Dairy Guidelines
COOPERATIVE EXTENSION SERVICE, V.P.I., BLACKSBURG, VIRGINIA

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Nutritional Values of Milk

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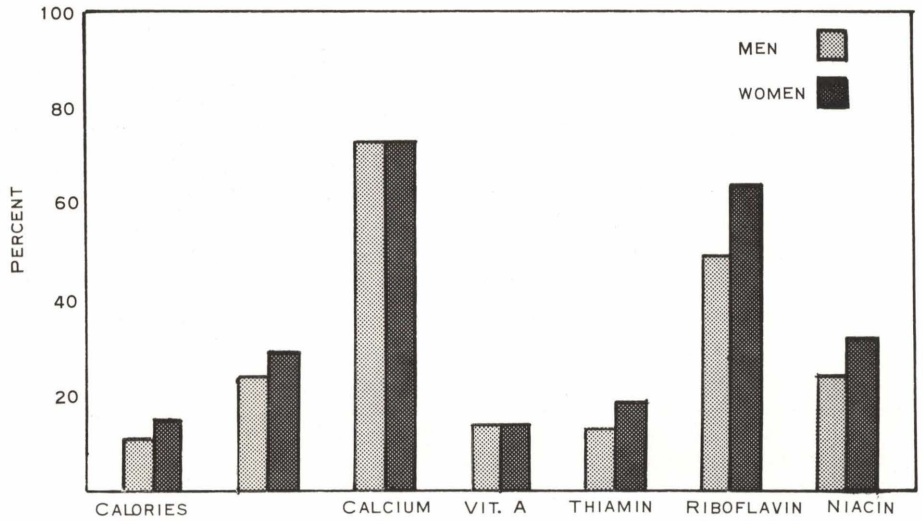

Contribution of 1 pint of milk to recommended daily dietary allowances of 25 yr. old adults, based on nutritional allowances established by the National Research Council.

Because of milk's contribution to the essential nutritional needs of people, it is almost impossible to plan a well-balanced meal without having at least one or more dairy products on the menu.

A well-balanced diet should include sufficient, but not excessive, amounts of all essential nutrients. The most reliable way to do this is to include in the diet a varied, well-balanced combination of foods of both vegetable and animal origin. Among the animal foods, milk holds an important place because it contains many nutrients and has high nutritional value, both in itself and in supplementing other less nutritious foods.

ISSUED IN FURTHERANCE OF COOPERATIVE EXTENSION WORK, ACTS OF MAY 8 AND JUNE 30, 1914, IN COOPERATION WITH THE U. S. DEPARTMENT OF AGRICULTURE. W. E. SKELTON, DIRECTOR OF EXTENSION SERVICE, VIRGINIA POLYTECHNIC INSTITUTE, BLACKSBURG, VIRGINIA 24061.

How Much Milk Should You Consume?

Milk is the only natural food which supplies an abundance of calcium (76% of the calcium in the total food supply in the U.S.). Everyone needs calcium for the growth and/or maintenance of healthy bones; therefore nutritionists consider calcium needs when forming recommendations for the amounts of milk to consume daily for good nutrition.

Milk allowances increase from childhood through the teens as more calcium is required for growing bodies. Adults require less calcium than teenagers, but they sometimes underestimate their need for milk. Expectant and nursing mothers need extra milk to supply demands for calcium.

Table 1 shows the daily milk allowances recommended by nutritionists for different age groups.

Table 1. Daily Milk Allowances

Age Group	Recommended Milk Allowances
Children, under 9 years	2 to 3 cups (1 pt. to 1½ pt.)
Children, 9 to 12 years	3 or more cups (1½ pt. or more)
Teenagers*	4 or more cups (1 qt. or more)
Adults, all ages	2 or more cups (1 pt. or more)
Expectant mothers	3 or more cups (1½ pt. or more)
Nursing mothers	4 or more cups (1 qt. or more)

*Expectant teenage or nursing teenage mothers need more milk than other teenagers.
Source: U.S.D.A. Home and Garden Bulletin No. 57 "Getting Enough Milk."

The above allowances can be met in part, or in whole, by other dairy products. On the basis of calcium, the following can be substituted for 1 cup (½ pt.) of milk.

1-1/3 ounces of Cheddar cheese
1-1/2 ounces of American cheese
1-1/4 ounces of Swiss cheese
1-3/4 ounces of cheese food
1 pound of cream cheese
11 ounces of cottage cheese
1-2/3 cups of ice cream
1 cup of ice milk
2/5 cup sweetened condensed milk
1/2 cup of evaporated milk
1/3 cup of nonfat dry milk
1-1/8 cup of half and half
1-1/6 cup of light cream
1-2/3 cup of heavy cream
1 cup of fluid skim milk, buttermilk, chocolate milk, or chocolate drink
3/4 cup of lowfat milk (fortified with 2% nonfat milk solids)
3/4 cup of fortified skim milk (with 2% added nonfat milk solids)

Composition of Milk

Although recommended milk allowances are based on calcium needs, milk contains some of all the essential food nutrients our bodies need; some in substantial amounts, and only a few in insignificant amounts. Table 2 presents the gross composition of milk from cows, goats, and humans.

Table 2. Composition of Milk*

Type	Water	Protein%	Fat %	Carbohydrate %	Ash%
Cow's milk	87.4	3.5	3.5	4.9	.7
Goat's milk	87.5	3.2	4.0	4.6	.7
Human milk	85.2	1.1	4.0	9.5	.2

*Source: Newer Knowledge of Milk, 3rd edition, National Dairy Council.

Water Although cow's milk is a fluid product containing 87 to 88% water, it contains 12 to 13% total solids, an amount comparable to the solids content of many other foods. Because milk, basically, is a food specifically prepared by nature for the nourishment of the very young, it provides the water necessary for life. The water also acts as a carrier for those constituents that are dissolved, those that exist in colloidal suspension, and those that exist in an emulsion state.

Protein Milk provides about 25% of the total protein in our food supply. The protein, casein, found only in milk, makes up about 82% of the total milk protein. Casein exists in colloidal suspension and is easily coagulated by the action of acids and certain enzymes. The many other proteins that have been identified in milk can be collectively termed as whey proteins, since they are dissolved in the serum of the milk.

Proteins are made up of amino acids which are absorbed and reassembled to form body proteins. The human body has the ability to synthesize some amino acids, while others must be pre-formed, consumed in foodstuffs, and converted by body processes to amino acids. The latter make up what are called "essential amino acids." Milk proteins are high quality proteins that contain all the essential amino acids, and provide them in the proper balance in which they are needed.

Milk Fat Milk fat, with other dietary fats, serves as a concentrated source of energy. The fatty acids of milk fat (at least 64 different fatty acids) give it the distinctive pleasing flavor that compliments many prepared foods. It also contains those vitamins that are fat soluble--vitamins A, D, E, and K. Milk fat exists in a highly emulsified state which facilitates its digestion. Its high proportion of short-chain fatty acids appears to make this fat especially well utilized, particularly by infants and aged persons.

Lactose Lactose is milk's major carbohydrate and accounts for about half of the solids-not-fat in milk. Lactose is dissolved in the serum portion of milk and its relative sweetening power is about 1/6 that of sucrose (table sugar).

Minerals Milk contains 7 minerals as major constituents and many more in minor or trace amounts. At least 13 of the minerals are considered to be dietary essentials. Because most of these minerals are widely distributed in foods, or are needed in such small amounts, they present no recognized dietary problem.

Calcium and phosphorus are essential in human nutrition for building bony structures and for certain metabolic processes. Milk is the chief source of food calcium in the diet of people in the U.S. and has the added advantage of containing phosphorus in the same biological relationship to calcium as in the growing skeleton. It would be difficult and impractical to provide the recommended daily amounts of dietary calcium without using milk or milk products because calcium is poorly distributed among other commonly-eaten foods.

Vitamins All of the vitamins known to be required by man are found in milk. Some are fat-soluble and are associated with butterfat, while those that are water-soluble are found in the nonfat portion of milk. Only some of them are discussed below.

Vitamin A and its precursor, carotene, are present in high concentration in milk fat. The carotene, from which vitamin A is formed in the body, gives milk fat its characteristic color.

Vitamin D content in fresh milk is low. Because of man's dependence upon this vitamin, which enhances absorption of calcium and phosphorus in the body, most commercially pasteurized milk is fortified with 400 I.U. of vitamin D per quart.

Riboflavin - Milk is an abundant source of this vitamin (B_2) which is important for proper growth, the sense of sight, the nervous system, and for healthy skin and hair.

Niacin - Although niacin occurs in milk at a low level, it is in a fully available form. In addition, milk proteins are a good source of the amino acid, tryptophan, from which niacin is formed in the body.

Thiamine - Milk contains significant amounts of this vitamin (B_1) which is important in the prevention and cure of beriberi.

Other vitamins occurring in milk at substantial levels include pantothenic acid (B complex), pyridoxine (B_6), biotin (B complex), and vitamin B_{12}. Folic acid, choline, inositol, and para-amino benzoic acid are also found in milk. Quantitative requirements for these vitamins have not been established, but they are considered essential for humans.