

# Basic Vitamins: Water-Soluble and Fat-Soluble

## Summary

Functions and sources of vitamins and their roles regarding maintenance of optimum health.

## Main Core Tie

Food And Nutrition

[Strand 5 Standard 1](#)

## Background for Teachers

Examine vitamins and study their functions and food sources.

Vitamins are found in nearly all the foods listed on MyPyramid. They do not supply energy as carbohydrates, fats and proteins do, but they are essential because they regulate the body chemistry and body functions.

Vitamins cannot be produced by our bodies. They must be ingested (eaten in our food). Vitamins assist the body in using food by bringing about biochemical reactions so life can be maintained.

Science is still learning about many of the functions of vitamins. Vitamins are divided into two groups:

An incomplete list of vitamins include:

FAT-SOLUBLE VITAMINS	WATER-SOLUBLE VITAMINS
Vitamin A	Vitamin C (ascorbic acid)
D	Vitamin B Complex
E	B1 (thiamin)
K	B2 (riboflavin)
	Niacin
	B6 (pyridoxine)
	B12 (cobalamin)
	Folacin (Folate or Folic Acid)

Fat-soluble vitamins are transported through the body by being absorbed and stored in fat. Water-soluble vitamins are dissolved in water and transported through the body.

Some people believe that if small doses of vitamins are good for you, more is better. The vitamins ingested by an individual regulate fixed reactions that take place in fixed times. Too few vitamins keep the body from operating at full capacity. Too many may be damaging to your health. Just as too much water in a glass will spill over (demonstrate), so too many vitamins will be excreted or stored, and an excess can be toxic.

Folic Acid (Folate or Folacin) has appeared much in recent medical research. It plays a role in the formation of red blood cells, aids in cell growth and division, and helps with protein metabolism. It is vital that women of childbearing age get enough folic acid (especially in the first month of a pregnancy) to prevent neural tube defects in their unborn child. Because Folic Acid helps clear the blood of excess homocysteine, an amino acid that has been linked with heart attacks, it may reduce the risk of heart attacks. Fortified breakfast cereals, liver, asparagus, spinach, and legumes are good sources of Folic Acid. (Ohio State Extension Fact Sheet)

Another category of vitamins that have had much attention are Antioxidants because of their possible link to cancer prevention. While studies have conflicting results, it is wise to look at antioxidants in the battle over disease and toward optimal health. "Antioxidants are substances that may protect cells from the damage caused by unstable molecules known as free radicals. Free radical damage may

lead to cancer. Antioxidants interact with and stabilize free radicals and may prevent some of the damage free radicals otherwise might cause. Examples of antioxidants include beta-carotene, lycopene, vitamins C, E, and A, and other substances. Antioxidants are abundant in fruits and vegetables, as well as in other foods including nuts, grains and some meats, poultry and fish." (National Cancer Institute Fact Sheet)

## FUNCTION OF VITAMINS

### FAT

#### SOLUBLE

- VITAMIN A
    - vital to good vision
    - prevents night blindness
    - severe deficiency causes blindness
    - necessary for healthy skin, hair growth
    - keeps mucous membranes healthy
  - VITAMIN D
    - found in foods and obtained from the sun
    - helps bones use the mineral calcium to build strong bones
    - prevents rickets
  - VITAMIN E
    - helps breakdown polyunsaturated fats
    - antioxidant, protecting blood cell membranes from overexposure to oxygen
    - (no proof of a role in aging, sexual performance, or prevention of cancer and/or heart disease)
  - VITAMIN K
    - essential for clotting of blood
    - found in foods and manufactured by Vitamin K producing bacteria in the small intestines
- #### WATER SOLUBLE
- VITAMIN C
    - most famous vitamin (also called ascorbic acid)
    - helps form collagen or body cement
    - helps in growth and repair of body tissue and blood vessels
    - prevents scurvy

- can be decreased by cigarette smoking, stressful injuries and oral contraceptives
- excessive doses can cause kidney stones and break down red blood cells

#### VITAMIN B COMPLEX

- B1 - Thiamine - energy metabolism, nerve function, & muscle control
- B2 - Riboflavin - involved in use of fat, protein and carbohydrates
- Niacin - energy metabolism, maintain healthy nervous system and skin
- B6 - normal immune and nervous system
- B12 - producing antibodies, helps folacin function, maintenance of nerve tissue
- Folacin - synthesize DNA  
- cell division

NOTE TO TEACHER: There are two skill supplements in this section of the curriculum. You may wish to do the Fruits & Vegetable supplement at this point before going onto the Minerals unit.

#### Instructional Procedures

#### LEARNING ACTIVITIES AND TEACHING STRATEGIES

##### OPTION #1

It is important to know the functions of some basic vitamins, deficiency symptoms that occur without them and common sources. Discuss how VITAMINS: WHAT DO A THERMOSTAT, A GAS PEDAL, AND A VITAMIN HAVE IN COMMON?

NOTE TO TEACHER: This statement makes a good bell ringer activity. Put it on the board or overhead before class and as students enter have them respond to it. Discuss answer. (They all start and regulate body functions and how the body uses its energy sources).

##### OPTION # 2

Have students take notes on vitamins. Continue using the [SIX ESSENTIAL NUTRIENTS worksheet](#) found in the Pyramid discussion section. Add to the bulletin board display.

##### OPTION #3

To introduce vitamins, pose the question, "How is your body like a sponge?" Using a sponge, demonstrate that the sponge can only absorb so much water. Make an analogy that the body can only absorb so many vitamins. Stimulate student discussion by asking the following questions:

What happens when the body takes in too many water-soluble vitamins?

(They are easily excreted in the urine should more than the needed amount be present.)

What happens when the body takes in too many fat-soluble vitamins?

(Like other lipids, once they are absorbed from the intestinal tract, they can't easily be excreted. They are stored in the liver as fatty tissues and can reach toxic levels.)

What is toxicity?

(Toxicity is the ability of a substance to harm living organisms.)

#### OPTION #4

While working in teams have the students read in a text or do research in library resources. Assign each unit or group a vitamin. Have the students complete [VITAMIN BASICS](#) while reports are being given. Discuss vitamin deficiency diseases.

vitamin A

vitamin D

vitamin E

vitamin K

vitamin C

vitamin B complex:

thiamin (B1) riboflavin (B2)

niacin

folacin

vitamin B6

vitamin B12

VARIATION: Create an advertisement and/or a bulletin board that "sells" a particular vitamin. Have students work in groups. The advertisement or bulletin board must include: food sources, function in the body, deficiency disease. Use [EVALUATION FORM FOR VITAMIN PRESENTATION](#) to judge results.

VARIATION: Have each group or team write one test question and the answer to that question.

These could be compiled to comprise a quiz.

#### OPTION #5

Have the students find recipes which will make vegetables more appetizing and still maintain their nutrient value.

As a class, compare the nutrient differences between the raw vegetables and their prepared counterparts. Use Appendix C--Nutritive Values of Foods in Nutrition, Food, and Fitness by West (2006), or another chart that shows nutritive values of cooked vs. raw vegetables.

OR compare nutritive values of dark green vegetables vs. light green. Orange vegetables vs. white. You'll see that darker vegetables are rich in vitamins and minerals. That's why MyPyramid suggests eating a variety of vegetables and including the dark green and orange and red vegetables.

NOTE TO TEACHER: Students who are not experienced in reading the nutritive value charts will need some direction. They should not assume that a low number automatically translates to a low nutritive value. Have the students look at the % of RDA in order to make a value comparison. Helping them to read the charts is an excellent way to teach reading in the content area. For example 1000 IU of Vitamin A looks like a great amount but it is only 20% of the RDA.

Demonstrate the use of a variety of kitchen utensils used in various cooking methods and procedures. Beside conventional cooking pans etc., demonstrate the use of the crock pot, pressure pan, electric fry pan, and microwave oven.

Have students research to discover what happens to vitamins when vegetables are cooked. Have them complete the worksheet [RAW VS COOKED](#). Discuss various cooking methods best suited for cooking vegetables.

VARIATION: Have each group prepare one recipe. Assign each unit a different vegetable recipe, and perhaps a different cooking or preparation technique. (This could be done as a round robin activity).

Have them prepare that vegetable in two different ways. Assemble the prepared dishes in one location. Have students compare cooking methods visually and by taste. Discuss results.

NOTE TO TEACHER: An additional bit of information is an article by Beth Weinhouse reporting on Best Ways to get the Broccoli Benefit. Quote: " We now know that eating broccoli can ward off

cancer, thanks to a special chemical it contains, but how you cook the vegetable may be crucial to getting the full benefit. Best bets are microwaving and steaming because they leave the cancer-fighting chemical intact, say researchers at Baltimore's Johns Hopkins University (other cooking methods are still being studied). If you can't stand broccoli no matter how it's cooked, don't worry: high levels of the same chemical also show up in kale, cauliflower, brussels sprouts, carrots, and green onions."

#### OPTION #6

Discuss nutrient preservation. Select and display one raw vegetable with questionable popularity along with its nutrient content. Pose the questions, "If you don't like any vegetables, what can you do? What could be done to make this vegetable more appetizing?" On the chalkboard, help the students develop a list of techniques that will preserve the nutrient content. Include refrigeration, cutting, length of cooking time, cooking medium, temperature, and exposure to air.

Have the students study [VEGETABLE NUTRITION SUMMARY](#). Have them select one or two vegetables that will give them the most nutritive value and prepare a microwaveable vegetable quiche. Using nutritive value charts, ask each group to calculate the vitamin content of one serving and identify other foods that could be eaten in the meal to obtain 100% of the recommended daily allowance for Vit. A, Thiamine, Riboflavin, Niacin and Vit. C.

#### OPTION #7

Divide the class into groups and assign each group a fallacy from the resource [EXPOSING DIETARY MYTHS](#). Ask the students to use their present knowledge to brainstorm why each is false. Have the groups present their information. Invite other groups to add comments. Have the groups evaluate their responses using the references.

#### OPTION #8

As a final evaluation for basic vitamins, have the students complete [VITAMINS](#).

#### Bibliography

Argen, M.D., Sheldon Wellness Encyclopedia of Food and Nutrition (University of California at Berk, )

#### Authors

[Utah LessonPlans](#)