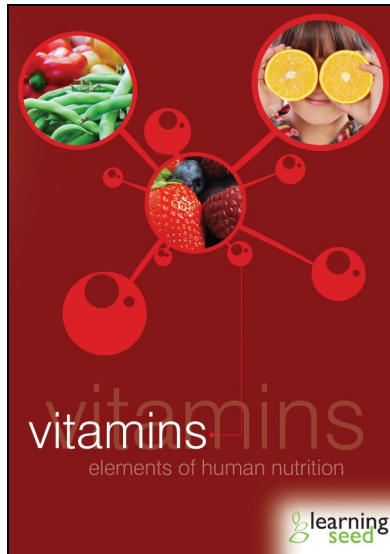


# Vitamins

## Elements Of Human Nutrition



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# Summary

“Vita” is Latin for “life,” and the best source of vitamins is the foods that we eat, and we need vitamins for many functions in our bodies. In this program we will explore vitamins and learn what they are, how we get them, and the way our bodies process them. We will learn the difference between fat soluble and water soluble vitamins, good food sources for vitamins, and facts about vitamin supplements.

Key points:

- Vitamins are organic because they contain carbon atoms and can be destroyed.
- There are two categories of vitamins called fat soluble and water soluble.
- Vitamins are a 20<sup>th</sup> century discovery; the word “vitamin” wasn’t used until 1920.
- The fat soluble vitamins are A, D, E, and K, and they are carried in the fats and oils of food.
- Sources of vitamin A are retinol from milk and beta carotene from dark green and deep yellow/orange vegetables.
- Some of vitamin A’s functions involve vision, the immune system, and bone growth.
- Sources of vitamin D are sunshine and fortified milk; it assists in bone health.
- Sources of vitamin E are vegetable oils; it is an antioxidant which helps keep the immune system and cells healthy.
- Vitamin K comes from green leafy vegetables as well as from bacteria in the digestive system; it helps with blood clotting and bone health.
- Water soluble vitamins include 8 vitamins in the B group and vitamin C.
- Water soluble vitamins need to be replaced every day.
- The B group includes thiamin, riboflavin, niacin, vitamin B-6, folate, vitamin B-12, biotin, and pantothenic acid.
- The B vitamins function in good vision, red blood cell formation, and healthy metabolism and skin.
- Vitamin C, or ascorbic acid, is needed for a healthy immune system, cells, and strong bones.
- Most people fall short of getting all that they need from food; a daily multivitamin that is balanced and provides 100% (or close to it) of each vitamin is a good idea for most people.

# Vitamin Science

Vitamins are organic substances that are essential in tiny amounts for growth and activity of the body. They are obtained naturally from plant and animal foods. Organic in this definition refers to the chemistry and molecules of vitamins. The word organic means that the molecules of the substance contain the element carbon. The term also means that vitamins can be destroyed and become unable to perform their functions in our bodies. Too much heat, certain kinds of light and even oxygen can destroy some vitamins. The amounts of vitamins ingested from food are measured in micrograms or milligrams.

Vitamins work with other substances in the body like enzymes and minerals. Together they perform such functions as strengthening bones, healing wounds, keeping the skin healthy, building cells, and helping to resist infections. Vitamins are separated into two groups, fat soluble and water soluble. The fat soluble vitamins are A, D, E, and K, and can dissolve in dietary fats and are stored in the liver and body fat. The body stores them for a longer amount of time, so they are not needed every day. Too much of these vitamins can become toxic and cause health problems. The water soluble vitamins are made up of 8 B vitamins and vitamin C. Water soluble vitamins dissolve in water, and are not stored in the body. Rather they travel through the bloodstream and need to be replenished every day. These vitamins are easily destroyed during food preparation and storage.

# Vitamin History

As far back as the time of explorer Vasco De Gama in 1497 to 1912 during Captain Robert Scott's South Polar expedition, disease was the major threat of death for human beings. Today we know that many people in history died from a disease called scurvy, which we have come to know as a lack of vitamin C. A lack of niacin, one of the B vitamins causes pellagra, a disease in which one's skin becomes flaky and leads to nervous and mental disorders. Diseases such as scurvy and pellagra caused epidemics that originated with a lack of certain vitamins in one's diet. Through the research of Dr. Goldberger and many other scientists, the secrets of vitamins were slowly unlocked throughout the early 20<sup>th</sup> century.

Vitamins are a 20<sup>th</sup> century discovery. The word "vitamin" wasn't used until 1920. Scientists did not know what these substances were, so they simply named them according to the alphabet, (A, B, C, etc.) and at one time all the way up to vitamin X.

# Fat Soluble Vitamins

Fat soluble vitamins are carried in the fats and oils of the foods one eats, and they are stored in the body for long periods of time. Vitamins A, D, E, and K are fat soluble.

Vitamin A, also known as retinol, is needed for skin and body tissue repairs. Children need vitamin A to build bones and teeth. Vitamin A is part of the body's defense system against infections. Vitamin A deficiency is a problem in countries where people eat very few dairy products, fruits, or vegetables. One of the first signs of a vitamin A deficiency is difficulty seeing at night because the retina of the eye needs the vitamin to function well. However, taking in extra vitamin A will not help healthy people see better. Skin creams and moisturizers with vitamin A might smooth skin, but it does not rewind the clock. The skin does not react in that way to vitamin A because it lacks the genetic information and does not know how to use the vitamin. Vitamin A is in fish, meat, and dairy foods, especially concentrated in the liver of fish and animals. Many vegetables also supply vitamin A, such as carrots, pumpkins, and squash; as well as the yellow fruits such as cantaloupes and peaches. Dark green vegetables, tomatoes, and sweet potatoes are also a good source. Most of these fruits and vegetables do not actually contain vitamin A, but rather contain beta carotene which the body converts to vitamin A. Carotene is the pigment that makes egg yolks yellow and carrots bright orange. Most adults carry enough vitamin A in their livers to supply them for months. Large doses of vitamin A can cause liver damage, and this is why most multi-vitamin supplements have some of the vitamin A come from beta carotene rather than retinol. You won't overdose on beta carotene, but too much will make the skin turn a yellow color. Many studies have made claims that beta carotene in fruits and vegetables helps reduce the risk of some cancers.

Vitamin D is important in bone formation. Most vitamin D is made when sunshine hits the skin. Too much sun can contribute to skin cancer, and using a sunscreen of SPF 15 or more will block vitamin D formation. Milk and margarine are both fortified with vitamin D. Those over the age of 65 only make about half as much vitamin D as children from the same amount of light exposure, so it is recommended to take a supplement for these people to get enough vitamin D. A vitamin D deficiency can cause an older disease called rickets, and it is cured by cod-liver-oil, which has a high concentration of vitamin D. Vitamin D is stored in the liver and as little as 5 times the Daily Value can produce unhealthy weight loss, vomiting, and calcium deposits in the lungs and kidneys.

Vitamin E remains the most mysterious of vitamins. The body needs it but its lack does not lead to any known disease. Vitamin E is the most exploited vitamin in that it is sold as a cure-all and even as an anti-aging potion. Vitamin E, vitamin C, and beta carotene are antioxidants. Some studies suggest that the trio might help to strengthen the body's immune system and play a role in cancer prevention.

Vitamin K helps stop the flow of blood from a cut and helps the body hold onto calcium in bones and makes sure it gets where it can build bones. Many foods supply vitamin K, especially leafy green vegetables. Certain bacteria in the digestive tracts can even make vitamin K for the body. Deficiency of this vitamin is very rare.

# Water Soluble Vitamins

The B-complex group and vitamin C are water soluble, meaning they dissolve in water and are not stored in the body and must be replaced every day. There are 8 B vitamins.

Vitamin B-1 is also known as thiamin. Thiamin keeps the body's cells and nerves in operating order. The body uses it to convert food into energy. It is also critical for memory and brain work. Thiamin is often part of energy-boosting drinks used to improve physical performance. Without B vitamins, you would have less energy, but taking extra B vitamins does not mean you will have more energy. A deficiency of thiamin is a serious medical condition, starting with a loss of sensation in the fingers and can lead to death. Severe alcoholics suffer from thiamin deficiency which causes them to have jerky eye movements, a staggering walk, and disorientation. No one food is a prime source of thiamin, and people that lack a varied diet suffer from the thiamin deficiency disease known as beriberi.

Vitamin B-2 is also known as riboflavin, and milk is its major source. The sun's ultraviolet light destroys riboflavin, which is why milk is rarely sold in glass containers today.

Vitamin B-9 is Folate, or folic acid. Research has shown that extra folic acid in the diets of women in their childbearing age lowers the risk of having babies with certain nervous system birth defects. Cereal and grain products are fortified with folate, as are vitamin supplements formulated for women.

Vitamin B-12 is essential for the nervous system, and the only people likely to lack this vitamin are those who have vegan diets. Vegans do not eat any food produced by animals. Meat, milk, and eggs all supply B-12.

Vitamin B-3 is more often called niacin. A deficiency in niacin produces the disease pellagra.

Vitamin B-6 is important in the process of how we absorb protein and fats, and it helps create red blood cells. Sources of B-6 are meat, fish, and poultry, but it can also come from potatoes and other starchy vegetables.

Biotin is a B vitamin that is important in the functioning of our metabolism and helps to release energy from the carbohydrates that we eat. Biotin comes in many foods, but it is especially found in liver, egg yolks, and soybeans.

Pantothenic acid is a B vitamin that helps with energy production and the formation of hormones, and is also found in many types of foods but particularly good sources are meats, potatoes, and whole grains.

Since the B vitamins are water soluble, if you take in too much the excess is excreted. Low levels of B vitamins are common among the elderly, as their bodies are less able to use the B vitamins from food, and supplements are often suggested.

Vitamin C, or ascorbic acid, is one vitamin humans cannot make; they have to get it from food. Vitamin C helps hold the cells together, heal wounds, and build bones and teeth. The best sources for vitamin C are citrus fruits, strawberries, melons, and leafy green vegetables. Vitamin C also helps to absorb and use Iron.

It is important to protect the vitamins in fruits and vegetables from being destroyed; simple ways of doing this include refrigeration, washing them before cutting them, storing them in airtight containers, and avoiding high temperatures and long cooking times.

# Supplements

America's society spends billions of dollars on vitamin supplements each year. Twenty years ago, the American Medical Association concluded that vitamin supplements were a waste of money. Today based on more current findings that 80% of Americans do not eat the recommended servings of fruits and vegetables, the AMA now advises adults to take at least one multivitamin pill a day.

Vitamin supplements are actually built into our food supply. Milk is fortified with vitamin D and skim milk with vitamin A. Flour is enriched with iron and some B vitamins, and margarine has added vitamin A. Vitamin C is added to various fruit-flavored drinks, and many breakfast cereals contain the equivalent of a vitamin pill in each serving.

If you are looking for a supplement, read the label and look for one that provides close to 100% of the recommended Daily Values for all nutrients. Some claim that there are more advantages of natural vitamin supplements over synthetic ones, but nutrition experts agree that the body cannot tell the difference because they are identical. It is important to avoid unbalanced supplements that supply a larger dose of one or more vitamins and very little of others. Keep in mind that nutrients interact. Adding too much iron can cut the body's ability to absorb zinc. Too much vitamin C interferes with the absorption of zinc and copper. Therefore avoid single vitamin supplements without a doctor's advice. Finally, keep vitamin supplements away from toddlers. The poison control center reports over 4,000 cases yearly of vitamin poisoning.



# Review

- Vitamins are organic substances that are essential in tiny amounts for growth and activity of the body.
- The two categories of vitamins are fat soluble (vitamins A, D, E, and K) and water soluble (vitamin B group and vitamin C).
- Fat soluble vitamins are stored for long periods of time and water soluble vitamins need to be replenished every day.
- The discovery of vitamins in the 20<sup>th</sup> century has led to the elimination of many deficiency illnesses such as scurvy and pellagra.
- The AMA now advises adults to take at least one multivitamin pill a day.
- It is important to remember that a supplement is called so because it is supposed to be supplementing a healthy lifestyle with a varied, balanced diet.

# Questions For Discussion

1. What does it mean when something is called “organic?” How does it relate to vitamins?

*The word organic means the molecules of the substance or compound contain the element carbon and can be destroyed. Vitamins are organic substances that are essential in tiny amounts for growth and activity of the body. Vitamins works with other substances in the body to perform functions like strengthening bones, healing wounds, keeping the skin healthy, building cells, and resisting infections.*

*Discussion Idea: Discuss the new wave of “organic products” and debate whether it makes a difference in using these products.*

2. How important is vitamin A? How do we get vitamin A? What does it do for our body and can we get sick from too much? What happens when there is a vitamin A deficiency?

*Vitamin A is a fat soluble vitamin needed for skin and body tissue repairs. Children need vitamin A to build bones and teeth. It is also part of the body’s defense system against infections. Vitamin A is found in fish, meat, and dairy foods, as well as dark green vegetables and yellow fruits. Large doses of vitamin A can cause liver damage, while a vitamin A deficiency may cause problems with night vision as the retina of the eye needs it to function well.*

3. What are some claims made about the importance of having vitamin E? What does vitamin E do for the body and why is it considered a “cure-all?”

*There is little known about vitamin E, but that the body does need it. Vitamin E is said to help with skin rejuvenation and is marketed as an anti-aging potion. Vitamin E is an antioxidant and when mixed with vitamin C and beta carotene might help strengthen the body’s immune system and help prevent cancer.*

4. What are the 8 B-vitamins? What do they do for the body? Why do people need to get b-12 injections?

*The B-complex group is water soluble, meaning they dissolve in water and are not stored in the body; they must be replaced every day. The vitamins in the group include thiamin, riboflavin, folate, B-12, niacin, B-6, biotin, and pantothenic acid. The B vitamins help with vision, red blood cell formation, and healthy metabolism and skin. People who exercise a vegan diet might not get enough B-12 vitamins and need supplements.*

5. What is some good advice when shopping for a vitamin supplement?

*It is important to read the label to make sure the vitamin provides close to 100% of the recommended Daily Values for all nutrients. It is also important to avoid unbalanced supplements that supply large doses of one or more vitamins and very little of others. Keep in mind nutrients interact with each other. Pay attention to any warning labels when purchasing vitamins. Store vitamin supplements away from toddlers because of their vulnerability to toxicity.*

## Suggested Activities

1. Visit an organic grocery store or a nutritional store with a large variety of vitamin supplements. What were the selling points of the supplements? What were their claims, and how varied is the selection? Were there any supplements that might not have been a good alternative? Research how much money is made from vitamin supplements alone in the United States today.

2. Create artwork displays about each vitamin. Depict the vitamin, where it comes from (which foods), what it does for the body, and if there are any drawbacks to having too much or too little in the body. Use Internet resources as well as the video for information.

# Research Project

Research the importance (if any) of prenatal vitamins. What are prenatal vitamins? What is their purpose and what are their functions? What are the benefits/drawbacks of prenatal vitamins? Research how to obtain prenatal vitamins and what kinds of vitamins are in the market for consumers. Are there consequences for not taking prenatal vitamins?

# Vitamins: Elements Of Human Nutrition

## Fill-In-The-Blank

Fill in the blanks with the correct words from the bank at the bottom of the page.

Vitamins are \_\_\_\_\_, which means they contain the element \_\_\_\_\_. Vitamins are separated into two groups. \_\_\_\_\_ vitamins are stored in the body for longer periods of time while \_\_\_\_\_ vitamins need to be replaced every day. \_\_\_\_\_ is caused by a vitamin C deficiency and sailors learned to prevent this disease by eating limes and other citrus fruits. Dr. Goldberger's research in the early 20<sup>th</sup> century revealed that \_\_\_\_\_ is a \_\_\_\_\_ deficiency. The fat soluble vitamins are \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_. The water soluble vitamins include the \_\_\_\_\_ group, which has \_\_\_\_\_ types and vitamin \_\_\_\_\_.

### Word Bank:

fat soluble	pellagra	eight	niacin	water soluble
organic	scurvy	carbon	A	B
C	D	E	K	

# Vitamins: Elements Of Human Nutrition

## Fill-In-The-Blank Answer Key

Fill in the blanks with the correct words from the bank at the bottom of the page.

Vitamins are organic, which means they contain the element carbon. Vitamins are separated into two groups. Fat Soluble vitamins are stored in the body for longer periods of time while water soluble vitamins need to be replaced every day. Scurvy is caused by a vitamin C deficiency and sailors learned to prevent this disease by eating limes and other citrus fruits. Dr. Goldberger's research in the early 20<sup>th</sup> century revealed that pellagra is a niacin deficiency. The fat soluble vitamins are A, D, E, and K. The water soluble vitamins include the B group, which has eight types and vitamin C.

# Vitamins: Elements Of Human Nutrition

## Multiple Choice Worksheet

Circle the best available answer for each of the following:

- 1) One of the first signs of a vitamin A deficiency is:
  - a) dry skin
  - b) poor vision at night
  - c) vomiting
  - d) yellow/orange colored skin
- 2) Which of these is not a function of vitamin C:
  - a) heal wounds
  - b) hold cells together
  - c) build bones
  - d) form red blood cells
- 3) Which of these is not a fat soluble vitamin:
  - a) B
  - b) K
  - c) A
  - d) E
- 4) "Vita" is Latin for:
  - a) life
  - b) health
  - c) happiness
  - d) wellness
- 5) This disease is from a vitamin D deficiency:
  - a) scurvy
  - b) rickets
  - c) pellagra
  - d) blindness
- 6) "Organic" means:
  - a) alive
  - b) fresh
  - c) containing carbon
  - d) containing oxygen
- 7) Dr. Joseph Goldberger's research helped cure prison inmates of:
  - a) scurvy
  - b) pellagra
  - c) mental illness
  - d) rickets
- 8) Scurvy can be treated by:
  - a) immunizations
  - b) eating citrus fruits
  - c) eating a vegan diet
  - d) vitamin B-12 shots
- 9) A source of vitamin D is:
  - a) oranges
  - b) meat
  - c) milk
  - d) green leafy vegetables
- 10) Severe alcoholics suffer from a deficiency of this vitamin which causes jerky eye movements, a staggered walk, and disorientation:
  - a) riboflavin
  - b) niacin
  - c) folic acid
  - d) thiamin

# Vitamins: Elements Of Human Nutrition

## Multiple Choice Worksheet *Answer Key*

Circle the best available answer for each of the following:

- 1) One of the first signs of a vitamin A deficiency is:
  - a) dry skin
  - b) poor vision at night**
  - c) vomiting
  - d) yellow/orange colored skin
- 2) Which of these is not a function of vitamin C:
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  - a) riboflavin
  - b) niacin
  - c) folic acid
  - d) thiamin**



# Vitamins: Elements Of Human Nutrition Quiz

Match the words in the first column to the best available answer in the second column.

- |       |   |                  |
|-------|---|------------------|
| _____ | Vitamins are this, meaning they contain the element carbon  | 1) vitamin C     |
| _____ | Sunshine is a good source of this vitamin   | 2) fat soluble   |
| _____ | These vitamins are not stored in the body and need to be replenished every day                          | 3) vitamins      |
| _____ | This vitamin is also known as retinol   | 4) vitamin K     |
| _____ | This vitamin comes in the form of leafy green vegetables and bacteria inside the digestive system       | 5) vitamin D     |
| _____ | Scurvy is a disease caused by a deficiency of this vitamin  | 6) organic       |
| _____ | These strengthen our bones, heal wounds, keep our skin healthy, build cells, and help resist infections | 7) vitamin A     |
| _____ | These types of vitamins are stored in the liver and body fat  | 8) water soluble |

# Vitamins: Elements Of Human Nutrition

## Quiz Answer Key

Match the words in the first column to the best available answer in the second column.

- |                         |   |
|-------------------------|---|
| <b>6) organic</b>       | Vitamins are this, meaning they contain the element carbon  |
| <b>5) vitamin D</b>     | Sunshine is a good source of this vitamin   |
| <b>8) water soluble</b> | These vitamins are not stored in the body and need to be replenished every day                          |
| <b>7) vitamin A</b>     | This vitamin is also known as retinol   |
| <b>4) vitamin K</b>     | This vitamin comes in the form of leafy green vegetables and bacteria inside the digestive system       |
| <b>1) vitamin C</b>     | Scurvy is a disease caused by a deficiency of this vitamin  |
| <b>3) vitamins</b>      | These strengthen our bones, heal wounds, keep our skin healthy, build cells, and help resist infections |
| <b>2) fat soluble</b>   | These types of vitamins are stored in the liver and body fat  |

# Glossary

B Vitamins	A group of eight B vitamins, including thiamin, riboflavin, folate, B-12, niacin, B-6, biotin, pantothenic acid
Carotene	The pigment that makes egg yolks yellow and carrots bright orange
Fat soluble	Vitamins that can dissolve in dietary fats and stored in the liver and body fat; these include vitamins A, D, E and K
Organic	Referring to chemistry and molecular structure, containing the element carbon and can be destroyed
Pellagra	Disease stemming from a deficiency in the B vitamin niacin, causing rough/flaky skin and leads to nervous and mental disorders, once believe to be caused by infection in prisons
Scurvy	Disease caused by a vitamin C deficiency
Vitamin	Organic substances that are essential in tiny amounts for growth and activity of the body
Water soluble	Vitamins that dissolve in water, not stored in the body, and need to be replaced every day; these include the eight B vitamins and vitamin C

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