

# **FOOD CHARTS**

## **Foods as Sources of the Dietary Essentials**

Prepared by

**A Joint Committee of the Council on Foods and Nutrition of  
the American Medical Association and of the Food and  
Nutrition Board of the National Research Council**

**For use in connection with an exhibit on  
Nutritional Deficiency Diseases**

**SCIENTIFIC EXHIBIT  
American Medical Association**

**"For the Prevention of Nutritive Failure, Dependence Should Be  
Placed Always on an Adequate Diet"**

*Revised Edition*

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535 NORTH DEARBORN STREET  
CHICAGO**

## FOOD CHARTS

### FOODS AS SOURCES OF THE DIETARY ESSENTIALS

It is important to have specific information about the composition and nutritional values of foods in order to recognize the principal sources of each of the dietary essentials. The present series of charts aims to provide this information about a number of the common food sources of protein, calcium, iron, vitamin A, thiamine (vitamin B<sub>1</sub>), ascorbic acid (vitamin C), riboflavin (vitamin G), and nicotinic acid (niacin). The quantities of these specific nutrients which the body needs each day, as recommended by the Food and Nutrition Board of the National Research Council, are provided in tabular form. There are also listed for purposes of comparison the minimum daily requirements of a number of important dietary essentials, as adopted by the Food and Drug Administration, in regulations pertaining to the labeling of foods for special dietary purposes.

The food charts show graphically the contribution of a selected serving, of the size indicated for each food, to the daily allowance for each of the important nutrients. The size of the selected serving varies with each food in accordance with the amounts that customarily may be chosen. If larger or smaller portions are consumed, then of course the contribution of each food would be proportionately greater or less. The values for the composition of each food have been selected from what are believed to be the best available data in the scientific and medical literature. It is to be expected that natural foods will show some variation in composition, and accordingly the values indicated in the charts may differ somewhat from those presented in other tables of food values. Many of the data on the composition of foods are tentative and for this reason considerable judgment must be exercised in drawing comparisons between foods. The contribution of each food is expressed in terms of weights or units, and in terms of percentages of the recommended daily allowances for the moderately active man weighing about 154 pounds. As the table

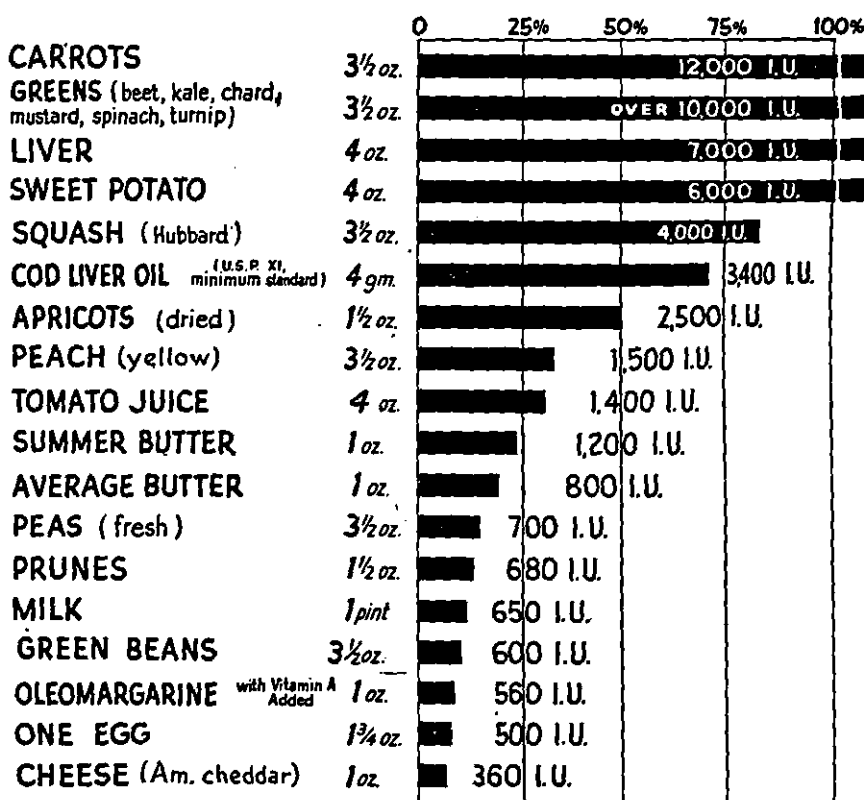
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This revised edition contains the most recent data available at time of publication on nutritional content of the foods listed, including nutritional values of baked goods under the latest enrichment regulations.—  
February, 1944.

# FOODS AS SOURCES OF VITAMIN A

Green, leafy and yellow vegetables are outstanding sources. Dairy products, eggs and liver (and fish liver oils) are the important animal sources. Vitamin A is well conserved in cooking . . . .

CONTRIBUTION OF SELECTED SERVINGS OF A FEW FOODS AS PERCENTAGES OF ADULT MALE ALLOWANCE ( 5000 INTERNATIONAL UNITS (I.U.) )



of recommended daily allowances shows, the requirements for adolescent boys and for pregnant and lactating women are higher. The requirements are also higher with respect to some of the factors for the very active man.

To appraise the complete nutritive value of any particular food it must not be forgotten that its content of all the dietary essentials must be given consideration.

A brief discussion of the tables and charts follows.

#### VITAMIN A

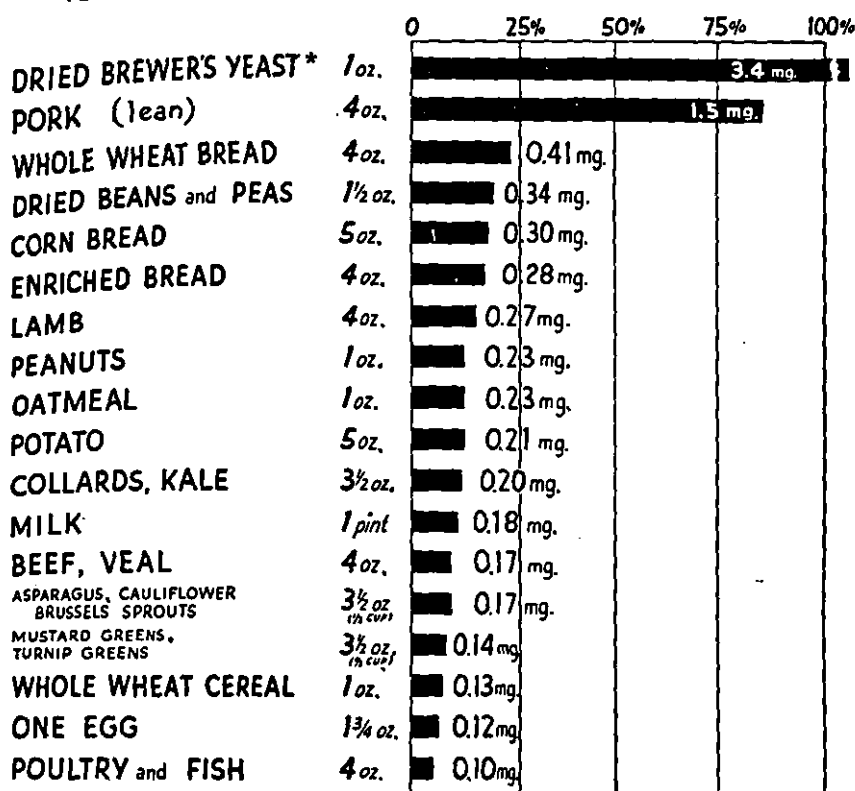
Vitamin A is a fat soluble vitamin that, like all the other dietary essentials, is necessary for growth and development. It is concerned with the normal health of many of the soft tissues of the body. It is also concerned with vision. A deficiency of this factor may result in pathologic changes in the eye, skin, and other structures in the body and probably results in an increased susceptibility to infections.

The chart shows the outstanding contribution that the green leafy and yellow vegetables can make to the vitamin A content of the diet. In these foods the vitamin A value is due to an orange pigment known as carotene or provitamin A, which is changed into vitamin A in the body. There is evidence that carotene in plant foods is not completely available to the body, but the vegetable foods mentioned are so rich in carotene that a single serving of some of them is capable of supplying more than the daily requirements for vitamin A. Milk, cream, butter, eggs, and liver are outstanding sources of this dietary essential. In these foods of animal origin, it is present as vitamin A itself. Oleomargarine with vitamin A added provides one eighth of the daily adult allowance in each ounce but ordinary vegetable oleomargarine is lacking in this substance.

# FOODS AS SOURCES OF THIAMINE (VITAMIN B<sub>1</sub>)

Except for pork, common foods supply only small amounts of thiamine, the best sources being nutritionally unimpaired cereals and meats; some thiamine may be lost in cooking, either through destruction by heat or extraction by water. . .

CONTRIBUTION OF SELECTED SERVINGS OF A FEW FOODS AS  
PERCENTAGES OF ADULT MALE ALLOWANCE (1.8 MILLIGRAMS)



\* U.S.P. XII Minimum Standard

#### THIAMINE

Thiamine or vitamin B<sub>1</sub> is a member of the vitamin B complex. It is one of the water soluble vitamins that functions as a component of a respiratory enzyme system of the cells. Pronounced deficiency of this vitamin results in the disease known as beriberi. Milder deficiencies are believed to be responsible for many of the common signs and symptoms of ill health. It is believed by many persons that deficiency of thiamine is more apt to occur in our diets than a deficiency of almost any other factor.

The chart shows the unique position of pork as a source of thiamine. A single pork chop, even after frying, will supply nearly the entire thiamine requirements of an adult for a day. Thiamine may be lost in cooking either from destruction by heating or extraction by cooking water.

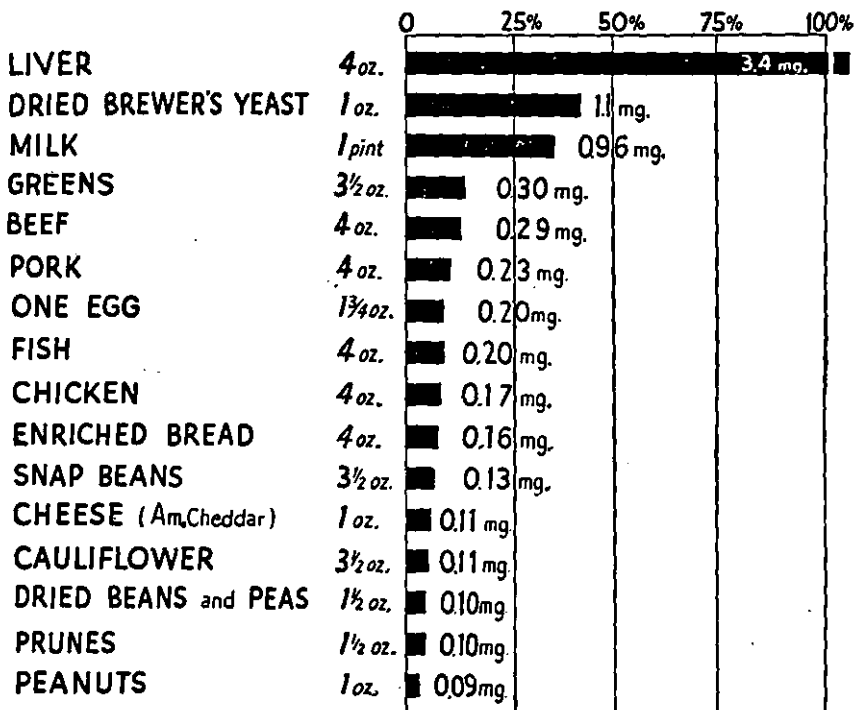
The practice of enriching baked goods is being extended by an order of the War Food Administration requiring enrichment of all white bread as well as rolls subsequent to May 1, 1944.

In this chart the oatmeal is reported in terms of dry weight. A serving of the cooked cereal will be about four times larger because of the added water. The relatively high value for corn bread is attributable chiefly to the milk and eggs commonly used in making this product.

# FOODS AS SOURCES OF RIBOFLAVIN (VITAMIN G)

Milk is the most important common source of riboflavin. This vitamin is not readily destroyed by heat but it may be lost by extraction in water during cooking and by prolonged exposure to light.

CONTRIBUTION OF SELECTED SERVINGS OF A FEW FOODS AS PERCENTAGES OF ADULT MALE ALLOWANCE (27 MILLIGRAMS)



## RIBOFLAVIN

Riboflavin, sometimes referred to as vitamin G, is a member of the vitamin B complex which is important for growth and development and is concerned with the respiratory enzyme systems. In the absence of this vitamin characteristic signs of deficiency develop.

Milk is the most important common source of this factor. A pint supplies one third of the daily allowance. Meats are the other important food source of riboflavin.

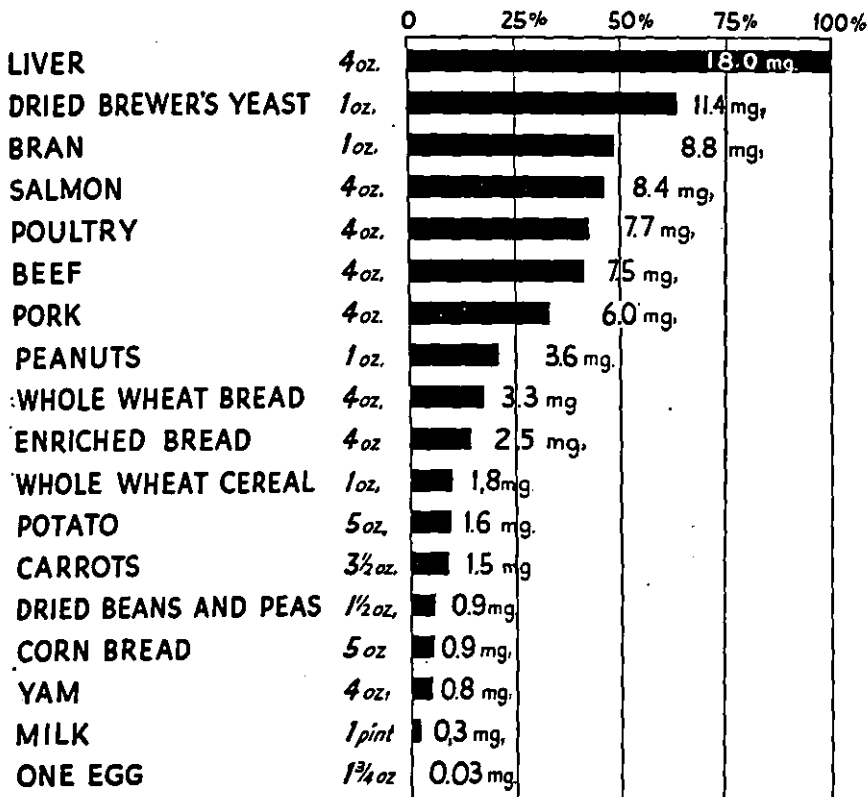
Enriched flour, as defined by the Food and Drug Administration since October 1, 1943, has been required to contain not less than 2.0 mgs. of thiamine, 1.2 mgs. of riboflavin, 16.0 mgs. of niacin and 13.0 mgs. of iron per pound. The corresponding minimum standards for enriched bread which have been proposed call for each pound to contain 1.1 mgs. thiamine, 0.7 mgs. riboflavin, 10.0 mgs. niacin and 8.0 mgs. iron. Although the amounts of riboflavin in enriched flour and enriched bread do not appear to be great, it has been shown that because of the amounts of these foods consumed, the present minimum level helps assure that the American dietary is adequate with respect to this important dietary constituent.



# FOODS AS SOURCES OF NIACIN (NICOTINIC ACID)

Meats are the most important  
common source of this vitamin

CONTRIBUTION OF SELECTED SERVINGS OF A FEW FOODS AS  
PERCENTAGES OF ADULT MALE ALLOWANCE (18 MILLIGRAMS)



## NIACIN

Niacin or as it is also known, nicotinic acid, is the factor so important in the prevention of pellagra. It is a member of the vitamin B complex and, like some of the other members of this group, it functions as part of a respiratory enzyme system of the tissues. Deficiency of nicotinic acid results in profound alterations of body chemistry and in tissue changes which involve the nervous system and digestive tract. Characteristic lesions often occur about the mouth, tongue, and on the skin. Patients with pellagra may also show deficiency of riboflavin, thiamine, and of other dietary essentials as well as niacin.

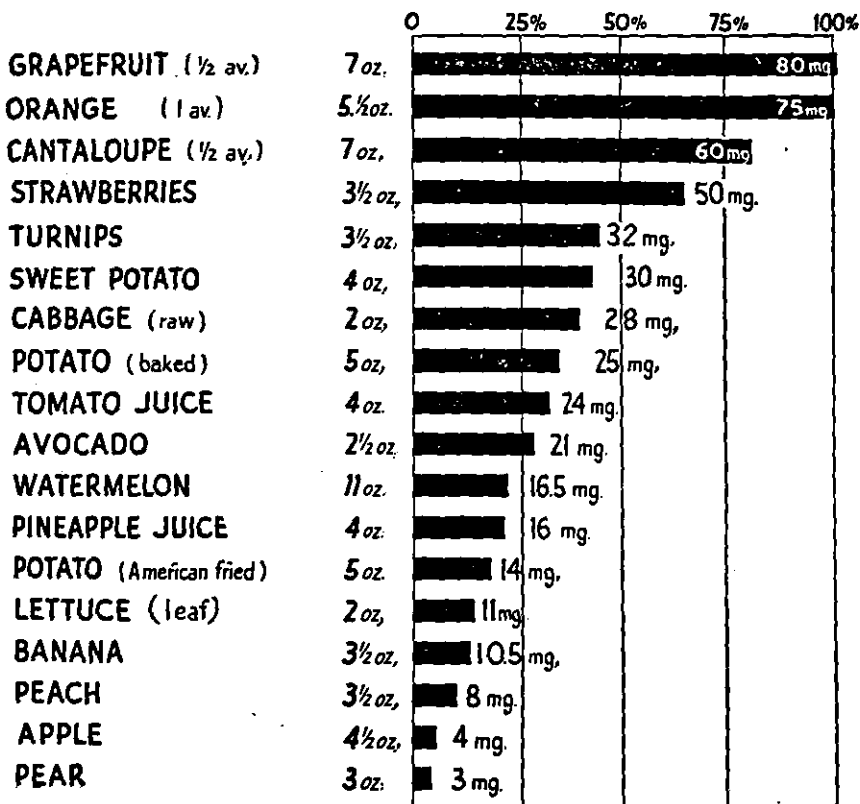
Knowledge of the distribution of niacin in foods is limited as yet. The data shown in the chart have been taken from reports by investigators at the University of Wisconsin and show clearly that meats are the most important common source of this vitamin. From the information now available it would appear to be difficult to obtain the quantities of nicotinic acid recommended unless meat is included in the diet. Whole wheat products are also capable of contributing significantly to the niacin requirement. Milk and milk products are comparatively poor sources of this dietary essential. However, it is known that infants thrive on cow's milk, and this indicates that their nicotinic acid requirements are being satisfied by this food.

As new data become available we shall know more about the distribution and requirements of this factor. It is quite likely that hitherto unrecognized sources of this dietary essential will become known.

# FOODS AS SOURCES OF ASCORBIC ACID (VITAMIN C)

In addition to citrus fruits and tomatoes many common fruits and vegetables supply significant amounts of ascorbic acid, especially if eaten raw. This vitamin is readily destroyed by heat and it is extracted by water.

CONTRIBUTION OF SELECTED SERVINGS OF A FEW FOODS AS  
PERCENTAGES OF ADULT MALE ALLOWANCE (75 MILLIGRAMS)



## ASCORBIC ACID (VITAMIN C)

Ascorbic acid belongs to the water soluble group of vitamins. It is a factor needed for the prevention of scurvy. Babies routinely are fed orange juice, tomato juice, or some other good source of vitamin C in order to meet the requirements of this factor. Vitamin C is important for the preservation of the normal healthy structure of the gums and soft tissues of the body and for the development of teeth and bones.

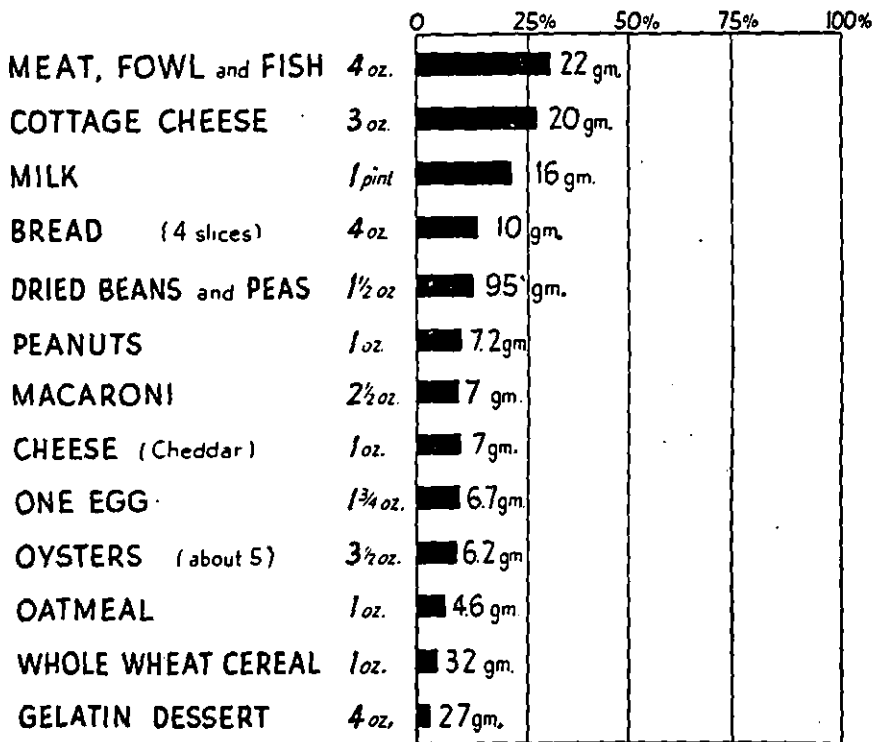
There are so many common sources of ascorbic acid that there is no reason why any person should not secure an abundant supply of this dietary essential, if fresh foods are available. In addition to citrus fruits and tomatoes, many common fruits and vegetables supply significant amounts of ascorbic acid, especially if eaten raw. This vitamin is readily destroyed by heat and even by standing at room temperature when neutral or bland types of foods are cut and exposed to the air. It is also soluble in water; hence, the cooking of food results in more or less destruction of ascorbic acid. Potatoes even though boiled or baked contain significant quantities of vitamin C, but if mashed they contain much less. The whipping of potatoes may result in complete destruction of the ascorbic acid because of the oxidation of this vitamin by the air.

As shown in the chart, half a grapefruit or a serving of strawberries will provide more than the daily requirements for ascorbic acid. The charts do not show the values of a number of canned fruit juices. A small glass of orange juice (about 4 ounces) will provide from 48 to 72 mgs. of ascorbic acid. An equal amount of canned grapefruit juice provides about 42 to 54 mgs., of tomato juice from 18 to 30 mgs., and of pineapple juice from 12 to 18 mgs. Grape juice and cider or apple juice as a rule contain negligible quantities of vitamin C.

# FOODS AS SOURCES OF PROTEIN

Animal foods are the best source of good quality protein.

CONTRIBUTION OF SELECTED SERVINGS OF A FEW FOODS AS PERCENTAGES OF ADULT MALE ALLOWANCE (70 GRAMS)



## PROTEIN

Proteins are compounds of high molecular weight which yield amino acids on digestion. They are characteristic of plant and animal cells. Plants can produce protein from simpler substances containing nitrogen; animals for the most part must receive their proteins from foods. Typical proteins are the solids of egg white and of cottage cheese. Egg white consists essentially of 12 per cent protein, 87 per cent water, and 1 per cent of inorganic salts and other substances. Cottage cheese contains casein, the principal protein of skimmed milk, to the extent of 23 per cent; there are also present 73 per cent water, and 4 per cent of other milk solids. Proteins vary in nutritive value depending on their content of amino acids.

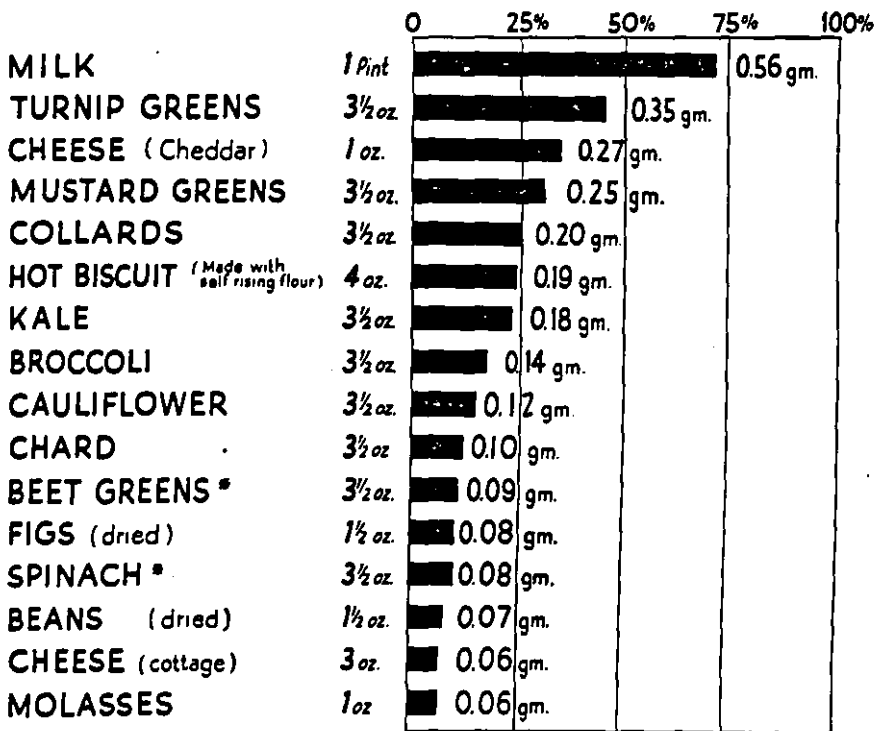
The chart shows that a 4-ounce serving of either meat, fowl, or fish will provide about 22 grams of protein, or a little less than a third of the adult allowance. A person who consumes in a day a reasonable portion of one of these foods together with a pint of milk, 4 slices of bread, an egg, and a serving of breakfast cereal secures from these foods alone 58 grams of protein. The remaining 12 grams necessary in order to satisfy the dietary allowance may be obtained readily from other foods that make up our ordinary meals. The chart shows that animal foods such as meats, milk, fish, and eggs are the best source of protein. The protein present in these foods likewise is known to be of high nutritive quality. Unless these foods are consumed regularly it is difficult to obtain the amounts of protein that are considered desirable.

The cereals, macaroni, beans, and peas listed in this chart are in terms of dry weights. The actual serving would weigh considerably more because of the water and milk or other substances which are used in preparing these foods for the table.

# FOODS AS SOURCES OF CALCIUM

Milk is the most important common source of calcium.

CONTRIBUTION OF SELECTED SERVINGS OF A FEW FOODS AS PERCENTAGES OF ADULT MALE ALLOWANCE (0.8 GRAM)



\* The calcium in beet greens and spinach is in the form of the oxalate which is not assimilated by the body...

## CALCIUM

By weight calcium is the most important inorganic element of the body. There is enough calcium in the body of a man to equal the calcium content of more than 3½ pounds of unslaked lime. More than 98 per cent of the calcium of the body is present in the bones and teeth. Calcium thus is of unique importance during growth when the skeletal structures are being produced. A deficiency of calcium during early life may lead to poor mineralization of these structures and a deficiency in adult life may lead to a depletion of calcium salts from the bones.

Compared to other foods, milk is unusually rich in calcium. This alone makes milk an important food for the pregnant or lactating woman. Adults who do not consume milk, either alone or incorporated with other foods, ordinarily obtain only about 0.3 to 0.4 gram of calcium, which is half or less of the daily allowance for a man. The calcium requirements of children are higher, and for this reason many physicians recommend that each child consume at least a quart of milk each day. Attention should be directed to table 1 where the unusually high calcium requirements of boys are listed. In order to supply the 1.4 grams of calcium that are needed by a boy in the age group of 13 to 20, it would be well if more than a quart of milk were consumed each day.

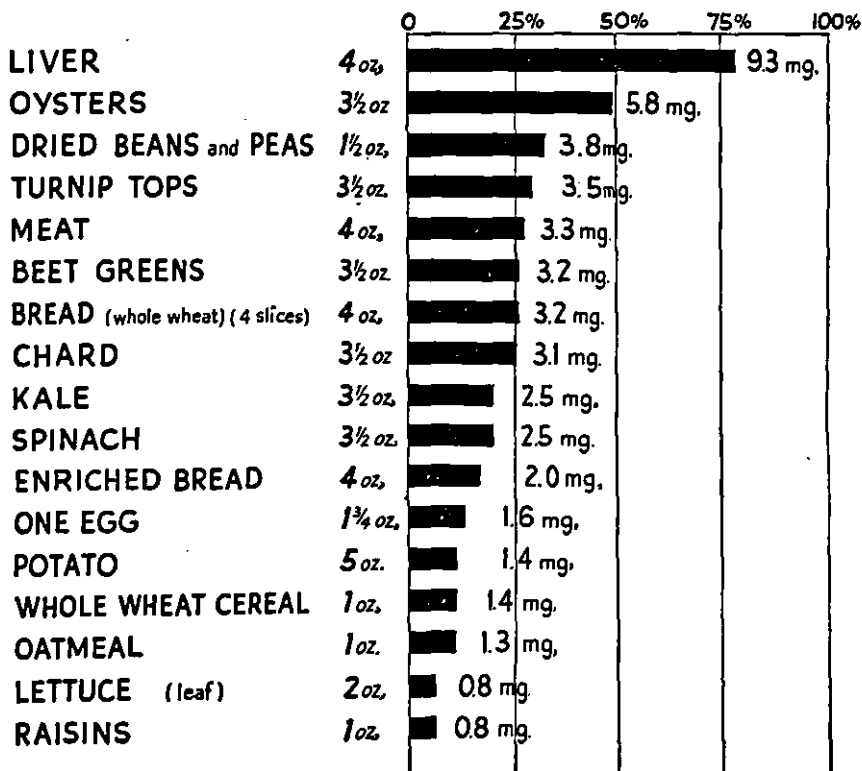
Cheese contains varying proportions of the calcium of milk, depending on the method of manufacture. Cheddar cheese is rich in calcium but cottage cheese is a relatively poor source. Outside of milk and some milk products, good sources of calcium are few. The relatively high concentration of calcium in mustard greens, turnip greens, and collards is noteworthy. The calcium in spinach is not available to the body because it is not absorbed. It is probable also that the calcium of beet greens is unavailable to the body. Hot biscuits made with self rising flour supply significant quantities of this dietary essential, because this flour is "phosphated" by the addition of a calcium phosphate salt.



# FOODS AS SOURCES OF IRON

Beans, meats, the green leafy vegetables  
and nutritionally unimpaired cereals  
are the best common sources of iron.

CONTRIBUTION OF SELECTED SERVINGS OF A FEW FOODS AS  
PERCENTAGES OF ADULT MALE ALLOWANCE (12 MILLIGRAMS)



## IRON

The amount of iron in the body is small, but at times it may not be easily obtained from foods. The weight of iron in the body of a man is about equal to the weight of a five cent piece. About two thirds of this iron is present in hemoglobin, the protein which constitutes the red coloring matter of the blood. Similar compounds of iron are essential agents in cellular oxidations. Deficiencies of iron may lead to a decrease in hemoglobin. Such deficiencies are most apt to occur during early childhood, in adolescence, in pregnant women, and in middle aged women. There are other forms of anemia, or hemoglobin deficiency, which are not related to iron.

The chart shows that beans and peas, meats, and the green leafy vegetables, and nutritionally unimpaired cereals are the best sources of iron. Enriched flour and enriched bread contain this dietary essential in significant amounts. The iron of different foods is not equally available to the body. The values listed in the chart are figures for total iron content. The availability of iron in all of the foods listed in this chart has not been accurately determined but the value for the dietary allowance has been expressed in terms of total iron rather than available iron.

OTHER REQUIREMENTS AND THE RECOMMENDED  
DAILY ALLOWANCES FOR SPECIFIC NUTRIENTS

The Food and Nutrition Board of the National Research Council which developed the table of dietary allowances, frequently called a "Yardstick of good nutrition," has emphasized that these figures (see table 1) represent a tentative goal toward which to aim in planning practical dietaries. The recommended allowances can be met by the selection of a good diet of natural foods. Such a diet also will provide other minerals and vitamins, the requirements for which are not well known, for example, copper, vitamin K, pantothenic acid and pyridoxine (the requirements for the latter two substances are as yet unknown). In the case of copper the Food and Nutrition Board recently has reached the following decision:

"The requirement for *copper* for adults is in the neighborhood of 1.0 to 2.0 milligrams a day. Infants and children

TABLE 1.—*Recommended Dietary Allowances*  
Food and Nutrition Board, National Research Council

	Calories	Protein Gms.	Oa Gms.	Fe Mg.	Vitamin A I. U.	Thiamine (B <sub>1</sub> ) Mg.	Ribo- flavin Mg.	Nicotinic Acid Mg.	Ascorbic Acid Mg.
<b>Man (70 Kg. or about 154 lbs.)</b>									
Moderately active.....	3,000	70	0.8	12	5,000	1.8	2.7	18	75
Very active.....	4,500	..	..	..	.....	2.3	3.3	23	..
Sedentary.....	2,500	..	..	..	.....	1.5	2.2	15	..
<b>Woman (50 Kg. or about 123 lbs.)</b>									
Moderately active.....	2,500	60	0.8	12	5,000	1.5	2.2	15	70
Very active.....	3,000	..	..	..	.....	1.8	2.7	18	..
Sedentary.....	2,100	..	..	..	.....	1.2	1.8	12	..
Pregnancy (latter half).....	2,500	85	1.5	15	6,000	1.8	2.5	18	100
Lactation.....	3,000	100	2.0	15	8,000	2.3	3.0	23	150
<b>Children up to 12 years:</b>									
Under 1 year.....	100/Kg.	3-4/Kg.	1.0	6	1,500	0.4	0.6	4	30
1-3 years.....	1,200	40	1.0	7	2,000	0.6	0.9	6	35
4-6 years.....	1,600	50	1.0	8	2,500	0.8	1.2	8	50
7-9 years.....	2,000	60	1.0	10	3,500	1.0	1.5	10	60
10-12 years.....	2,500	70	1.2	12	4,500	1.2	1.8	12	75
<b>Children over 12 years:</b>									
Girls, 13-15 years.....	2,800	80	1.3	15	5,000	1.4	2.0	14	80
16-20 years.....	2,400	75	1.0	15	5,000	1.2	1.8	12	80
Boys, 13-15 years.....	3,200	85	1.4	15	5,000	1.6	2.4	16	90
16-20 years.....	3,800	100	1.4	15	6,000	2.0	3.0	20	100

TABLE 2.—*Minimum Dietary Requirements*  
Food and Drug Administration, Federal Security Agency

	Calcium Gm.	Phosphorus Gm.	Iron Mg.	Iodine Mg.	Vitamin A (I. U.)	Thiamine Mg.	Ascorbic Acid Mg.	Riboflavin Mg.	Nicotinic Acid Mg.
Persons 12 or more years of age.....	0.75	0.75	10	0.1	4,000	1.0	30	2.0	10*
Pregnant or lactating woman.....	1.5	1.5	15	..	.....	..	..	..	..
Child 1 to 12 years.....	0.75	0.75	7.5	0.1	3,000	{ 0.50— 0.75 }	20	†	..
Infant (under 1 year)†.....	....	....	..	..	1,500	0.25	10	0.5	..

Vitamin D requirement is considered to be 400 I. U. or U. S. P. units irrespective of age.

\* This value is not in regulations but has been recommended by the Food and Nutrition Board, National Research Council.

† Requirement not established.

‡ Labels of products represented as substitutes for human milk are required to bear statements that additional quantities of vitamins or iron should be supplied from other sources, if in each 100 calorie portion there should be less than 30 U. S. P. units of vitamin C, less than 50 U. S. P. units of vitamin D, or less than 0.75 mg. of iron.

require approximately 0.05 mg. per kilogram of body weight. The requirement for copper is approximately one-tenth of that for iron."

Regarding vitamin K the Food and Nutrition Board has written as follows:

"The requirement for *vitamin K* is usually satisfied by any good diet. Special consideration needs to be given to newborn infants. Physicians commonly give vitamin K either to the mother during pregnancy or to the infants immediately after birth."

It should be mentioned that 1 milligram of thiamine equals 333 international units and 1 milligram of ascorbic acid (vitamin C) equals 20 international or U. S. P. units. The needs for infants increase with the growth of the baby. The quantities listed in the table are for infants at the age of approximately 6 to 8 months. The requirements for protein and calcium listed for infants would be less if derived from human milk. The allowances for older children are calculated in terms of the middle year in each group and for moderate activity.

Concerning vitamin A, it has been pointed out that the requirements may be less if animal foods are the principal source. The requirements probably are greater if they are satisfied chiefly by the use of vegetable foods which contain the provitamin, carotene.

No values have been assigned for the vitamin D requirements of older children and adults, though the vitamin is recognized to be important in the nutrition of all ages. When not available through exposure to sunlight, this vitamin should be provided to the extent of about 400 U. S. P. units daily. No chart for vitamin D has been provided because ordinary foods are not to be relied upon as sources of this essential. There are available cod liver oil and other fish liver oil preparations as well as other pharmaceutical products which supply vitamin D. In addition, vitamin D milk, either fluid or evaporated milk, is obtainable in most communities. This product may contain either 135 or 400 U. S. P. units of vitamin D to the quart. It is essential to consult the labels of milk products in order to determine their vitamin D potencies.

The iodine requirements can be met by the regular use of iodized salt. Sea foods are generally good

sources of iodine but in many localities they are so unavailable or used so infrequently that dependence should not be placed on them. The Food and Nutrition Board has written about the iodine requirement as follows:

"The requirement for iodine is small; probably about 0.002 to 0.004 milligram a day for each kilogram of body weight. This need is easily met by the regular use of iodized salt; its use is especially important in adolescence and pregnancy."

#### MINIMUM REQUIREMENTS OF FOOD AND DRUG ADMINISTRATION

Many commercial products intended for special dietary purposes will be labeled in accordance with regulations developed by the Food and Drug Administration. For this reason the minimum daily requirements for important dietary constituents are shown in table 2. The values selected are those which have been shown to be reasonably above the quantities necessary to prevent gross signs of dietary deficiency diseases. They are minimum requirements rather than desirable intakes.

#### OTHER SOURCES OF INFORMATION

There now are available many books on nutrition and many tables of food values. Many excellent pamphlets have been prepared by state and other organizations, especially by the agricultural experiment stations. Information about available government publications on foods and nutrition may be secured from the Office of the Chief, Nutrition Programs Branch, Office of Distribution, War Food Administration, Washington, D. C.