.com/watch?v=zzevAFN3OKU

(D COMPLEX IN HINDI)

STRUCTURE

Vitamin E is a fat-soluble nutrient found in many foods. In the body, it acts as an antioxidant, helping to protect cells from the damage caused by free radicals. Free radicals are compounds formed when our bodies convert the food we eat into energy. People are also exposed to free radicals in the environment from cigarette smoke, air pollution, and ultraviolet light from the sun.

The body also needs vitamin E to boost its immune system so that it can fight off invading bacteria and viruses. It helps to widen blood vessels and keep blood from clotting within them. In addition, cells use vitamin E to interact with each other and to carry out many important functions.

AGE	RECOMMENDED AMOUNT
Birth to 6 months	4 mg
Infants 7–12 months	5 mg
Children 1–3 years	6mg
Children 4–8 years	7 mg
Children 9–13 years	11 mg
Teen boys 14–18 years	15 mg
Teen girls 14–18 years	15 mg
Adult men	15 mg
Adult women	15 mg
Pregnant teens	15 mg
Pregnant women	15 mg
Breastfeeding teens	19 mg
Breastfeeding women	19 mg

SOURCES OF VITAMIN E

Vitamin E is found naturally in foods and is added to some fortified foods. You can get recommended amounts of vitamin E by eating a variety of foods including the following:

• Vegetable oils like wheat germ, sunflower, and safflower oils are among the best sources of vitamin E. Corn and soybean oils also provide some vitamin E.

• Nuts (such as peanuts, hazelnuts, and, especially, almonds) and

- seeds (like sunflower seeds) are also among the best sources of vitamin E.
- Green vegetables, such as spin -ach and broccoli, provide some vitamin E.
- Food companies add vitamin E to some breakfast cereals, fruit juices, <u>margarines</u> and spreads, and other foods.



DEFICIENCY SYMPTOMS

Vitamin E deficiency is very rare in healthy people. It is almost always linked to certain diseases in which fat is not properly digested or absorbed. Examples include Crohn's disease, cystic fibrosis, and certain rare genetic diseases such as <u>abetalipoproteinemia</u> and <u>ataxia</u> with vitamin E deficiency (<u>AVED</u>). Vitamin E needs some fat for the digestive system to absorb it.



Vitamin E deficiency can cause nerve and muscle damage that results in loss of feeling in the arms and legs, loss of body movement control, muscle weakness, and vision problems. Another sign of deficiency is a weakened immune system.



SOME EFFECTS ON FOLLOWING DISEASE

HEART DISEASE

Some studies link higher intakes of vitamin E from supplements to lower chances of developing coronary heart disease. But the best research finds no benefit. People in these studies are randomly assigned to take vitamin E or a placebo (dummy pill with no vitamin E or active ingredients) and they don't know which they are taking. Vitamin E supplements do not seem to prevent heart disease, reduce its severity, or affect the risk of death from this disease. Scientists do not know whether high intakes of vitamin E might protect the heart in younger, healthier people who do not have a high risk of heart disease.

CANCER

Most research indicates that vitamin E does not help prevent cancer and may be harmful in some cases. Large doses of vitamin E have not consistently reduced the risk of colon and breast cancer in studies, for example. A large study found that taking vitamin E supplements (180 mg/day [400 IU]) for several years increased the risk of developing prostate cancer in men.

EFFECTS

Two studies that followed middle-aged men and women for 7 or more years found that extra vitamin E (201–268 mg/day [300–400 IU], on average) did not protect them from any form of cancer. However, one study found a link between the use of vitamin E supplements for 10 years or more and a lower risk of death from <u>bladder can-</u> <u>cer</u>.



Vitamin E dietary supplements and other antioxidants might interact with chemotherapy and radiation therapy. People undergoing these treatments should talk with their doctor or oncologist before taking vitamin E or other antioxidant supplements, especially in high doses.

EYE DISORDERS

<u>Age-related macular degeneration (AMD)</u>, or the loss of central vision in older people, and cataracts are among the most common causes of vision loss in older people. The results of research on whether vitamin E can help prevent these conditions are inconsistent. Among people with AMD who were at high risk of developing advanced AMD, a supplement containing large doses of vitamin E combined with other antioxidants, zinc, and copper showed promise for slowing down the rate of vision loss.

MENTAL FUNCTION

Several studies have investigated whether vitamin E supplements might help older adults remain mentally alert and active as well as prevent or slow the decline of mental function and <u>Alzheimer's dis-</u> <u>ease</u>. So far, the research provides little evidence that taking vitamin E supplements can help healthy people or people with mild mental functioning problems to maintain brain health.

STRUCTURE OF VITAMIN E



IUPAC ID: (2R)-2,5,7,8-tetramethyl-2-[(4R,8R)-4,8, 12-trimethyltridecyl]-3,4-dihydrochrom -en-6-ol

video: https://www.youtube.com/watch?v=KNwf9XTTr4A

VITAMIN K

Vitamin K is a nutrient that the body needs to stay healthy. It's important for blood clotting and healthy bones and also has other

functions in the body. If you are taking a blood thinner such as <u>warfarin (Couma-din®</u>), it's very important to get about the same amount of vitamin K each day.

The amount of vitamin K you need depends on your age and sex. Average daily recommended amounts are listed below in micrograms (mcg).

AGE	RECOMMENDED AMOUNT
Birth to 6 months	2.0 mcg
Infants 7–12 months	2.5 mcg
Children 1–3 years	30 mcg
Children 4–8 years	55 mcg
Children 9–13 years	60 mcg
Teen boys 14–18 years	75 mcg
Teen girls 14–18 years	75 mcg
Adult men	120 mcg
Adult women	90 mcg
Pregnant teens	75 mcg
Pregnant women	90 mcg
Breastfeeding teens	75 mcg
Breastfeeding women	90 mcg



Warfarín (Coumadín)

VITAMIN K

SOURCES OF VITAMIN K

Vitamin K is found naturally in many foods. You can get recommended amounts of vitamin K by eating a variety of foods, including the following:

- Green leafy vegetables, such as spinach, kale, broccoli, and let-tuce
- Vegetable oils
- Some fruits, such as blueberries and figs
- Meat, cheese, eggs, and soybeans

DEFICIENCY SYMPTOMS



KALE

Severe vitamin K deficiency can cause bruising and bleeding problems because the blood will take longer to clot. Vitamin K deficiency might reduce bone strength and increase the risk of getting osteoporosis because the body needs vitamin K for healthy bones.

SOME EFFECTS ON FOLLOWING DISEASES

OSTEOPOROSIS

Vitamin K is important for healthy bones. Some research shows that people who eat more vitamin K-rich foods have stronger bones and are less likely to break a hip than those who eat less of these foods.



A few studies have found that taking vitamin K supplements improves bone strength and the chances of breaking a bone, but other studies have not.

CORONARY HEART DISEASE

Scientists are studying whether low blood levels of vitamin K increase the risk of coronary heart disease, perhaps by making blood vessels that feed the heart stiffer and narrower. More research is needed to understand whether vitamin K supplements might help prevent heart disease.

STRUCTURE

VITAMIN K1 (PHYLLOQUINONE)





IUPAC ID: 2-methyl-3-[(2E)-3,7,11,15-tetramethylhexadec-2-en-1-yl]naphthoquinone

VITAMIN K

VITAMIN K2 (MENAQUINONE)

$$C_{31}H_{40}O_{2}$$



IUPAC ID: 2-methyl-3-[(2E,6E,10E)-3,7,11,15-tetramethylhexadeca-2,6,10,14-tetraenyl] naphthalene-1,4-dione

VITAMIN K3 (MENADIONE)

 $C_{11}H_8O_2$



IUPAC ID: 2-Methylnaphthalene-1,4-dione video: <u>https://www.youtube.com/watch?v=r90ptZSF6q0</u> CONSUMED WITHOUT DOCTOR CONSULTATION.**

NOT ALL VITAMINS CAUSES PROBLEMS WHEN IT EXCEEDS LIKE VITAMIN E, NON SYN-THETIC VITAMIN K, VITAMIN B1, VITAMIN B2, VITAMIN B5, VITAMIN B7, VITAMIN B12.

NOTE: SOME INFORMATION WOULD VARY SINCE SOME OF THE STUDIES ABOUT THE VITAMINS ARE CARRIED OUT.

THE GIVEN VIDED LINKS ARE NOT FOR PROMOTION PURPOSE

ALSO READ THE PANDAMIC OUTBREAK COVID-19



STAY HOME STAY SAFE

OUTBREAK COVID-19

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